AGRICULTURAL DECISION-MAKING IN TURKEY FROM CLIMATE CHANGE PERSPECTIVE: A NEW ROAD MAP FOR THE PERIOD OF 2021-2050

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ABSTRACT

AGRICULTURAL DECISION-MAKING IN TURKEY FROM CLIMATE CHANGE PERSPECTIVE: A NEW ROAD MAP FOR THE PERIOD OF 2021-2050

The expectation that it can affect basic life resources and particularly food security on a global, regional, and local scale with its impact on the ecosystem has made climate change one of the most urgent issues on the global agenda. Extreme weather events due to climate change may degrade food quality, affect access to food and raise food prices, markedly affecting agricultural productivity. Many countries have already been faced the global impacts of climate change, therefore studies on the effects that may occur on ecosystems are of great importance. As one of the regions that may be most affected by climate change, the Mediterranean Basin is at risk in terms of agricultural production due to temperature increases and precipitation regime changes, and what's more the increase in the frequency and severity of extreme weather events due to climate change. As a country located in the Mediterranean Basin, Turkey may also suffer from climate change. This situation poses a risk in terms of crop production value and export income, particularly for products with high commercial value grown in Turkey. Therefore, the study has focused two crops of the country i.e., hazelnut and grape with the high commercial value. In the first stage, the climate data for different phenological periods and different variables for each crop was obtained from the regional climate model, RegCM4.4 with the MPI-ESM-MR global climate model under the RCP8.5 pessimistic scenario for the baseline of 1991-2012 and the future period of 2021-2050. In the second stage, the change in hazelnut yield was analyzed by statistical approach, panel data method, and the change in grape yield was analyzed using the crop growth simulation model, STICS. At the last stage, how the climate conditions of hazelnut (88 locations) and grapes (96 locations) will change in the future has been examined by using membership function. However, considering the crop production values of these two crops and export revenue contribution to the national economy, the possibility of new locations where these crops may grow in the future has been analyzed in 923 locations throughout Turkey. Accordingly, at this stage of the thesis, climate suitability index was calculated for hazelnut and grape, and climatic suitability conditions were determined according to 5 classification ranges. In brief, it has been observed that climate change may have a negative impact on both hazelnut and grape yields in the future and it is predicted that there may be significant reductions in climatic suitability conditions in the locations where these two crops grow.

ÖZET

TÜRKİYE'DE İKLİM DEĞİŞİKLİĞİ BAKIŞ AÇISINDAN TARIMSAL KARAR ALMA SÜRECİ: 2021-2050 PERİYODU İÇİN YENİ YOL HARİTASI

Ekosistem üzerindeki etkisiyle temel yaşam kaynaklarını ve özellikle gıda güvenliğini küresel, bölgesel ve yerel ölçekte etkileyebileceği beklentisi, iklim değişikliğini küresel gündemin en acil konularından biri haline getirdi. İklim değişikliğine bağlı aşırı hava olayları tarımsal verimliliği önemli ölçüde etkileyerek gıda kalitesini bozabilir, gıdaya erişimi etkileyebilir ve gıda fiyatlarını yükseltebilir. İklim değişikliğinin küresel boyuttaki etkileriyle birçok ülke halihazırda yüzleşmekte, bu nedenle özellikle ekosistemler üzerinde oluşabilecek etkilere yönelik çalışmalar oldukça önem arz etmektedir. Akdeniz Havzası iklim değişikliğinden en fazla etkilenecek bölgelerden biri olarak sıcaklık artışları ve yağış rejimindeki değişimlerle dahası aşırı hava olaylarının sıklığı ve şiddetinin artmasına bağlı tarımsal üretim açısından risk altındadır. Türkiye de Akdeniz Havzası'nda yer alan bir ülke olarak iklim değişikliğinden nasibini alacaktır. Bu durum özellikle Türkiye'de yetişen ticari değeri yüksek ürünler için bitkisel üretim değeri ve ihracat geliri açısından bir risk oluşturmaktadır. Bu nedenle, bu çalışma ülkede ticari değeri yüksek iki ürün olan fındık ve üzüme odaklanmıştır. Çalışmanın üç aşaması bulunmaktadır. Birinci aşamada, 1991-2012 geçmiş ve 2021-2050 gelecek periyodu için RCP8.5 kötümser senaryosu altında bölgesel iklim modeli, RegCM'den MPI-ESM-MR küresel iklim modeli kullanılarak her bir ürün için farklı fenolojik dönemler ve farklı değişkenler için 10 km çözünürlükte iklim datası elde edilmiştir. İkinci aşamada, fındık verimindeki değişim istatistiksel yaklaşımla panel veri metodu ile, üzüm verimindeki değişim ise ekin büyüme simülasyon modeli, STICS kullanılarak analiz edilmiştir. Son aşamada ise, fındık (88 lokasyon) ve üzüm (96 lokasyon) için iklimsel uygunluk koşullarının gelecekte nasıl değişeceği üyelik fonksiyonundan yararlanılarak incelenmiştir. Bununla birlikte, bu iki ürünün bitkisel üretim değeri ve ulusal ekonomiye olan ihracat geliri katkısı dikkate alınarak, bu ürünlerin yetişebileceği yeni lokasyonların olabilirliği Türkiye genelinde 923 lokasyonda gelecek için incelenmiştir. Buna göre, tezin bu aşamasında fındık ve üzüm özelinde, iklim uygunluk indexi hesaplanmış ve beş sınıflandırma aralığına göre iklimsel uygunluk koşulları belirlenmiştir. Özetle, gelecekte iklim değişikliğinin hem üzüm hem de fındık verimi üzerinde olumsuz etkisi olduğu gözlenmiş, bu iki ürünün yetiştiği lokasyonlarda iklimsel uygunluk koşullarında önemli azalmalar olabileceği öngörülmüştür.

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LIST OF SYMBOLS/ABBREVIATIONS

Symbol	**Explanation**	**Unit**
AET	Total Actual Evapotranspiration	mm
α	Constant term	
β_0	Constant term	
β_1	Slope coefficient	
CH_4	Methane	mL/day
CO_2	Carbon Dioxide	
Cov	Covariance	
DTR	Diurnal Temperature Range	° C
i	Unit	
μ_i	Unit effects	
N_2O	Nitrous Oxide	
Pr	Total Precipitation	mm
Rad	Solar Radiation	Mj/m2
RH	Relative Humidity	%
$\sigma_u{}^2$	Variance of error terms	
$\sum \hat{u}^2$	Sum of squares of error terms	
SunD	Duration of Sunshine	hour
t	Time	
T_{max}	Maximum Temperature	° C
T_{mean}	Mean temperature	° C
T_{min}	Minimum Temperature	° C
u_{it}	Error term	
Var	Variance	
WS	Wind Speed	m/sn
X_1	Explanatory variables	
Y_{it}	Dependent variable	
$\hat{Y}_{it}$	Estimated Dependent variable	

Abbreviation	**Explanation**
A	Humid tropical (hot) climate
AC	Acceptable
AFRUITPOT	Maximum number of fruit structures
ALBSOL	Albedo of lean soil
B	Arid climates
BAU	Business as Usual
BE	Between-groups estimation method
BS	Subtropical step
C	Humid medium latitude (temperate)
Cf	Humid subtropical
CROIFRUIT	Increase of weight of fruit per square meter per day
Cs	Mediterranean climate
Csa	Temperate, dry summer, hot summer
D	Humid cold mid latitude (severe in winters)
DENSITESEM	Plant sowing density
DESHYDBASE	Rate of change of fruit water content vs thermal time
Df	Humid climate (terrestrial)
Ds	Continental climate
DUREEFRUIT	Total growth period of a fruit at the setting stage to the physiological maturity
E	Polar climates (polar)
EF	Modeling Efficiency
EIC	Equal Interval Classification
ES	Extremely Suitable
ETMAX	Maximum evapotranspiration
ETMIN	Minimum evapotranspiration
EU	European Union
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FE	Fixed Effect
FGELFLO	Frost stress index
FGLS	Flexible generalized least-squares method
FPFT	Fruit sink strength

FTEMPREMP	Thermal stress index
GCMs	Global Circulation Models
GCSI	Grape Climate Suitability Index
GDD	Growing Degree Days
GHG	Greenhouse Gas
GLS	Generalized least squares method
GMAX	Maximum soil temperature
GMIN	Minimum soil temperature
H2OFRVERT	First water rate in the fruit
HAUTBASE	Basal height of crop
HAUTMAX	Maximum height of crop
HCSI	Hazelnut Climate Suitability Index
IAMF	Maximum acceleration of leaf growth, end of juvenile phase
IDEBDES	Onset of water dynamics in fruit
IDEBDORM	Beginning of dormancy
IDRP	Onset of filling of harvested organs
IDW	Inverse Distance Weigthing
IFINDORM	Break of Dormancy
ILAX	Maximum leaf area index, end of leaf growth
ILEV	Emergence or Budding
IMAT	Physiological maturity (the harvested organ stop growing in dry matter terms
INN	Nitrogen Nutrition Index
INNLAI	Nitrogen stress factor
INOU	End of fruit setting (for indeterminate crops)
IPCC	Intergovernmental Panel on Climate Change
IREC	Harvest
JVC	Number of vernalising days
KOP	Konya Plains Project
LAI	Leaf Area Index
LM	Lagrange Multiplier
LR	Likelihood Ratio
LSDV	Least squares dummy variable method
MAE	Mean Absolute Error
MAGRAIN	Weight of the grains

MGM	Turkish State Meteorological Service
MoEU	Ministry of Environment and Urbanization
MPI-ESM-MR	Global Climate Model of the Max Planck Institute for Meteorology
MS	Marginal Suitable
MSE	Mean Squared Error
NBC	Natural Break Classification
NBINFLO	Number of clusters of the crop
NBOITE	Number of boxes in boxcertrain technique
NFRUIT	Number of fruits in box of boxcertrain technique
NFRUITNOU	Number of fruit structures formed daily
PC	Percentile Classification
PGRAINMAXI	Maximum dry rain weight
PI	Photothermal Index
POLS	Pooled least squares method
Q0	Cumulative soil evaporation above which evaporation rate is decreased
QNGRAIN	Amount of nitrogen in the grains
QNplante0	Initial nitrogen amount in the plant
r	Correlation Coefficient
RAAMAX	Maximum aerodynamic resistance
RAAMIN	Minimum aerodynamic resistance
RCP2.6	Low pathway where radiative forcing peaks at approximately 3 W m^{-2} (Optimistic Scenario)
RCP4.5	Intermediate stabilization pathway, radiative forcing is stabilized at approximately 4.5 W m^{-2}
RCP6.0	Intermediate stabilization pathway, radiative forcing is stabilized at approximately 6.0 W m^{-2}
RCP8.5	High pathway where radiative forcing peaks at approximately 3 W m^{-2} (Pessimistic Scenario)
RCPs	Representative Concentration Pathways
RE	Random Effect
RegCM4.4	Regional Climate Model, version 4.4
Resperenne0	Initial reserve of biomass
RFPI	Factor that slows the plant growth due to the photo-period

RFVI	Factor that slows the plant growth due to the vernalization
RMAE	Relative Mean Absolute Error
RMSE	Root Mean Squared Error
RNET	Net radiation from sun
RNETMAX	Maximum net radiation from sun
RNETMIN	Minimum net radiation from sun
RRMSE	Relative Root Mean Square Error
SGB	Directorate of Strategy Development
SOURCEPUITS	Source / sink ratio
SPFRUIT	Trophic stress index
STAMFLAX	Cumulative thermal time between the maximum acceleration of leaf growth and maximum leaf area index
STDORDEBOUR	Cumulative thermal time between the dormancy break and the bud break
STDRPNOU	Cumulative thermal time between the starting date of filling of harvested organs and end of setting
STFLODRP	Cumulative thermal time between flowering and starting date of filling of harvested organs
STICS	Multidisciplinary Simulator for Standard Crops
STLEVDRP	Cumulative thermal time between the emergence and starting date of filling of harvested organs
STRESSDEV	Maximum delay factor
SU	Suitable
TCULT	Crop surface temperature
TCULTMAX	Maximum crop surface temperature
TCULTMIN	Minimum crop surface temperature
TCXSTOP	The maximum temperature to the maximum upper temperature where development stops
TDMAX	37 ° C for grapes
TDMAXDEB	Maximal temperature for hourly calculation of phasic duration between dormancy and bud breaks
TDMIN	10 ° C for grapes
TDMINDEB	Minimal thermal threshold for hourly calculation of phasic duration between dormancy and bud breaks
TEAUGRAIN	Water ratio of grain

TEMPDESHYD	Increase in fruit dehydration rate due to the increase in crop temperature
TGELFLO10	Temperature that causes 10 % frost damage
TGELFLO90	Temperature that causes 90 % frost damage
TI	Thermal Index
TMAX	Maximum air temperature
TMIN	Minimum air temperature
TOMGRO	Dynamic Tomato Growth and Yield Model
TSOL	Soil Temperature
TURFAC	Water stress factor
TURKSTAT	Turkish Statistical Institute
UDEVCULT	Effective crop temperature
UNFCCC	The United Nation Framework Convention on Climate Change
UPVT	Crop temperature
VPI	Photothermal Index which Reckons Vernalization
VS	Very Suitable
WE	Within estimation method
WGII AR5	Fifth Assessment Report (AR5), Working Group II

1. INTRODUCTION

1.1. A Brief Overview to Climate Change, IPCC Projections and Adaptation

Since the industrial revolution, atmospheric carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) concentrations have significantly increased. Between 1750 and 2011, anthropogenic CO_2 emissions accumulated in the atmosphere were around 2000 $GtCO_2$. Approximately 40 % of these emissions remained in the atmosphere, and the remaining 60 % (about 1200 $GtCO_2$) were stored on land (in plants and in soils) and in the ocean. Approximately 30 % of this released anthropogenic CO_2 has been absorbed by the oceans, resulting in acidification in the oceans. Approximately half of the anthropogenic CO_2 emissions accumulated in the atmosphere between 1750 and 2011 occurred in the last four decades. This may be explained by the fact that each decade of the last thirty years has been warmer than the past ten years (IPCC, 2014a). Eventually, the climate has changed, and we have been experiencing its effects much more deeply. Therefore, it is worth mentioning some keywords to understand impacts and the risks arising from climate change.

1.1.1. Key Terms for Understanding the Climate Change and Climate Change Impacts (IPCC, 2013)

Climate Change: Here we will focus on climate change caused by human activities. Some of the energy coming from the sun to the earth is reflected directly and some arrive to the earth's surface thanks to the greenhouse gases like carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) in the atmosphere. It allows different climate types to be formed in different geographies of the earth. However, due to the increase in greenhouse gases in the atmosphere in the last century, some of the energy that needs to be reflected from the earth surface is kept and changes occur in the climate system we are accustomed to in the medium and long term. In this context, change in the climate system can be identified by changes in the mean and variability for the decades or longer. The United Nation Framework Convention on Climate Change (UNFCCC) defines the climate change as: "*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods*" (UNFCCC, 1992).

Climate Change Impacts: Climate change impacts are now clearly observed. Changes in the frequency, severity and duration of short and long-term extreme weather and climate events affect the natural and human systems. These effects often result from the vulnerability of a society or system exposed to these changes. In other words, ecosystems suffer from these effects and, those societies are unable to cope with, moreover, livelihoods, health conditions and infrastructure services are damaged and become insufficient.

Extreme Climate Events: They are climate events damaging ecosystems due to climate change. Extreme climate events occur in two ways: short and long term. The short-term ones are extreme weather events such as heatwaves, hurricanes, floods that occur on a day-based sudden and fast. Long-term ones are extreme climate events due to climatic changes in a long period of time, such as drought.

Natural (Climate) Hazards vs Natural Disasters: It usually refers to climate-related physical or geographical events, which occur naturally. They are natural events in weather cycles. If natural hazards lead to a significant loss of human life or damage to property or environmental damage, it is called natural disaster. 1.3 million people died, and 4.4 million people injured and displaced and became homeless due to climate-related and geophysical disasters from 1998 to 2017 (Mizutori and Guha-Sapir, 2017). Most of these fatal impacts were thanks to geophysical events such as tsunamis, 91 % of all disasters were caused by floods, storms, droughts, heatwaves, and other extreme weather events (Mizutori and Guha-Sapir, 2017). 95.6 million people were affected by 335 natural disasters in 2017. 9,697 people died and it caused an economic loss of $335 billion (CRED, 2017). The frightening socio-economic figures that have emerged as a result of these disasters reveal the reality of climate change that we have already faced and need to be urgently addressed.

Exposure: Exposure is a dynamic factor that varies temporally and spatially, based on economic, social, demographic, geographical, cultural, institutional, governance and environmental factors (Cardona et al., 2012). In a way, it is to damage people’s basic requirements including, housing, livelihood, sanitation services, infrastructure, ecosystem services, and environmental resources, in other words economic, social, and cultural assets in places depending on the development level. That is all settings about human life could be adversely affected by exposure to climate change impacts.

Vulnerability: Vulnerability is the lack of capacity to cope and adapt by covering variety of concepts such as economic, social, environmental. The main differences in the vulnerability of societies or systems arise from some non-climatic factors, such as socio-economic inequalities, which depend on the development level. However, although they are not caused by climate change, the vulnerabilities contain various risks depending on their differences. The literature on risk is concerned with exposure to natural hazards stemming from climate change and underdevelopment level covering non-climatic factors. Climate change risks are expected to amplify vulnerabilities and extend the conditions by introducing new uncertainties. For example, more economically vulnerable societies may become vulnerable in many respects i.e., socially, and environmentally with climate change, in particularly underdevelopment. Communities with different characteristics as social, economic, cultural, political, and institutional can be particularly undefended to climate change and adaptation strategies. As a matter of fact, vulnerability often does not arise from a single situation. Often, it is caused by the inadequacy of multiple factors. It should be taken into consideration that a society with low income may experience both social and demographic problems. For example, societies with low-income levels cannot also reach adequate levels of education and uncontrolled reproduction is very common in these societies. The combination of several negative factors emerges as an outcome of social processes that give rise to these inequalities. Social processes that constitute inequalities are differences such as gender, class, ethnicity, age, and ability. High vulnerability as a function of exposure, sensitivity and adaptive capacity are often the result of distorted development processes such as environmental mismanagement, uncontrolled demographic changes, rapid and unplanned urbanization in inappropriate areas, poor governance, and scarce livelihood options for the poor (Cardona et al., 2012). In other words, the risk is determined not only by the climate and weather events (the natural hazards) but also by the exposure and vulnerability to these hazards.

Risk: Risk refers to the risk of climate change impacts resulting from vulnerability by exposure to natural hazards. Risk can be broadly defined as the likelihood of catastrophic events that may occur because of extreme weather events, or the possibility of occurrence of new situations that may occur due to these disasters. Risks increase due to the uncertainties of the results that may arise from the effects of climate change. The effects of climate-related extreme weather events such as heatwaves, droughts, floods, cyclones, and forest fires have recently posed a negative risk to the functioning of all living ecosystems (very high confidence). Depending on extreme weather events, the damage to ecosystems further increases vulnerability. In brief, the answer to the question of "what does ecological damage or the risk of ecosystems functioning refer to" becomes meaningful. For instance, damage to food production systems and water supply sources or infrastructure systems can exemplify the loss of ecosystem sustainability. The sustainability of ecosystems is essential for human welfare. Thus, the vulnerability levels of developed and developing countries towards climate change are directly proportionate to their level of welfare.

Adaptation: The process of arrangements to cope with climate change impacts. Adaptation is to take social and institutional precautions based on ecosystem against the effects of climate change and to prepare social systems for the short- and long-term disasters. Governments try to integrate climate change into their development plans and to improve long-term policies. Some adaptation practices integrated into development plans and supported by long-term policies are as follows: disaster risk management, infrastructure improvements, public health measures and reduction of socio-economic vulnerabilities through diversification of livelihoods, coastal management and coastal forestations, water resources management, protection of natural area and environment, technology improvements and pre-warning systems, strengthening of the energy infrastructure and the use of renewable energy systems, agricultural diversity for food security, future climate forecasts with high-resolution climate models and climate policies. In general**,** it requires **a transformation** in the basic properties of natural and human systems. In other words, it can be defined as the transformation of societies or systems with social, environmental, and economically diversified sustainable development tools to create better living conditions or to be prepared for possible climatic disasters. This transformation enables communities to become stronger and more sustainable. For example, in underdeveloped society struggling with so many problems, poverty reduction makes it more socially and economically viable.

Resilience: Resillience can be defined as the capacity of social, economic, and environmental factors to cope with a natural disaster stemming from climate change or any disturbance trend to protect their fundamental structures and essential functions or the ability of reorganizing and also maintaining the adaptive, learning and transformation capacity for stress and change (IPCC, 2014b, 2014c, 2014d). In other words, briefly, the ability of recovering of a system or community potentially exposed to the effect of hazards which may have damaged basic requirements. The resilience of countries against climate change indicates their ability to stand up recurrence due to their social, institutional, economic, and environmental structure elasticity, when they are damaged. The high resilience of a country means that that country can quickly heal its wounds against the effects of climate change and normalize life in a short time.

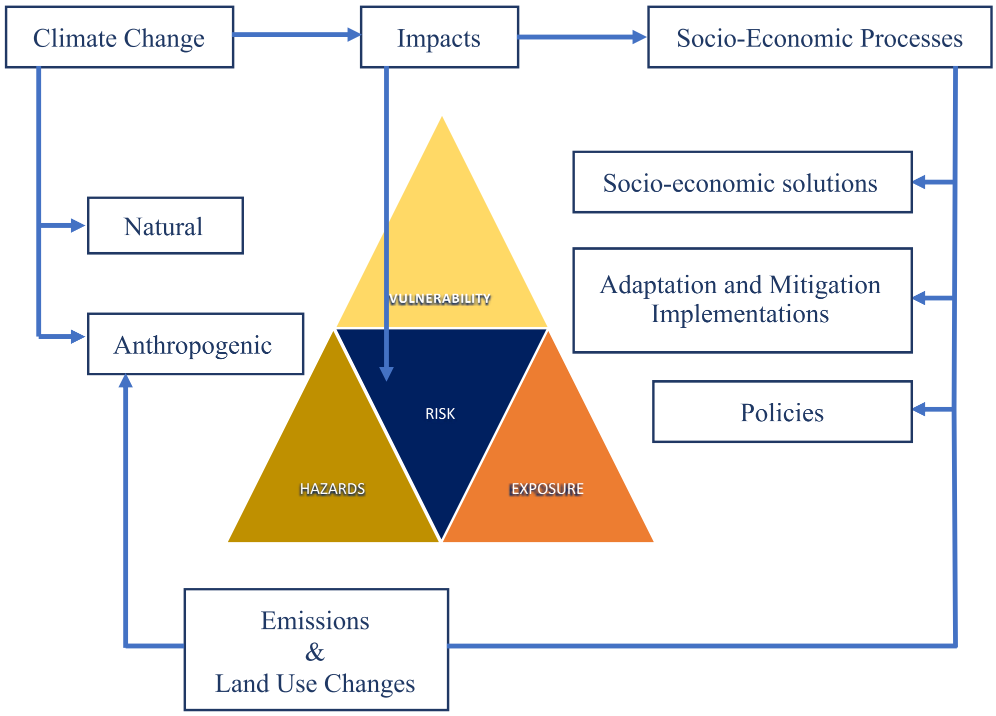


Figure 1.1. The core concepts of the WGII AR5. Risk of climate-related impacts results from the interaction of climate-related hazards with the vulnerability and exposure of human and natural systems. Changes in both the climate system (left) and socioeconomic processes including adaptation and mitigation (right) are drivers of hazards, exposure, and vulnerability (Source: Rearranged by the author regarding IPCC (2014b)).

In sum, we should understand well the risks posed by climate change, environmental damaging from the natural disasters and the socio-economic vulnerabilities resulting from these effects, and the risks that may arise because of further exposure to these effects. Also, we need to be able to build the adaptation process and support policies, which consist of socio-economic solutions in order to make it sustainable. Therefore, it is also important to grasp the cycle of key terms (Figure 1.1).

1.1.2. IPCC Scenarios

Scientists benefit from a variety of climate models that are designed to forecast the impacts of climate change on natural and human systems in the future, and to adapt and mitigate these impacts. These climate models, which are operated with various scenarios, reveal various projections with significant outputs for the impact studies regarding the future.

From a scientific point of view, it is possible to measure the climatic variables such as temperature and precipitation in the past, and accordingly, to specify the temperature and precipitation changes. However, it is necessary to foresee the changes in the climate and its effects on natural and human systems to be able to take measures in the future. For this reason, scientists create various climate scenarios in order to reduce or provide adaptation to these effects depending on the development of economic systems. RCPs (Representative Concentration Pathways) are a set of emission scenarios designed to address potential development policies that may impact climate change (Moss et al., 2010; van Vuuren et al., 2011). RCPs represent the level that radiative forcing (W/m^2) will reach at the end of the century. There are four RCP scenarios, namely RCP2.6, RCP4.5, RCP6.0, RCP8.5.

All these scenarios have been designed considering various demographic and economic trends or technological advances (Riahi et al., 2007). Among these scenarios, RCP2.6 is the most optimistic scenario developed to limit anthropogenic climate change. In order to achieve this scenario, developed and developing countries should start to reduce greenhouse gases released by acting together. RCP8.5 is defined as the most pessimistic scenario representing the business as usual (BAU) case. These four scenarios are RCP8.5 (pessimistic scenario), which means continuing to develop economically without making any changes to the standard way of living; RCP4.5 and RCP6.0, which require some changes in the standard way of living, and RCP2.6 (optimistic scenario) which mean radical changes that must be done to the standard way of living. In the literature, there are studies explaining RCPs' meaning, development, and selection process in detail (Moss et al., 2010; van Vuuren et al., 2011).

In this study, the RCP8.5 scenario is used because it represents the BAU case. RCP8.5 is the worst-case emission scenario, and it corresponds to high greenhouse gas emissions in the atmosphere. The scenario predicts that greenhouse gas concentrations will increase significantly in the upcoming period and will cause a beam of 8.5 Watt per square meter at the end of the century (Riahi et al., 2007, 2011). As for this scenario, economic growth will continue in the same way without any measures regarding climate change. This means that CO_2 emissions will continue without any compromise on the way of life to grow economically worldwide.

1.2. Climate Change and Agriculture

Climate has direct and indirect influences on human life. Climate has constantly been changing in millions of years, and all living creatures are slowly adapting to this changing climate. In this way, the changes in the climate do not have a negative effect on the living creatures. However, in the last century, due to the rapid increase in greenhouse gases in the atmosphere, the climate changes that have occurred in hundreds of years have started to form on a scale of decades. Climate change resulting from achieving the highest levels of carbon dioxide in history directly affects agricultural production. Since crops with certain ecological requirements cannot easily adapt to these changes, significant decreases in agricultural productivity have been experienced.

According to the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), crop yields in many parts of the world show a decreasing trend with changing climate (Porter et al., 2014; Ray et al., 2015). The change in crop yield is undesirable for many reasons such as income risk and supply stability. Some studies draw attention that low-yield variability leads to stable farmer incomes (Reidsma et al., 2010; Li et al., 2013; Ray et al., 2015) and food supply (Slingo et al., 2005; Lobell et al., 2011; Ray et al., 2015) by significantly obstructing the price boom that have a negative impact on food security worldwide. The price boom has affected crop producers by disrupting the income and food supply stabilization (Ray et al., 2012, 2013, 2015). Particularly in countries that are dependent on food imports, weather forecasts and climate projections play an important role in accurately monitoring global food production (Iizumi et al., 2013; Ray et al., 2015).

There has been much discussion on the strong impact of climatic factors on the crops. Many studies on agricultural impact refer to the effects of climatic change on the crop yield (Adams et al., 2001; Mall et al., 2006). The planting and harvest dates and phenological periods of the agricultural products are influenced by the climatic conditions. Changes in phenological structure depending on changes in climatic (e.g., temperature, precipitation, relative humidity, duration of sunshine, etc.) and soil conditions (e.g., nutrients, moisture content, water stress, etc.) affect production quantity and crop quality, which are especially important for high commercial value crops. In this way, climate change has been threatening the quality of life by reducing the amount of available food with the growing population more particularly in developing countries. Many developing countries, which are vulnerable to the effects of climate change and currently facing food security issues, are struggling extensively with extreme climate events arising from climate change.

In fact, the agriculture sector is one of the sectors that will be the most affected by climate change, as well as having an important share in greenhouse gases in the atmosphere. Precisely for this reason, estimating and monitoring the socio-economic and environmental impacts of climate change on crop yield is crucial for the future. However, it is difficult to see that how to make an impact clearly on producers for the future in different locations (Hardy, 2003). In the last three decades, assessment of the relationships between climate change and future agricultural production has been carried out in several different aspects which emphasize production and yield change, physical processes of growth, management options and economic impacts (Singh and Stewart, 1991; Easterling et al., 1992; Kenny et al., 1995; Olesen and Bindi, 2002; Parry et al., 2004; Ewert et al., 2005; Olesen et al., 2007; Ortiz et al., 2008; Lobell et al., 2011; Olesen et al., 2011; Rowhani et al., 2011; Zhang and Huang, 2012; Osborne and Wheeler, 2013; Tao et al., 2013; Wheeler and von Braun, 2013). Many studies indicate the relationship between climate factors and crop yield and what the relationship depends on (Olesen and Bindi, 2002; Ewert et al., 2005; Olesen et al., 2007; Lobell et al., 2011; Olesen et al., 2011; Rowhani et al., 2011; Zhang and Huang, 2012; Osborne and Wheeler, 2013; Tao et al., 2013; Wheeler and von Braun, 2013). There are numerous studies with averages of climatic variables in a specific time representing the climate change effects (Asseng et al., 2011; Lobell et al., 2011; Urban et al., 2012; Butler and Huybers, 2013; Wheeler and von Braun, 2013), and fewer studies are concerned with the variations in climate change impacts on the crop yield over high-resolution time in the literature (Chen et al., 2013; Osborne and Wheeler, 2013). Many of them emphases that agricultural productivity is affected by combined effects of rising temperatures and risk of droughts, and declining water availability based on changing precipitation regime.

Climate variability explains the more than 30 % of the interannual variability of global crop yield (Ray et al., 2015). The vast majority of studies on basic crops, i.e corn, rice and wheat, sugar beat emphasize that a few degrees of temperature increase may result in a decline in crop yield (Freckleton et al., 1999; Pidgeon et al., 2001; Asseng et al., 2011). The severity of this adverse impact exhibits a spatio-temporal variability behavior. Some studies are addressing the negative relationship between sugar beet yield and temperature (Freckleton et al., 1999) and drought due to the decrease in precipitation and increase in temperature, sugar beet yield may reduce in east Ukraine and southern Russia by more than 40 % and central Ukraine, west Poland, east Germany, and England by 15-30 % in the future (Pidgeon et al., 2001). Some are addressing the strong relationship between the variations in precipitation and yield (Chmielewski and Potts, 1995; Stephens and Lyons, 1998). In a comprehensive panel analysis by Lobell et al. (2011) which investigates globally the impact of climate trends on crop production (i.e., maize, rice, wheat, and soybean), it is indicated that the change in temperature is more critical than the change in precipitation. It was also detected that duration of sunshine, relative humidity, and wind speed are influential variables on crop yields (Zhang et al., 2017) like a scale-down in the maize and wheat yields with a decrease in solar radiation in Beijing between 1961 and 2003 (Chen et al., 2013).

1.2.1. Describing Vulnerable Regions and Socio-Economic Groups based on the Regional Agricultural Impacts

As many of us know very well, climate change is now an urgent issue in the world agenda. Some regions around the world are more affected by climate change impacts than others, and this impact is expected to increase in the future. It is stated that although there is no certainty about the direction of the effect balance (positive or negative), the positive effects will be seen in the high latitude regions. However, in general, according to many studies involving a large number of regions and crops, climate change has more adverse impacts than positive on crop yield (IPCC, 2014b). Excessive increase in mean temperatures will further affect crop yields and this effect will be more destructive in tropical regions than in temperate regions (Porter et al., 2014). If today's trends continue, it is expected that the potential agricultural output will be decreased globally, and the decrease rate will be higher in the developing countries (Türkeş, 2014).

While the rising temperatures have a negative influence on the yields in several countries of Europe (Peltonen-Sainio et al., 2010), whereas in Northern Europe, it is expected that crop yield may increase, and new species will be able to be grown (Olesen and Bindi, 2002; Ewert et al., 2005; Porter et al., 2014). However, it is expected that agricultural areas in hot and arid regions might be severely affected by adverse conditions because of climate change (Olesen and Bindi, 2002). A whole range of climate change and climate variability studies using both global and regional climate models under both observation data and various greenhouse gas emission scenarios for the Mediterranean Basin show that the Mediterranean Basin might be adversely affected by climate change in the 21st century (Trigo et al., 2006; Önol and Semazzi, 2009; Türkeş et al., 2011; Sen et al., 2012; Türkeş, 2012; IPCC, 2013; Ozturk et al., 2013; Türkeş, 2013). This also means that agricultural production in the Mediterranean might be affected by short and long-term extreme climate events in the future (IPCC, 2014c) and it may also create a socio-economic vulnerability for the demographic structure that makes a living with agriculture in the region. With the increase in temperature in Southern Europe, fertile agricultural land areas are projected to decrease due to inadequate irrigation and these adverse conditions are expected to affect the living conditions of Mediterranean farmers. On the other hand, despite the high temperature in the Mediterranean, the production has increased due to technological practices in recent years, but yield is still low (European Environment Agency, 2004; Ciais et al., 2005) and severe agricultural losses for the future are also expected in the Mediterranean Basin, including Turkey (Porter et al., 2014). Turkey may also suffer from these impacts in terms of agricultural production as a Mediterranean Basin country. Thus, the thesis that forms the main theme, farmers, as socio-economic groups, providing livelihood from agriculture in particular growing high-value commercial crops in Turkey also seem to be already affected by climate change and this impact might be expected to be higher in the future.

1.3. Policy Instruments and Activities for Adaptation in the Agricultural Sector

There is a need to change the production systems and social and economic structures in order to reduce the vulnerability of societies against the changing climate. There are two ways to achieve this. **The first** is that climate change-related issues should be incorporated into established or ongoing development programs, policies, or management strategies rather than separately developing adaptation and mitigation strategies. **The second** is the development of the current system's capacity to absorb existing shocks and to reorganize distortions resulting from the dynamics of ecological systems. Either way, what needs to be done is to combat climate change impacts and to improve agricultural capacity, increase agricultural resilience and thus eliminating agricultural vulnerability and achieving adaptation in agriculture (Figure 1.2).

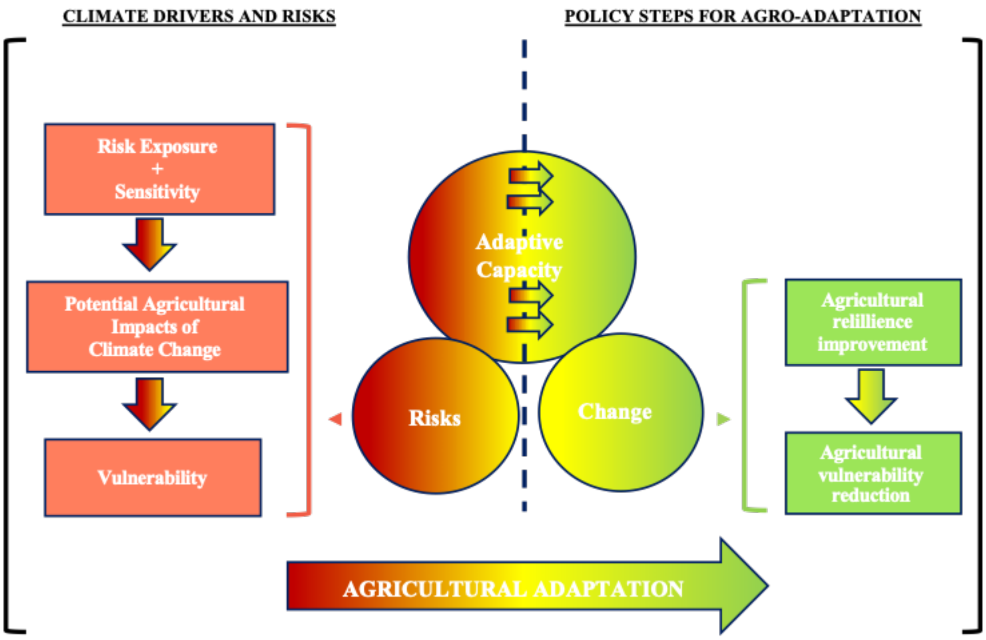


Figure 1.2. Schematic representation of the adaptation progress, conditioned by exposure, sensitivity, vulnerability, adaptive capacity and policy instruments (Source: Rearranged by the author with reference to FAO (2017)).

However, mitigation processes include a large reduction of emissions from land-use change, land management and livestock management. Greenhouse gas (GHG) emissions from agriculture accounted for about 10-12 % of anthropogenic greenhouse gas emissions in 2010. Agriculture is the sector with the largest non-carbon dioxide (non-CO_2) greenhouse gas additives such as methane. In this manner, carbon may be stored in soil and biomass. Emissions from energy use in economic activities can be reduced by replacing fossil fuels with biofuels. The potential for reducing GHG emissions from agriculture through changes in consumption could be substantially higher than technical mitigation options. Approaches include reducing food waste, changing diets towards less GHG-intensive food (e.g., substitution of animal products with plant-based food), and reducing over-consumption in regions where this is prevalent (UNFCCC, 2014).

Various applications can be applied to ensure adaptation in agriculture. First, it is necessary to develop crop and farming practices by considering disasters and related income and crop losses due to short- and long-term extreme weather events such as drought and floods, and applicable and sustainable policies regarding water resource management. In this context, four basic titles should be emphasized. These are as follows; i) crop development and farming practices, ii) water resource management, iii) disaster risk management, iv) crop and income loss risk management. To explain them briefly;

Crop Development and Farming Practices: This part is taken into account by the two separate parties, namely the practices to be carried out by the farmers and the private sector support as well as the practices to be done only by the public. The individual practices of the farmers are to ensure the diversity of crops and to create substitutes. It means that instead of planting a single variety of crops, products that are resistant to climate change can be planted together, thus a small proportion of crops will be damaged. Or, instead of continuing to plant the same product for years, a product with low water demand may be preferred against an expected drought in the region.

One of the practices to be implemented by the private sector or public sector is to carry out studies to create hybrid crops and to develop crops with higher tolerances that are more resistant to adverse climatic conditions or extreme climatic events. The establishment of seed banks to support farmers in crop diversification is one of the other policies that should be developed for adaptation. Another adaptation policy is the promotion of crop diversification through incentives and taxes (Figure 1.3). Thanks to these adaptation policy measures; crop failure can be prevented with crop diversification or substitution options in support of the public and private sector.

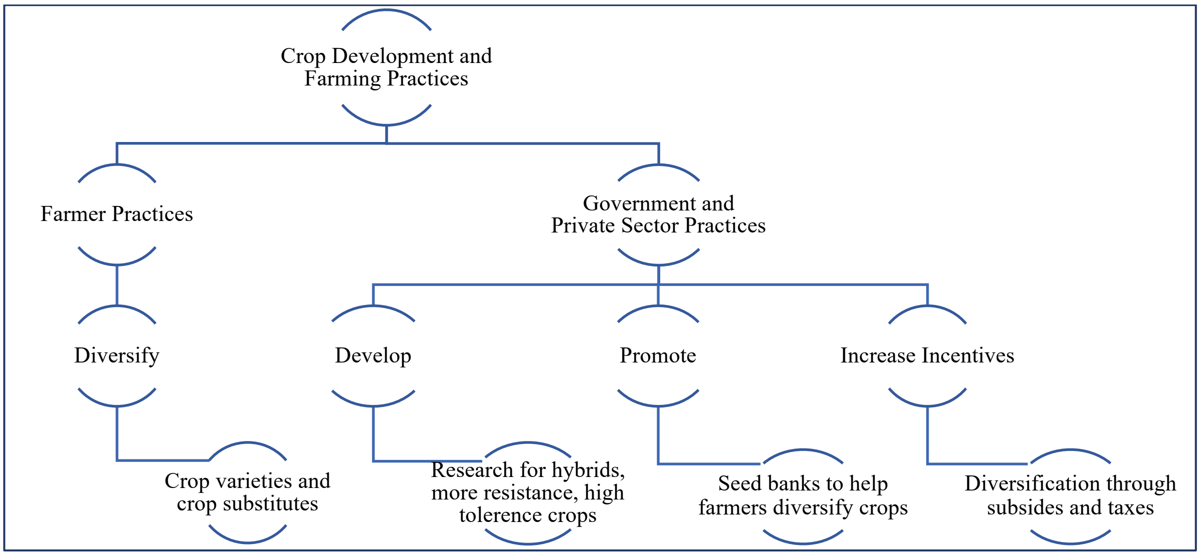


Figure 1.3. Crop development and farming practices as a policy instrument for adaptation in the agricultural sector (Bockel and Tinlot, n.d.).

Water Resource Management: Water resource management is the second issue that needs to be addressed to ensure adaptation in agriculture. The existing system needs to be repaired, developed, or supported by new technological tools. For the protection of water resources, the establishment of the necessary infrastructure for the storage, distribution and efficient use of water; prevention of unnecessary irrigation-related losses in agriculture; reuse of wastewater in agriculture; developing new irrigation techniques such as drip and spray irrigation, and conducting and supporting research on new crop varieties that require less water are adaptation policy instruments within the scope of water resource management (Figure 1.4).

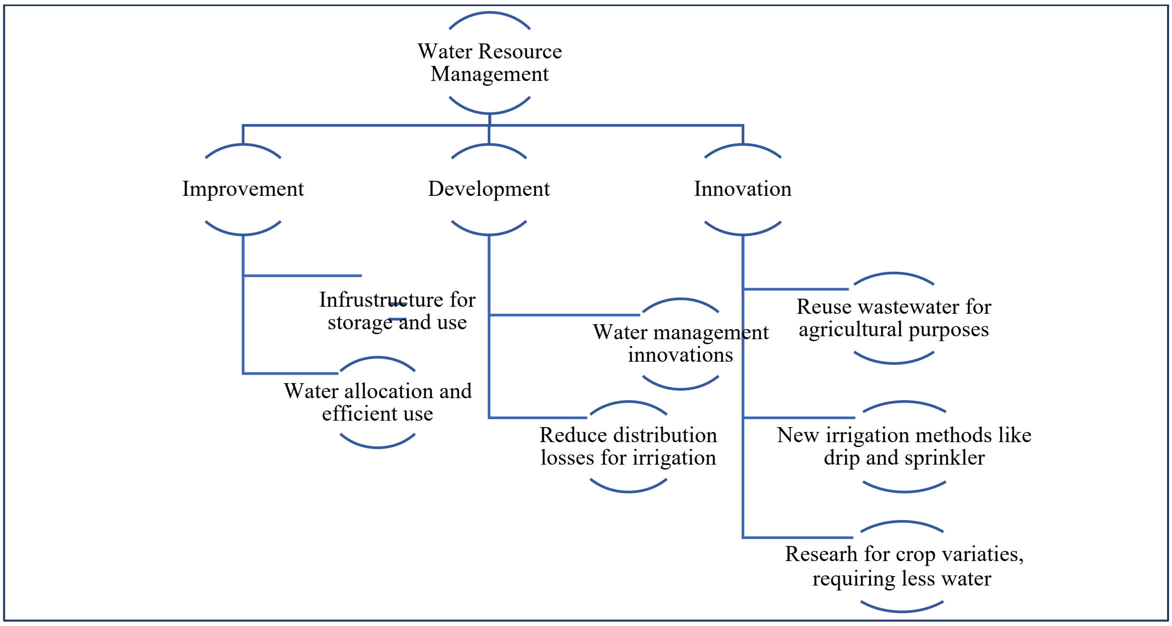


Figure 1.4. Water resource management as a policy instrument for adaptation in the agricultural cector (Bockel and Tinlot, n.d.).

Disaster Risk Management: This refers to the risk management for loss of or damage to property due to natural disasters caused by climate change or natural processes. As well as the development of pre-warning systems and infrastructure investments for disasters, it is important to develop the capacity of public and local governments about disaster risk management and to establish disaster coordination centers. To strengthen the agricultural infrastructure, investing in this field and supporting these investments with incentives will accelerate the adaptation. In this respect, the resilience of societies will increase, and their vulnerability will decrease. The disaster coordination centers established within the scope of disaster risk management should be in continuous communication with the meteorology departments. It is important to diversify the crops that grow with less water and are resistant to drought (Figure 1.5).

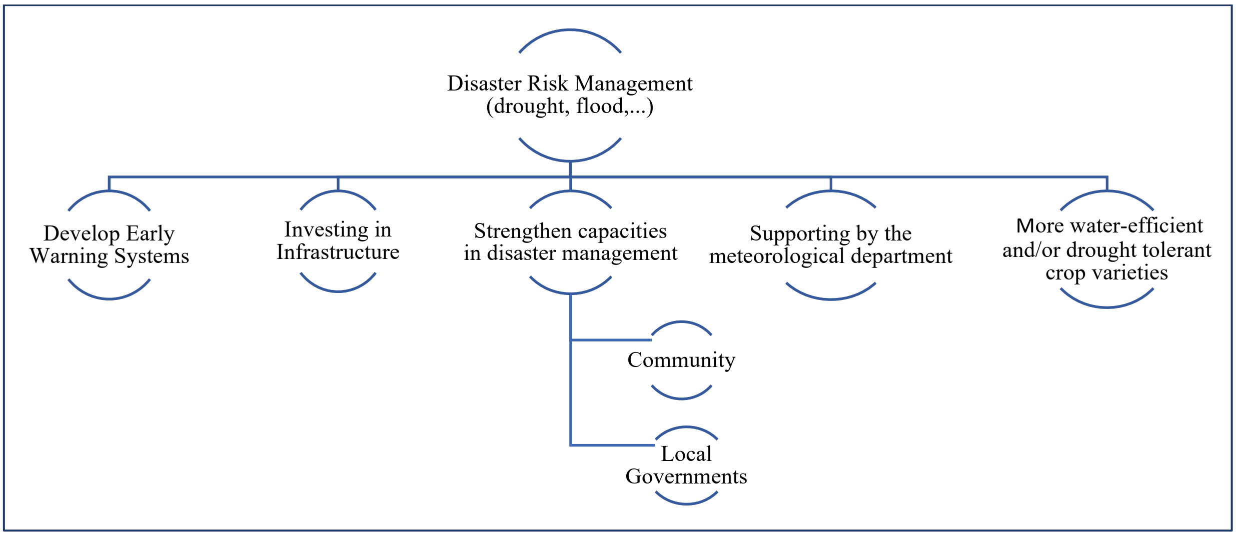


Figure 1.5. Disaster risk management as a policy instrument for adaptation in the agricultural sector (Bockel and Tinlot, n.d.).

<u>Risk Management on Crop and Income Loss</u>: Diversification of household income is an important policy instrument for households not to be affected by crop failures or sudden price increases. For example, while some household members work in the agricultural sector, others may prefer other sectors or agricultural activities can be continued through agricultural diversification and without being attributed to a single product. Thus, these losses would be less effective on household income. It is also necessary to develop risk management capacities of communities and diversify risk management tools with options such as seed banks or crop insurance which is to protect farmers against crop failures due to natural disasters, such as floods, hail, and drought. In these diversifications, insurance should play an active role. It should be ensured that disasters related to climatic change caused by extreme weather events take place more effectively in insurance options. This would be major progress in risk management. On the other hand, although the insurance is one of the most progressive tools for risk management, its role can be limited in managing the risks related with farming (Roberts, 2005). It should be combined another risk management options or extension to a whole set of risk management measures (Figure 1.6).

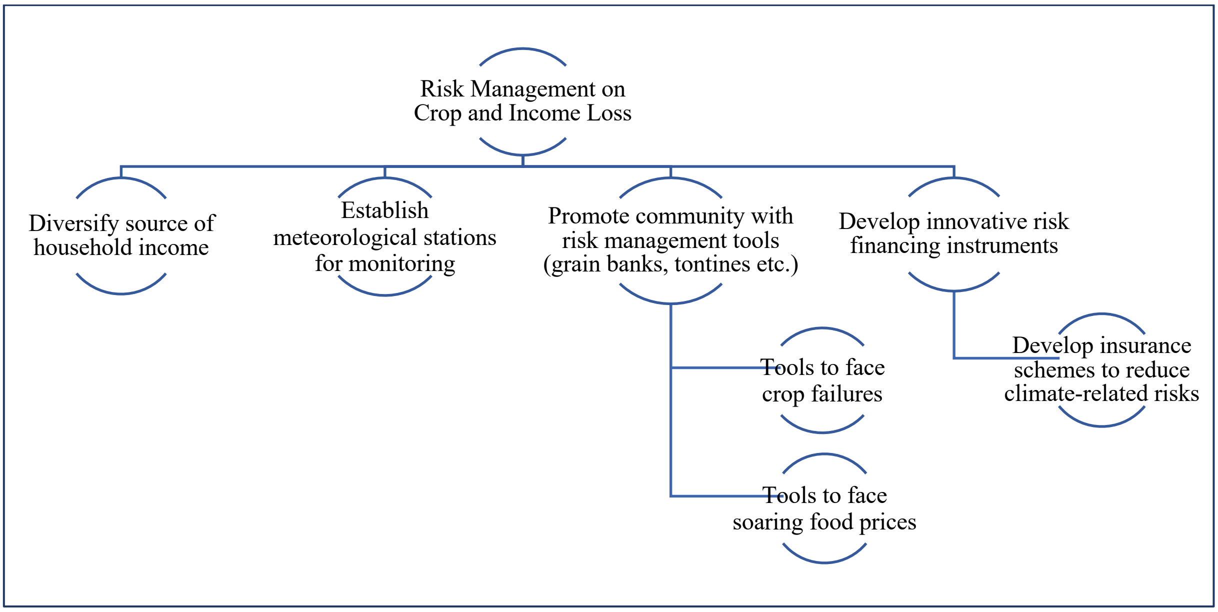


Figure 1.6. Disaster risk management as a policy instrument for adaptation in the agricultural sector (Bockel and Tinlot, n.d.).

1.3.1. Why Are Adaptation Policies and Regulations Important?

Why are adaptation policies and legal regulations needed? How effective are they in fighting climate change? The key roles of policies and regulations in adaptation are to ensure that decision-makers in the government and private sector are effective in preparing the country for the impacts of climate change. In fact, these policies and legal regulations allow the decision-makers to hold the correct, useful, and applicable position and take action for a fast and effective adaptation process. Although adaptation is a process that needs to be realized very quickly, it can be very slow due to political, economic, and geographical reasons.

In the adaptation process, communities, in general, should be encouraged by the governments to understand the risks they may face and to build resilience against natural disasters that may arise due to climate change. At this point, it is also important to determine the policies that encourage recovery after the socio-economic problems and risks that may arise after the extreme climate events. Adaptation should be made at the community level and governments should support this process with facilitating policies. The most important factor in achieving the adaptation process will be the government's adoption of this process and support by appropriate policies and legal arrangements. In other words, in the process of adaptation, governments lead all societies by fulfilling all responsibilities and functions, thus enabling them to reach the target faster and more easily. The support of the private sector is also effective in achieving this process easily and quickly. Policies are also important because they can create fair and efficient markets for the private sector and lead to positive adaptation results.

1.3.2. Agricultural Adaptation Policy in Turkey

Even though agriculture is one of the sectors that will suffer the most from climate change, it is one of the main reasons for this change in the climate. Production-oriented policies in the agricultural sector to climate change adaptation process for Turkey should be one of the primary strategies. To adapt to the effects of climate change, it is necessary to create an organized and competitive structure. Only in this way, the destructive effects of climate change on agriculture can be eliminated and thus the sustainability of ecosystem services can be ensured. Sustainability of ecosystem services can only be achieved through environmental improvement, biodiversity, and food security. For this reason, action plans and national and regional development strategies related to the agricultural sector should be reviewed and necessary adaptation strategies should be determined based on sector.

Several approaches should be considered to adapt to the impacts of climate change on the agricultural sector. Some of these are: food safety, diversity in production, consumption habits, agricultural insurance, and price stabilization, supporting farmers and product promotion, agricultural sustainability, efficiency, and competition, combating agricultural drought and desertification, conservation of biological diversity and supporting these approaches with policies and legal arrangements.

Therefore, let's briefly explain Turkey's National Climate Change Adaptation Strategy and Action Plan (2011). The actions planned in this context are briefly summarized below:

- Integrating agricultural production and food safety policies into climate change adaptation process by including climate change in the rural development plan (integration of climate change impacts on water resources, food safety, natural disaster risks, ecosystem, and public health into the "Agricultural Drought Strategy and Action Plan" and integration of producer support activities into the climate change adaptation process),
- Collaboration with international organizations for the adaptation process and integration of inter-institutional protocols into the climate change adaptation process,

- Improving the capacities and increasing the number of institutions carrying out scientific studies throughout the country and establishing climate change research centers, especially in regions where drought is felt more, and updating and monitoring the data,
- Development of R & D activities related to agricultural product diversity, land and water management,
- Establishment of “Soil and Land Database and Land Information System” considering the effects of climate change and establishment of “Drought and Flood Information System”,
- Strengthening the capacity of provincial drought crisis centers and developing crisis management plans; conducting disaster analysis by monitoring agricultural drought within disaster management and monitoring agricultural droughts,
- Prioritization of economic, social, and environmental impacts in regions that will be more affected by agricultural drought for the socio-economic impacts of climate change in the agricultural sector and training women farmers for climate change,
- Sustainable Water Management: Promoting the efficient use of water in agriculture-based industry, encouraging crop types suitable for climatic conditions by using water efficiently in agricultural basins, reducing water losses in the agricultural sector through appropriate irrigation techniques, developing irrigation and water management systems specific to local conditions, and transition to new and technological systems,
- Implementation of modern harvest systems for the protection of soil and agricultural biodiversity against the effects of climate change and development of agroforestry, development of innovative and appropriate agricultural techniques to adapt to climate change and ensure the sustainability of natural resources, investigation of the effects of climate change on agricultural products whose gene pool in Turkey, conservation of agricultural biodiversity and resources by conducting R & D studies on the effects of climate change on aquaculture and livestock, prioritizing land consolidation practices to increase agricultural productivity in flood-risk areas,
- Establishment of climate change units in provincial organizations to improve institutional capacity and inter-institutional cooperation throughout the country during the agricultural adaptation process, strengthening the capacities of the relevant institutions affiliated to the Ministry of Agriculture and Forestry and strengthening the inter-institutional cooperation, to inform local stakeholders in the agricultural sector about alternative product models, to increase the awareness and capacity of trade unions and cooperatives, society, raising awareness of drought damage assessment commissions, provincial crisis centers and provincial drought review commissions and member organizations, unions, cooperatives and

local administrators working at the local level for the adaptation process, increasing the existing capacities and accessibility of flood and drought early warning systems.

1.4. The Objective of the Thesis

In the broad sense, agricultural production depends on three main factors: socioeconomic factors, such as farming systems, land tenure, commodity prices, market conditions, trade etc.; management options including a selection of varieties, such as planting dates, crop diversity, implementation techniques, etc.; physical and bioclimatic factors, such as soil, water, vegetation, climate etc., which compose renewable natural resources.

Various studies have examined the role of climate change in agriculture specifically crop yield. However, for a clear understanding of the impact of climate change on crop yields over the years, it is necessary to project the climate conditions in the region for the future and to know clearly under which climate conditions the crop grows productively.

The changes occurring in the climate system on the whole continents including oceans are causing the frequency and the intensity of extreme events to increase and various risks on natural ecosystems. Considering most of the studies, spanning many regions and crops, it is expected that climate change may have more adverse effects than positive on crop yield. According to this, the agricultural sector is the leading sector of the most affected ones from climate change impacts. Since the Turkish economy is partially based on agriculture, Turkey is expected to be one of the most affected countries in terms of agricultural productivity in particular commercial crops. Turkey has a significant share in the world in terms of the commercial value of some agricultural products (e.g., hazelnut, apricots, cherry, grape, fig, etc.). Thus, it is crucial to estimate the change in the future yields of these crops in the context of climate change. Therefore, this study focuses on the socio-economic impacts and risks on the crop yield in changing climate for the period of 2021-2050 with respect to the reference period of 1991-2012 in Turkey, and how crop pattern should be re-designed particularly in some regions due to these impacts and risks. This is exactly what is aimed in this study how much of the long-term variability in observed crop yields (i.e., hazelnut and grape, which are the commercial crops) across regional croplands in Turkey through combining climate model and statistical model/crop growth simulation model and determination of climate suitability of selected locations in the future.

2. LITERATURE REVIEW

2.1. Climate Classification for Turkey

Geographic units in the climate system such as climate zones and climate regions show the effect of the atmosphere on the environment and humans. The impact on human beings is mostly based on food and water resources by affecting ecosystem services. For this reason, climate classification is important to determine the climatic conditions that make the areas livable.

The Köppen climate classification (Peel et al., 2007; Türkeş, 2010) is an empirical study. Hereunder, each climate is defined according to long-term averages calculated annually or for specific months of the year. This classification is based on the fact that the climatic observational data (climatic time series) used to determine the climate in a location. It is precisely based on the temperature and precipitation data are long enough to produce meaningful averages and variability measurements rather than factors that explain the causes of the climate events, such as large-scale pressure and wind systems, air masses, facades, and various types of storms. In this context, the average temperature should be at least 30 years and the rainfall should be at least 40 years to obtain the averages of values, standard deviation, or coefficient of variation. In addition to Köppen classification, many other climatic classifications use two climatic elements, mostly temperature and precipitation, and a period of 40-50 years is considered sufficient (Türkeş, 2010). In the Köppen system, large clusters of climates and their subsets are expressed letters to determine seasonal characteristics of temperature and precipitation. Accordingly, within the five main climatic clusters and vegetation groups, climatic zones and representative letters are as following (Table 2.1): equatorial and tropical zone (A), arid zone (B), mid-latitude zone (C), cold or snow zone (D), and pole zone (E) (Türkeş, 2010).

Table 2.1. Köppen Geiger Climate Classification for Turkey according to the type and regions (Peel et al., 2007; Türkeş, 2010).

Main Climate Groups	Main Climate Type and Description
A	**Humid tropical (hot) climate:** Generally humid and unsweetened climate; monthly average temperature climates in which over +18 ° C and over all months.
B	**Arid climates:** Climates where annual evaporation is much higher than annual precipitation, climates with a water gap.
C	**Humid mid-latitude (temperate):** Generally humid climates; climates where the average temperature of the coldest month is above 0 ° C and below +18 ° C, the average temperature of the warmest month does not exceed +10 ° C.
D	**Humid cold mid latitude (severe in winters):** Generally moist; the average temperature of the coldest month is less than 0 ° C, the warmest month of the average temperature is below +10 ° C, cold climates are severe in winter.
E	**Polar climates (polar):** Climates where the average temperature of the hottest month is less than +10 ° C.

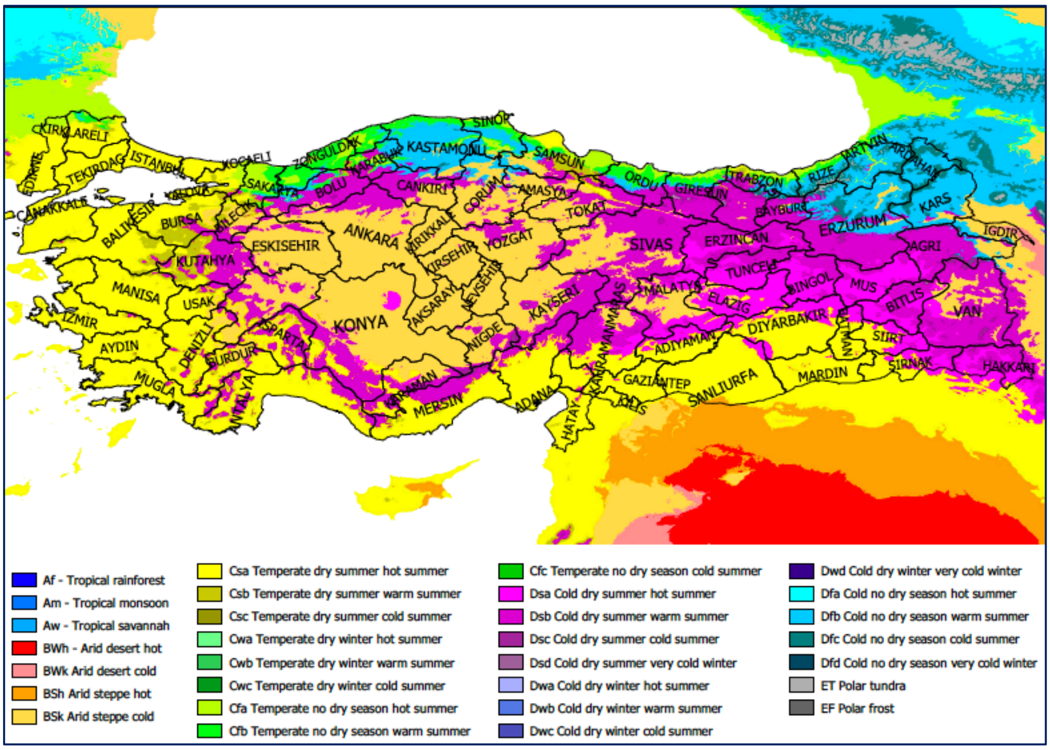


Figure 2.1. Köppen Climate Classification for Turkey at 1-km resolution (Beck et al., 2018).

Considering the first letter according to Köppen climate classification, Turkey is generally located in the C range and the effects of B and D climate class are also observed in some places

(Figure 2.1). Considering the first two letters according to Köppen, the locations of Van and Iğdır which is located in the central part of Central Anatolia and the eastern part of Eastern Anatolia is classified as subtropical step (BS). The Black Sea Region (except the inner parts of the western part of the region) is classified as humid subtropical (Cf). Marmara, Aegean Mediterranean and Southeastern Anatolia regions and western and southern parts of Central Anatolia are classified as a Mediterranean climate (Cs). On the other hand, Central and Eastern Anatolia regions (middle and northern belt) are generally classified as continental climate (Ds). Erzurum-Kars section of Northeast Anatolia and a small area to the north of Central Anatolia are in the humid climate (Df) class, also called terrestrial (Türkeş, 2010, 2016).

2.2. Climate Change Impacts on Agriculture in Turkey

It is known that climate change is a very urgent issue because of its negative impact on many sectors in particular agriculture in many parts of the world. A whole range of climate change and climate variability studies on the Mediterranean Basin in particular, using both global and regional climate models under both observation data and various greenhouse gas emission scenarios indicate that the Mediterranean Basin might be adversely affected by climate change in the 21st century (Trigo et al., 2006; Önol and Semazzi, 2009; Türkeş et al., 2011; Sen et al., 2012; Türkeş, 2012; IPCC, 2013; Ozturk et al., 2013; Türkeş, 2013). This also means that agricultural production in the Mediterranean might be affected by short and long term extreme climate events in the future with also creating a socio-economic vulnerability for the demographic structure that makes a living with agriculture in the region (IPCC, 2014c).

Common results obtained from different model outputs indicate that a large part of Turkey will face warmer and more arid climate in the near future, and it will be among the regions that will be most affected by the consequences of future climate change. Drought along with temperature increases in the regions are dominated by the Mediterranean climate in Turkey, whatever the climate classification, (semi-arid, arid, and moist), is an indicator to reveal that the high vulnerability against the possible consequences of climate change. Accordingly, in the first half of the 21st century in Turkey, it is expected that the increases in average up to 4 °C. These increases are expected to be higher in the hot season. It is clearly observed that the rate of increase in air temperatures, which is expected to be higher in the hot seasons, will strengthen from the west of the country, which is dominated by the Mediterranean climate and to the east which is dominated by the dry and hot subtropical in general (Turp et al., 2014). On the other hand, the expected reduction in precipitation in Turkey is overall up to -1.2 mm/day. When looking at the geographical patterns of the decrease in precipitation, it is generally predicted that the southern and western regions (except for winter), with the dry summer Mediterranean precipitation regime, will receive less precipitation throughout the year (Turp et al., 2014). Seasonal precipitation and high annual variability in these regions indicate that drought expectations will increase in the future. Besides, the Black Sea Region, which has a humid and mild climate with a rainy season, is expected to receive more precipitation in the future, particularly the eastern part where the most humid and even oceanic climate is observed. In addition to temperature increases, and precipitation decreases, it should be considered that precipitation increases, and excessive precipitation can be observed regionally and seasonally (Turp et al., 2014).

Turkey is also among the countries in the Mediterranean that may receive the largest share of this impact. Climate change impacts on agriculture in Turkey are expected to be significant depending on water availability (Evans, 2005). High variations in climatic parameters indicating extreme climate events (minimum-maximum-mean temperatures, precipitation, humidity, duration of sunshine, etc.) significantly affect the production and yield of crops.

In Turkey, there are a limited number of studies on the relationship between climate change and crop yields or agricultural production. Studies in the literature are generally on the effect of temperature increases. Climate change and related meteorological disasters cause serious negative effects especially on agricultural production (Gürkan et al., 2017). Although temperature increases due to climate change and CO_2 concentration seem to have a positive effect initially on agricultural production in some locations, they cause a decrease in agricultural production and crop quality in the long run (Akalın, 2014). The decrease in agricultural production and the deterioration in crop quality are worrying both for producers and the country's economy due to loss of income. Changing climatic conditions according to the projections point to a decrease in wheat, barley, corn, cotton, and sunflower yields in the middle of the century (Dellal, 2012; Gürkan et al., 2017). It is predicted that the expected temperature increases in the next two decades will cause a decrease in agricultural production (Demir, 2013). On the other hand, despite the negative effect of temperature on agricultural production in some regions, it is observed that precipitation has a positive effect. However, it is observed that the overall impact of climate change on the agricultural sector due to the higher temperature might be negative (Başoğlu and Telatar, 2013).

Agricultural production directly affects soil and water resources, and soil and water resources directly affect the amount and yield. Therefore, the consequences of changes that may occur in soil and especially water resources might be worst on agricultural production. Accordingly, the agricultural sector is one of the sectors that will be most affected by the effects of climate change and its breadth is high (MoEU, 2012). According to the climate change projections in the 21st century, it is predicted that the phenological periods of the crops will change and it is observed that, the phenological periods of crops may be shifted early in response to increasing temperatures. Increasing temperatures are predicted to accelerate plant development in mid-northern latitudes (Kadioğlu and Şaylan, 2001). Accordingly, the growth period of cherry, which is one of the important commercial products of Turkey, is adversely affected by late spring frost due to climate changes and by excessive precipitation, especially during flowering and fruit formation. Besides, it is expected that a high negative relationship between the fruit formation, harvest period of cherry, and temperature increases throughout Turkey, and it is observed that the fruit formation has shifted to earlier dates (Türkoğlu et al., 2014). On the other hand, apple is adversely affected by excessive temperatures in summer and frost during bud breaks. It is observed that the flowering period occurs earlier (Türkoğlu et al., 2014). Besides, there is a negative relationship between the earing, harvesting dates of winter wheat and temperature increases (Türkoğlu et al., 2014). In general, the shortened development period due to the acceleration of crop growth, early harvest dates, and impacts due to high temperatures corresponding to the ripening are expected to degrade the crop quality and decrease the producer incomes by decreasing the market values (Türkoğlu et al., 2014). On the other hand, the relationship between climatic variables and apricot yield is very strong (Gunduz et al., 2011) and apricot yield has been strongly affected by the climatic conditions (Gezer et al., 2009; Gunduz et al., 2011). Malatya has good ecological and soil conditions in terms of apricot cultivation, which has the highest quality (Güleryüz et al., 1999; Altindag et al., 2006). However, it is possible to talk about irregularities and decreases in apricot yield due to climate change (Gunduz et al., 2011; Karakaş and Doğan, 2018; Bartolini et al., 2019). Around the location of Iğdır all apricot orchards suffer from spring frosts in some years during late spring (Ercisli, 2009). The temperature is the most important variable affecting the yield in different phenological periods (Ozkan and Akcaoz, 2002), and the minimum and maximum temperature have a negative impact on yield during flowering and planting, respectively (Gunduz et al., 2011). Additionally, total precipitation has also a positive impact on yield while the humidity has a negative impact on apricot yield during flowering (Gunduz et al., 2011). A study considering temperature and precipitation changes draw attention to the positive effect of April precipitation and the negative effect of sudden temperature changes on apricot yield (Karakaş and Doğan, 2018). As the temperature increase during flower bud growth causes early flowering, it affects the vegetative development adversely, reducing the fruit size and impairing the fruit quality (Rodrigo and Herrero, 2002). Temperature increases in cold climates in the spring period causes early flowering and makes the flowering period longer by stressing the crop, on the other hand, in temperate climates, temperature increases cause insufficient cooling of the crop and result in spillage in flower buds and lower fruit set (Acarsoy, 2013; Acarsoy Bilgin and Mısırlı, 2015; Guo et al., 2015). In apricot species with high climatic sensitivity, flower bud breakdowns vary according to locations depending on years (Acarsoy, 2013). It is observed that there is a relationship between the loss of flower buds and chilling hours in apricot trees (Engin and Akçalı, 2014). This results in significant yield decrease in species that do not receive adequate chilling (Engin and Akçalı, 2014).

3. MATERIALS AND METHODS

3.1. Crop Patterns and Crop Characteristics in Turkey

3.1.1. Characteristics and Climate Requirements of Hazelnut

Turkey has a significant share of world production of some commercial agricultural products (e.g., hazelnut, apricots, cherry). Hazelnut has a high commercial value, and Turkey is the world leader in production. Turkey's hazelnut output is on the average of 70 % of world production, followed by Italy, the Caucasus countries (Azerbaijan and Georgia), Iran, the United States, and Spain, respectively. The share of the European Union is 17 % (GTB, 2018).

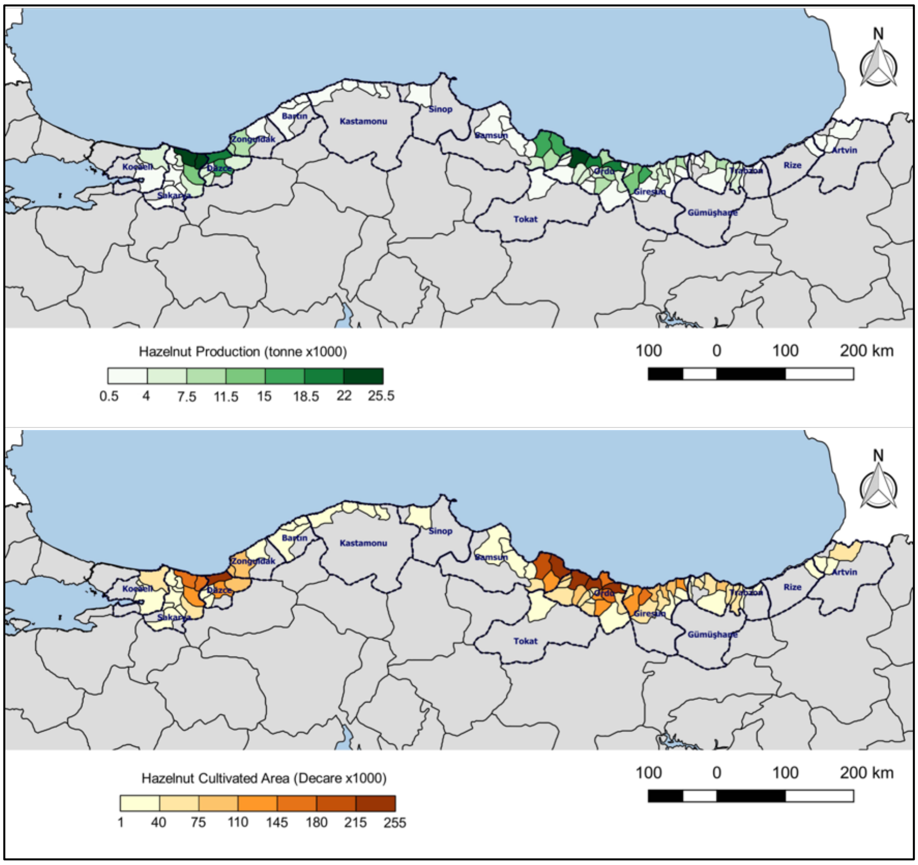


Figure 3.1. Spatial distribution of average production (tonne) and average cultivated area (ha) for hazelnut in Turkey for the period of 1991-2012.

Hazelnut farming in Turkey covers approximately 700 thousand hectares and 550 thousand tonnes annually, mostly within the Black Sea region and the eastern Marmara sub-region (Figure 3.1). The reason for choosing hazelnut as a target fruit in this analysis is its mono-cultural characteristics, high production quantity in Turkey, and the strong effects of Turkey's production on the global hazelnut market.

Hazelnut (*Corylus avellana* L.) is a perennial climax crop that requires specific climatic conditions. Perennial crops may be affected by climatic conditions with the uncertainties of crop responses to climate impacts (Lobell et al., 2006, 2007). They generally grow in places where the risk of frost is rare. Hazelnut trees are part of the native vegetation of the Black Sea Region and accordingly the Black Sea Region and the Eastern parts of Marmara are natural habitats for them. The Black Sea region with the lowest seasonality regularly receives precipitation throughout the year. According to the geographical distribution of the Köppen-Geiger climate classification for Turkey (Türkeş, 2010, 2016), the Black Sea Region coastlines and the eastern part of the Marmara are dominated by the humid temperate (mid-latitude) climate. The fully humid temperate climate with warm summer and mild winter is seen in the central and eastern parts of the Black Sea. In Eastern Marmara, temperate dry summer climate is dominant. According to the Thornthwaite moisture index, the zones that make up the natural habitat of hazelnut are in the class of moist climate type (Türkeş, 2010, 2016). In terms of annual rainfall amounts of Turkey, two of the three wet regions are Western and Eastern Black Sea. The moist mid-latitude climates are suitable climate zones for forest and woody vegetation since they have the temperature and precipitation conditions necessary for the growth of tree community (Türkeş, 2016). Therefore, those areas are already getting enough and regular precipitation and have suitable conditions unless being an extreme climate event for growing of hazelnut. In terms of climate classification, although the hazelnut growing regions have humid temperate mid-latitude climates with mild winters, microclimate conditions are observed in some part s of the region. While the central Black Sea sub-region has a moderate mid-latitude climate, very hot summers are observed in the east and west. A semi-humid and humid climate dominates over the eastern Marmara sub-region. Besides, as the altitude increases from the coastline to the inner part, climatic conditions also vary spatially. Except the larger Istanbul district, the northern part of the Thrace sub-region of the Marmara region, (Kırklareli), Western Black Sea region (Bilecik, Bolu, Karabük, Zonguldak, and Bartın) and Eastern Black Sea region (Giresun, Trabzon, Rize, and Artvin) are the places, which have the lowest risk of vulnerability and drought in Turkey (Türkeş, 2017).

The Black Sea Region of Turkey has a humid temperate climate, rainy in all seasons, and receiving the highest precipitation in the autumn (Türkeş, 1998, 2016). Under humid and temperate climatic conditions due to regular precipitation demand, hazelnut is growing well suitable (Mehlenbacher et al., 1993; Beyhan and Odabaş, 1996a; Köksal, 2002). It grows more efficiently especially in places with annual average precipitation of 755 mm, and the average annual temperature is 13 - 16 °C. In addition to these requirements, the hazelnut needs 60 % relative humidity during the last part of the bearing and early part of maturing (Köksal, 2002). Hazelnut is also a fruit that is affected by extreme climate events. It is relatively affected by temperatures below 0 °C, but under conditions where the average winter temperatures fall below -8 °C, the fruit is damaged. During the flowering (pollination) period, minimum air temperature and minimum soil air temperature should not fall below 0 °C. Temperatures falling below 0 °C adversely affect the flowering period of hazelnut and decline yield (Beyhan and Odabaş, 1996b). The most important factor limiting the hazelnut production in the inner parts away from the coast is very low winter temperatures. Hazelnut species giving early leaves are very sensitive to spring frost risks. The tree trunk is resistant up to -25 to -30 °C during the dormancy period, but the cold tolerance of the tree decreases with the beginning of development (Köksal, 2002). Considering the climate requirements for the summer season, the highest temperatures should not exceed 36 °C (Köksal, 2002). Hazelnut can be planted in higher elevations up to 600 m along the coast of the Black Sea and Eastern part of the Marmara Region. While the hazelnut grows most efficiently in low-lying areas near the shore, the climatic conditions above 600 m limit hazelnut production (Köksal, 2002). The hazelnut yield is affected by certain climatic conditions as well as some cultural like the use of traditional practices, trimming, weeding, etc. and physiological factors such as soil type, nutrient content of soil etc. The change in those factors, depending on various reasons, has a direct effect on yield (Beyhan and Odabaş, 1996b; Lobell et al., 2007).

The flowering of hazelnut is completed in the first four months of the year, and it produces fruit approximately in the last months of spring and early summer. Table 3.1 shows three phenological periods (i.e., vegetative season (VS), flowering season (FS), and grain filling season (GFS) including bearing and ripening (MGM, n.d.).

Table 3.1. Phenological periods of hazelnut.

Vegetative Season (from dormancy to flowering)	October, November, December
Flowering Season (bud break and fully flowering)	January, February, March, April
Grain Filling Season (from bearing to ripening)	May, June, July, August

The phenological stages of Oregon hazelnut represent the general outlook for all hazelnuts grown in the Northern Hemisphere and the sequence of those stages are also the same in other places. Growth begins with the end of dormancy in winter, and the leaves appear in March-April.

Bearing comes up in May-June, while ripening begins at the end of June and early of July and the nutshell gradually matures in August (Lagerstedt, 1979; Baldwin, 2015). Past and future effects of climate over the phenological periods have received less attention in the literature (Tao et al., 2006; Ortiz-Bobea and Just, 2012; Ahmad et al., 2017; Zscheischler et al., 2017). Therefore, this part of the study investigates the effect of climate change on hazelnut yield by considering phenological periods rather than annual values.

During the ripening period corresponding summer months, extreme maximum temperature, irregular or inadequate precipitation and loss of moisture causing water stress might lead to deterioration of fruit water balance. This is called agricultural drought and leads to the burning and falling of the fruit clusters, and it makes the loss of yield inevitable. Additionally, the hazelnut tree, which is not exposed to sufficient heat during the flowering period, may encounter the issue of non-flowering. When the trees are exposed to more sunlight, an increase in stomatal density increases and chlorophyll count as well as thickening of the palisate tissue which means a positive effect for photosynthesis (Valentini et al., 2009). The lack of sufficient temperature and sunshine prevents the growth of the fruit due to the decrease of photosynthesis (Mehlenbacher et al., 1993; Silva et al., 1996; Beyhan and Marangoz, 1999) and the inadequate amount of water leads to reduce hazelnut size and poorly filled in the course of kernel growth (Valentini et al., 2015).

The number of studies revealing the relationship between climate and hazelnut yield is extremely limited (Ana et al., 1998; Tous, 2005; Beyhan and Marangoz, 2007; Baldwin, 2015). Some studies draw attention to the effect of temperature increases, soil moisture, water stress, and low humidity on hazelnut production. Soil moisture stress because of high temperature and low humidity has an adverse impact on the hazelnut production in Australia (Baldwin, 2015). Considering the characteristics of water sensitivity of hazelnut, the water is a key element for the quality and quantity (Girona et al., 1994; Bignami and Natali, 1997; Cristofori et al., 2012) during the growth and yield formation (Mingeau and Rousseau, 1994; Tombesi, 1994). A few studies draw attention to the negative impacts of the temperature increases in the future decades on hazelnut production (Ustaoğlu, 2012; Ustaoglu and Karaca, 2014). However, there is a lack of scientific assessments analyzing the climate change impact on the Turkish hazelnut yield by combining with a statistical approach and climate model outputs. For this reason, this part of the study aims to analyze the effects of climate change on hazelnut yield with the statistical model created after obtaining the climate parameters from the regional climate model, RegCM4.4 under the RCP8.5 pessimistic scenario (BAU) in the 30-year future time horizon covering 2021-2050. Humid-temperate coastal zone (maximum 30 km to inner parts) of the Black Sea Region and the eastern part of the Marmara Region, where the natural habitat of the hazelnut fruit is located, are also the domains used in the study.

3.1.2. Characteristics and Climate Requirements of Grape

The history of grape cultivation is almost as old as human history. Archaeological evidence suggests that the viniculture goes back to 6500 years B.C. in the Neolithic age. Hammurabi, the king of Babylon, made the first wine trade rules of history in 1700 B.C.. As a result of the migration of Hittites to Crete and Thrace in 3000 B.C., the western world became acquainted with viticulture and spread throughout Europe with the influence of Greeks and Romans (Trinklein, 2013). The history of viniculture in Anatolia dates to 5000 B.C.

According to FAO data (FAOSTAT, n.d.), more than 79 million tons of grape production has been realized in on an area of 7500 thousand hectares in more than hundred different countries of the world. Turkey has a significant share in the world in dried and table grape production. China is the main producer of table grape production in the world. In recent years, China has created new vineyard areas and improved yields by using modern breeding methods. It has made China the largest supplier of Asia. Turkey ranks second after China. Italy and Greece are the largest producers of the European Union. In all these countries, negative effects of climate change on grape production results in yield losses. Due to the yield losses, agricultural income has been decreasing and it causes a decline in the grape growing areas in these countries (SGB, 2019).

Turkey has very favorable ecological conditions regarding viticulture. Except for the higher parts of the Central and Eastern Anatolia and the Black Sea coastal regions, grapes can be grown in the whole country. Turkey has an important share in terms of both the production area and production quantity. The yield obtained from grape cultivation is still far below the country's potential. Turkey has an approximately 470 thousand hectares of vineyards spanning across the country with approximately 4 million tonnes production on average annually (Figure 3.2). The most common cultivation is in the Aegean Region. Almost half of the total vineyard areas and more than half of production belong to this region. The province with the largest production area in the region is Manisa. On a provincial basis, each province has at least 1 % of the vineyard area in its agricultural pattern. Manisa is followed by Denizli and Mersin. In addition to the width of the agricultural areas, Aegean Region also ranks first in the production of table and dried grapes. More than half of the country's production is met from this region. 90 % of dried grape production is covered by Manisa, which has the largest vineyards (SGB, 2019).

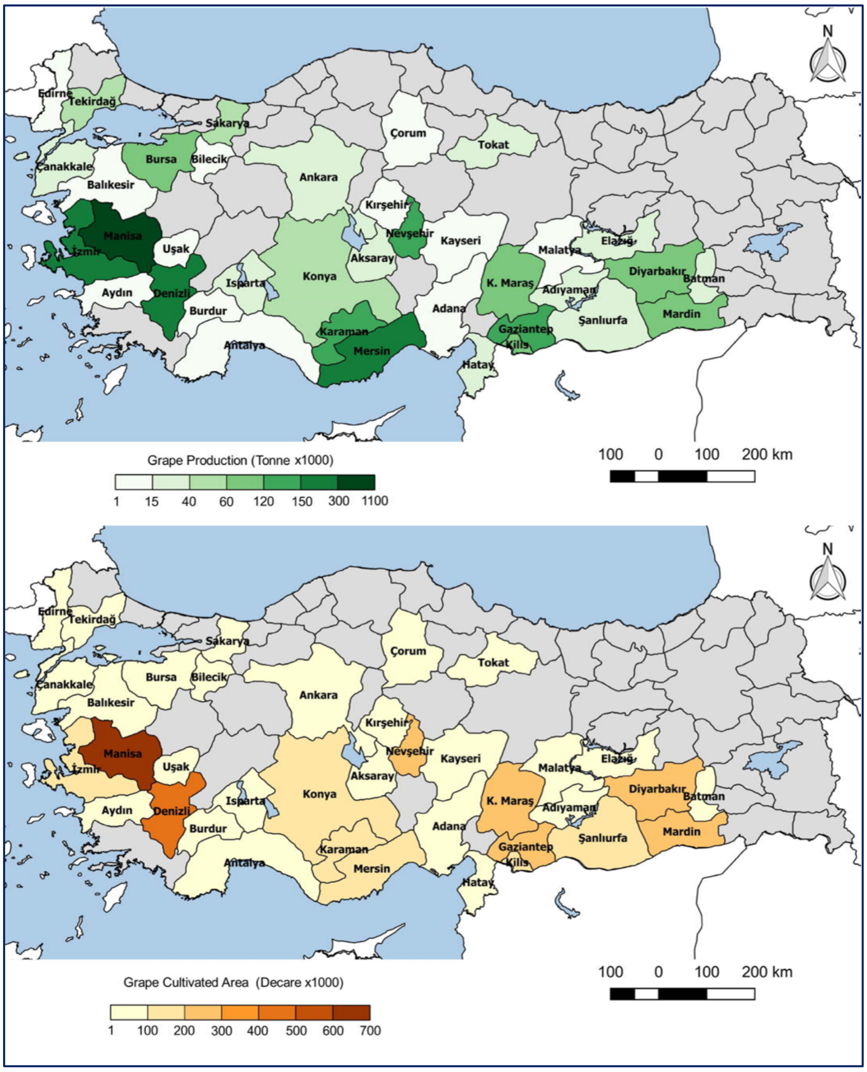


Figure 3.2. Spatial distribution by province of average production (tonne) and average cultivated area (ha) for grape in Turkey for the period of 1991-2012.

The main vineyard areas Denizli, Manisa and Izmir in Aegean Region, Tekirdag, Edirne, Canakkale in Thrace, Ankara, Nevşehir in Central Anatolia, Diyarbakir in the Southeast, and Elazig in Eastern Anatolia. These are followed by Bozcaada, Bursa, Ankara, Malatya, Antalya, Konya, Adapazarı and Tokat. Tekirdağ and surroundings is one of the most important vineyards and wine production regions. The coastal length between Tekirdağ and Şarköy, Gallipoli and Saros Bay, Mürefte, Uçmakdere, and Çınarlı located on the coast that continues after Şarköy are very important locations to produce grape and wine. Grape varieties by locations are as follows (Table 3.2):

Table 3.2. Growing Regions and Sub-regions, Consumption Types of Some Grape Varieties in Turkey.

Type of Grape	Growing Region	Consumption Type	Color
Papazkarası	Tekirdağ and Edirne	wine grape, must grape	red
Karasakız	Çanakkale and Bozcaada	wine grape, must grape	red
Sauvignon Blanc	Adapazarı, Geyve and Saros Bay, Antalya	wine grape, must grape	yellow-white
Semillon	Tekirdağ and Şarköy	wine grape, must grape	yellow-white
Çalkarası	Denizli	wine grape	red
Alicante Bouchet	İzmir	table grape, dried grape, wine grape, must grape	red
Chardonay	Denizli, Antalya, Tekirdağ	wine grape, must grape	yellow-white
Gamay	Mürefte (Tekirdağ), Şarköy	wine grape, must grape	red
Yapıncak	Mürefte (Tekirdağ), Şarköy	wine grape, must grape	yellow-white
Sultana	Manisa, Denizli, İzmir, Gaziantep	Sofralık, kurutmalık	yellow-white
Bornova Misketi	İzmir	Sofralık, şaraplık	yellow-white
Cabernet Sauvignon	Çeşme ve Urla (org. France), Antalya	wine grape, must grape	red
Carignan	İzmir	table grape, dried grape, wine grape, must grape	red
Merlot	İzmir (Menderes), Çeşme (Ovacık village), Urla, Edirne	wine grape, must grape	red
Syrah	İzmir and Antalya	wine grape, must grape	red
Pinot Noir	Tekirdağ, Antalya	wine grape	red
Kalecik Karası	Ankara, Kırşehir, Denizli, İzmir	wine grape, must grape	blue-black
Emir	Nevşehir, Kırşehir, Kayseri, Niğde	wine grape, must grape	yellow-white
Narince	Tokat, Çorum, Amasya, Antalya	table grape,wine grape, must grape	yellow-white
Öküzgözü	Elazığ and Malatya, Antalya (a few years)	wine grape, must grape	red
Besni	Adıyaman	table grape, dried grape	yellow-green
Şire	Mardin	wine grape	red
Boğazkere	Diyarbakır, Antalya (a few years)	wine grape, must grape	red
Horoz Karası	Gaziantep, Kilis, Hatay	wine grape, must grape	blue-black
Sergi karası	Gaziantep	dried grape, wine grape, must grape	dark red
Dökülgen	Kilis	wine grape, must grape	yellow-white
Rumi	Kilis	table grape, dried grape, wine grape, must grape	yellow-green
Hasandede	Ankara, Çorum, Çankırı	wine grape, must grape	yellow-white
Alphonse Lavelle	İzmir, Mersin, Çanakkale, Uşak, Isparta, Bursa	dried grape, wine grape	blue-black

Grapevine is a perennial plant with an uncertain growth stage (Gary et al., 2003). The uncertain growth term applies to species with strong competition between their leaves and fruits (Brisson et al., 2003; García de Cortázar-Atauri, 2006). Grape is a fleshy fruit, and they are distinguished by their different physiological characteristics. Here we can talk about two simultaneous formation dynamics called water and dry matter in the growth process. In other words, these two important formation dynamics in the process act in the opposite direction with a decrease in water content and an increase in dry matter (Ollat, 1997; Matthews and Shackel, 2005; García de Cortázar-Atauri, 2006). During the growth of the plant, two different cycles occur simultaneously (Coombe and Dry, 1988; García de Cortázar-Atauri, 2006). The vegetative cycle that begins with the development of the side buds following dormancy continues with the explosion of the buds, the growth of the branches and the emergence of the plant majesty, and this cycle ends with the fall of the leaves. The reproductive cycle starts with flowering and trophic competition occurs between vegetative growth and reproduction (García de Cortázar-Atauri, 2006).

The most important climate variable affecting the grape quality in viticulture is temperature. The economic viability of a grape ecosystem depends on the fact that the average annual temperature does not fall below 9 °C. The best temperatures for the vines are between 25-30 °C (KOP, n.d.). The average annual temperature range is 11-16 °C for optimum growth. Depending on the ideal averages, the hottest month average temperatures should not fall below 18 °C, the coldest month average temperature should not fall below 0 °C and the summer average temperature should not fall below 20 °C. At temperatures above 35 °C, the grapevine begins to be damaged, and sunburns occur in direct sunshine clusters. When temperatures rise above 40 °C, wrinkles begin to appear on the sun-facing faces of the grain and may turn darker in color. If high temperatures persist for a long time, all grains may crease and die. The resistance of grapes against sunburn caused by high temperature varies according to grape species (KOP, n.d.). It is considered as the development period for grapes between 1 April and 31 October in the northern hemisphere. The average temperature between these dates should be above 13 °C (Çelik et al., 1998). The vine, which can withstand up to -15 °C in the dormancy period depending on its type, is damaged by temperatures falling below 0 °C, especially during vegetation. Especially after -1 °C, the degree of damage differs according to some species depending on daytime temperatures before and after frost and their resistance to cold weather (Öztürk, 1996; Ulupınar and Söylemezoğlu, 2017). In addition, the temperature also affects the color and taste depending on the amount of sugar contained therein. In places with relatively low temperatures, the amount of sugar decreases and the sour begins in the fruit (Öztürk, 1996; Ulupınar and Söylemezoğlu, 2017). Late spring frosts and early autumn frosts are the most important ecological factors limiting viticulture, but late spring frosts are more threatening for vine than early autumn frosts. Areas exposed to frequent late spring frosts are not suitable for viticulture. Grapevine is usually damaged starting from -12 °C and when reaching -20 °C, the level of damage to the stem and branches increases (Çelik et al., 1998). Grapevine requires a long and rainless summer season. The distribution of precipitation during the year is also important. Excessive and irregular rainfall may damage the grapevine (KOP, n.d.). The ecosystems with total annual precipitation of 600 mm are economically suitable for viticulture without additional irrigation (Çelik et al., 1998). However, some irrigation support may increase the yield in grapevine (KOP, n.d.). The areas that receive lower amounts of precipitation (300-600 mm per year) might be suitable for more drought-resistant species (vinifera species). Excessive rainfall during the flowering may adversely affect pollination and fertilization by reducing grain temperature. Excessive precipitation seen in the veraison, and harvest period causes the cracking of the grains with the absorption of excess water accumulated in the soil, and consequently the quality and the yield decreases. The hail in spring and early summer causes tearing of vine leaves and decreasing photosynthesis ability. In addition, the grains are damaged by the hail (KOP, n.d.). Mild winds (not exceeding 3-4 m/s) are particularly useful for plant-water balance and photosynthetic ability, especially at the beginning of grapevine development. Shoots not yet tied at the beginning of the vine development are damaged at wind speeds above 10 m/s (Çelik et al., 1998). In cold regions, the temperature decreases further with the effect of the wind and the development of the vines weakens (KOP, n.d.). When the humidity falls below 50 % during the veraison and grain formation corresponding to July and August, drought starts, and the fruit quality is negatively affected. If the relative humidity is high for a long time (above 60 %), some diseases occur and damage the fruit (Öztürk, 1996; Ulupınar and Söylemezoğlu, 2017). The ideal humidity conditions for viticulture in an ecosystem are between 50-60 %. Grapes need a certain temperature sum to ripen in accordance with their own phenology. This temperature sum, expressed as growing degree days (GDD), varies by species. GDD is calculated by accumulating daily temperatures of 10 °C and above during the development period of the grapevine (starting from the awakening of the buds in April and October and continuing until harvest). It is called as vegetation period and it varies according to the grape type for the specific location (Ulupınar and Söylemezoğlu, 2017). The vine requires in general an average of 1600-2000 GDD per year to mature, some grape types i.e., early, mid-early and latest-early approximately from 900 to 2200. Based on the crop varieties, there may be a need for a lower or higher temperature sum. In regions with mild climate, the vegetation period (for example, Denizli and its surrounding areas in the Aegean Region) takes longer, starts early, and ends late (Ulupınar and Söylemezoğlu, 2017). The vegetation time can be calculated in several ways. According to one method, it is the number of days ($T_{mean} \geq 10$ °C) in which the average temperature is 10 °C and above between 1 April-31 October for all locations (Ulupınar and Söylemezoğlu, 2017). According to another method used in determining the vegetation time, it is the time between the first day and the last day of 10 °C and above-average temperature (Ulupınar and Söylemezoğlu, 2017).

3.2. Description of Variables

Different climatic variables are used in methodologies for different crops. The variables in the statistical model used to analyze the change in hazelnut yield are mean temperature (T_{mean}), diurnal temperature range (DTR), precipitation (Pr), evapotranspiration (AET), relative humidity (RH) and duration of sunshine (SunD). The climatic variables in the dynamic model, STICS used to analyze the change in grape yield are minimum (T_{min}), maximum (T_{max}) and mean temperature (T_{mean}), precipitation (Pr), relative humidity (RH), solar radiation (Rad), wind speed (WS).

In the membership function applied for climate suitability index and classification, the climatic variables are (T_{max}), (T_{min}), and (T_{mean}), (Pr), (AET), (RH), (SunD) for hazelnut, (T_{max}), (T_{min}), and (T_{mean}), (Pr), (AET), (RH), (WS) for grape.

3.3. Input Data

3.3.1. Crop Yield data

The data for the period of 1991-2012 is obtained from the Turkish Statistical Institute, including production, cultivated area and number of fruit trees for hazelnut and grape (TURKSTAT, n.d.-a, n.d.-b). When the data on the number of trees with fruits is used in yield calculations, significant errors related to some years have been determined; therefore, considering the reliability of the data, the yield data used in the analysis is considered as per cultivated area (in 1000 m^2) (Eq. 3.1):

$$\text{Yield}\left(\frac{\text{kg}}{10^3\text{m}^2}\right) = \frac{\text{Production (kg)}}{\text{Cultivated Area}(\ 10^3\text{m}^2)} \tag{3.1}$$

3.3.2. Climate Data and Indices Using Regional Climate Model, RegCM4.4

Climate models are dynamic and highly complex mathematical software that is shaped on basic physics laws (Newton Laws, Thermodynamic Laws, etc.). They take all atmosphere-ocean-land interactions, all feedback, and cycles on a global and local scale into account. Modeling studies, which were started using simple equations and fundamental parameters to make weather forecasts in the early twentieth century, have been developed with the help of advancing science and technology and continued with more complex and reliable climate models. Currently, the most advanced climate models are the so-called “General Circulation Models” or “Global Climate Models” (GCMs). These models consider the circulation and movements in the atmosphere and oceans on a global scale and contain the atmosphere-ocean interactions in the most accurate way. These models simply divide the world into certain equally spaced boxes (grid or raster) to provide climatic data about a desired point in the earth. Since we aim to project the possible climatic conditions of the future, the critical point here is how to determine the climate of the future. Therefore, to what extent the greenhouse gas emissions, which are the main cause of the current climate change, will change in the future and how much of the atmospheric concentrations will increase the heat by keeping more of the energy coming from the sun in the earth should be projected as a first step. Therefore, future atmospheric greenhouse gas concentrations are predicted with various scenarios. These scenarios are called RCP (Representative Concentration Pathway) (van Vuuren et al., 2011) and reveal a range of optimistic and pessimistic situations from low greenhouse gas emissions to high greenhouse gas emissions, as in our current course. Using the Representative Concentration Pathway (RCP) scenarios of IPCC, the future climate of the whole world is projected with the help of global models in different scenario sets. In this way, the answer to the question of what kind of climate we will encounter when the behaviors are changed to reduce greenhouse gas emissions or if no effort is made on greenhouse gas reduction and the current practice is maintained.

By considering these evaluations, climate projections were made at a 10 km resolution for the future period of 2021-2050 under the pessimistic concentration scenario (RCP8.5), in other words, when everything continues with the current conditions. Besides, the 1971-2000 past period was also obtained from the model as a reference period to make the comparison between the past and the future, and to test accurate parameterization by assessing the performance of the model. The data obtained from the model for the past were tested with observation data of the same period. According to these projections, within the scope of different locations for different crops/fruits, 923 locations were analyzed in terms of climate change effects based on sub-regions, and the degree of sensitivity to climate change was determined. The modeling results in this part of the study are significant as they have input characteristics in terms of yield change and pattern change analysis of the crops in the study. Hereunder, climate data obtained from RegCM4.4 for 923 locations and then it was interpolated using the Inverse Distance Weighting (IDW) method in the next step. IDW is a spatial interpolation method that estimates unknown values with distance, closest points, barriers (GIS Geography, n.d.). IDW interpolation can be set up in different ways. Just remember that the investigation of the number of closest points specifies how many points should be used. In this study we have applied the closest 4 points to the location coordinates were determined from the grid data obtained from RegCM4.4 (Eq. 3.2). Briefly, we are going to first to the grid points, then taking the location coordinates and lastly, we are combining them with IDW interpolation method (Figure 3.3).

$$\mathrm{Data_{final}} = \frac{\sum_{i=1}^{n}\left(\frac{\mathrm{Data_i}}{\mathrm{Distance_i^2}}\right)}{\sum_{i=1}^{n}\frac{1}{\mathrm{Distance_i^2}}} \tag{3.2}$$

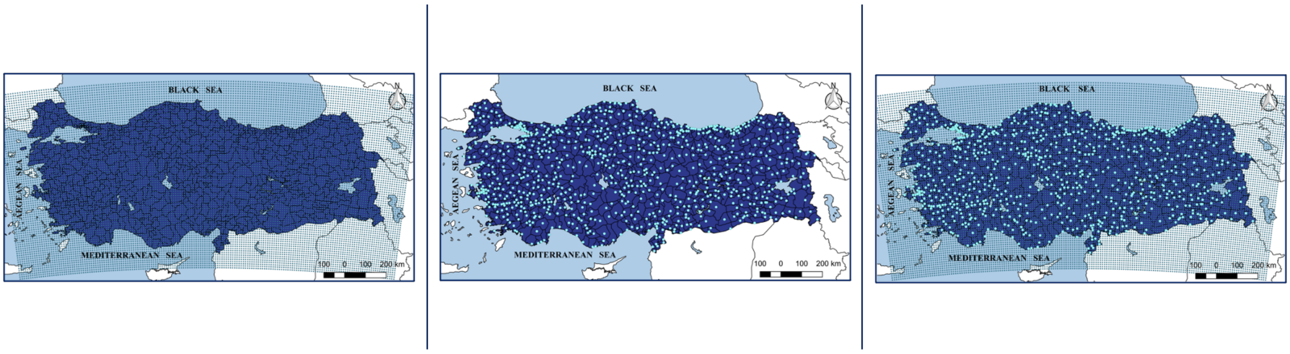


Figure 3.3. Combined Grid and the coordinates according to the IDW.

The parameters are determined based on hazelnut and grape specific climate requirements and the relationship between yield and climate variables in the literature. The statistical model is designed to observe the effect of climate parameters on the yield obtained from the regional climate model. In the study, only the contribution of the climate effect is tried to be evaluated without any other factors. Maximum temperature (T_{max}), Minimum temperature (T_{min}), Mean temperature (T_{mean}) (°C), Precipitation (Pr) (mm), Actual evapotranspiration (Eva) (mm), Relative humidity (Rh) (%), and Duration of sunshine (Sund) (hr) (Zhang et al., 2017), and Wind speed (WS) (m/s) are used as climatic variables. Besides, the diurnal temperature range (DTR) (°C) is also calculated using temperature outputs of the climate model. The definition and time range of the variables are shown in Table 3.3.

Table 3.3. Detailed description of the regional climate model processes and the variables used in the model. Yield data have the annual time series of 1991-2012 for the baseline and 2021-2050 for the future period. Time range of the climate variables covers each month and each day of the years between 1991 and 2012 for the baseline while it covers each month and each day of the years between 2021 and 2050 for the future period.

Inputs	: 1 GCM model, MPI-ESM-MR		
Domain/Sub-Domains	: Turkey, 923 locations		
Regional Climate Model : RegCM4.4.3			
Grid resolution	: 50km x 50 km (downscaling) and 10km x 10km (double nested)		
Baseline time scale	: 1991-2012		
Future time scale	: 2021-2050		
Projection scenarios	: RCP8.5 (BAU) - history and future		
Variable	**Definition**	**Time Range**	**Unit**
Yield	Annual yield	Annual*	(kg/da)
Variables in Statistical Model, Panel Data for Hazelnut			
Mean temperature	Monthly average mean temperature	October-August*	(°C)
Precipitation	Monthly total precipitation	October-August	(mm)
Evapotranspiration	Monthly total actual evapotranspiration	October-August	(mm)
Relative humidity	Monthly average relative humidity	October-August	(%)
Duration of sunshine	Monthly total duration of sunshine	October-August	(hr)
Diurnal temperature range	Monthly average diurnal temperature range	October-August	(°C)
Variables in Crop Growth Simulation Model, STICS for Grape			
Maximum temperature	Daily maximum temperature	January-December**	(°C)
Minimum temperature	Daily minimum temperature	January-December	(°C)
Mean temperature	Daily mean temperature	January-December	(°C)
Precipitation	Daily total precipitation	January_December	(mm)
Relative humidity	Daily relative humidity	January-December	(%)
Solar Radiation	Daily total solar radiation	January-December	(MJ)
Wind Speed	Daily wind speed	January-December	(m/s)
Variables in Membership Function for Hazelnut			
Minimum temperature	Monthly average minimum temperature	October-August	(°C)
Maximum temperature	Monthly average maximum temperature	October-August	(°C)
Mean temperature	Monthly mean temperature	October-August	(°C)
Precipitation	Monthly total precipitation	October-August	(mm)
Evapotranspiration	Monthly total actual evapotranspiration	October-August	(mm)
Relative humidity	Monthly average relative humidity	October-August	(%)
Duration of sunshine	Monthly total duration of sunshine	October-August	(hr)
Variables in Membership Function for Grape			
Minimum temperature	Monthly average min temperature	January-October***	(°C)
Maximum temperature	Monthly average max temperature	January-October	(°C)
Mean temperature	Monthly mean temperature	January-October	(°C)
Precipitation	Monthly total precipitation	January-October	(mm)
Evapotranspiration	Monthly total actual evapotranspiration	January-October	(mm)
Relative humidity	Monthly average of relative humidity	January-October	(%)

** The 11-month period between October of the previous year and August of the following year is considered as the vegetation year for hazelnut. ** The 12-month period between January and December for the same year is considered as for grape in STICS. *** The 10-month period between January and October for the same year is considered as the vegetation year for grape.*

Diurnal temperature range (DTR*)*: Diurnal temperature range is basically defined as the difference between daily maximum temperature (T_{max}) and daily minimum temperature (T_{min}) (Eq. 3.3). Although DTR gives more information on climate change rather than average temperatures, it is generally ignored in the studies assessing the impact of climate change on crop yields (Lobell, 2007). DTR can give better understanding of the effect of change in extreme temperatures on crop yield. Because DTR can increase or decrease depending on the positive or negative change in maximum and minimum temperatures. Considering the nonlinear relationship between temperature and the plant physiology (Chen et al., 2003), the harmful impact of change in DTR on crop can be associated with high water stress, low photosynthesis rate, and high chilly or scorching temperatures (Tubiello et al., 2002; Lobell, 2007).

$$\mathrm{DTR} = \mathrm{T_{max}} - \mathrm{T_{min}} \tag{3.3}$$

3.4. Methodological Approaches

In the study, crop selection was made according to the world ranking in the top 10 of agricultural production and export in all across Turkey. Following their phenology description, climate parameters were obtained from regional climate modeling, RegCM4.4. In the study, the impact of climate change on crop yield in the future is analyzed by statistical model (multi regression-panel data) with year-to-year variability for hazelnut and crop growth simulation model (STICS) with day-to-day variability for grape. In the second part, the change in the crop pattern in the future is examined using the membership function for hazelnut and grape.

3.4.1. Statistical Approach

3.4.1.1. Panel data method-multi regression model. The statistical models do not give any information about physical growth, but they give an idea about the relationship between climate variables and crop yield under climate scenarios from IPCC. The statistical model estimates the variations in crop characteristics due to climate change. Therefore, climate scenarios are also significant for the statistical approach. These approaches have been used to estimate the impact of climate change on agricultural productivity in many studies (Landau et al., 2000; Jones and Storchmann, 2001; Caprio and Quamme, 2002; Lobell et al., 2006; Cyr and Kusy, 2007; Lobell et al., 2007). In other words, since statistical models do not include the physiological process of plant growth, they differ from the plant-based models. In the grand scheme of things, the statistical approach is used to demonstrate how climate variability affects crop growth and quality (Jones et al., 2005), but they can not estimate crop yield with different management practices for reducing climate change impacts (Levin and Muller-Landau, 2000).

The data used during the statistical analysis can be used in 3 different ways: cross-section, time series, and panel data. Unlike the other two, the feature of panel data is that it combines time series with cross-sectional data. The panel data method can be briefly defined as the combination of units such as countries, regions, cities, companies, individuals for a specific period. In other words, it can be expressed as the monitoring of the observations of the units (sections) over time. Hence, in the study, climate data are given to the statistical model as an input for different regions (total 88 locations for hazelnut; total 96 locations for grape) where the crops are grown over a period of 22 years.

Panel data has some advantages over other methods in terms of the consistency and reliability of model results (Nerlove and Balestra, 1992; Baltagi, 1995; Gujarati, 2003). The cross-sectional data method does not model dynamic states. In time series analysis, long periods should be taken into consideration in terms of the reliability of model results. Panel data analysis can eliminate negativities by combining both methods. Since the cross-section and time-series observations are combined in the panel data method, the number of observations increases, and this situation positively contributes to the model result. In this way, analysis is made possible even when there is a short time series and/or insufficient cross-section observation. However, even if the panel data provides analytical convenience, in general, some problems may arise in terms of the results, since the data in the panel is generally taken with a large cross-section size and a short period. Therefore, although panel analysis can be performed with a shorter time series, the high number of observations in total contributes positively to the result. Panel data creates fewer multicollinearity issues between variables. It creates variability by bringing together the variation between two periods with the variation between microunits and brings down multicollinearity. Besides, panel data offers the opportunity to work with a more extensive data set and reduces the trend effect. It results in higher reliable parameter estimates, a higher degree of freedom, and lower multicollinearity between explanatory variables, in short, more effective, and consistent estimations. There are a large number of non-measurable explanatory variables that influence the behavior of the units (countries, households, individuals, cities, firms, locations involved in this study) in any cross-section. Excluding these variables in the model leads to bias estimates. A similar situation arises when the time series variables that affect the behavior of micro-units in the same direction but differently in each period are excluded. These problems are eliminated in panel data analysis. In the estimations made using the cross-sectional data, only the differences between the units are examined. Panel data analysis allows them to be carried out both for units and for a specified period.

General Linear Panel Data Equation;

The general linear panel data equation assumes that the error term is distributed independently and normally for the entire period and all units (Eq. 3.4).

$$Y_{it} = \beta_{0it} + \beta_{1it}X_{1it} + \beta_{2it}X_{2it} + \ldots + \beta_{kit} X_{kit} + u_{it} \tag{3.4}$$

In the model, i=1, 2, ..., N is the cross-sectional unit and t=1, 2, ..., T is the time

Before the projection of the model, some tests were made under some assumptions related to the selection of fixed effect or random effect model depending on whether the parameters have unit and/or time effect.

The models that can be used according to the characteristics of the sample in the panel data analysis are as follows:

1. Classic model: This model, which is accepted as the most basic and limited panel data model (Cameron and Trivedi, 2005), is both constant and slope parameters fixed according to units and time, in other words, all observations are homogeneous (Yerdelen Tatoğlu, 2012, 2013). In the model, the error terms are homoscedastic (with fixed variance) by unit and time. The model assumes that the parameters are not affected by units or time, but generally, this assumption cannot be provided, so this model is not preferred. In other words, there is no correlation between error terms (u_{it}) and explanatory variables (X_{kit}) (Eq. 3.5). The observations for each unit are independent, meaning uncorrelated.

$$Y_{it} = \beta_0 + \sum_{k=1}^{k}\beta_k X_{kit} + u_{it} \tag{3.5}$$

Constant term does not change over time and units.	Slope parameters do not change over time and units.

In the classical model, suitable pooled least squares (Pooled Ordinary Least Square - POLS), least squares (Least Square - LS), or generalized least squares (Generalized Least Square - GLS) methods can be used. GLS estimators give more effective results compared to OLS estimators if the error terms are heteroscedastic and autocorrelated in these panel models.

2. One-way model (unit effect or time effect models): These models contain unit or time effects, unlike the classic model. Unit effects or time effects are expressed mathematically in the model as follows:

The models, which the slope coefficients are constant, and the constant coefficient has variability according to the units, are unit effect models (Eq. 3.6). The same is true for the time effect. It is represented by the following equation:

$$Y_{it} = \beta_{0i} + \sum_{k=1}^{k} \beta_k X_{kit} + u_{it} \tag{3.6}$$

Models, where all coefficients have variability according to units and constant over time, are expressed with the following equation (Eq. 3.7):

$$Y_{it} = \beta_{0i} + \sum_{k=1}^{k} \beta_{ki} X_{kit} + u_{it} \tag{3.7}$$

One-way models can be used as fixed-effect or random-effect models.

3. Two-way models (unit and time effect models): These models are both unit and time effect models.

Models, where slope coefficient is constant and constant coefficient has variability according to units and time, are unit and time effect models (Eq. 3.8). It is expressed by the following equation:

$$Y_{it} = \beta_{0it} + \sum_{k=1}^{k} \beta_k X_{kit} + u_{it} \tag{3.8}$$

The general problem encountered in panel data analysis is whether to work with a fixed effects model or random-effects model. It is primarily based on the possible correlation assumption between the cross section-specific error term and the explanatory variables. If there is no correlation between unit effects and explanatory variables, the random-effects model, whereas if the unit effects and explanatory variables are correlated, the fixed effects model should be preferred. In other words, this correlation relationship arises concerning the broad or limited main mass of the cross section. If the cross sections (N) come from a large main mass, the random-effects model should be chosen or vice versa.

Fixed effects model: In the fixed-effects model, the slope parameters are the same for all units, while the fixed-parameter varies from unit to unit due to the unit effect. In other words, differences between units are expressed by the constant term taking different values for each unit. In short, the slope coefficients are not affected by unit and time in these models, and the slope parameter is considered constant for all units. Unlike the slope coefficient, the constant term contains the effect of each unit, so it does not change depending on time but differs for each unit (Eq. 3.9) (Balestra and Krishnakumar, 2008). Besides, in fixed-effect models, it is assumed that there is no correlation between the explanatory variables and the error term. Still, the assumption that there is a correlation between the unit effect and the explanatory variables is accepted, and the change over time is considered (Yerdelen Tatoğlu, 2012, 2013).

$$Y_{it} = \beta_{0it} + \beta_{1it}X_{1it} + \beta_{2it}X_{2it} + \ldots + \beta_{kit}X_{kit} + u_i \tag{3.9}$$

$$\beta_{0it} = \beta_{0i} = \overline{\beta} + \mu_i \,; \qquad \beta_{1it} = \beta_1 \,; \qquad \beta_{2it} = \beta_2 \ldots, \beta_{kit} = \beta_k$$

As stated by; μ_i = effects of unit differences constant over time, u_{it} = error term

In fixed-effects models, least squares dummy variable method (LSDV), within estimation method (WE), between-groups estimation method (BE), pooled least squares method (POLS), maximum likelihood, generalized least squares method (GLS), flexible generalized least-squares method (FGLS) can be used.

Random effect model: In some cases, differences between units can be random, not fixed. These models are used where the units in the sample are chosen by randomly (Eq. 10 and Eq. 11). In these models, it is assumed that many variables affect the dependent variable but are not included in the model as an explanatory variable. These variables are considered as excluded variables, and some of these variables are assumed to contain only unit effects, while others are expected to include both unit and time effects. If there is no correlation between unit effects and explanatory variables, the use of the fixed-effects model causes the changes that stem from the random-effect of the unit to be eliminated in the model, and consistent estimators cannot be produced. In this case, it is more convenient to use the pooled least squares method with robust standard errors.

$$Y_{it} = \beta_{0it} + \beta_{1it}X_{1it} + \beta_{2it}X_{2it} + \ldots + \beta_{kit}X_{kit} + \mu_i + v_{it} \tag{3.10}$$

or

$$Y_{it} = \beta_{0it} + \sum_{k=1}^{k}\beta_k X_{kit} + (v_{it} + \mu_i) \tag{3.11}$$

It represents the error term and the error term includes the random effect

As stated by; v_{it}: refers to all error in the model, μi: refers to the unit error in the model, unit differences and the change between units based on the assumption that the change in time is constant (i. represents the constant of the cross section).

In random effect models, pooled least squares method (POLS), between-groups estimation method (WE), maximum likelihood, generalized least squares (GLS), flexible generalized least squares (FGLS), general, flexible generalized least squares, two-stage generalized least squares, generalized estimation equation methods can be used.

As with models, there are some hypothetical differences between the methods to be used for the estimations. It is an issue to be considered, which estimation method is used for which model. Choosing the appropriate projection method is very important for consistency and reliability. The methods to be used in the models that can be applied depending on the characteristics of the sample in the panel data analysis.

Pooled least squares method (POLS) (Greene, 2008), First difference method (Wooldridge, 2002). Least squares dummy variable method (LSDV), Within-groups estimation (FE), Between-groups estimation method (BE), Generalized Least Square (GLS), Feasible Generalized Least Squares (FGLS) (Verbeek, 2004), Maximum likelihood method (Matyas, 1992; Hsiao, 2014) are the methods applied in the analyses depending on the data characteristics. Two of them i.e., within-groups estimation (FE), generalized least square (GLS) are given in more detail because they are used in the study.

Within-groups estimation (FE): In the presence of unit effects, it is known that there is a loss of a degree of freedom in the estimates made using the dummy variable method. As an alternative to this method, the within-groups estimation method can be used to prevent it. In the within-groups estimation method, the differences between the variables from time averages are taken. Estimation coefficients obtained in this method are the same as the LSDV method (Eq. 3.12, Eq. 3.13, Eq. 3.14, and Eq. 3.15).

If it is formulated with a simple regression;

$$Y_{it} = \alpha + \beta X_{it} + \mu_i + \varepsilon_{it} \tag{3.12}$$

Averages of variables by time;

$$\widehat{Y}_i = \frac{1}{T}\sum_{t=1}^{T} Y_{it}\ , \qquad \widehat{X}_i = \frac{1}{T}\sum_{t=1}^{T} X_{it}\ , \qquad \hat{\varepsilon}_i = \frac{1}{T}\sum_{t=1}^{T} \varepsilon_{it} \tag{3.13}$$

$$\widehat{Y}_{it} = \alpha + \beta \widehat{X}_{it} + \mu_i + \hat{\varepsilon}_{it} \tag{3.14}$$

By taking the difference of two equations, the model equation is obtained.

$$(Y_{it} - \widehat{Y}_i) = \beta(X_{it} - \widehat{X}_i) + (\varepsilon_{it} - \hat{\varepsilon}_i) \tag{3.15}$$

In this equation, coefficients are obtained by estimating with OLS method.

Generalized Least Square (GLS): In the case of heteroscedasticity, OLS estimators lose their effectiveness even though they maintain their stiffness and consistency. In such a situation, the results cease to be reliable. It is recommended to apply this method in the fixed effects model if there are heteroscedasticity and autocorrelation in the model. In other words, the variance of error terms of the model changes, and there is a correlation between error terms (Eq. 3.16).

$$Y_{it} = \alpha + \mu_i + X_{it}\beta + \varepsilon_{it}\ , \qquad v_{it} = \mu_i + \varepsilon_{it} \tag{3.16}$$

Here, unit effects are a component of the error term (Equation16). This method also provides estimation in the case of the assumption that there is no relationship between unit effects and explanatory variables, that is, by considering unit effects as a variable in the random-effects model. Here, unit effects are included as a component of the error term. The GLS method means to estimate this equation with OLS by obtaining a converted equation (Eq. 3.17) from the original equation.

$$\frac{Y_i}{\sigma_i} = \beta_1 \frac{1}{\sigma_i} + \beta_2 \frac{X_{2,i}}{\sigma_i} + \ldots + \beta_k \frac{X_{k,i}}{\sigma_i} + e_i \tag{3.17}$$

The error term of the transformed equation (Eq. 18);

$$e_i = \frac{u_i}{\sigma_i} \tag{3.18}$$

The variance of e_i is as follows and is constant (Eq. 19);

$$\mathrm{Var}(e_i) = E(e_i)^2 = E\left(\frac{u_i}{\sigma_i}\right)^2 = \left(\frac{1}{\sigma_i^2}\right) E(u_i)^2 = \left(\frac{1}{\sigma_i^2}\right) \sigma_i^2 = 1 \tag{3.19}$$

Estimating the transformed equation with OLS means predicting the original equation with GLS. Applying OLS to the transformed equation is also called Weighted OLS (weighted least square-WLS). Because each observation is weighted with the inverse of the error term variance. Weighted OLS is a special case of GLS, a more general method. The reason for using weights in weighted OLS is that observations with high variance have a lower weight in the estimate (Kızılırmak, n.d.).

With OLS β_0 (Eq. 3.20), β_1 (Eq. 3.21), error term ($\hat{u}_i$) (Eq. 3.22), Cov ($\hat{\sigma}_u^2$) (Eq. 3.23), Var (β_0) (Eq. 3.24), Var (β_1) (Eq. 3.25) ve Cov (β_0, β_1) (Eq. 3.26) respectively;

$$\hat{\beta}_0 = \frac{\sum X_i^2 \sum Y_i - \sum X_i \sum X_i Y_i}{n\sum X_i^2 - (\sum X_i)^2} \tag{3.20}$$

$$\hat{\beta}_1 = \frac{n\sum Y_i X_i - \sum Y_i \sum X_i}{n\sum X_i^2 - (\sum X_i)^2} \tag{3.21}$$

$$\hat{u}_i = Y_i - \hat{Y}_i \tag{3.22}$$

$$\hat{\sigma}_u^2 = \frac{\sum \hat{u}_i^2}{n - k} \tag{3.23}$$

$$\mathrm{Var}(\hat{\beta}_0) = \hat{\sigma}_u^2 \frac{\sum X_i^2}{n\sum X_i^2 - (\sum X_i)^2} \tag{3.24}$$

$$\mathrm{Var}(\hat{\beta}_1) = \hat{\sigma}_u^2 \frac{n}{n\sum X_i^2 - (\sum X_i)^2} \tag{3.25}$$

$$Cov(\hat{\beta}_0, \hat{\beta}_1) = \hat{\sigma}_u^2 \frac{(-\sum X_i)}{n\sum X_i^2 - (\sum X_i)^2} \tag{3.26}$$

Method Preference: Going further step by step, the question of "which method should be preferred in which case" becomes meaningful. The validity of the classical model is tested with the F test. This test examines whether data varies by unit, and if the data does not differ by unit, it is appropriate to use the classic model. The method to be used for the classical model is the pooled least squares method (Yerdelen Tatoğlu, 2013). If there is a correlation between error terms and unit and/or time effect, i.e., random-effects, the least-squares method dummy variable is more effective than the pooled least squares method. In the fixed-effects model, although the least squares dummy variable gives the same result, the within-group estimator is more suitable because the number of observations and the size of the period causes loss of freedom in the dummy variable method (Yerdelen Tatoğlu, 2013). In the presence of heteroscedasticity, autocorrelation and cross-sectional dependency in the model, the variance-covariance matrix of the error term is not equal to the unit matrix. Even if this situation does not cause inconsistency in large sample models, it affects the estimation effectiveness by affecting variances, standard errors, test statistics (t, F), R^2, and confidence intervals. In this model, if there is at least one of heteroscedasticity, autocorrelation, and cross-sectional dependency, one of the ways to follow is to correct standard errors without any intervention in parameter estimates, that is, to obtain robust standard errors or estimation methods suitable should be chosen (Yerdelen Tatoğlu, 2013).

If the model has heteroscedasticity, Huber (1967), Eicker (1967) and White (1980) estimators, if the model contains heteroscedasticity and autocorrelation, Arellano (1987), Froot (1989) and Rogers (1994) robust standard error estimators are used. It is possible that these estimators can be used in the presence of homoscedasticity and the absence of autocorrelation. Another estimator that can be used in the case of heteroscedasticity and autocorrelation in the model is Newey-West (Newey and West, 1987, 1994). The Newey-West estimator is the expanded version of the White (1980) estimator, and when no autocorrelation (that is, the delay length "0" is selected for autocorrelation), the two give the same result. Newey-West (Newey and West, 1987, 1994) robust standard error estimators can be used in both time series and panel data (Yerdelen Tatoğlu, 2013). The use of all these estimators is decided by considering whether the cross-sectional data is larger than the time series.

The assumption in the fixed effect model is that “unit effects cannot be related to the explanatory variables in the model”. The fixed effects estimator based on this assumption is considered to be consistent and effective. For the random effects estimator to be consistent and effective, there should be no relationship between unit effects and explanatory variables. If the model estimation is to be made according to the inference of each unit or a particular unit, it is more appropriate to use a fixed-effects model. If the importance of each unit is limited in the model, and there is wide mass observation inference, then it will be appropriate to prefer random effects. Which of these models will be used can be determined by Lagrange Multiplier (LM) Test, Likelihood Ratio Test or Hausman test, as well as the preference of what exactly is essential in terms of the model mentioned above? We need to mention what these tests are briefly: Lagrange Multiplier (LM) which is the test for random effects, Likelihood Ratio (LR) Test and the Hausman Test. The Hausman test is briefly explained below because it is applied in the study.

Hausman Test: This test is used to determine which model should be used between fixed and random effect models in panel data analysis. The factor that most affects this choice, and the most apparent difference between the models, is the fact that the unit effect is related to the explanatory variables, as mentioned earlier. The Hausman test analyses whether there is a relationship between the error term (unit effect) and the explanatory variables, and it decides which model is appropriate. In this case, the presence of the relationship leads us to the fixed effects model, and the absence of the correlation leads us to the random effect model. According to this test, the null hypothesis states that a random effect model is appropriate. If the null hypothesis is rejected, then it can be said that the fixed-effects model is applicable.

Besides, there are some test and estimation methods used in panel data analysis, and they vary according to the characteristics of the data. For this reason, it is necessary to determine the features of the data before the analysis, make appropriate tests, and choose the method to be used. Failure to select the proper method may lead to inconsistency and unreliability in the model results. To explain the necessity of determining the characteristics of the data briefly: whether the units included in the data (countries, regions, corporations, individuals, etc.) have similar characteristics (homogeneous or heterogeneous structure) is determinant in the method selection. Units in panel data can be in a homogeneous or heterogeneous structure. For example, individuals, companies or cities included in the panel can be more heterogeneous as they may have different characteristics, while a more homogeneous structure may be encountered in the provinces or sub-locations of a region with low seasonality. However, since each unit may differ in some cases, the data must be appropriately tested. Let's go briefly explain the assumptions which must be tested before analysis.

i. Heterogeneity: Units such as individuals, corporations, locations, provinces, and countries in the panel data are generally heterogeneous. For example, if the province or sub-locations are considered as a unit in the panel to examine the climatic conditions, it should be taken into consideration that the provinces and sub-locations may be heterogeneous since they may be located at different altitudes. However, if the provinces or sub-locations in the region at a certain interval and in which the seasonality is low will be taken into consideration, a significant problem may not arise in terms of heterogeneity. Not considering heterogeneity in the model, parameter estimates may be inconsistent. Therefore, assuming that the fixed and/or slope parameters are heterogeneous, the model results will be more reliable. Panel data can take into account cross-sectional heterogeneity with high probability in a section-specific manner with its prediction techniques. In this way, the negative effect of heterogeneity on the model result can be eliminated. In the model; i) when all parameters are homogeneous, least squares method, maximum likelihood method, and generalized least-squares method, ii) when the fixed parameter is heterogeneous, generalized least squares method, least squares dummy variable method, first difference estimators, and within- and between groups estimators, iii) when all parameters (both constant and slope parameters) are heterogeneous, homogeneous model estimators should not be used because the use of homogeneous estimators in such models will affect the reliability by causing bias in the model results.

ii. Cross-sectional dependency: Another problem that may arise in the model is the correlation between the units of the model. Cross-sectional dependency means the correlation between the error terms for each unit. There may be several reasons for this situation. However, this may be because variables (unit or time effects, or both) excluded from the model, in general, are dependent across the units. As the model's heterogeneity is removed, cross-sectional dependency may decrease, and sometimes it may disappear. The presence of correlation between units is also essential in choosing the method to be applied in the analysis. Moreover, cross-sectional dependency in the data should be considered even in the selection of unit root tests. In most of panel data, the effects of excluded variables (unit and/or time) are assumed to be distributed independently across the units. The random selection of units (such as individuals, companies) may be the correct method because in this case, the correlation between units is not very important.

However, sometimes, when it comes to units such as countries, regions, cities, sub-locations, the correlation between units cannot be ignored.

iii. Heteroscedasticity: For some reasons, the variance of error terms may be variable. Error variances may decrease or increase due to developments in data collection techniques over time, specification errors due to the exclusion of some variables, or outliers in the data. As mentioned earlier, changing variance may be due to the incorrect model specification. For example, taking the logarithm of the data can often reduce or eliminate the changing variance problem. Therefore, the model specification needs to be determined carefully. If it is known that there are variables excluded in the model, it should be taken into consideration that there may be heteroscedasticity. Although it depends on the existence of other assumptions, it may be appropriate to use the GLS method if the cause of the changing variance is exactly known, and for the unknown or unpredictable case, White resistant standard errors should be preferred.

iv. Autocorrelation: The existence of autocorrelation in error terms is explained by the fact that there is a relationship between the successive values of error terms in both time and space. Autocorrelation may stem from factors such as not taking some independent variables into the model, selecting the model mathematically incorrectly, mismeasuring the dependent variable, changing data, or processing data for a specific purpose. If there is autocorrelation in the error terms, the estimated coefficient variances will be smaller than the actual variance, and it will be deviated and inconsistent. Therefore, the R^2 value can be estimated much larger than this, and in this case, the t and F statistics and the confidence intervals obtained cannot rely upon either. Accordingly, the model results will also deviate and lose their effectiveness.

After determining whether the model has a heterogeneous structure and whether there is a cross-sectional correlation, unit root tests are applied for panel data considering the generation (i.e., first and second) and groups of them.

Unit Root Tests: Unit root tests investigate whether the model variables are stationary. Stationarity is the situation where the mean, variance, and autocovariance are constant over time for a given variable in a unit. It is necessary to test whether the panel data models are stationary and to make them stationary to avoid false regression in the analysis. There are a wide variety of panel root unit tests to be applied according to the characteristics of the data. In the literature, these tests are categorized as first and second-generation panel unit root tests and homogeneous and heterogeneous panel unit root tests. The selection of the panel unit root test is made according to data. Before making the panel unit root tests, it is necessary to test whether there is cross-sectional dependency and the heterogeneous structure in the model. If there is a correlation between units in the model, second-generation tests should be chosen, and if there is the heterogeneity, heterogeneous panel unit root tests should be preferred. If the parameters are homogeneous, and there is no correlation between units, more straightforward methods used in time series analysis can also be used for panel data. If there is heterogeneity in the parameters, and there is no correlation between units, stationary and non-stationary series can be used together in panel analysis.

The most critical conditions for the panel are the heterogeneity of the parameters and the cross-sectional dependency. Some applications should be applied in case of such a situation. For example, some transformations can reduce the effect of correlation between units, or some methods may be preferred to ensure the reliability of the model in terms of results.

Another point to be considered after determining whether there is stationarity in the panel is that the linear combinations of nonlinear time series are stationary, in other words, if these series are co-integration. In such a situation, there are some points to be considered. If these series are not stationary, and they are cointegrated after the test, then there is a long-term relationship between these series, and regression is not reliable in terms of results (spurious regression). It is vital to detect the existence of long-term relationships between time series in order not to obtain a spurious regression. Parameters derived from co-integration models give long-term relationships between variables and the methods to be used to estimate long-term relationships are also determined by the correlation between units and whether parameters are homogeneous. In summary, the status of the data (whether it has been measured correctly or whether it is manipulative, the characteristics of the units in the sample, the relationships between the sections, the relationship of error terms with the explanatory variables) affects the tests to be used, with which transformation the data should be used, the choice of models and the choice of methods to be used in model selection.

First group panel unit root tests are unit root tests used in homogeneous panels and are also called homogeneous panel unit root tests. These tests are Harris and Tzavalis (1999), Breitung (2000), Hadri (2000), Levin et al. (2002). Second group panel unit root tests are used for heterogeneous panels and are also called heterogeneous panel unit root tests. These tests are Im et al. (2003), Fisher type-Fisher ADF (Fisher, 1932). The first group of panel unit root tests and the second group of panel unit root tests are separated from each other with the autoregressive parameter characteristics. The assumption accepted in the first group of panel unit tests is that all series of units have a standard autoregressive parameter. In the second group of tests, the autoregressive parameter is not usual between the units but separate for each unit. If there is no correlation between units, Im et al. (2003) test, Levin et al. (2002) and Fisher test types are more effective. In the case of correlation between units in error terms, Fisher test types are more effective than Levin et al. (2002) and Im et al. (2003). Besides, if the panel data contains both stationary and unit root on a variable basis, Fisher test types are more effective in terms of results.

In this study, a model was created by the logarithmic transformation of data, and unit root tests were carried out both as the first and second generation. After the transformation, the model was determined to be stationary, and the method was selected as the within-group estimator for the fixed effects model (FE) and the GLS method for the random effect model (RE). The results of the model were obtained with the robust standard errors by considering the presence of heteroskedasticity and autocorrelation.

3.4.1.2. Model limitations. Two different input data are used in statistical modeling which were two separate stages of the model. One of these is the yield data obtained from TURKSTAT as the dependent variable in the statistical model and the other one is the data of climate variables obtained from the regional climate model, RegCM4.4

Although the yield data obtained from TURKSTAT was per tree under normal circumstances, some inconsistencies were observed when this data was checked yearly. Still, it could not be verified. For this reason, yield data was calculated for the decare, and the yield was considered as per cultivated area (in 1000 m^2) kg in the model. Also, for this data, inconsistencies were detected in a few locations for some years, and verification could not be achieved. However, when compared with the yield data per tree, discrepancies were found to be less. As a partial solution for data reliability, 105 locations for hazelnuts, which were initially planned to be included in the model, were reduced to 88. However, since the number of trees per decare varied in each area, it was assumed that there was no change based on the number of trees per decare when examining the future yield change compared to the past.

When we look at the limitations of the climate model, since a field study could not be conducted for 88 locations for hazelnuts, the climate data from the model could not be obtained by directly considering the coordinates of the lands where cultivation was carried out. The outputs derived from the climate model were gathered according to the climate data of the coordinates calculated by considering the closest 4 points with the Inverse Distance Weighting Method (IDW), as mentioned before for the locations in the study.

Also, in the domains with heterogeneous topography, such as Turkey, the climate variables should be obtained with different parameterisation for each sub-location. This requires more technical power and cost. Therefore, depending on the resolution, bias may occur in climatic parameters obtained from the regional climate model. However, despite all these limitations it can be said that RegCM has acceptable reliability in modeling of Turkey's climate.

3.4.2. Dynamical Approaches - Plant Process-Based

Plant Process-Based Models focus on how a specific plant responds to changing environmental factors including weather conditions, soil characteristics, amount of CO_2 and management practices in a given period of time. These models have different options to band together with various factors like environmental, soil nutrition and management options. They simulate the plant growth process including different crop growth options with genetic characteristics under IPCC scenarios (Representative Concentration Pathways - RCPs) in order to investigate the impacts of projected future climate change on crops such as maize, wheat, soybean, groundnut, grape, bean, sunflower, tea, etc. (Tubiello et al., 2002; Webb et al., 2007; Yao et al., 2007). Some of these models that are widely used in the literature are given below (Table 3.4).

Table 3.4. The crop models widely used in the literature.

CERES	• Crop Environment Resource Synthesis	Ritchie and Otter, 1985
ARCWHEAT	• Agricultural Research Councial	Weir et al., 1984
SUCROS	• Simple and Universal Crop Growth Simulator	van Keulen and Seligman, 1987
EPIC	• Erosion Productivity Impact Calculator	Williams et al., 1989
DSSAT	• Decision Support Systems for Agro-Technology	Jones et al., 2003
APSIM	• The Leading Software Framework for Agricultural Systems Modelling and Simulation	Holzworth et al., 2014
ALMANAC	• Agricultural Land Management Alternatives with Numerical Assessment Criteria Model	Kiniry et al., 1992
WOFOST	• World Food Studies Simulation Model	van Diepen et al., 1989
ADEL	• Architectural Model of Development based on L-Systems	Fournier et al., 2003
CROPSIM	• A model describing the growth and development of wheat	Hunt and Pararajasingham, 1995
CropSYST	• Cropping Systems Simulation Model	Stöckle et al., 2003

Crop modeling mimics crop growth and development with the help of various variables. The model uses 3 types of variables - briefly explained - i) the external driving variables: standard climate variables, ii) the internal driving variables: from the other modules in the model, iii) the output variables: calculating variables in the model (Oteng-Darko et al., 2013). Since a variable takes a new value at each time step, there is no single parameter associated with that variable. Parameters independent of soil, plant and crop management are considered as structural parameters, not input parameters (Brisson et al., 2003). A crop model simulates the behavior of leaves, roots, stems, and harvested organs, which are the components of the crop. For that reason, a model gives not only the yield at harvest time but also the yield according to the simulations at each step in the development process. Therefore, the interaction of different variables during crop development also affects the yield (Ataman, 2017).

Crop growth simulation model is a system for analyzing environmental effects on productivity with crop system management at various time and space. There are many different crop models. All models are still being developed because each model can work better for some crops and the interactions with the environment. New interactions of different crops continue to be learned and added to the models. Many aspects of crop growth model stages often overlap with the actual crop stages. It is the same for grape. However, the general stages of plant growth like finalization of the crop, dormancy entry or dormancy exit times, stopping of leaf development, the formation of the water content, beginning of grain filling and reach the physiological maturity are the parts that cause uncertainty in the models (García de Cortázar-Atauri, 2006). Many models have been developed to simulate agricultural systems. However, only a few are executable for grapes. Crop models developed by VineLogic (Nendel and Kersebaum, 2004; Walker et al., 2005) can be used for vine simulation. However, problems may arise in these models in terms of different parameters that might lead to the different uncertainty. Vitisim is another model for grape growth simulation (Lakso and Poni, 2005). In the model with a user-friendly interface, crop development is achieved through carbon balance. However, as in many of these models, the stochastic effect of canopy might cause the uncertainty in the simulation of some mechanisms like root and carbon (Lakso and Poni, 2005; Ataman, 2017). CropSyst is another model used for grape simulation. Many variables are included in CropSyst, especially for grapes, but the model is problematic in terms of the difficulty of the interface and the parameterization cannot be performed at the desired level.

STICS (Simulateur mulTIdisciplinaire pour le Cutures Standard) is a dynamic simulation model created by the Institut National de la Recherche Agronomique in 1996 (Brisson et al., 2003). It was originally developed for simulation of other crops such as corn, wheat rather than grapes.

Later, García de Cortázar-Atauri (2006) adapted grape to the model in his doctoral dissertation study. The STICS differs in many ways from existing crop models. First, STICS can be used for many different crops (corn, wheat, sunflower, carrot, lettuce, sugar cane, banana, vine, soybeans, feed products, etc.). In addition, the robust construction of the model allows users to apply it in different regions and climates. It can be developed; for example, new modules can be easily integrated into the system. In addition, there are various platforms (e-mail group, seminars, online forums, etc.) where users and developers can discuss their ideas and questions for future developments (Brisson et al., 2008). Moreover, every step of the simulation process can be followed thanks to the user-friendly interface and output reports.

3.4.2.1. Crop Growth Simulation Model, STICS. STICS is organized into main processes including seven modules with different tasks. The modules, each consisting of sub-modules are working out separately with above-ground parts and underground parts of plant. The first set of three modules i.e., phenology, shoot growth and yield formation works out with the ecophysiology of above-ground biomass, i.e. the relationship between the physical structure of the plant and environmental factors and another set of four modules i.e., root growth, water balance, nitrogen balance, soil transfers work out how the soil returns the interaction with underground parts (Table 3.5). The microclimate module deals with the combined effects of water balance and climate on the air humidity and temperature within the canopy. Crop management module, on the other hand, works out the interactions between soil and crop system with the applied management techniques (Brisson et al., 2008). The main processes of STICS are plant growth, development, water, and nitrogen balance. Input variables are mostly related to soil, climate and plant characteristics and the output variables include yield and quality parameters, plant phenology, nitrate leaching and water discharge to the environment.

STICS is a dynamic model that can simulate the behavior of the soil-plant system in consecutive cycles on a yearly basis. It can simulate both annual and perennial plants separately or simultaneously. In the model, the upper atmosphere is characterized by weather variables (i.e., minimum, maximum temperatures, precipitation, evaporation, wind speed and relative humidity or dew point), while the lower atmosphere is characterized by soil and subsoil dynamics. Biomass, nitrogen content, leaf area index and the number of harvested organs on the surface are important dynamics in terms of crop development process. Vegetative organs such as leaves, stems, branches or curved leaves, roots are functionally separated as radiation, water and nutrient receptors. Soil is defined as a series of horizontal layers, each characterized by the organic mineral, nitrogen and water contained therein. Interaction between soil and crop is being provided through roots.

Table 3.5. STICS Model Inputs, Model Outputs, Model Modules and Explanations.

Model Inputs	
• Initial Soil Values • Initial Plant Values • Climate Values • Management Options	
STICS Modules	
• Phenology (Phasic Development) • Shoot Growth • Yield Formation	A first set of modules works out the ecophysiology of above ground biomass
• Microclimate	The microclimate module simulates the combined effects of water balance and climate on the air humidity and temperature within the canopy
• Management options	The crop management module simulates the soil and crop interactions with the applied techniques
• Root Growth • Water balance • Nitrogen Balance • Water, Nitrogen and Temperature Transfers	A second set of modules works out how the soil functions in interaction with underground plant parts
Model Outputs	
• Yield Quantity • Yield Quality • Nitrate Leaching • Water Drainage	

The model simulates the average behavior of a plant against climate variables or management options without taking into account the random size of the canopy. The roots that allow the interaction between soil and crop are defined by their length distribution in the soil profile. STICS simulates the system's carbon, water and nitrogen balances and makes it possible to calculate agricultural output such as crop yield, input consumption as well as environmental outputs. However, the use of STICS is limited in such crop systems since some processes like drought resistance, soil anoxia is not considered. Growth is traditionally achieved by carbon balance (de Wit, 1978; Brisson et al., 1998, 2003, 2008), i.e., capture of the sunlight by green leaves, then conversion to above-ground biomass and to the organs to be harvested in the final stage. Since the nitrogen balance is partially dependent on the carbon balance, the two are simulated simultaneously.

Depending on the type of plant, the day length (photoperiod) and a thermal index (degree-day) with the necessary cooling for entry into flowering (vernalization), control the development of the crop. Plant development is based on the concept of growing degree days (GDD), which is determined as the cumulative value of the difference between average temperature and base temperature (Bonhomme, 2000). However, there is also need for cooling so that the grapevine (*Vitis vinifera* L.) can start the cycle of the bud burst out of the dormancy (Alleweldt, 1957, 1959, 1963, 1964; Fournioux, 1997; García de Cortázar-Atauri, 2006).

3.4.2.1.1. Development (phenological) stage of STICS. STICS includes two phenological stages i.e., vegetative and reproductive stages (Table 3.6). They are consisting of different processes. The stages in the phenological structure of the model depend on leaf area index (LAI) and crop growth processes.

Table 3.6. Phenological stages of STICS.

Vegetative Cycle	Reproductive Cycle (Filling Stage)
• Sowing (or planting)	
• Germination	
• Emergence	
• End of the juvenile phase	• Beginning of the phase critical for grain number
• Maximal leaf area index	• Beginning of fruit filling
• Beginning of senescence	• End of fruit setting
• Stage when leaf area index is nil	• Physiological maturity
• Harvest	

The development module basically defines; i) the development of the leaf area index, and ii) the period during grain-filling of the harvested organs. This process starts from the planting, continues with the formation of leaves and ends with the grain-filling of the fruit for harvest. The process of formation of leaves includes seed germination and lengthening of the epicotyl. The carbon accumulated in the plant shapes the growth of the crop (de Wit, 1978; Brisson et al., 1998, 2003, 2008). Solar radiation is captured by the leaves and then converted into aboveground biomass, which is directed to the harvesting organs in the final stage of the growth. The nitrogen content of the crop depends on carbon deposition and nitrogen availability in the soil. If the nitrogen and water in the soil are insufficient, the stress appears and the stress limits leaf growth and reduces biomass accumulation. When nutrition is limited, the possibility of water or nitrogen stress is taken into account by three indices that can effectively reduce the development of plant leaves and the use of radiation. Depending on the plant type, crop development is provided by either thermal index (TI) (degree-day), photothermal index (PI) or a photothermal index which reckons vernalization (VPI). These indexes are calculated by taking water and nitrogen balances into consideration. In other words, the periodic cycle of plant phenology (the sum of degree days) involved in the development phase of the model is multiplied by a photoperiodic or vernalization limiting factor.

Phenological stages are used to simulate plant dynamics and grain-filling of harvesting organs. The two phenological stages are independent of one another. For example, the onset of grain-filling of the harvesting organ can take place before or after the 'maximum leaf area index' step; or as with many crop models, the phenological stages simulated by STICS may be different from those typically described on agricultural scales. These are growth stages rather than organ formation stages (Brisson and Delécolle, 1992) and are associated with changes in the trophic and morphological strategy of the crop that affect the development of leaf area index and grain filling stage.

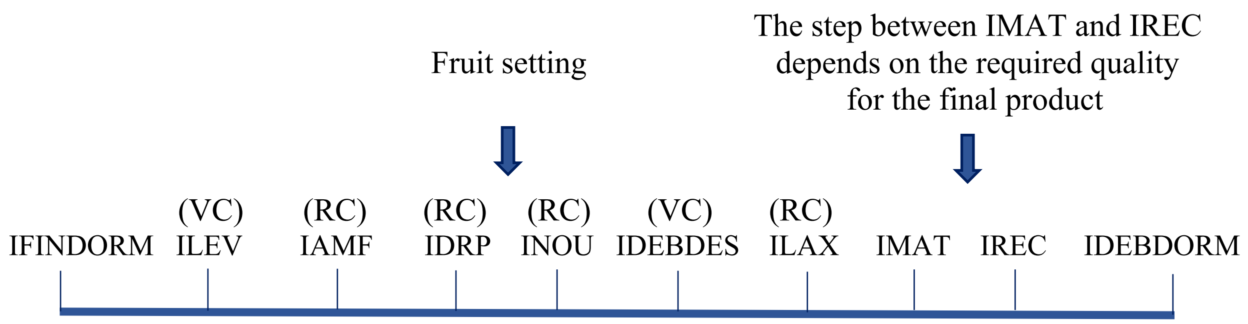
The formation of the leaves (emergence) is divided into i) seed germination phase, and ii) the lengthening of epicotyl / hypocotyl phase. The duration of these phases depends on the temperature of the seedbed, the water condition, and the depth of sowing. The formation of a frost in the seedling stage reduces plant density. Germination and the death of seedlings (except in the case of freezing) between germination and emergence are not considered in the model. This is another point about the limitation of the model.

The periods that separate the consecutive stages between the emergence process and physiological maturity are specific to each species and variety. As in other models, the periodic cycle of plant phenology involved in the development phase, i.e., growing degree days is multiplied by a photoperiodic factor [photothermal index (PI) that yields crop development] or a vernalization limiting factor [photothermal index with vernalization (VPI) that yields crop development] (Weir et al., 1984). The photoperiodic factor is calculated between two-day photoperiods (day length in vegetation) with an increasing function for long-day plants and a decreasing function for short-day plants. The vernalization factor is the ratio between the sum of the vernalization (the time that a plant requires low temperature from the beginning of its development to move into the generative period) days from planting and the vernalization requirement (Brisson et al., 2002). The sum of the degree-days can be calculated according to the air temperature, or the crop temperature obtained from the energy balance. When considering the crop temperature in the phenology, the duration of the phases should be adjusted according to the standard values expressed in the "air temperature" development units (Brisson et al., 2002).

In the model, biomass accumulation is calculated for each day. Daily accumulation of biomass on the ground is a parabolic function of radiation captured by the crop. This function takes cognizance of the maximum radiation utilization efficiency (RUE) for each species, which may be different in reproduction and vegetative stages. The water and nitrogen stress must be born in mind when calculating the RUE. In the model, if the atmosphere is enriched with CO_2, the RUE can be changed by considering the direct effects of climate change (Stockle et al., 1992). The accumulation of biomass on the ground is a function of the temperature calculated by a curve with three cardinal temperatures (minimum, maximum and optimum). The parabolic shape refers to a reduction in the efficiency of radiation use in the event of high radiation. The effect of temperature on shoot / root division is neglected (Brisson et al., 1998).

3.4.2.1.1.1. Above-ground biomass development. Development processes vary according to species. There is a need for different temperatures, precipitation, minerals, and daylight for each species. These processes are calculated in the program with development units (Figure 3.4) based on the accepted growing degree days (GDD). GDD is included as a development unit in the model, and it is calculated by adding the values obtained after subtracting the base temperature (10 ^{o}C for grape) from the average temperature (Winkler et al., 1974). The temperature variable is always used as a determining factor in phenological development in crop models. However, some studies have concluded that it is more accurate to use crop temperature rather than using the air temperature directly (Ong, 1983; Pararajasingham and Hunt, 1991; Seghieri et al., 1995; Casals, 1996; Desclaux and Roumet, 1996; Brisson et al., 1998). Crop temperature, unlike the air temperature, deals with how the crop is affected by its environment. The crop temperature calculated with the microclimate takes into account details such as the heat lost by the crop due to evaporating moisture, the energy it absorbs as radiation from the sun, and the canopy that the upper leaves make to the lower parts.

PHENOLOGICAL STAGES



IFINDORM : Break of dormancy
ILEV : Emergence or budding
IAMF : Maximum acceleration of leaf growth, end of the juvenile phase
IDRP : Onset of filling of harvested organs
INOU : End of fruit setting (for indeterminate crops)
IDEBDES : Onset of water dynamics in fruit
ILAX : Maximum leaf area index, end of leaf growth
IMAT : Physiological maturity (the harvested organ stop growing in dry matter terms
IREC : Harvest
IDEBDORM : Beginning of dormancy

Figure 3.4. List and illustration of phenological stages of STICS for grapevine.

Other variables that influence crop growth have different effects on development by accelerating or slowing down the unit's thermal time. In the STICS model, effective crop temperature (UDEVCULT) is used for the total temperature taken into account for the degree-days. If other variables were not taken into account in crop development, the UDEVCULT variable would be our GDD value. The Development Unit, which is obtained by reckoning with the other variables that have an accelerating and slowing effect along with the UDEVCULT variable, is called 'UPVT' (crop temperature). UPVT shows the amount of temperature collected daily, which includes the accelerating and slowing factors for the crop, namely GDD. Effective crop temperature is obtained by multiplying crop temperature by other accelerating and slowing factors. It determines the development of the whole crop, especially leaf and fruit development after the dormancy. The lengths of the development periods and when the next period will start are also determined by UPVT. In leaf growth, the leaf growth rate that reaches the maximum (IAMF) and the maximum reach of the leaves (ILAX) from the bud development (ILEV), and in the fruit development, the date when the fruit first appears (IDRP), the date when the fruit structure occurs (INOU) when the water dynamics in the fruit will begin (IDEBDES), and fruit ripening time (IMAT) are the development points determined by UPVT.

It is relatively difficult to define the IAMF stage for grapevine. It can be considered as the stage where the number of leaves after the juvenile stage reaches an average of 3 to 4. The IMAT stage, that is, the start time of physiological maturity, can be expressed as the cessation of dry matter accumulation in fruits. Therefore, the IMAT stage does not always mean that the harvest time is reached with full ripening of the fruit. In the period between IMAT and IREC, the fruit reaches the desired quality and takes its final form, and the manufacturer decides how long this period will be. The elapsed time between stages may vary depending on the species and variety. In STICS, these stages are called development units as in many other models (Weir et al., 1984).

In the STICS model, dormancy begins on the 213th day of the year (as a default value), and the crop meets the need for chilling. The crop meets the need for chilling during the dormancy period until IFINDORM and is named as post-dormancy between IFINDORM and ILEV. With the positive effect of increasing temperatures in the degree-day accumulation, the period is completed, and the ILEV date is determined. In the model, the temperature factor affects the crop growth positively from the dormancy (IFINDORM) to the ripening (IMAT). This effect is reckoning with as UDEVCULT and increases linearly from the minimum temperature (TDMIN) (10 °C for grapes) to the maximum temperature (TDMAX) (37 °C for grapes) and decreases linearly from the maximum temperature to the maximum upper temperature (TCXSTOP) where development stops completely. If the crop surface temperature (TCULT) is lower than the TDMIN, the effective crop temperature (UDEVCULT) value is taken as “0” and this indicates that there is no improvement. If the TCULT value is between TDMIN and TDMAX, the UDEVCULT value is calculated as TCULT - TDMIN, in other words, the UDEVCULT value indicates how much the surface temperature of the crop is higher than the minimum temperature required for crop growth. If the TCULT value is between TDMAX and TCXSTOP (Eq. 3.27);

$$\mathrm{UDEVCULT(I)} = \frac{\mathrm{TDMAX} - \mathrm{TDMIN}}{\mathrm{TDMAX} - \mathrm{TCXSTOP}}\ (\mathrm{TCULT\ (I)} - \mathrm{TCXSTOP}) \tag{3.27}$$

is calculated with the formula, and if it is above TCXSTOP value, UDEVCULT value is specified as ‘0’ again.

The TCULT (Eq. 3.28) variable, which is the crop surface temperature, is calculated by the model by taking the arithmetic average of the maximum crop surface temperature (TCULTMAX) (Eq. 3.29) and minimum crop surface temperature (TCULTMIN) values (Eq. 3.30).

$$\mathrm{TCULT(I)} = \frac{\mathrm{TCULTMAX\ (I)} - \mathrm{TCULTMIN(I)}}{2} \tag{3.28}$$

Maximum and minimum air temperature (TMAX, TMIN), maximum and minimum net radiation (RNETMAX, RNETMIN), maximum and minimum soil temperature (GMAX, GMIN), maximum and minimum evapotranspiration (ETMAX, ETMIN), and maximum and minimum aerodynamic resistance (RAAMAX, RAAMIN) variables are effective at maximum and minimum crop surface temperature. With this equation, in addition to the air temperature, the effect of the energy transported as radiation from the sun on the crop temperature is taken into account. RNET refers to the net radiation from the sun. GMAX and GMIN represent the energy absorbed by the soil, ETMAX and ETMIN represent the energy absorbed for evapotranspiration. Since the GMAX-GMIN and ETMAX-ETMIN values are outside the crop, the amount of radiation acting on the crop is determined by subtracting it from the net radiation. RAAMAX, on the other hand, is mainly related to how fast the water on the crop surface evaporates, that is, how quickly it transfers energy to water molecules, depending on the wind. Crops with larger leaves and hard surfaces will have more resistance against the wind, and the energy they receive from the evaporation of water and the incoming radiation will be more.

$$\mathrm{TCULTMAX(I)} = \mathrm{TMAX(I)} + \frac{\big(\mathrm{RNETMAX(I)} - \mathrm{GMAX(I)} - \mathrm{ETMAX(I)}\big).\mathrm{RAAMAX(I)}}{1200} \tag{3.29}$$

$$\mathrm{TCULTMIN(I)} = \mathrm{TMIN(I)} + \frac{\big(\mathrm{RNETMIN(I)} - \mathrm{GMIN(I)} - \mathrm{ETMIN(I)}\big).\mathrm{RAAMIN(I)}}{1200} \tag{3.30}$$

During the calculation of the UPVT value, there are some other variables that have an accelerating and slowing effect along with the UDEVCULT value. These are the factors that slow the plant growth due to the photo-period (RFPI), the factor that slows the plant growth due to the vernalization (RFVI), the maximum delay factor (STRESSDEV) caused by stress and water and nitrogen stress (TURFAC and INNLAI). The development of photo-periodic crops varies depending on the light they receive during the day, that is, the length of the day. Since grape is not a photo-periodic crop, RFPI value does not have a slowing or accelerating effect. Similarly, since vernalization is a determining factor for herbaceous crops and grapes are a perennial woody crop, RFVI does not have an accelerating and slowing effect. The need for chilling in woody crops affects the date of dormancy end and has no accelerating and slowing effect on the stage of development. The TURFAC factor causes a delay in the development of the crop due to lack of water, while the INNLAI factor causes a delay in crop development depending on the amount of nitrogen in the soil. In the STICS model, however, the delay factor value is assigned as “0” in the default values created for grapes. The formula created by considering all the variables and used in the program for the calculation of the UPVT value is as follows (Eq. 3.31):

$$\mathrm{UPVT(I)} = \mathrm{UDEVCULT(I).\,RFPI(I).\,RFVI(I).}\left[\mathrm{STRESSDEV.\,min}\big(\mathrm{TURFAC(I).\,INNLAI(I)}\big) + 1 - \mathrm{STRESSDEV}\right] \tag{3.31}$$

RFVI value can take a value between 0-1 in herbaceous crops, and values less than 1 have a slowing effect on crop growth. In woody perennial crops, RFVI value is taken as “0” when the crop is in the dormancy period, and it gets “1” when it comes out of dormancy. In the UPVT formula used, UPPT value is equal to UDEVCULT since RFPI values are not used for grape, and STRESSDEV value is assigned as “0”.

3.4.2.1.1.2. Stress indices. Stress indices are values between 0 and 1 which cause a decrease in the vital functions of the plant. These indices are often calculated as a function of stress state variables. The soil water content in the roots is defined by the water stress variable and the nitrogen nutrition index is defined by the nitrogen stress variable and the source ratio is defined by the trophic stress variable.

The way in which some stress conditions that arise during the plant's development process interacts with each other is probably the weakest point of the “limiting factor” approach (Brisson et al., 1997). In STICS, stresses are multiplied with each other because the forms of action are assumed to be independent. When these stresses interact with each other, the resulting active stress is more severe (having a lower value due to multiplication with each other). For example, nitrogen deficiency influences photosynthetic enzymes, while water deficiency affects radiation utilization efficiency at the stoma level, and these stresses are assumed to be independent of each other. On the other hand, both nitrogen and water stresses limit the growth of the leaf by reducing the expansion of the cell membrane, therefore, the two stresses are assumed to be inter-dependent. The interactions associated with these are much more complex since a delay caused by stress may result in plant death during plant development. Another index, trophic indexes, is active only for indeterminate crops and shows the lack of assimilats (or carbon) to allow for potential plant growth. Trophic stress has a special status because it is not due to an environmental source from outside the crop, such as water and nitrogen, but from the internal carbon imbalance of the crop.

3.4.2.1.1.3. Microclimate. The daily crop temperature is considered as the arithmetic mean of the maximum and minimum crop temperature. The simplified approach in the calculation of crop temperature is based on the relationship between mid-day surface temperature and daily evapotranspiration (Seguin and Itier, 1983; Riou et al., 1988). In this approach, it is assumed that the minimum crop temperature coincides with the air temperature. The energy balance approach is based on two calculations during maximum and minimum temperatures. While atmospheric radiation is assumed to be constant throughout the day, soil radiation is assumed to be calculated during maximum and minimum temperatures. At the end of the day, the heat flow in the soil is calculated as an empirical function of wind under the canopy and minimum net radiation (Cellier et al., 1993). Temperature and air humidity are used to calculate atmospheric radiation (Brutsaert, 1982). If the air humidity variable is not available, atmospheric radiation is estimated using the assumption that the minimum air temperature corresponds to the dew point temperature. Albedo varies between soil and vegetation (Ritchie, 1985). Soil albedo varies according to soil type, moisture in the surface layer and the presence of mulch or vegetation. Soil radiation depends on crop temperature. In the afternoon the heat flow in the soil is considered to be 25 % of the maximum net radiation under the canopy.

The microclimate of the canopy affects various plant processes, such as photosynthesis, evapotranspiration, and ultimately crop growth and development. In addition, since most crop growth models cannot calculate the microclimate of the canopy, they use standard climate data as the driving parameters (Brisson et al., 2006). STICS, unlike other models, has a sub-module to calculate the temperature and humidity inside the canopy**.** This makes a difference compared to other crop models for crop growth simulation.

3.4.2.1.2. LAI (Leaf Area Index/Shoot Growth). Due to the key role of the leaf area index in the model, the STICS includes several options to simulate this variable. The standard option directly simulates the leaf area index based on the net balance between growth and aging (over-maturation) (Brisson et al., 1998). Leaf area index develops through various stages such as growth, stability (for the identification of species) and aging. The initial calculation of the net leaf growth rate involves only the phenological stages. This stage is explained by the growth logistic curve that initially grows gradually, faster grows in the middle and continues to grow at a slower rate towards the end and stabilizes when it reaches its maximum value after a while which is specific to species with a deviation point at the juvenile phase (time when the plant does not begin to mature). The first calculated value is then multiplied by the effective crop temperature, the plant density combined with the inter-plant competition factor, and the water and nitrogen stress index values.

The leaf area index with determinate growth remains constant between LAX (maximum LAI) and SEN (senescence) stages. In the plants with indeterminate growth, this stationary phase is not structurally present. Water stress can cause premature aging and premature maturity due to the high crop temperature used to calculate developmental units. The 'lifetime concept' (in degrees-days) used by Maas (1993) considers aging initiated by water and nitrogen stress, and a portion of the biomass produced over a period of time is lost due to aging. Biomass loss due to severe stress or aging at low temperatures (below temperatures that may be effective for leaf growth) leads to a decrease in leaf area index. The conversion from the aging biomass to the leaf area is conducted with a specific leaf area parameter.

The model uses some simple hypotheses for a dynamic estimate of crop geometry; i) The shape of the petal (or leaves of the crop) covers a volume that is simple and has a rectangular or triangular section. ii) It is possible to limit the height of the crop. When the maximum height is reached, the crop can only change along the width. iii) Some processes aimed at controlling the shape of the plant or reducing the LAI may be simulated by the model.

Crop growth models generally include temperature as the main variable affecting crop development (Weir et al., 1984; Amir and Sinclair, 1991). As with other models in STICS, the temperature is one of the main variables that feed leaf area development. Stress (i.e., water, nitrogen, trophic stress) during shoot growth is also an important factor in the leaf area index. For grapevine, the stress comes up during vegetative and reproductive development with the plant's internal competition between water and nitrogen. Shoot growth is also affected by crop management techniques or preferences and radiation retention (Brisson et al., 2008).

3.4.2.1.3. Yield formation. Yield is the weight and quality of harvesting organs, which are reproducible (i.e., dried grains or hydrated fruits or vegetative storage organs). Yield estimation is the main objective of most crop models. The number of harvested organs is rarely simulated and, if so, is usually calculated independently from yield simulation.

STICS simulates two types of structures: determinate growth and indeterminate growth. The characteristic of determinate growth or indeterminate growth (express the types of competition between vegetative and aggregated organs) does not indicate the type of harvesting organs. In STICS, harvesting organs with determinate growth are called “grain” and harvesting organs with indeterminate growth are called “fruit”. The grape in this study has an indeterminate characteristic.

For the species with determinate growth, the grain number depends on the average growth rate of the crop at the grain number determination stage (LAT-DRP). The dry matter and nitrogen deposited in the grains are calculated by applying linearly increasing 'harvest indices' to shoot biomass and nitrogen. Threshold temperatures for translocation may temporarily stop the filling of harvested organs. The mass of each grain is then calculated as the ratio between yield and grain number, even if it does not exceed a genetic limit.

Vegetative and reproductive stages in plants that have indeterminate growth occur completely or partially simultaneously. For these plants, the fruits are rooted between the beginning of grain-filling and the end of fruit formation. During this time, the number of fruits changes each day depending on a genetic parameter and the total temperature (Bertin, 1995). During growth, the fruits go through some stages corresponding to increasing physiological ages. The physiological and biological status of the fruits and the time they spend in each stage for this to occur vary depending on the temperature. In these species, the harvest organs (fruits) that grow in a certain period grow and the development of the leaves continues. There is a trophic interaction between the sequential cohorts of harvest organs of the plant and the growth of various organ groups. In this way, the organs are formed, and fruiting occurs when the grains are filled. The sensitivity of the fruit number to trophic (or carbon) stress (included as a parameter in the model) is generally higher than that of leaf and fruit growth. The model does not simulate any competition between the number and weight of harvest organs for plants such as sugar beets or potatoes or with short fruit filling times. In the model, competition is mainly done with leaves.

In simulation models, the number of grains, which is an important component of agronomic diagnosis (Meynard and Sebillotte, 1994), is generally associated with trophic constraints (Cordery and Graham, 1989) or spike biomass (Weir et al., 1984) of the crop that is at the flowering stage. However, the critical period for adjusting the number of grains in the development process is 20-30 days before flowering. This period coincides with the formation of spike structures and is therefore particularly sensitive to environmental and trophic constraints (Fischer, 1979; Fischer and Stockman, 1980; Abbate et al., 1995; Uhart and Andrade, 1995). The number of grains during yield formation is determined before the grain-filling period. This number is determined by the average growth rate of the canopy during this period. The dry matter and nitrogen accumulated in the grain are calculated by applying evolutionary harvest indices to the dry matter and nitrogen content of all air particles. These indices increase as a linear function of the time from the beginning of the internal filling of harvesting organs (IDRP) to physiological maturity (IMAT). The weight of the grains (MAGRAIN) and the amount of nitrogen in the grains (QNGRAIN) are obtained from the harvest indices. Then, the weight of each grain (PGRAINMAXI) (this weight is the upper limit which is the genetic limit) is the ratio between the number of grains and the weight. The evolutionary harvest index in the model was inspired by Sinclair's work (Spaeth and Sinclair, 1985; Sinclair, 1986; Muchow et al., 1990; Amir and Sinclair, 1991). Therefore, the final harvest index in STICS is sensitive only to the time it takes for the fruit to be filled. Water and nitrogen stress after flowering do not alter the evolution of the harvest index, but several studies have found that water deficit may cause such a change (Sadras and Connor, 1991). However, the fruit filling time may be shortened due to water stress since the growth is controlled by the crop temperature.

The yield value for the crop is related to the weight of the fruit and the quality of the fruit formation. In the STICS model, separate yield calculations are made for determinate and indeterminate crops. As mentioned above, in determinate crops, the harvested part is grain, and in indeterminate crops, the harvested part is the fruit, and grape growth is among indeterminate crops. There are three essential steps in the process of fruit formation: the period in which the fruit forms, the period when the fruit ripens, and the quality of the fruit.

3.4.2.1.3.1. Fruit set process. Fruit formation takes place in the period between the date when the fruits begin to fill after flowering (IDRP) and the date on which the fruit formation ends (INOU). This event, which is defined as fruit formation, is the period that determines how much fruit structure (fruit involvement) will turn into fruit. At the end of this period (INOU), the crop has small fruit structures that will later turn into fully formed fruits. The number of fruits in the model is expressed by the number of fruit structures formed daily (NFRUITNOU; fruit/m^2) during this period. The NFRUITNOU (Eq. 3.32) depends on the variable of the maximum number of fruit structures (AFRUITPOT; $\frac{\text{fruit}}{\text{inflo.degree.days}}$) that can occur daily depending on the crop type by being determined by parameterization and given as input to the model, the daily rate of development (UPVT) calculated by the model, the number of clusters of the crop given as input to the model (NBINFLO), frequency of sowing of the crop given as input (DENSITESEM; $\frac{\text{plant}}{\text{m}^2}$), the trophic stress index (SPFRUIT), the parameterization of which is made by García de Cortázar-Atauri

(2006) for grape and the default values used accordingly, and the frost stress index (FGELFLO), which is determined as the default value, is calculated by the damage temperatures caused by frost for the crop and is effective as of flowering. The parameters given as input to the model are TGELFLO10, which expresses the temperature that causes 10 % frost damage on flowers, and TGELFLO90, which expresses the temperature that causes 90 % frost damage on the flowers.

$$\mathrm{NFRUITNOU(I)} \\ = \mathrm{AFRUITPOT.UPVT(I).NBINFLO(I).DENSITESEM(I).SPFRUIT(I).FGELFLO(I)}$$

(3.32)

<u>*3.4.2.1.3.2. Maturity process.*</u> The ripening period refers to the extent of time between the date when the fruits begin to fill (IDRP) and the dates when the physiological ripening of the fruit is completed (IMAT). The program uses the “boxcar train” technique in the TOMGRO model (Goudriaan, 1986; Jones et al., 1991; Brisson et al., 2003) to calculate this period. According to this technique, the development process of the fruit is divided into boxes or age classes that point to each phase, and the fruit that completes its development in the box passes to the next box (the next phase). The number of boxes used in this technique is named as the NBOITE variable, and “10” is determined as the default value (García de Cortázar-Atauri, 2006). Another critical variable is the degree-day amount (DUREEFRUIT; degree. days) received by the crop in the period between IDRP and IMAT, where we determine the value for each location by parameterization based on the climatic conditions and grape types. While the DUREEFRUIT value covers the entire developmental phase, variables that indicate degree-day for intermediate phases are also important for the model because the variables that shape crop growth are not functional in every phase, so they can be effective in intermediate phases. According to the Boxcartrain technique, the elapsed time in each box for fruit is calculated by dividing the total degree-day amount it receives during the ripening period by the number of boxes ($\frac{\mathrm{DUREEFRUIT}}{\mathrm{NBOITE}}$). The fruit that reaches the last age class or the last box reaches physiological maturity. Fruit growth value, which represents the gram increase of the amount of fruit per square meter per day for each growth box (CROIFRUIT; $\frac{\mathrm{gram}}{\mathrm{m}^2}$) (Eq. 3.33), depends on the number of fruits in that box (NFRUIT), fruit sink strength (that is, the amount of the substance that the fruit receives daily) (FPFT; $\frac{\mathrm{gram}}{\mathrm{m}^2.\mathrm{day}}$), source / sink ratio (SOURCEPUITS) ($\frac{\mathrm{gram}}{\mathrm{m}^2}$ / $\frac{\mathrm{gram}}{\mathrm{m}^2}$), and thermal stress index (FTEMPREMP). When calculating the source / sink ratio, the ratio of the sum of the resource values to the sum of the basin values is considered. The source values are the crop daily growth amount, that is, the change in the amount of material the crop takes from the soil and the mass of the crop’s organs other than its leaves, fruits, and branches). Sink values are the

daily intake of fruit and leaves. In summary, the increase in the solid mass of the fruits in a box is obtained by dividing the daily change of mass of the whole plant from the soil and the existing stem mass to the sum of the change in the part that can go to the leaves and fruit. This ratio shows the power of leaf and fruit, the organs of the crop, to absorb substances such as carbon-nitrogen. By multiplying this ratio by the unit change amount of the fruit (FPFT) ($\frac{\text{gram}}{\text{m}^2.\text{day}}$) and the thermal stress index, which is a slowing factor, the amount of substance the fruit receives in the box daily is obtained. For obtaining the daily total mass increase, this amount of material is multiplied by the number of fruits in the present box (NFRUIT).

$$\text{CROIFRUIT(I, K)} = \text{NFRUIT(I, K). FPFT(K). SOURCEPUITS(I). FTEMPREMP(I)} \qquad (3.33)$$

SOURCEPUITS values are calculated with the default values determined for the model, and the FPFT value is directly proportional to the maximum dry grain weight (PGRAINMAXI) and DEVJOUR value of a grain calculated by parameterization for each grape type. DEVJOUR variable is not defined as a name, and its formula is as $\frac{\text{TCULT}-\text{TDMIN}}{\text{DUREEFRUIT}}$. Along with this variable, the crop temperature factor is also effective in fruit formation. When the crop accumulates the necessary degree-day for fruit ripening (DUREEFRUIT), the fruit becomes physiologically mature, and according to its growth in this process, the number of fruits, fruit weight, and crop yield are formed.

3.4.2.1.3.3. Quality process. Simulation of harvested crop quality is a unique feature of STICS. The accumulation of various categories of biochemical compounds is simply simulated. Nitrogen is calculated as a function of a “nitrogen harvest index” which is proportional to the grain-filling phase. For sugars and lipids, the concentration is assumed to be proportional to the dry matter in the harvesting organs. The water content is calculated independently and based on the dynamics of hydration (or dehydration) depending on species parameters and the development of crop temperatures during filling and ripening. It, therefore, contains the necessary information about the crop quality.

3.4.2.1.3.4. Harvest process. There are two options in STICS to determine the harvest date. The first option is to harvest by the maturation of the crop according to the degree-day sum, and the second option is to harvest when the water percentage in the fruit reaches a certain value. The percentage of water in the fruit was used as the determining factor in the García de Cortázar-Atauri (2006). Therefore, the ratio of water in the fruit is important in terms of harvest date. In the IDRP-IMAT phase, while the fruit continues to develop towards ripening, water dynamics starts as of the date of IDEBDES. The first water rate in the fruit (H2OFRVERT) is considered constant until the start of the fruit water dynamics (IDEBDES). DESHYDBASE variable ($\frac{\text{gram}_{\text{water}}}{\text{gram}_{\text{FM}}.\text{degree.day}}$) depending on the thermal time (degree-day), which is considered as the default value after this date (García de Cortázar-Atauri, 2006), shows the rate of change in the water content of the fruit over time. Just as the ripening of the fruit depends on the degree-day, the water ratio of the fruit changes depending on the degree-day. Another important variable is the proportional coefficient of the difference between crop temperature and air temperature (TEMPDESHYD; $\frac{\%\ \text{water}}{°\text{C}}$). The difference between the calculated temperature of the plant (TCULT; °C) and the air temperature is effective in determining the amount of water in the fruit. A value is obtained by multiplying the number of days since IDEBDES and the value of DESHYDBASE. Also, from the date of IDEBDES, a value is obtained by multiplying the difference between the crop temperature and the air temperature of each day with the coefficient of difference and these values are summed up in itself. Then these added values are subtracted from each other. The last value obtained is subtracted from the first water ratio (H2OFRVERT, $\frac{\text{gram}_{\text{water}}}{\text{gram}_{\text{FM}}}$), and the water ratio (TEAUGRAIN; $\frac{\text{gram}_{\text{water}}}{\text{gram}_{\text{FM}}}$) in the fruit is calculated (Eq. 3.34).

$$\begin{aligned}\text{TEAUGRAIN}(\text{I},\text{K}) \\ &= \text{H20FRVERT} - \text{DESHYBASE}.(\text{I} - \text{IDEBDES}(\text{K}) + 1 \\ &- \sum_{J=IDEBDES(K)}^{I} TEMPDESHYD.\big(TCULT(J) - TAIR(J)\big)\end{aligned} \tag{3.34}$$

In the initial formation of the fruit, its solid weight is very low and mostly consists of water. Therefore, H2OFRVERT is a high rate and, although the water amount of the fruit increases until the harvest time, the water rate in the fruit decreases and the harvest takes place when the specified water rate is reached (IREC). All these processes detailed above give us information about which parameters should be given as input to which stage of the model, which parameters are considered as default values already in the model, or which parameters should be calculated and used in the module at what stage and how the parameterization should be done.

Accordingly, some plant parameters (tdmin, tdmax, tdmindeb, tdmaxdeb, hautbase and hautmax) in STICS are fixed at a value regardless of the upper and lower boundaries (García de Cortázar-Atauri, 2006), while some parameters are from the field, from observation or literature, or calculated in the model.

3.4.2.1.4. Root Growth. In STICS, the roots act only as water and mineral nitrogen absorbers (in the form of nitric or ammonia). The first calculation gives the depth of the roots which proceeds in proportion to soil temperature with a species-specific coefficient. Root depth in the soil depends on the water content. In the annual crops, the root front starts at the planting depth and in perennial plants the initial value of the root front may be deeper in the soil. The growth of the root also stops when a depth of soil is reached, which can constitute a physical or chemical barrier, or when net leaf growth stops. A second calculation yields the root density profile according to two possible options. The 'standard profile' option makes it possible to calculate the root profile that is effective in absorption, assuming that it always has the same curved shape created on the basis of plant parameters and the depth of the dynamic root front (Brisson, 1998). This formalization assumes that the root density on the surface always reaches the optimal threshold for water and nitrogen absorption. There is a second option that makes it possible to estimate the root density to simulate low-density crops where the root density is not optimal or to consider the effects of soil restrictions on root distribution. Growth in root length is calculated using a logistic growth function similar to that of leaves, and then distributed to each layer of soil in proportion to existing roots and as a function of soil constraints.

It is assumed that only the root front grows between germination and emergence. The calculation for annual or perennial crops is initiated with an existing root density profile. Each constraint is defined as an index between 0 and 1 for a given layer and is assumed to be independent of the others. The resulting index is the product of the basic indices and determines the root distribution in the soil layers.

3.4.2.1.5. Water Balance. Water balance is used to calculate the water condition of the soil and plant, as well as water stress indices that reduce net photosynthesis and leaf growth. It is based on estimating the water requirements of the soil-leaf system on the one hand and estimating the water supply to the soil-root system on the other. The climate variables used to calculate water balance are precipitation and evapotranspiration (the potential evapotranspiration in the soil and the actual evapotranspiration related to water availability in different stages). Evapotranspiration is calculated using soil data and maximum transpiration. In each layer, the permanent hydric properties of the soil (such as water content at the field capacity and melting point of the soil, soil density) are considered constant. A maximum of five layers in various thicknesses are defined to characterize the entire soil profile. Soil depth is obtained by adding the thickness of the layers. Depending on the irrigation systems, the water supply may be on the crop, under the crop or in the soil (drip irrigation). Under the crop irrigation, water supply is not affected by the mechanisms i.e., the rain is caught by the plant in the canopy, and drip irrigation under the soil, water supply is not affected by the evaporation in the soil. The water contained in the leaves can evapotranspirate and significantly reduces the saturation gap in the canopy and crop water requirements. The water captured by the canopy is proportional to the leaf area index (LAI) (0.2 to 0.7 mm), which varies by species (Brisson et al., 2003). The condition of the soil surface may change the water and heat balance of the soil-plant system. The dry soil surface is characterized by albedo. In STICS, the soil surface condition (e.g., mulching) might be an input that affects the water and heat balance of the soil-plant system (Brisson et al., 2003).

3.4.2.1.6. Nitrogen Balance. The net nitrogen mineralization in the soil is the sum of the mineralization of humus and organic residues (crop residues or organic wastes). Humus mineralization is dependent on moistened organic nitrogen reserves, soil texture, soil temperature, and soil moisture (Mary et al., 1999). It is assumed that tillage will not directly affect the humus mineralization of the soil, and it is assumed that the carbon-nitrogen ratio of the moistened organic material is constant. The mineralization of organic residues depends on the features of the organic residues, the decomposition rates that depend on the temperature and moisture being incorporated into the soil depth in soil conditions. The net nitrogen mineralization (positive or negative) resulting from the decomposition of residues depends on the carbon to nitrogen ratio of organic residues, microbial biomass, and moistened organic matter.

Daily nitrogen absorption is equal to the minimum supply quantity due to crop requirement provided by the soil root system. The soil nitrogen source is calculated per layer of 1 cm along the root depth. The nitrogen source is formed by the nitrate transportation from a point in the soil to the nearest root (transport flux) and active absorption by the root (basin flux). This source is equal to the minimum of the two fluxes. Nitrate accumulation occurs depending on the absorption capacity of the plant, the root density nitrate concentration in the surrounding environment. The ratio of plant nitrogen content (calculated by the critical dilution curve) corresponds to the Nitrogen Nutrition Index (INN) from which the nitrogen stress indices are derived.

3.4.2.1.7. Thermal Environment. In STICS, the thermal environment of the crop is simulated using the upper limit temperature for calculating soil temperature (TCULT) or directly the soil temperature (TSOL (Z)) for soil processes. Thus, in contrast to air temperature, these are driving variables for thermo-sensitive mechanisms. In the model, canopy evapotranspiration is used in the calculation of daily energy balance to estimate daily crop temperature. This equilibrium takes into account atmospheric conditions, i.e., standard meteorological data and crop evapotranspiration in water balance. The daily calculation of the energy balance is based on an estimate of the water requirement of the crop (Smith et al., 1996). One of the important factors considered when calculating the thermal environment is the albedo of the soil. Calculation of crop temperature also considers the effects of soil color and dryness on soil albedo. These effects may play an important role in the pace of crop development, especially in the spring. The albedo of the soil corresponds to a value of 0.23 between the albedo of lean soil (ALBSOL) and the albedo of vegetation (Ritchie, 1985). The albedo of lean soil varies according to soil type (ALBEDO of dry soil) and water content of the surface layer. It increases linearly with the amount of water in the surface layer. The variation in soil temperature depends on the surface conditions that activate the daily thermal variation, as well as the thermal inertia of the environment. This inertia is responsible for reducing the daily average temperature based on depth compared to the surface.

3.4.2.2. Model Validation. When evaluating a model, the main point is to compare the model outputs with the observation data. Especially in models related to natural sciences, each model contains an error since the modeled system depends on many variables physically. The primary purpose of the parameterization is to reduce the error resulting from the model and to obtain the closest results to the observation value. The model, which has been run for the past, whose parameterization and correction has been made, can be run to project the future.

When using STICS, two different error margins come to the fore (Actually, there are three error margins along with the TURKSTAT data, but the ones mentioned here are related to the model). The first is the error margin arising from STICS. In other words, it can occur due to the incompatibility of the data entered as the default value for each crop (or species) or the data obtained from the field. The second is the error margin resulting from the climate model depending on the achievement of the climate output given to STICS. ERA-Interim Global Atmosphere Reanalysis data was used to parametrize the STICS model. This data includes climate variables obtained for the whole region by re-analysis of observation atmosphere data.

Parameterization is done by comparing the actual yield with the model yield. Therefore, after the parameterization, the variables used in the model should be closest to reality. For this reason, ERA-Interim re-analyzed observation data was used for climate data and parameterization was performed. The parameters obtained by the parameterization and the climate data of the MPI-ESM-MR global climate model created by the Max Planck Institute were used to compare the yield between past and future periods. For the comparison of the past and future periods to give a more accurate result, the same climate model should be used for both periods. Therefore, ERA-Interim climate data is used only for parameterization. Still, history and future data of the MPI-ESM-MR global climate model are used for comparison of past and future yield.

3.4.2.3. Crop Model Sensitivity Analysis. In STICS, the sensitivity analysis is based on a specific range of input parameters. Some of these inputs are obtained directly from the field experiments, while others are taken into consideration according to the values in the literature. Inputs for some input variables are those already included in the model itself for grapevine as in García de Cortázar-Atauri (2006).

In the model sensitivity analysis, soil properties, soil albedo calculated according to the lower and upper boundary of soil properties, cumulative soil evaporation (in Q0 - mm), specific to the type of soil calculated in relation to the upper and lower boundaries of the soil clay content representing the transition to the second stage of evaporation, runoff rate (ruisolnu), the maximum soil depth (in zesx - cm) affected by soil evaporation, the initial nitrogen amount in the plant (QNplante0 - kg N/ha), the lower and upper limit input values for the initial biomass (carbon) reserve (resperenne0 - t/ha) consider.

The values of variables to be used for many crops in the STICS Crop Model have been determined by various studies. Grape parameterizations were also made by García de Cortázar-Atauri (2006) and added to the STICS crop model. In this parameterization, many values are common for all grape types, but there are also variable values that vary according to grape types and cultivated regions. The most important of these variables were determined by sensitivity analysis and model parameterization was performed according to the result of this analysis. For sensitivity analysis, the effect of these values on grape yield and phenological stages was examined by changing and running the upper and lower limit values for each variable in grape varieties parametrized by García de Cortázar-Atauri (2006). In this way, by keeping the effect of other variables constant, it was possible to observe how each variable affects the model output separately. Data obtained from the literature for lower and upper limit values and frequency of cultivation were used independently for wine grapes and table grapes. For the other variables, the lowest and highest values determined by García de Cortázar-Atauri (2006) for grapes were used. As a result of this review, as in García de Cortázar-Atauri (2006), the most important variables were determined as PGRAINMAXI, AFRUITPOT, DENSITESEM, and NBINFLO in this study. Here;

PGRAINMAXI (gram) : Maximum grain weight (at 0 % water content). It defines the maximum dry weight of fruit, which limits the development of the fruit and affects yield.

AFRUITPOT (1/deg*day) : Maximal number of set fruits per degree-day (indeterminate growth), which limits the fruit growth.

DENSITESEM (1/m^2) : Frequency of sowing of grapevine stock. It is the number of the plants in per square-meter. It is important variable on both the yield per area and properties of fruits.

NBINFLO (1/plant) : Imposed number of inflorescences per plant. Like DENSITESEM it is also effective on both yield and fruit properties.

Additionally, DESHYDBASE is another sensitive variable in the model, but its sensitivity is higly lower comparing with those four variables.

DESHYDBASE (g(water)/g(FM)*°C): The rate of change of fruit water content per degree-day. Water content determines the the maturity of the fruit along with degree-day

As for sensitivity analysis in the study, the effect of each variable (%) on the yield formation is given in Table 3.7. Each of these variables is critical, as they differ between grape varieties and are responsible for yield formation.

Besides, in García de Cortázar-Atauri (2006), the DUREEFRUIT (deg.day) is also sensitive variable in the model. However, even if it is the most sensitive, since we cannot obtain the upper and lower limits or the value that should be used for the grape varieties in our study from the field, and we use the value from the literature, so no parameterization has been made for this variable.

DUREEFRUIT (deg.day) : Total growth period of a fruit at the setting stage to the physiological maturity. It indicates the number of day-degree required by the plant during the fruit formation stage.

Table 3.7. According to the sensitivity analysis, the level of effect of the variables that affect the yield formation by grape type.

GRAPE TYPE	AFRUITPOT	DENSITESEM	NBINFLO	PGRAINMAXI	DESHYDBASE	HAUTBASE	JVC	STAMFLAX	STDORDEBOUR	STDRPNOU	STFLODRP	STLEVDRP
Alphonse Lavelle	113.19	120.90	50.66	54.41	0.47	-0.22	-0.49	1.11	-0.27	19.84	0.00	-4.93
Besni	85.86	76.89	58.88	58.91	3.55	-0.23	-0.67	1.93	0.81	-7.47	2.40	3.90
Boğazkere	103.94	65.71	58.12	65.32	5.40	0.28	-0.72	2.52	-2.09	19.60	0.00	-4.44
Dimrit	122.13	100.90	61.71	52.18	8.50	0.18	-0.72	-0.14	-3.59	20.39	0.00	-2.11
Emir	79.66	53.00	78.42	98.95	10.25	-0.75	-1.45	0.55	2.63	32.56	0.00	-2.91
Horoz Karası	80.52	87.27	56.73	52.83	0.32	-0.51	-0.06	2.59	-0.10	21.06	0.00	-3.44
Kalecik Karası	131.37	65.10	66.21	74.35	5.51	0.26	0.28	1.34	-0.01	23.49	0.00	-0.61
Karasakız	84.24	21.83	18.29	61.61	1.18	-0.65	1.78	-1.23	-0.13	16.92	0.00	-2.99
Merlot	104.78	117.10	18.57	54.62	-0.32	-0.83	0.86	-0.64	-2.44	18.38	0.00	0.72
Narince	108.30	131.61	66.49	58.36	7.80	-0.03	-1.49	-0.04	-4.40	21.80	0.00	-2.92
Papaz Karası	84.72	74.00	16.49	57.67	0.49	0.02	2.27	-0.36	0.67	17.34	0.00	-2.28
Redglobe	48.39	39.22	16.59	40.09	1.61	0.89	1.63	0.48	0.49	18.27	0.00	-4.63
Sultana Seedless	57.04	40.59	40.77	36.46	2.62	0.06	1.25	-0.12	-0.38	16.49	0.00	-5.48
Syrah	32.59	12.37	3.97	10.68	15.01	0.21	-2.49	-4.35	-4.85	6.34	0.00	-16.59
Çal Karası	104.59	168.45	56.42	62.45	5.13	0.21	0.85	1.29	0.09	22.19	0.00	1.28
Öküzgözü	107.67	37.01	18.78	63.22	5.83	0.56	0.94	0.77	1.48	17.64	0.00	-5.70
Şire	18.49	13.35	38.08	8.96	0.89	-0.16	-1.30	0.36	-9.26	1.27	0.00	-4.06
Average	86.32	72.08	42.66	53.59	4.37	-0.04	0.03	0.36	-1.26	16.83	0.14	-3.36

AFRUITPOT is the maximal number of set fruits per degree-day, which limits the fruit growth.
DENSITESEM is the number of the plants in per square-meter. It is important variable on both the yield per area and properties of fruits.
NBINFLO is the number of inflorescences per plant. Like DENSITESEM it is also effective on both yield and fruit properties.
PGRAINMAXI defines the maximum dry weight of fruit, which limits the development of the fruit and affects yield.
DESHYDBASE demonstrates the rate of change of fruit water content per degree-day. Water content determines the the maturity of the fruit along with degree-day
HAUTBASE is the base height of the crop which effective on the foliage structure of crop.
JVC is defined as the vernalisation day number, which is one of the parameter determines the dormancy period.
STAMFLAX is the needed degree-day value between the maximum acceleration of leaf growth and the maximum leaf area index. It affects the lengt of this period.
STDORDEBOUR is the needed degree-day value between the dormancy break and the budbreak. It affects the lengt of this period.
STDRPNOU is the needed degree-day value between the start of filling of fruits and the end of settings. This period is the all setting process period of fruits. STDRPNOU variable affects the lengt of this period.
STFLODRP is the needed degree-day value between the flowering and the start of filling of fruits (beginning of fruit set process). It affects the lengt of this period.
STLEVDRP is the needed degree-day value between the emergence and the start of filling of fruits (beginning of fruit set process). It affects the lengt of this period.

3.4.2.4. Crop model calibration and parameterization. There are two ways to calibrate dynamic models. The first one is the parameterization based on the parameters covered in the literature, and the other method is the estimation of the parameters by adapting the variables affecting the dynamic system.

This part of the study was to investigate how the grape yield may have changed climatic conditions in the future in different regions of Turkey. In this context, daily climatic data and annual grape yield data for the past period of 1991-2012 and how the annual grape yield may change under the projected climatic conditions for the years 2021-2050 were calculated by using the crop model and by determining the important physical parameters for the grape in the model.

In STICS, fruit formation in grapevine occurs between the beginning of filling and setting fruit. The amount of fruit for each day is defined by a crop variable specific to each variety. In STICS, this variable is "AFRUITPOT" which means degree-day fruit number. It is one of the variables that have the most impact on yield formation. When the amount of fruit becomes clear, the fruits go through various stages, and how long each phase lasts depends on how much total temperature the fruit requires at that stage. Temperature and source/sink balance are also considered in the mechanism (Brisson et al., 2003). Source sink balance influences the growth of the fruit. Another important variable, NBINFLO was calculated by field measurements made. In parameterization, the upper and lower limits were considered as the maximum and the minimum number of blooms observed in the field per plant or in the literature.

For PGRAINMAXI, AFRUITPOT, DENSITESEM and NBINFLO, which were determined as critical variables during parameterization, values taken at equal intervals between minimum and maximum values were run 800-4000 times for the past by using ERA-Interim climate data and the combination of model variables by varying for each grape type. With the checking over of grape parameterization values made by García de Cortázar-Atauri (2006), the PGRAINMAXI value for grapes is between 1.62 and 3.33 with 0.3 interval, AFRUITPOT value is between 1.15 and 3.66 with 0.3 intervals, while the NBINFLO value differs according to the grape type, an average of 8 different values for each. For the DENSITESEM value, the model was run repeatedly with a range of 0.11 - 0.20 with 0.01 interval for table grapes, between 0.25 - 0.33 values with 0.01 interval for wine grapes, with a range of 0.11 - 0.33 with 0.02 interval for some types of grapes consumed both for wine and table.

During the study of the crop model, while the values of that year are formed, each year is affected by the previous year. After the first two years, the fluctuation in the variables that caused it to be affected from the previous year decreases and becomes more stable. Therefore, the output data of the first two years were extracted to increase the consistency of the model and to make the outputs more stable.

Measures of agreement between measured and calculated data: Each output of the model was compared statistically with the observation data of the location. This comparison demonstrates which of the parameter values is the most appropriate (Table 3.8). For this comparison, bias (Eq. 3.36), mean squared error (MSE) (Eq. 3.37), root mean squared error (RMSE) (Eq. 3.38), mean absolute error (MAE) (Eq. 3.39), relative root means square error (RRMSE) (Eq. 3.40), relative mean absolute error (RMAE) (Eq. 3.41), modeling efficiency (EF) (Eq. 3.42), correlation coefficient (r) (Eq. 3.43) and index (Eq. 3.44) values were calculated. These values give us information about the compatibility between the measured values and the model values. The bias value gives us the average difference between the measured and calculated values. If the bias value is positive, this indicates that the average measured values are higher than the model values; if negative, the model values are higher than the measured values on average. Therefore, the bias value closest to the zero value is ideal. Since the bias value is the average of the value differences for each year, it is not a sufficient measure alone in the consistency of the model. For example, the model output, which is very high for one year, maybe very low for the other year, and in this case, bias takes a value close to zero, but the model does not give the expected result. The MSE value provides the average of the sum of squares of the difference between the measured and calculated values. In this way, the negative and positive values will not neutralize each other, and there will be no problems as in the bias value. The RMSE value is the square root of the MSE value. The advantage of the RRMSE value is that it allows us to obtain a percentage value without units, as it is obtained by dividing the RMSE value by the average observation value. Since this value is a normalized value, it allows us to compare error rates for different grape types. Another important value, MAE, solves the problem caused by the positive and negative values in the bias value by taking the absolute value of the difference between the measured and calculated values. The advantage of the RMSE value is that since it takes the absolute value of the difference, the effect of the large difference encountered when taking its squares disappears. The RMAE value, on the other hand, enables the comparison of the error rates between different grape types by ensuring that the MAE value obtained similarly to RRMSE is without unit and gives a percentage value. As can be seen, each of them provides convenience or superiority from different aspects. While evaluating the effectiveness of the model, the values closest to zero are searched in all Bias, MSE, RMSE, RRMSE, MAE, and RMAE values. EF value is one of the most widely used methods for modeling efficiency. Unlike other control measures, the upper limit of the EF value is 1, although it has no lower limit, and the values approaching 1 for EF means the better model works. The Correlation Coefficient (r) value shows the relationship between the measured and calculated values. It takes a value between -1 and 1 and being close to 1 means the higher linear relationship between the measured and calculated values. However, determining the perfect linear relationship does not show that the model is flawless. Therefore, bias and r values should be looked at together to reach the correct conclusion about model efficiency. The index value is similar to the EF value, and the values approaching 1 indicate that the model works better.

Each of these calculated statistical values are listed separately, and the parameters used for the model output corresponding to the ideal value were determined. Some of the statistical values were examined to give the same ranking. For example, the RMSE ranking and the RRMSE ranking are the same, whereas the RRMSE value also offers the opportunity to compare with the statistical values examined for other locations. By evaluating the scale of fit between model data and observation data (all these statistical values, RMSE, MAE, etc.), the parameterization was completed by selecting the appropriate parameters. Using these parameters with the past and future outputs of the MPI climate model, the STICS model was conditioned for past and future periods, and a periodic comparison was made in grape yield. To select suitable parameters, r and bias values were examined together. Besides, RMSE, MAE, index, and EF values were also tested. Accordingly, the parameter values that were most compatible with the observation data were selected. The formulas used for statistical comparison and described in detail above are as follows:

Table 3.8. Measures of agreement between a model and measured data.

CONTROL METHOD	EQUATION	
Difference	$D_i = Y_i - \hat{Y}$	(3.35)
Bias	$\text{Bias} = \frac{1}{N}\sum_{i=1}^{N} D_i$	(3.36)
Mean Squared Error	$\text{MSE} = \frac{1}{N}\sum_{i=1}^{N} (D_i)^2$	(3.37)
Root Mean Squared Error	$\text{RMSE} = \sqrt{\text{MSE}}$	(3.38)
Mean Absolute Error	$\text{MAE} = \frac{1}{N}\sum_{i=1}^{N} \lvert D_i \rvert$	(3.39)
Relative Root Mean Squared Error	$\text{RRMSE} = \frac{\text{RMSE}}{\overline{Y}}$	(3.40)
Relative Mean Absolute Error	$\text{RMAE} = \frac{1}{N}\sum_{i=1}^{N} \frac{\lvert Y_i - \hat{Y} \rvert}{\lvert Y_i \rvert}$	(3.41)
Modeling Efficiency (Efficiency Factor)	$\text{EF} = 1 - \frac{\sum_{i=1}^{N}(Y_i - \hat{Y}_i)^2}{\sum_{i=1}^{N}(Y_i - \overline{Y}_i)^2}$	(3.42)
Corelaration Coefficient	$r = \frac{\sum_{i=1}^{N}[(Y_i - \overline{Y})(\hat{Y}_i - \overline{\overline{Y}}_i)]}{\sqrt{\sum_{i=1}^{N}[(Y_i - \overline{Y}_i)^2]\sum_{i=1}^{N}[(\hat{Y}_i - \overline{\overline{Y}}_i)^2]}}$	(3.43)
Agreement Index	$\text{index} = 1 - \frac{\sum_{i=1}^{N}(Y_i - \hat{Y}_i)^2}{\sum_{i=1}^{N}(\lvert \hat{Y}_i - \overline{Y}_i \rvert + \lvert Y_i - \overline{Y}_i \rvert^2}$	(3.44)

N: *Total number of year*
Y_i: *Observed yield in* i^{th} *year*
$\hat{Y}_i$: *Model yield in* i^{th} *year*
$\overline{Y}$: *Average observed yield*
$\overline{\overline{Y}}$: *Average model yield*

García de Cortázar-Atauri (2006) made investigations for the variables used in the STICS and determined the variables that were common and different for grape species (Table 4.1 in Appendix A). For the variables that did not differ among grape varieties, the default values created by field studies and parameterization were used. Variables that differ between grape species are STDORDEBOUR (degree-day between the exit from dormancy and bud burst), STAMFLAX (degree-day between the maximum leaf growth rate and the date when leaf surface area is maximum), STLEVDRP (degree between budburst and fruit filling), STFLODRP (degree-day between flowering and beginning of filling of fruits), STDRPNOU (degree-day between the beginning of filling of fruits and the end of fruit formation), JVC (chilling unit sum), AFRUITPOT (maximum number of fruit structures that can be formed per day), PGRAINMAXI (maximum dry weight of a grape grain), Deshydbase (the rate of change of water content of the fruit depending on degree-day), NBINFLO (the number of clusters), HAUTBASE (the height of the crop) and DENSITESEM (frequency of sowing of the crop). A sensitivity analysis was performed for all these variables. As a result of the analysis, AFRUITPOT, PGRAINMAXI, NBINFLO, and DENSITESEM variables were observed to have a significant effect on yield (Table 3.7). Accordingly, for other variables that differed according to the grape type, the mean of the parameterization values in García de Cortázar-Atauri (2006) was used, which was conducted for different grape types and had a low effect. For AFRUITPOT, PGRAINMAXI, NBINFLO, and DENSITESEM variables, parameterization was done for each grape type. The values from the parameterization were included in the model (STICS) based on the location where the related grape species grow. Parameterization of this variable was made separately for each location since the DUREEFRUIT variable (degree-day between fruit filling and fruit ripening) varies according to the location. For this, STICS was test run on a location basis and the degree-day required by the plant until harvest was determined. The variables, the units of the variables, the lower and upper boundaries and values used in the model are specified in (Appendix B).

3.4.2.5. Crop model limitations. Studies on the possible impacts of climate change are based on model estimates. Moreover, most models do not provide reliable estimates of changes in regional variability at local scale (de Wit et al., 1970; Brisson et al., 2008). Nowadays, the validity of the models is complicated by the fact that the data obtained from the field is not precise and this information is rarely found in the literature.

GCMs have so far failed to produce reliable estimates of climatic changes such as changes in the frequency of short- or long-term extreme weather events, such as droughts, floods, or storms, although they can significantly affect product yield. The reason for this is that although GCMs are successful in simulating the global values of surface air temperature and precipitation values, they do not yield reliable results on a regional scale due to low resolution (Goudriaan, 1977).

Crop growth models can be considered as systems in which the behavior of some components is not fully understood and the differences between model output and actual systems are not fully considered in model creation. Therefore, crop models make deviant estimates because they cannot incorporate natural processes into the model at a comprehensible level and due to computer power limitations. Model validation methodologies are still not enough. The main reason for this is that, unlike traditional methods, a large group of hypotheses are tested simultaneously in a model (Murthy, 2002).

The reliability of the model is limited, as model parameters and propellant variables can often not be measured under ideal conditions for the product and often cannot be obtained from site-specific conditions for the specific product. Sometimes parameters that need to be measured routinely but cannot be measured can be very important. In this case, the general parameters to be used in the model and the parameters that determine the physiological status of the plant is a problem in terms of reliability (Murthy, 2002). In addition, the measured parameters can vary depending on the natural soil heterogeneity in relatively small areas and changes due to the effects of livestock practices on the soil. This indicates that there should be differences in parameters for larger areas and this is another limitation for the model (Murthy, 2002).

In fact, model performance is limited by the quality of input data. The data on the growth and development of crops on the soil are much more reliable, but the data on the root growth and soil properties are less reliable (Murthy, 2002). Most simulation models require reliable and complete meteorological data. This data is often obtained from station data or sometimes from the climate model. If there is no station data close to the area to be studied for a specific product, station data at farther points are used and this data does not fully model the impact on that product. The data obtained from the climate model are sometimes obtained with lower resolution than necessary and the results of the model can be biased depending on the topography. In other words, air, or climate data to be given as input to the model may not be at the desired reliability, which directly affects the model result. Finally, sampling errors also contribute to inaccuracies in the observed data (Murthy, 2002).

In fact, in order for a crop growth model to be a high-performance model, the plant must carefully contain elements that represent real-world behavior, in other words, it must be a model that takes into account the parameters that determine the entire physiological and biological state of the plant.

However, it does not seem possible to develop such a model since the biological system is very complex and many of the processes involved are not fully understood (Jame and Cutforth, 1996). Even if an ideal crop model can be produced, it is difficult to collect system parameters and input data that are important to the plant.

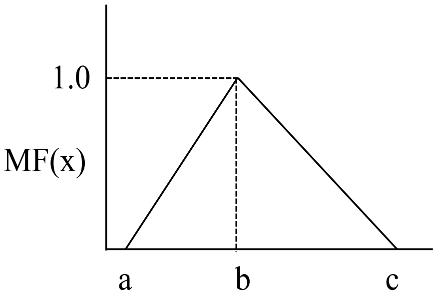
In conclusion, in order to achieve successful results in crop growth models, model limitations should be well known, and maximum reliable input data should be provided through field experiment rather than literature.

3.4.3. Membership function method (Fuzzy Clustering)

Fuzzy membership functions were introduced by Zadeh (1965) for dealing with uncertainty and they can be applied where clusters do not have strictly defined boundaries (Zadeh, 1965). Zadeh (1973) says that the closer you look at a real-world problem, indistinctness becomes the solution. Zadeh expressed the principles and algorithms of fuzzy membership functions as follows (Zadeh, 1965, 1968; Elmas, 2007); i. in fuzzy clustering, approximate values are used instead of specific values. ii. information can be defined with very little, little, small, large linguistic expressions. iii. all values are shown with a membership degree in the range [0-1]. iv. each logical statement can be converted into a fuzzy statement. vi. the fuzzy membership function is a suitable method for systems whose mathematical model is very complex and challenging (Keskenler and Keskenler, 2017).

Fuzzy clustering is a supportive method that can help to model in case of lack of data or uncertainty (Sivanandam et al., 2007). In other words, it is a mathematical function that determines the degree of membership depending on the degree of uncertainty or fuzziness in a fuzzy set, which can be defined as a characteristic function that assigns a value between 0 and 1 to each element in a universal set. Fuzzy clustering applications include land suitability (Braimoh and Vlek, 2004) and forecasting (Jain and Babita Jain, 2013) practices in general. Therefore, in this study, fuzzy clustering was applied in calculating the climate suitability index. There are many types of membership functions of which three of them are briefly explained below (Samanta, n.d., 2018; Suganya et al., 2018).

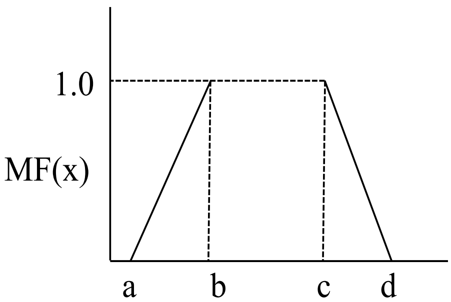
a. <u>Triangle membership function:</u> Three parameters a, b and c describe the function of triangle membership. a and c represent the bottom ends of the triangle and b represents the vertex of the triangle (a; lower boundary and c; upper boundary, where membership degree is zero, b; the center value where membership degree is 1. The figure (Figure 3.5) and expression (Eq. 3.45) are given below:



$$\mathrm{MF}\ (x) = \begin{cases} 0 & \text{if } x \leq a \\ \dfrac{x-a}{b-a} & \text{if } a \leq x \leq b \\ \dfrac{c-x}{c-b} & \text{if } b \leq x \leq c \\ 0 & \text{if } x \geq c \end{cases} \tag{3.45}$$

Figure 3.5. Triangle relationship of membership function

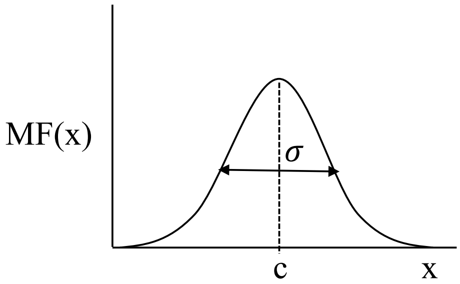
b. <u>Trapezoidal membership function:</u> It is described by four parameters, which are a and d represent the bottom corners of the trapezoidal shape and b and c represent the top corners of the trapezoidal shape. The figure (Figure 3.6) and expression (Eq. 3.46) are given below:



$$\mathrm{MF}\ (x) = \begin{cases} 0 & \text{if } x \leq a \\ \dfrac{x-a}{b-a} & \text{if } a \leq x \leq b \\ 1 & \text{if } b \leq x \leq c \\ \dfrac{d-x}{d-c} & \text{if } c \leq x \leq d \\ 0 & \text{if } d \leq x \end{cases} \tag{3.46}$$

Figure 3.6. Trapezoidal relationship of membership function

c. Gaussian membership function: This function considers the distance from the origin (c) and the width of the curve (σ). It is given by the figure (Figure 3.7) and the expression (Eq. 3.47):



$$MF\ (x, c, \sigma, m) = \exp\left[-\frac{1}{2}\left|\frac{x-c}{\sigma}\right|^{m}\right] \tag{3.47}$$

Figure 3.7. Gaussian relationship of membership function

The evaluation criterion to be used for determining the crop pattern has been identified with several features that express the final output. This stage was shaped by determining the factors that may affect the crop pattern in the future and the degree of their impact according to their weight. Therefore, while making these criteria, the climatic conditions from the crop growing regions and literature. The step-by-step path and the assumptions taken into account are as follows: i. As stated in the previous sections, the yield values obtained from TURKSTAT were considered per decare not per tree, because of some inconsistencies in the number of trees per year. In this stage of the study, locations are not compared with each other in terms of yield, and it is assumed that the number of trees per decare per location is not changed and the reference period (1991-2012) for crop yields is used to determine the thresholds of climatic variables. ii. 5 different classifications i.e., extremely suitable, very suitable, suitable, acceptable, and marginal suitable have been made by using Climate Suitability Index values. While calculating the index, the upper and lower limits are used to survive crop and the lower and upper limits required for optimum yield. In this determination, the lowest value was accepted as 5 % and the highest value as 95 % percentile for yield based on all locations, since the yield did not have a distinct distribution characteristic such as normal or gamma distribution. For optimum values, climatic data corresponding to 25 % and 75 % percentile were considered. iii. By using a simple formulation based on membership function, the coefficients were calculated as approximate values between [0-1] instead of specific values to determine the Crop-Climate Suitability Index. The range values of the membership function are computed using the Trapezoidal method.

Applying the method, respectively (Nguyen et al., 2011);

Defining objective: It is the first step of land suitability analysis. It refers to that determination of crop pattern in a location-basis for each selected crop in whole Turkey. This part should be done carefully to make accurate start to the analysis.

Selection of evaluation factors according to the definition of objective: Determination of climatic variables and related limiting factors affecting the crop according to the crop pattern: According to this application, a set of features should be defined that provide the functionality for the final purpose desired (Malczewski, 1999). In other words, an evaluation criterion that expresses the quality of each effective variable should be created. Field studies, experimental information or literature are used in determining or developing these criteria. The important thing here is to check whether there are factors that limit the crop yield. For example, the precipitation variable is not considered as a limiting factor because even if the location does not receive sufficient natural precipitation, it is not considered as a limiting factor as this can be eliminated by additional irrigation methods. However, if precipitation is a crucial variable, then weighting for the relevant crop should be done accordingly. In this thesis, as Malczewski (1999) said, it is provided to determine the climatic suitability conditions within the scope of the selected crop and to weight them according to the effect on the yield and the evaluation criteria for the crop is made considering all these factors. In addition to using the literature, the requirements of climate conditions by the crop, on a variable basis were determined monthly by considering the 22-year period between 1991 and 2012 in the locations where the crop was grown, and these conditions were weighted using the panel data (multi-regression) method.

Factor standardization: In this study, the trapezoidal membership function method was used to determine the suitable degrees. Standardized results provide more accurate output as it allows for gradual transitions between “0” and “1” (Nguyen et al., 2011). While “0” value expresses unsuitable conditions, the “marginal suitability” range starts with the value closest to “0”. In contrast, the value of “1” gives full membership, i.e., “extremely suitability” representation. Values between “0” and “1” give us partial membership and the degree of suitability is determined according to the range in which the values correspond (Nguyen et al., 2011).

Combination of the factors: After determining the limiting and non-limiting factors for the crop yield, we need to combine them. Precipitation is a non-limiting factor in the literature because the amount of water required by the crop can be eliminated by additional irrigation methods with appropriate management options. In contrast, the temperature required for the crop is accepted as a limiting factor since it is not a factor to be eliminated by human made. In the study, limiting and non-limiting factors were weighted (Eq. 3.48) with multiple regression method and then combined with the additive method. There are two combination methods used in the membership function literature. One is multiplicative and the other one is additive. In the study, after weighting the factors, the additive method used to integrate limiting and non-limiting factors.

$$y_i = \sum_{j=1}^{n} w_j x_{ij} \tag{3.48}$$

Where, y_i is the overall score for ith location and w_j is the weight for jth factor.

Classification of the overall scores (determining the suitability range): The classification of overall scores allows to see the climate suitability level concerning the variables, namely maximum, minimum, mean temperature, precipitation, evapotranspiration (this is for hazelnut, not grape), relative humidity, duration of sunshine and wind speed (this is for grape, not hazelnut). Different climate suitability classifications i.e. extremely suitable (ES), very suitable (VS), suitable (SU), acceptable (AC) and marginal suitable (MS) have been specified with overal scores based on different criteria have been determined for different phenological periods (on a monthly basis).3 approaches i.e Equal Interval Classification (EIC), Percentile Classification (PC) ve Natural Break Classification (NBC) were used to classify suitability between 0 and 1 (ArcGIS, n.d.; Spatial Analysis Online, 2020). The NBC approach is preferred (Fisher, 1958; Jenks and Caspall, 1971) because it provides variance minimization. The main point in this approach is that the classification ranges are determined by separating the values where significant changes occur. It may vary depending on the number of classes selected, and unlike other methods, it tends to have unusual class boundaries.

4. RESULTS

4.1. Regional Climate Model Results, RegCM4.4

4.1.1. Input for Hazelnut

In this section, changes in the climate variables are illustrated for the period of 2021-2050 with respect to the reference period of 1991-2012 for the hazelnut growing regions (Figure 4.1) with different altitudes in the Black Sea region and the eastern Marmara sub-region (Figure 4.2).

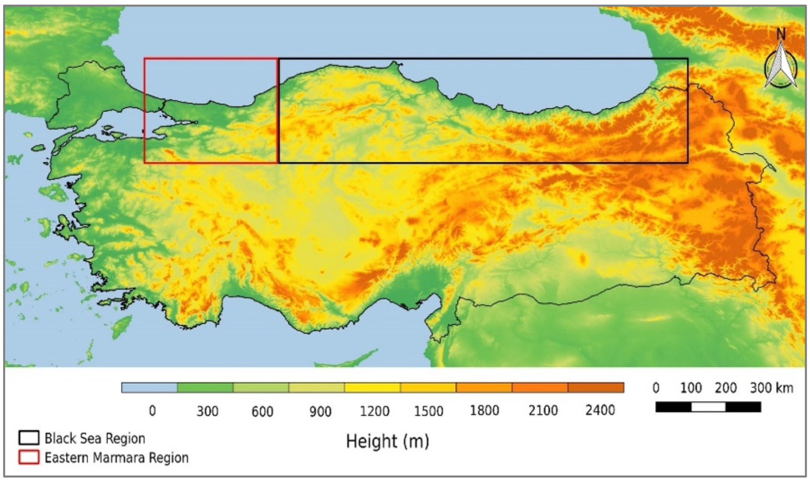


Figure 4.1. Topographical map of Turkey and the hazelnut growing regions.

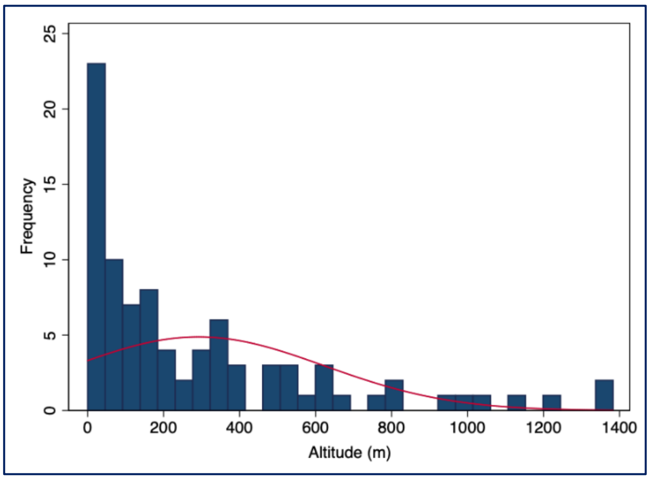


Figure 4.2. Altitude distribution for 88 locations in the Black Sea region and the eastern Marmara sub-region.

The climate parameters used in the model are changing according to crop and approach applied in the study. According to the 2021-2050 future vs. 1991-2012 baseline, 6 variables were used in the statistical model for the hazelnut yield change analysis. These variables are Tmean, DTR, Pr, AET, RH and SunD. There is something to say here. Minimum and maximum temperatures for hazelnut yield analysis were not used in this analysis because 12 different models with different variables were applied and it is observed that they are not statistically significant on yield, and it was decided to use mean temperature which is statistically significant.

On the other hand, in the climate suitability index and classification analysis for hazelnut, 8 variables were used. These variables are T_{max}, T_{min}, T_{mean}, DTR, Pr, AET, RH and SunD. Accordingly, the climate variables and the climate index obtained from the regional climate model RegCM4.4 were mapped for the hazelnut phenological periods, and the variables were shown in Figure 4.3, Figure 4.4, Figure 4.5, Figure 4.6, Figure 4.7, Figure 4.8, Figure 4.9, and Figure 4.10, respectively.

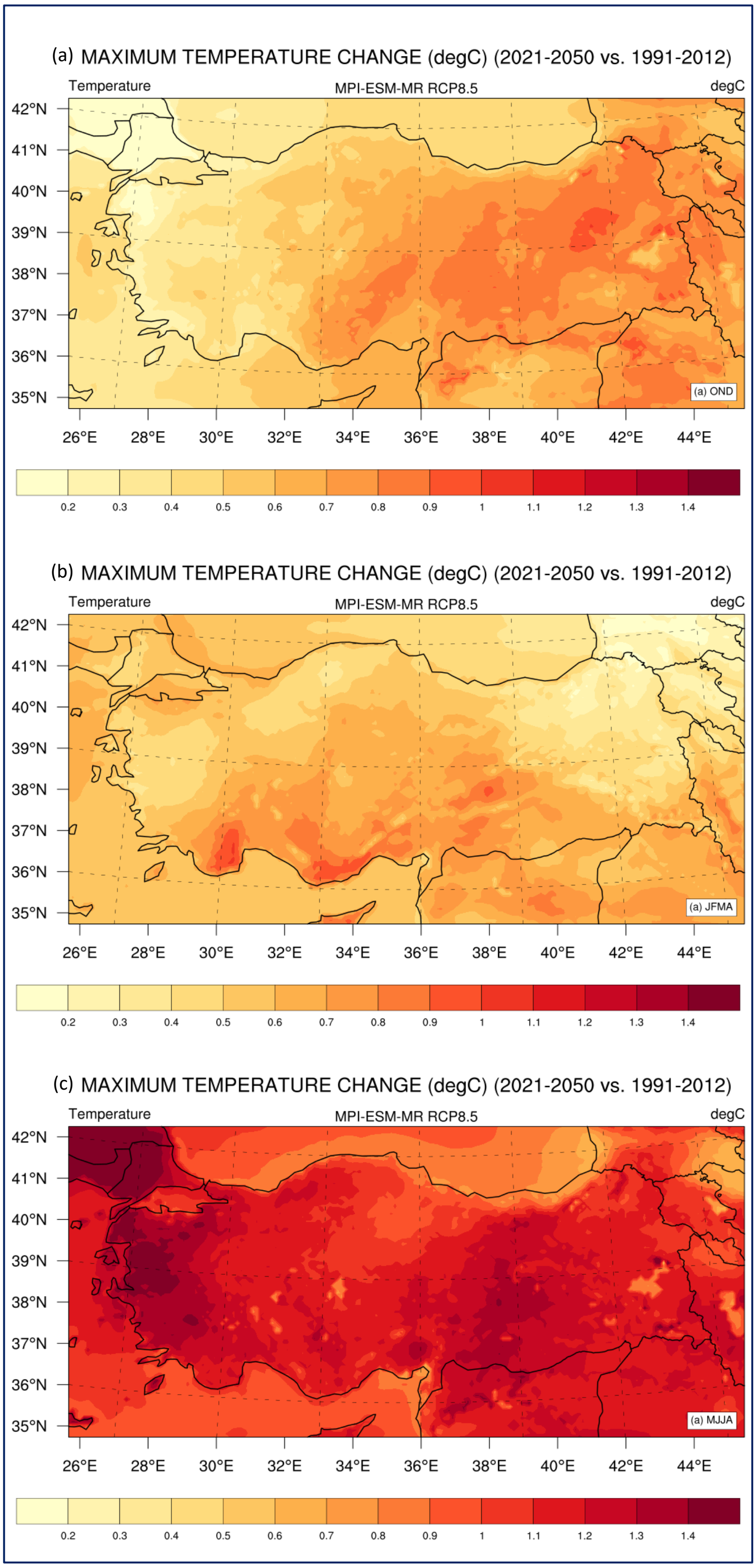


Figure 4.3. Projected hazelnut phenological changes in **monthly average maximum temperature** (°C) (a) vegetation period covering October-November-December (b) flowering covering January-February-March-April (c) grain filling (bearing and ripening) covering May-June-July-August under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

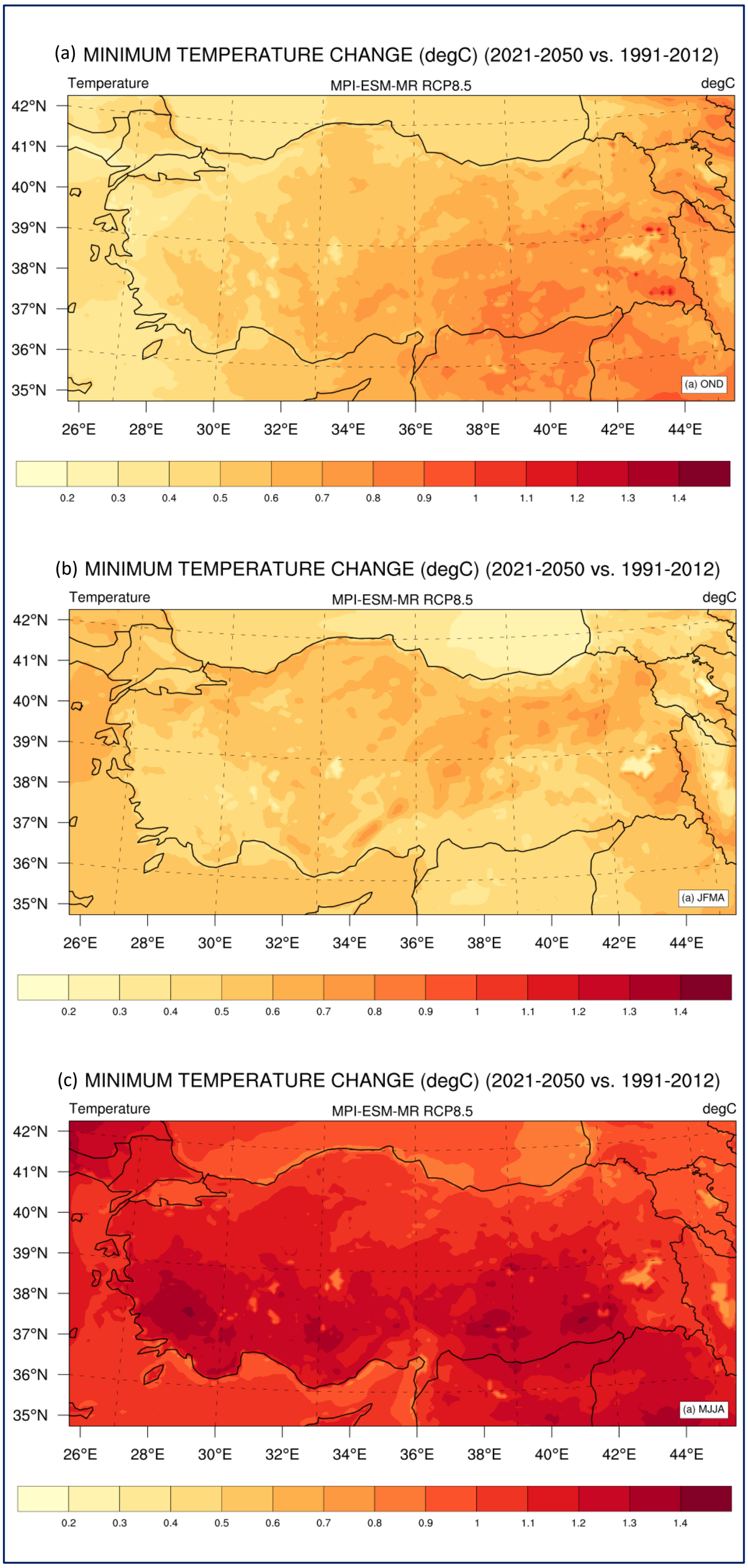


Figure 4.4. Projected hazelnut phenological changes in **monthly average minimum temperature** (°C) (a) vegetation period covering October-November-December (b) flowering covering January-February-March-April (c) grain filling (bearing and ripening) covering May-June-July-August under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

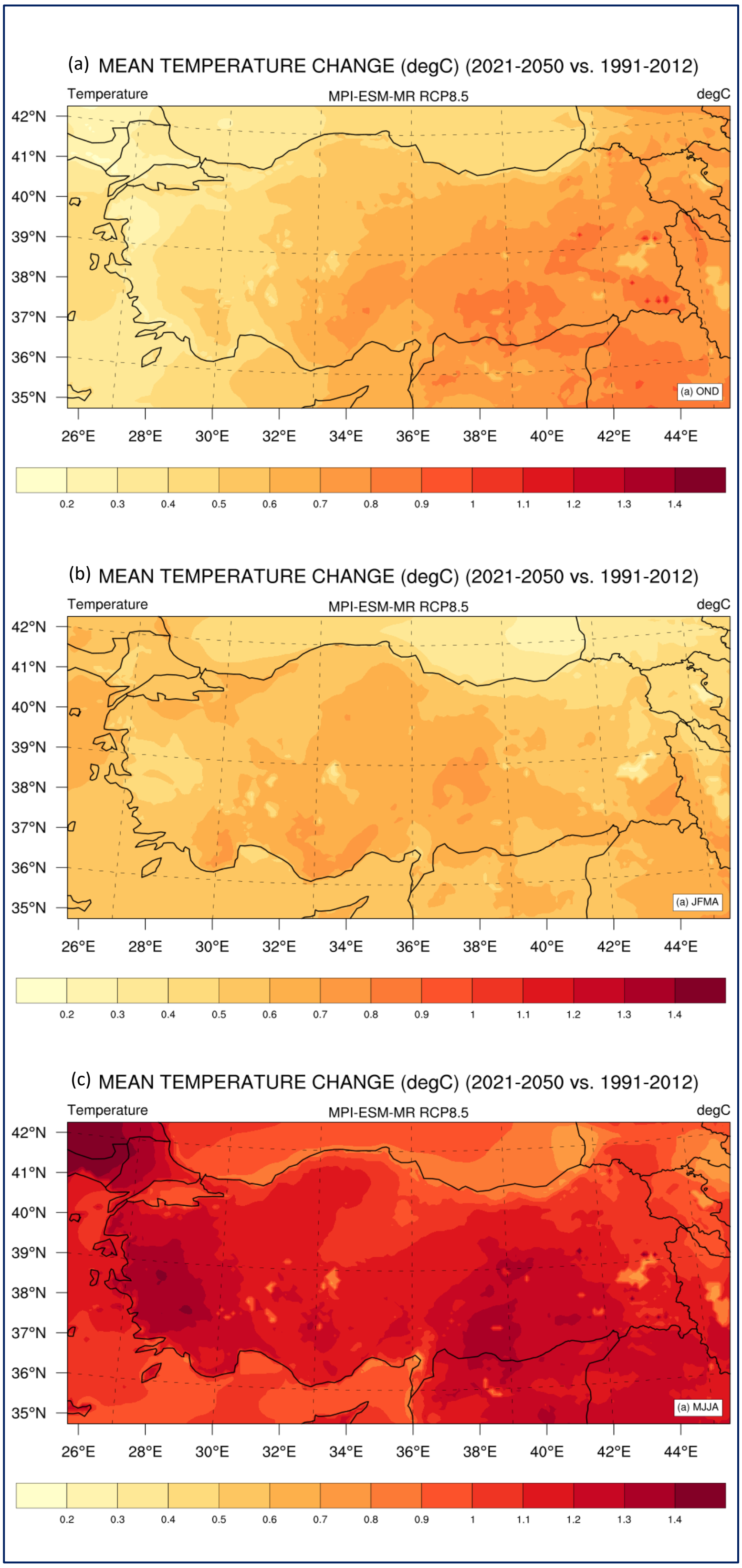


Figure 4.5. Projected hazelnut phenological changes in **monthly average mean temperature** (°C) (a) vegetation period covering October-November-December (b) flowering covering January-February-March-April (c) grain filling (bearing and ripening) covering May-June-July-August under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

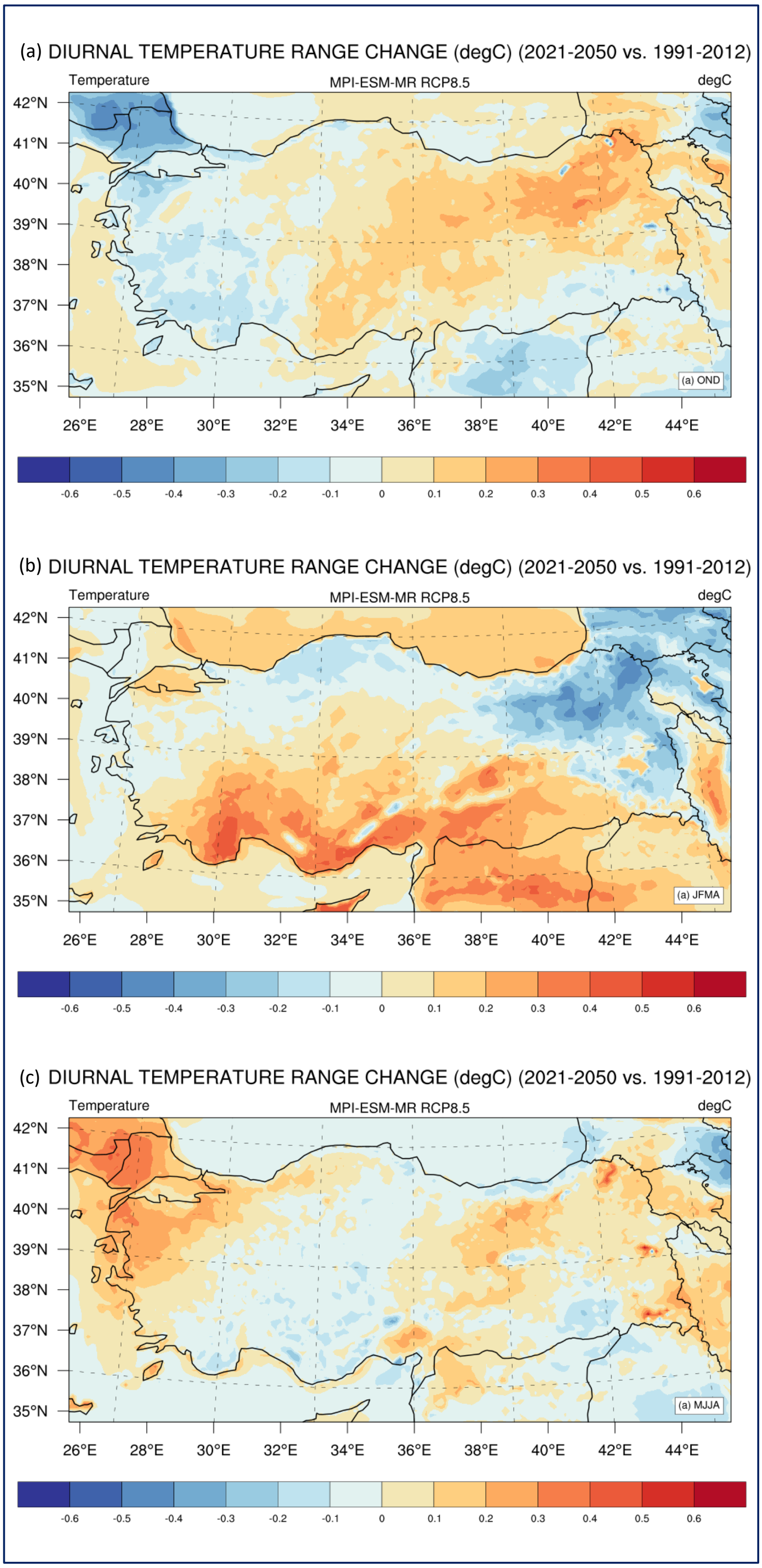


Figure 4.6. Projected hazelnut phenological changes in **monthly average diurnal temperature range** (°C) (a) vegetation period covering October-November-December (b) flowering covering January-February-March-April (c) grain filling (bearing and ripening) covering May-June-July-August under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

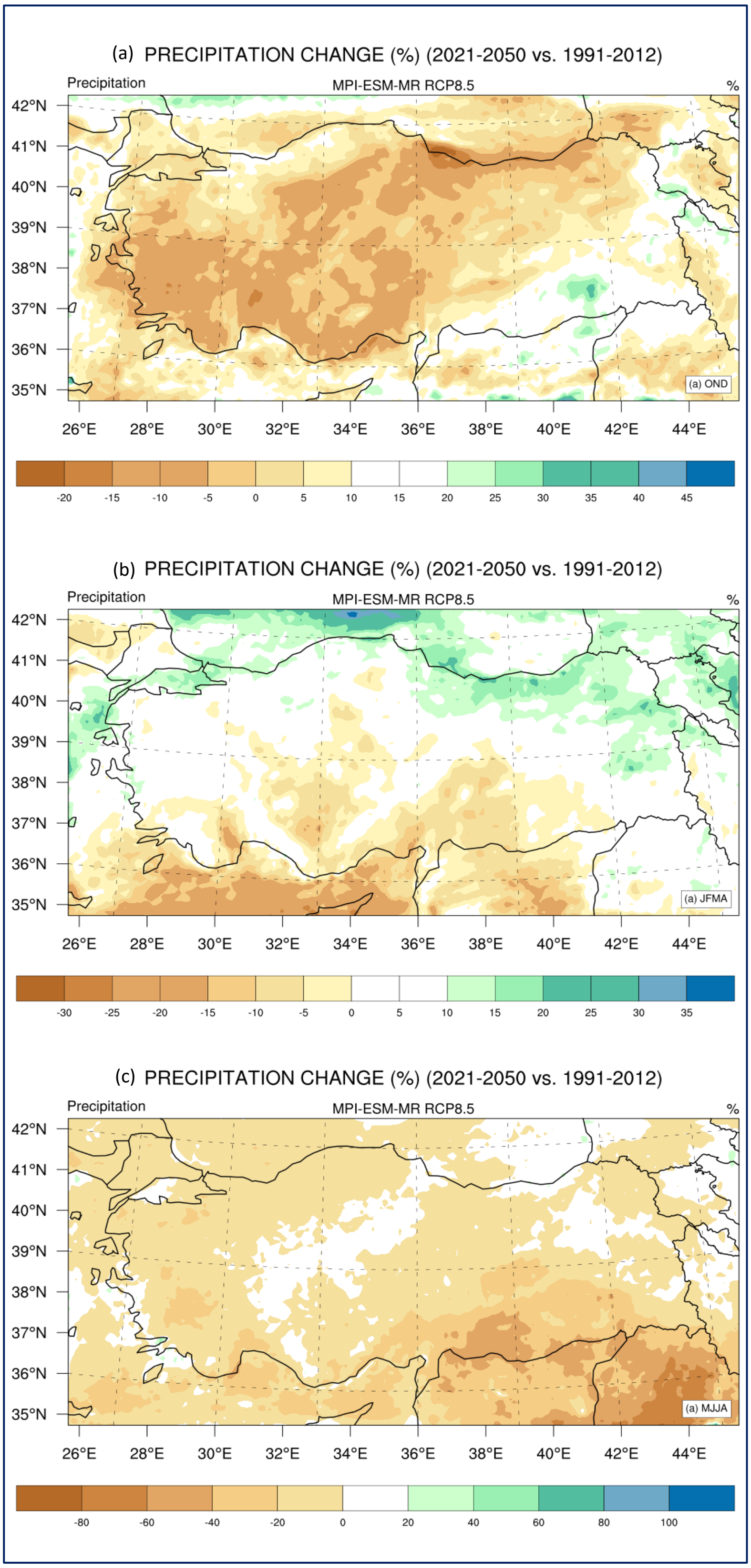


Figure 4.7. Projected hazelnut phenological changes in **monthly total precipitation** (%) (a) vegetation period covering October-November-December (b) flowering coveringJanuary-February-March-April (c) grain filling (bearing and ripening) covering May-June-July-August under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

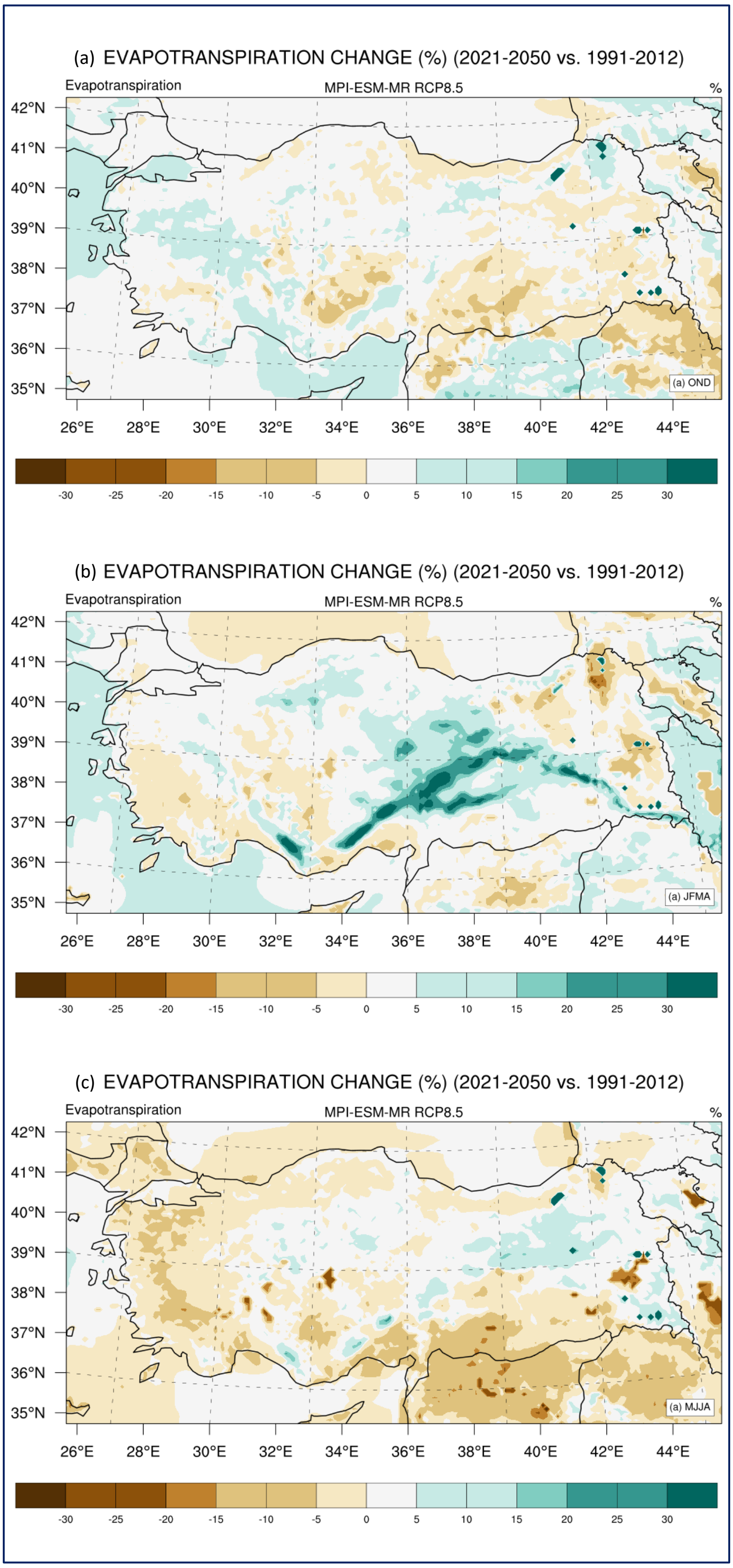


Figure 4.8. Projected hazelnut phenological changes in **monthly total actual evapotranspiration** (%) (a) vegetation period covering October-November-December (b) flowering covering January-February-March-April (c) grain filling (bearing and ripening) covering May-June-July-August under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

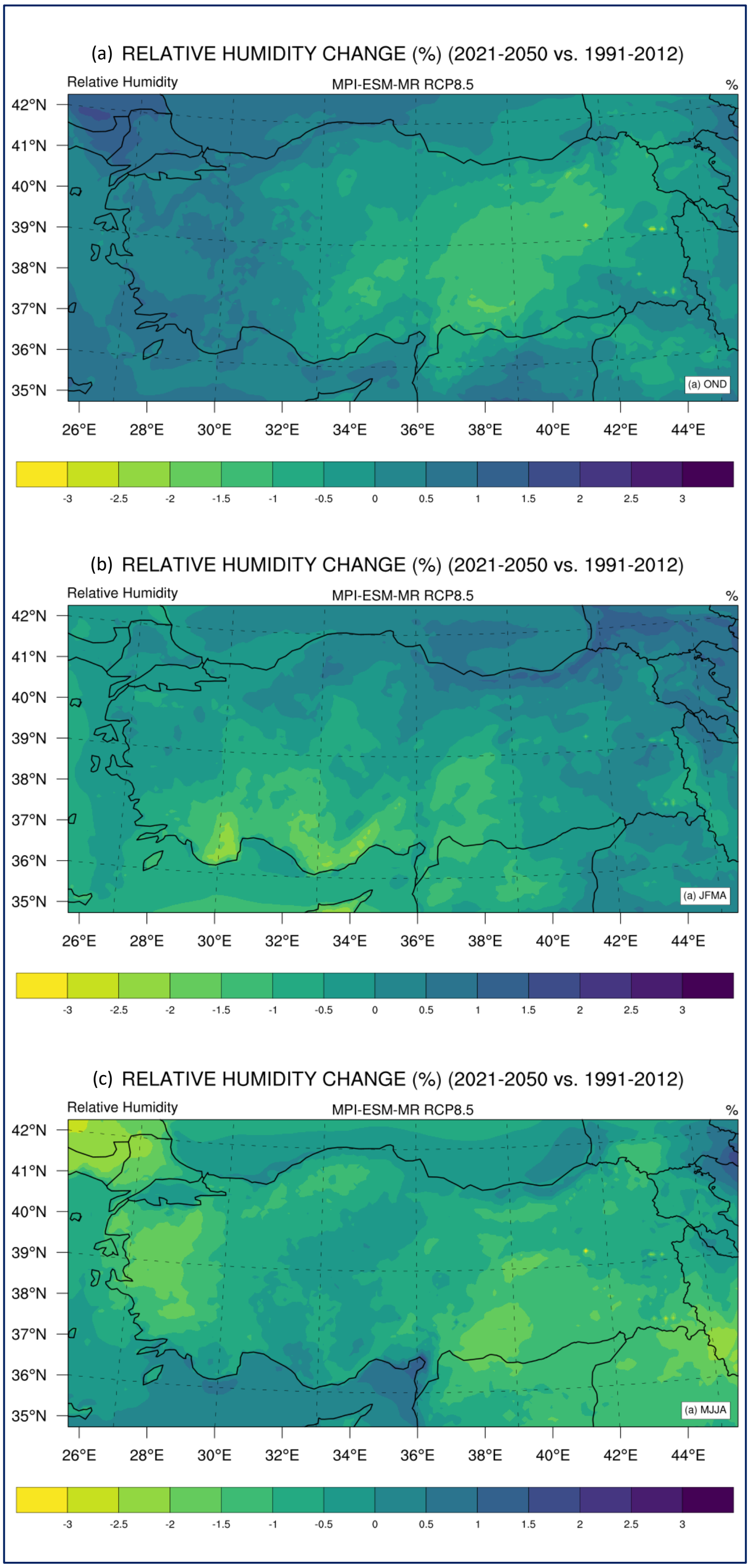


Figure 4.9. Projected hazelnut phenological changes in **monthly average relative humidity** (%) (a) vegetation period covering October-November-December (b) flowering covering January-February-March-April (c) grain filling (bearing and ripening) covering May-June-July-August under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

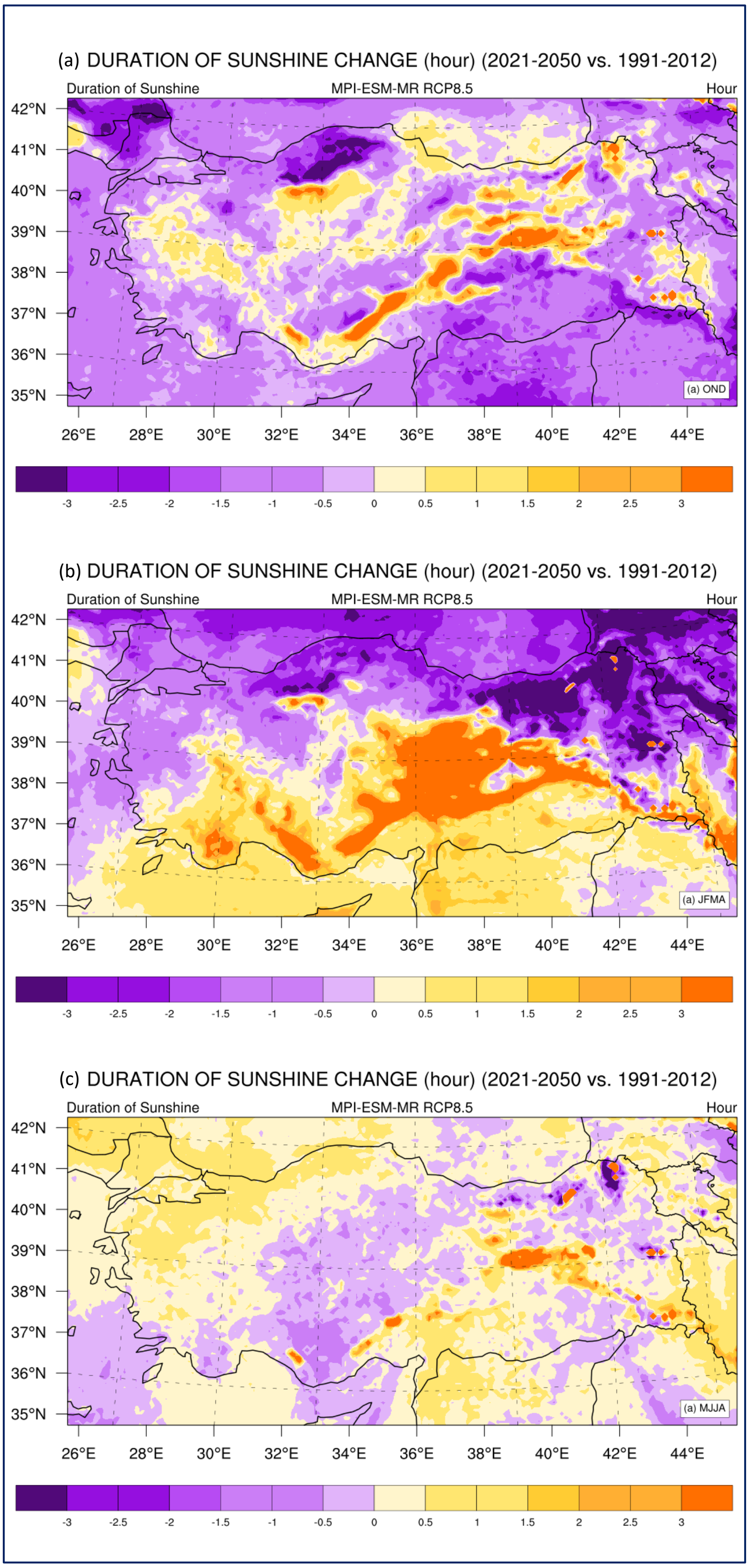


Figure 4.10. Projected hazelnut phenological changes in **monthly total duration of sunshine** (hr) (a) vegetation period covering October-November-December (b) flowering covering January-February-March-April (c) grain filling (bearing and ripening) covering May-June-July-August under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

By looking at the climate parameters, it is observed that the optimum conditions required for the development of the hazelnut will be affected in terms of the phenological periods (vegetation, flowering and grain filling) of the hazelnut.

In the vegetation period including October-November-December, it is observed that maximum temperatures will increase slightly in the central and eastern Black Sea (0.7-0.8 °C) compared to the western Black Sea and eastern Marmara (Figure 4.3a). This situation differs somewhat more in the flowering period that covers January-February-March-April, and it is expected that the eastern Marmara and the central Black Sea will increase slightly (0.6-0.7 °C) compared to the western and eastern Black Sea (Figure 4.3b). In the grain filling period, which includes bearing and ripening covering the months of May-June-July-August, it is expected that an increase between 1.1-1.4 °C in almost all the Black Sea except the coastal areas and East Marmara (Figure 4.3c). Accordingly, these increases in maximum temperatures in the period of bearing and ripening of hazelnuts indicate that there will be an increase in the maximum of maximum temperatures. This points out that there may be an increase in the number of high limit temperatures for hazelnuts to survive in this period, which increases the expectation of negative effects on hazelnut quality. For the Black Sea and East Marmara, as for maximum temperatures as well as minimum temperatures for the same regions, generally increases between 0.5-0.7 °C (Figure 4.4a) during vegetation, between 0.5-0.8 °C in flowering (Figure 4.4b) and between 1-1.4 °C in grain filling (Figure 4.4c). The average temperatures for hazelnuts should be within a certain range throughout the year. Accordingly, the average temperatures increase between 0.5-0.8 °C (Figure 4.5a) during the vegetation period, between 0.4-0.8 °C in flowering (Figure 4.5b), and between 0.8-1.4 °C (Figure 4.5c) in grain filling.

During vegetation period, an average of 0.3 °C decreases is predicted in DTR, eastern Marmara and in some parts of the western Black Sea region, while it is estimated that there will be an increase of 0.3 °C towards the east (Figure 4.6a). While a decrease in DTR is predicted in the flowering period in almost the entire Black Sea region, it is estimated that this decrease will be up to 0.5 °C (Figure 4.6b). In the Grain filling period, while DTR decreased by 0.2 °C in the coastal areas of the central and eastern Black Sea (due to the decrease in June, Figure 4.11b), it is expected that an increase to 0.4 °C elsewhere (Figure 4.6c). DTR gradually increases from March onwards and generally increases in summer except for June (Figure 4.11b).

By looking at the precipitation regarding phenological periods, in vegetation period covering October-November-December, it is expected that there will be 5-15 % increase especially in the eastern Marmara and the Western Black Sea, while a decrease reaching up to 15-20 % in the inner parts of the central Black Sea and the coastal area of the eastern Black Sea is expected (Figure 4.7a). As for the flowering, it is likely that there will be an increase of 5-20 % (Figure 4.7b) in almost all Black Sea coastline, the inner parts of central and eastern Black Sea and eastern Marmara. In the grain filling period, which coincides with the summer months, a decrease up to 20 % is expected (Figure 4.7c) in the central and eastern Black Sea except for a certain region. In evapotranspiration, in the vegetation period, a decrease of 5 % is expected in the coastal areas of the central and eastern Black Sea and the inner parts and the coastal regions of the western Black Sea. In contrast, it is expected to increase by 10 % (Figure 4.8a) elsewhere. Increases up to 15 % are expected across the region in the flowering (Figure 4.8b). In the grain filling, decreases are expected to be around 5 % across the region (Figure 4.8c).

The relative humidity is another important parameter in the development of hazelnut, especially at the end of bearing and at the beginning of ripening. During vegetation period, an increase of up to 1.5 % in relative humidity is predicted, and these increases are expected to be the highest in the most eastern of eastern Black Sea, the coastal areas of the western Black Sea and the eastern Marmara (Figure 4.9a). In the flowering, a decrease of 0.5 % is predicted in the eastern Marmara, while it is predicted that there will be an increase up to 2 % from the western to the eastern Black Sea (Figure 4.9b). In regard to the grain filling, it is expected to decrease up to 2 % in the inner parts from the central Black Sea to eastern Marmara, increase around 1% in the coastal areas, whereas an increase of up to 1.5 % in the coastal areas from the central Black Sea to the eastern Black Sea and a decrease of up to 2 % in the inner parts (Figure 4.9c).

Looking at the duration of sunshine, an average decrease of 3 hours is foreseen in the western Black Sea and eastern Marmara, and the decline is around 2 hours in the central inner parts of the central and eastern Black Sea during the vegetation period (Figure 4.10a). Besides, an increase of 1.5 hours is observed in the coastal areas, while up to an increase of 3 hours is expected in the inner parts of the eastern Black Sea. While a decrease of up to 3 hours is anticipated in the entire Black Sea region and the eastern Marmara in the flowering period, these decreases will be over 3 hours, specifically in the eastern Black Sea (Figure 4.10b). During the grain filling period, it is expected that an increase up to 1.5 hours in the eastern Marmara and the western Black Sea, once again increase up to 1.5 hours in the central and east black sea, and a decrease up to 1.5 hours in the east, and besides, a decrease and an increase of 3 hours (Artvin) in different areas in the eastern part of the Black Sea (Figure 4.10c).

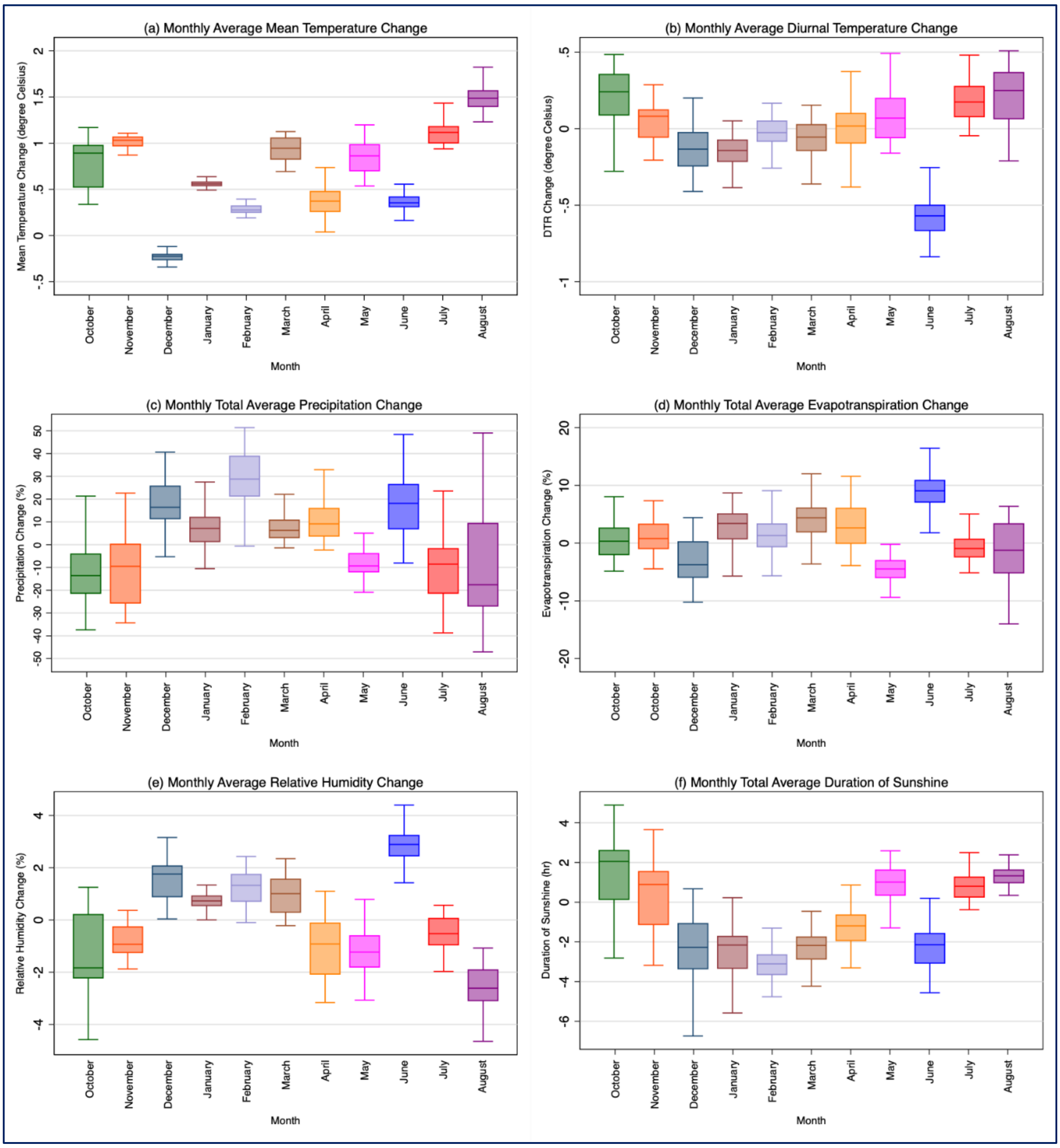


Figure 4.11. Projected changes in (a) monthly T_{mean} (℃), (b) monthly average DTR (℃), (c) monthly total Pr (%), (d) monthly total AET (%), (e) monthly average RH (%), and (f) monthly total SunD (hr) under RCP8.5 scenario for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

The boxplots for the change in multi-month averages of the climate variables are illustrated in Figure 4.11. Looking at the changes in T_{mean} for the period of 2021-2050 compared to the reference period of 1991-2012, it is expected that T_{mean} will increase in all months except December in the hazelnut growing regions (Figure 4.20a). It is seen that the increase in summer temperatures in July-August will be the highest (1-1.5 ℃) and it is expected that there will be an increase of around 0.5-1 ℃ in the other months. The difference between T_{max} and T_{min} will be slightly greater in October and August (Figure 4.20b). A positive increase is expected in October, November, May, July, and

August. The positive increase can be explained by a higher increase in maximum temperatures in these months compared to minimum temperatures. In October, November, May, July, and August an increase of up to 0.5 °C or a decrease of up to 0.4 °C can be observed for DTR. Higher minimum temperatures and lower maximum temperatures in June may result in a decline (up to 1 °C) on average DTR in the same month. There is a high variability in Pr change (Figure 4.20c), and it is particularly the highest in August. In all months except February, both increases and decreases can be observed. In February, an increase is expected in all locations. It is also seen that there will be an increase in seasonal precipitation averages in winter including the first month of the spring season. It is expected that Pr amounts will decrease more in summer and autumn. As in Pr, temporal and spatial variability in the change in monthly total AET is quite high (Figure 4.20d). On average, the highest decrease in total AET will be in May and the highest increase will be in June for the period of 2021-2050 with respect to the period of 1991-2012. It is also noteworthy that the total AET average will increase in January-February-March-April. It is projected that the average RH in June for the future period will be higher than in the past (Figure 4.20e). In general, RH will increase slightly in December, January, February, March, and June and a decrease in other months. The amount of change varies nearly by ±5 %. Since the amount of moisture especially in June is more substantial, the positive change in this month can be effective on hazelnut. For SunD, there is a general expectation of a decrease in December, January, February, March, and May, whereas an increase in October, November, April, June, July, and August is foreseen (Figure 4.20f). A decrease in SunD is expected more particularly in the flowering period, during which the amount of AET and RH increases. The situation may be related to the increase in the amount of cloudiness in the same months in the future. On average, while the decrease in SunD in February is expected to be slightly higher than in other months, the highest increase is foreseen in October and August.

4.1.2. Input for Grape

According to the 2021-2050 future vs. 1991-2012 baseline, 7 variables were used in the crop growth simulation model (dynamical plant-based simulation model), STICS for the grape yield change analysis. These variables are T_{max}, T_{min}, T_{mean}, Pr, RH, WS, and Rad. On the other hand, in the climate suitability index and classification analysis for grapes, 7 variables were used in the membership function. These variables are T_{max}, T_{min}, T_{mean}, Pr, AET, RH, and WS. Accordingly, the climate variables obtained from the regional climate model RegCM4.4 were mapped for the grape dormancy and vegetation period and the variables were shown in Figure 4.12, Figure 4.13, Figure 4.14, Figure 4.15, Figure 4.16, Figure 4.17, Figure 4.18, Figure 4.19, respectively.

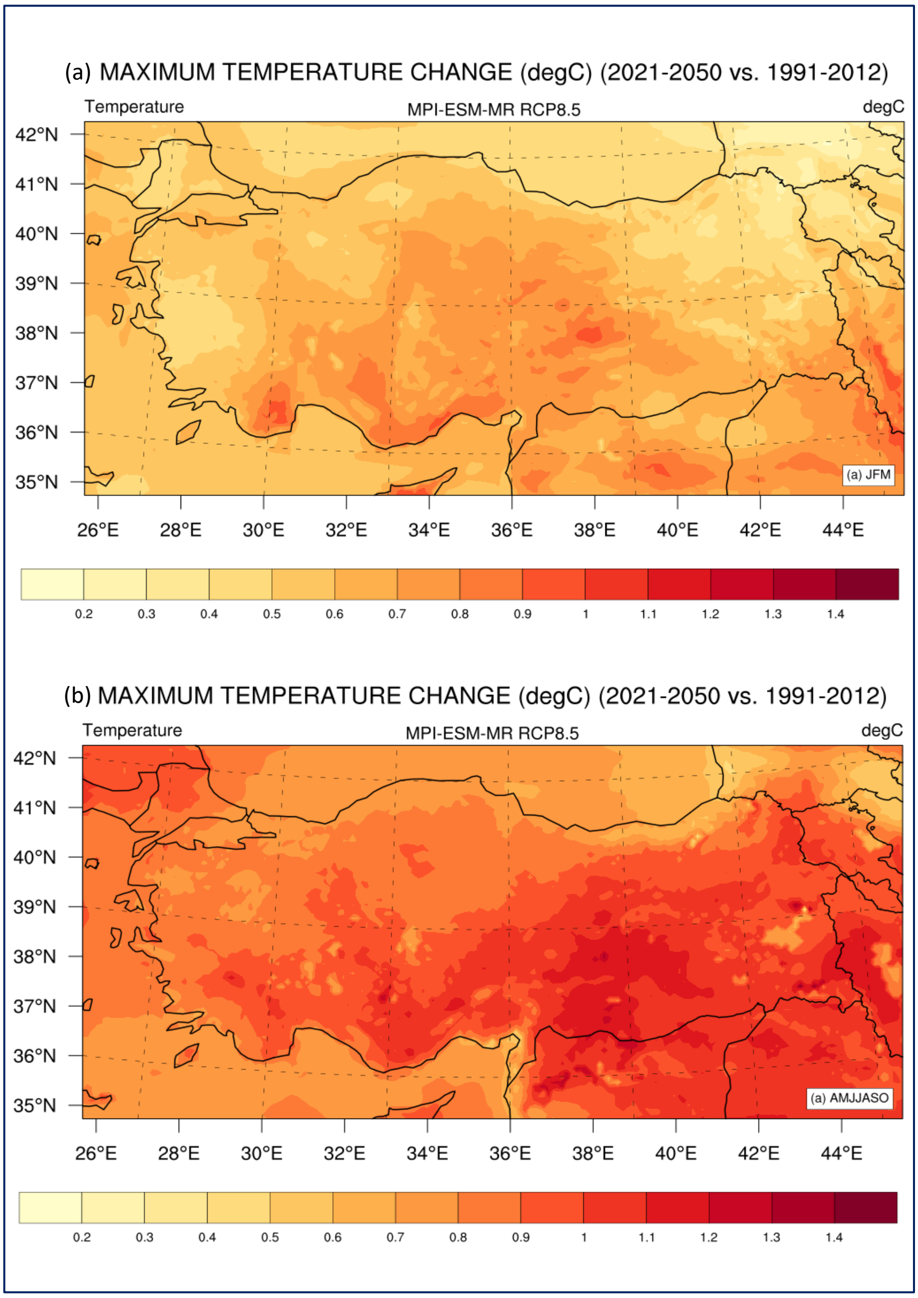


Figure 4.12. Projected grape phenological changes in **daily maximum temperature** (°C) (a) vegetation period covering January-February-March (b) development period covering April-May-June-July-August-September-October under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

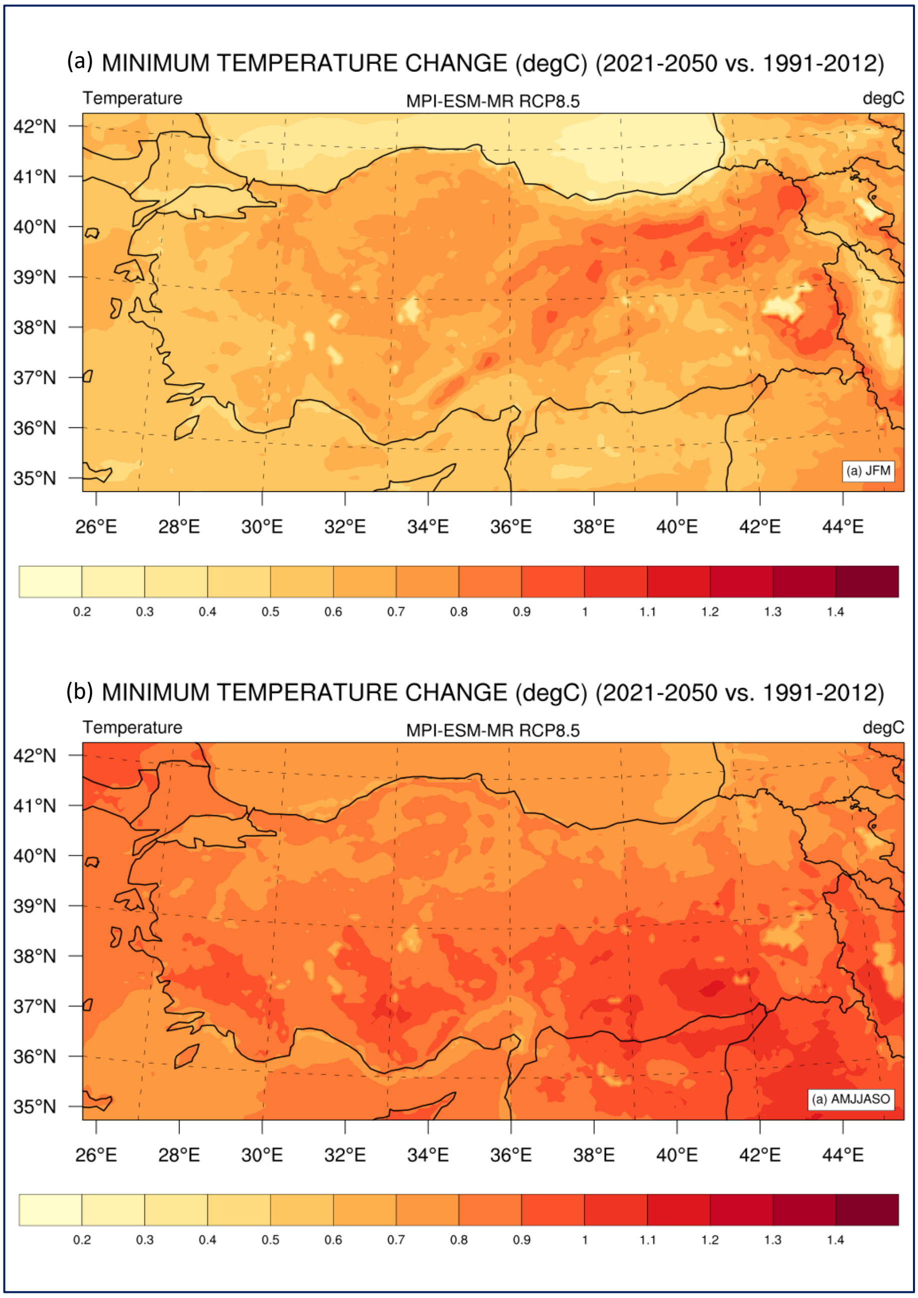


Figure 4.13. Projected grape phenological changes in **daily minimum temperature** (°C) (a) vegetation period covering January-February-March (b) development period covering April-May-June-July-August-September-October under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

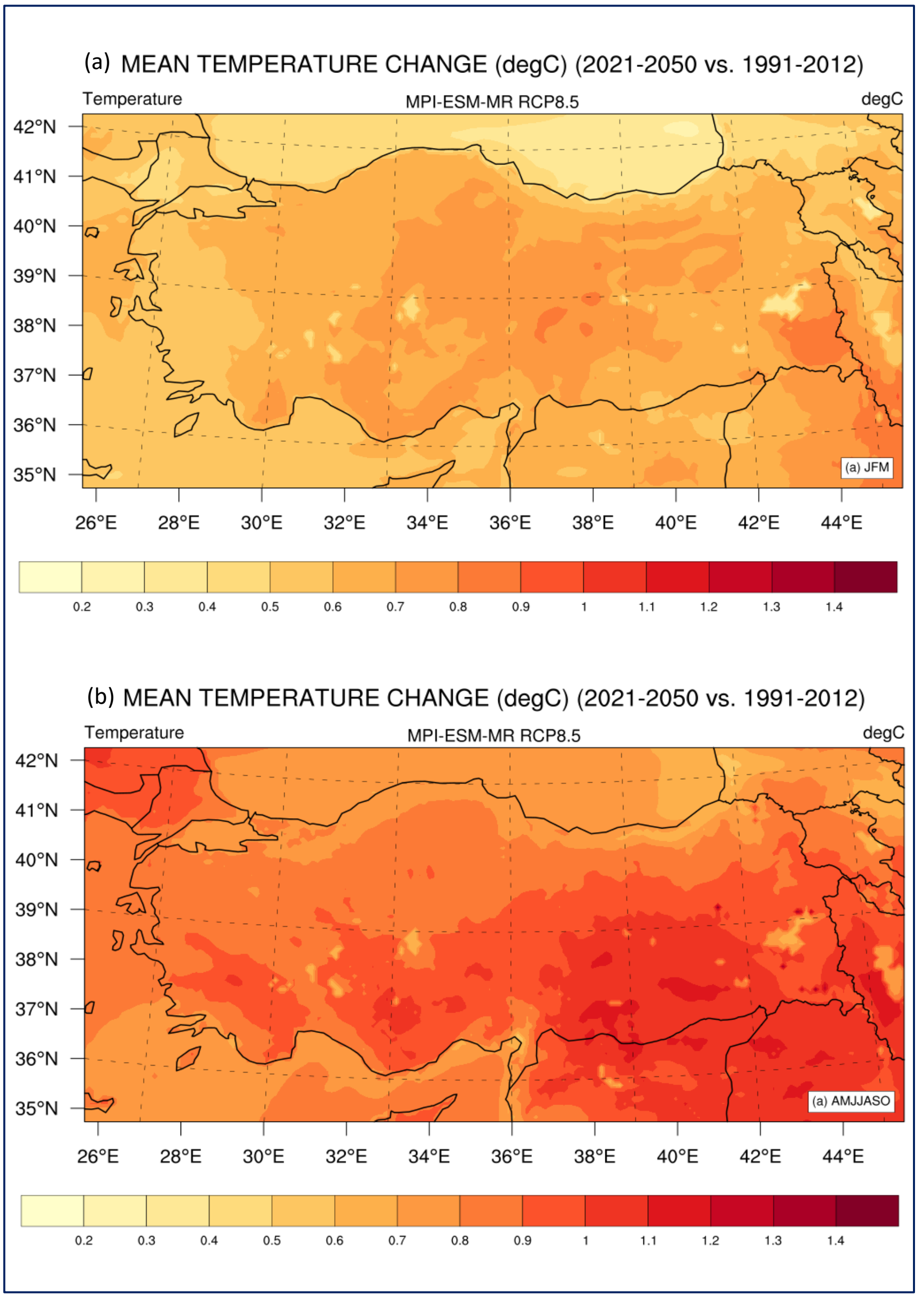


Figure 4.14. Projected grape phenological changes in **daily mean temperature** (°C) (a) vegetation period covering January-February-March (b) development period covering April-May-June-July-August-September-October under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

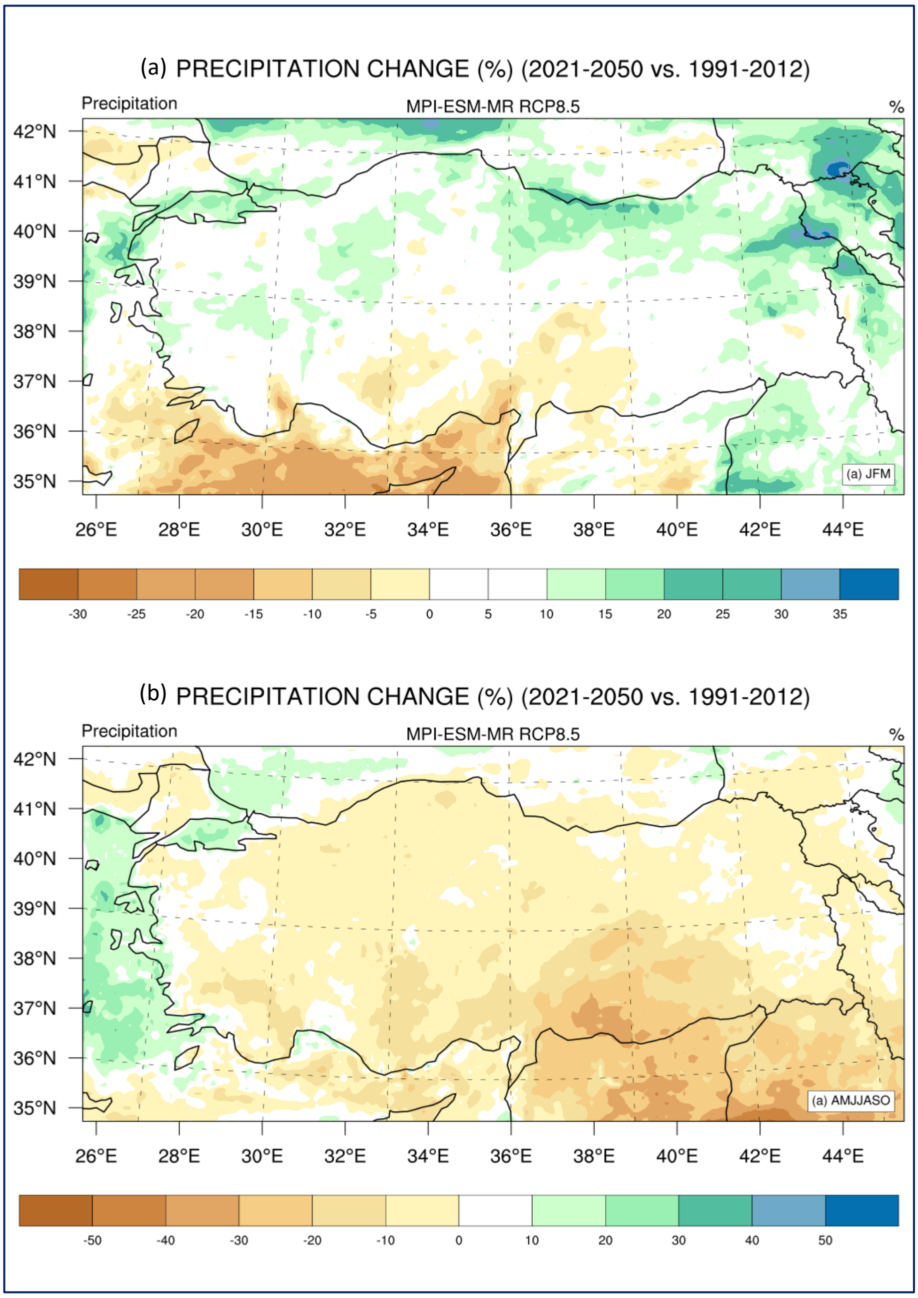


Figure 4.15. Projected grape phenological changes in **daily total precipitation** (%) (a) vegetation period covering January-February-March (b) development period covering April-May-June-July-August-September-October under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

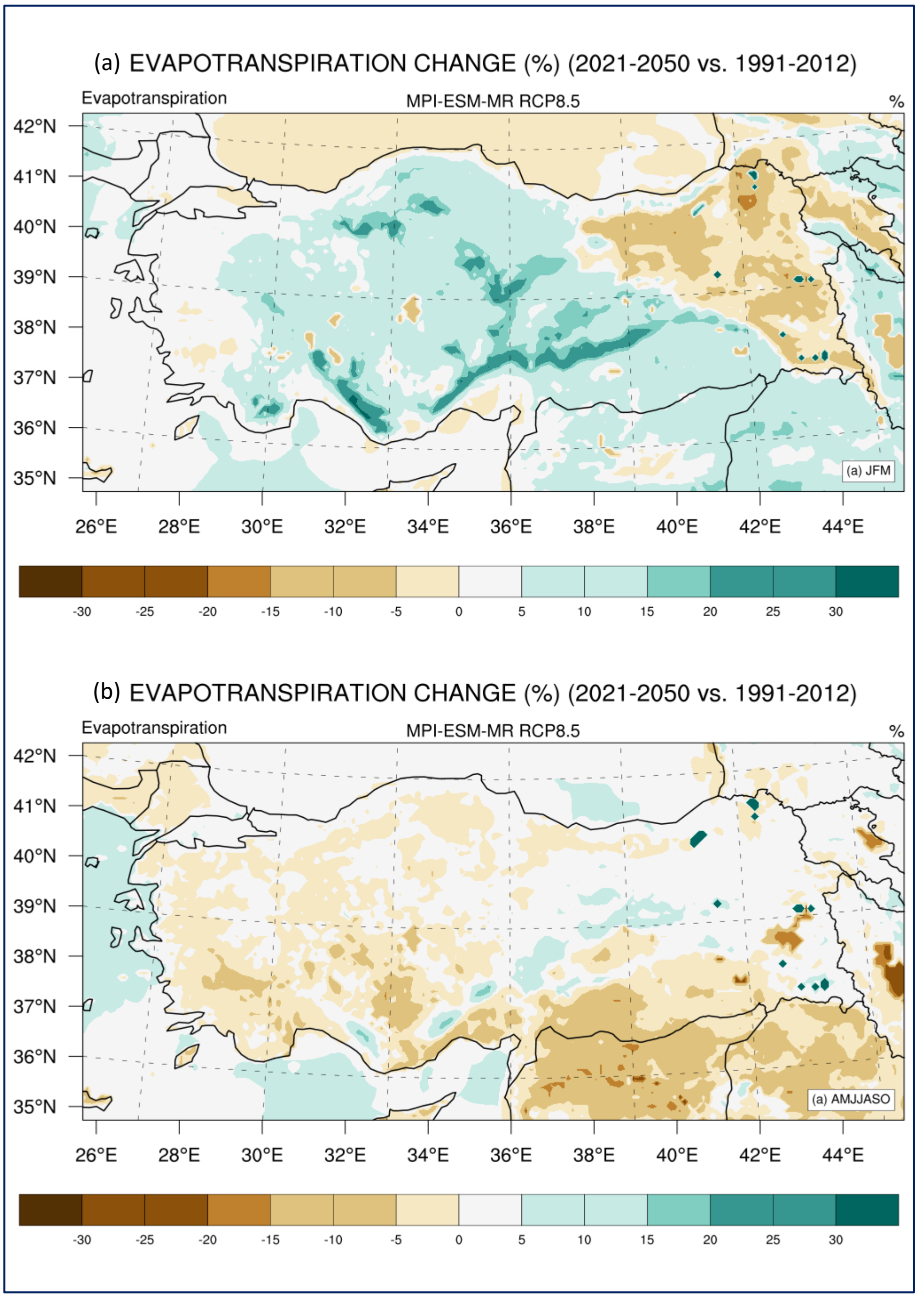


Figure 4.16. Projected grape phenological changes in **daily total actual evapotranspiration** (%) (a) vegetation period covering January-February-March (b) development period covering April-May-June-July-August-September-October under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

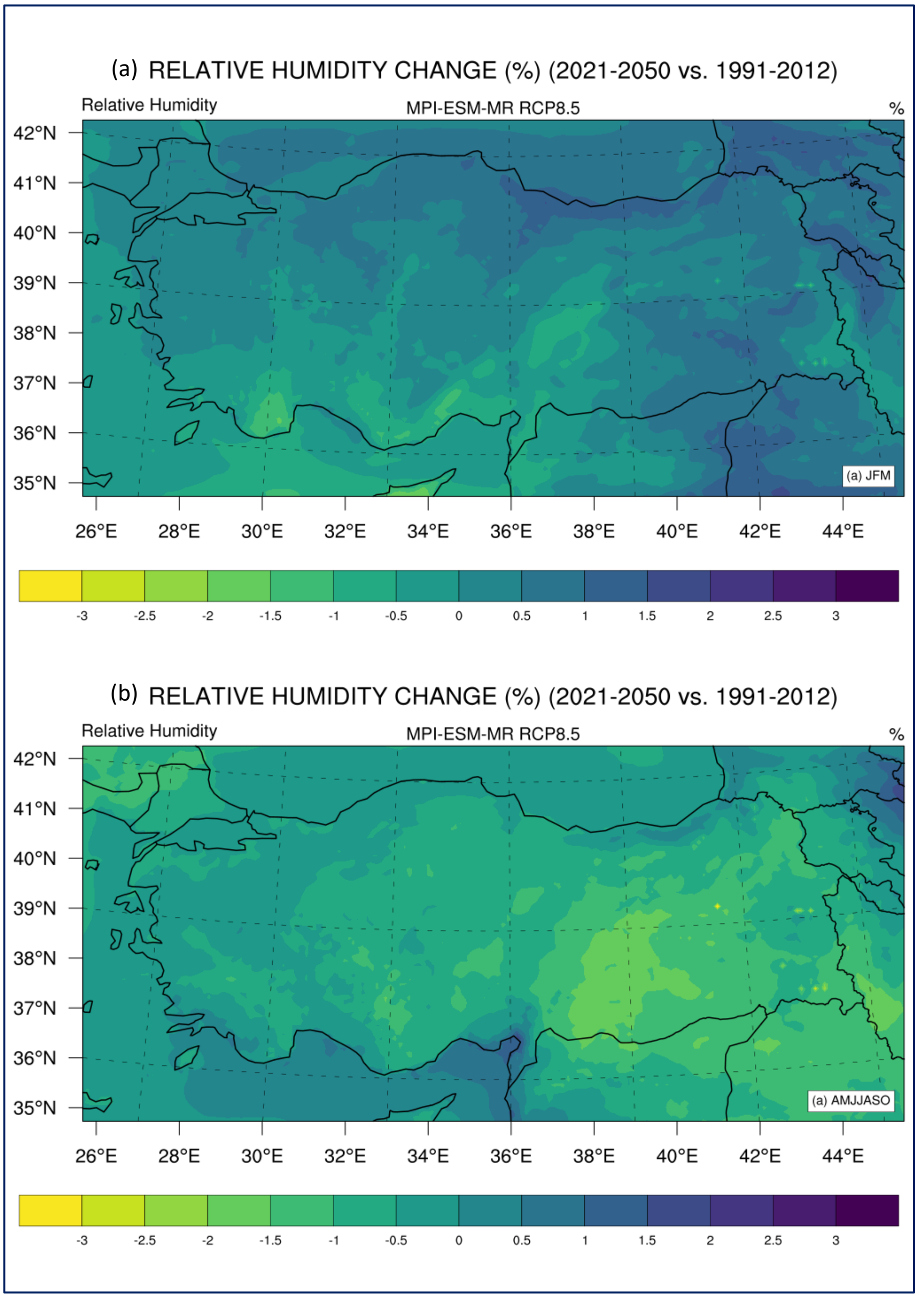


Figure 4.17. Projected grape phenological changes in **daily relative humidity** (%) (a) vegetation period covering January-February-March (b) development period with April-May-June-July-August-September-October under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

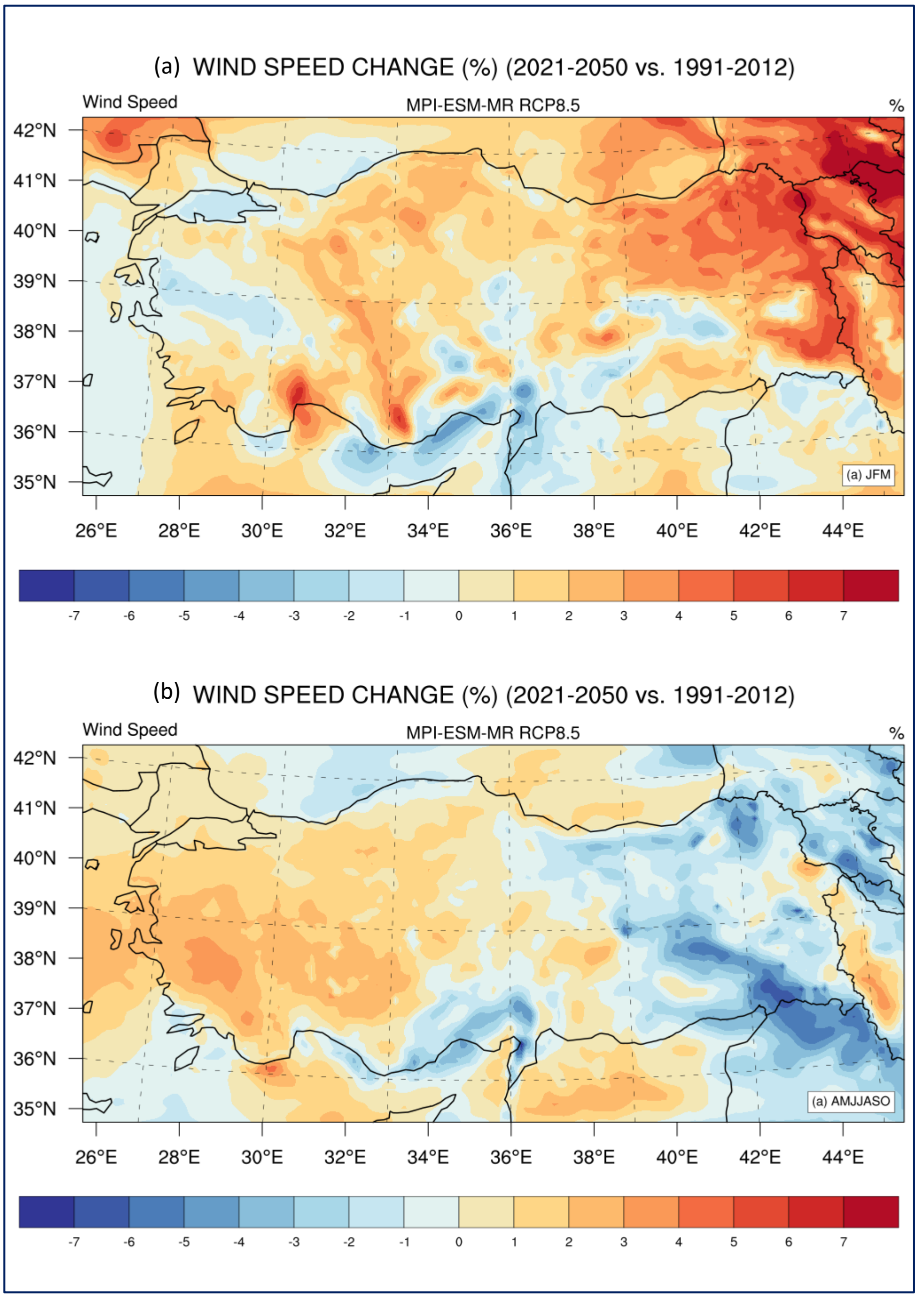


Figure 4.18. Projected grape phenological changes in **daily wind speed** (%) (a) vegetation period covering January-February-March (b) development period covering April-May-June-July-August-September-October under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

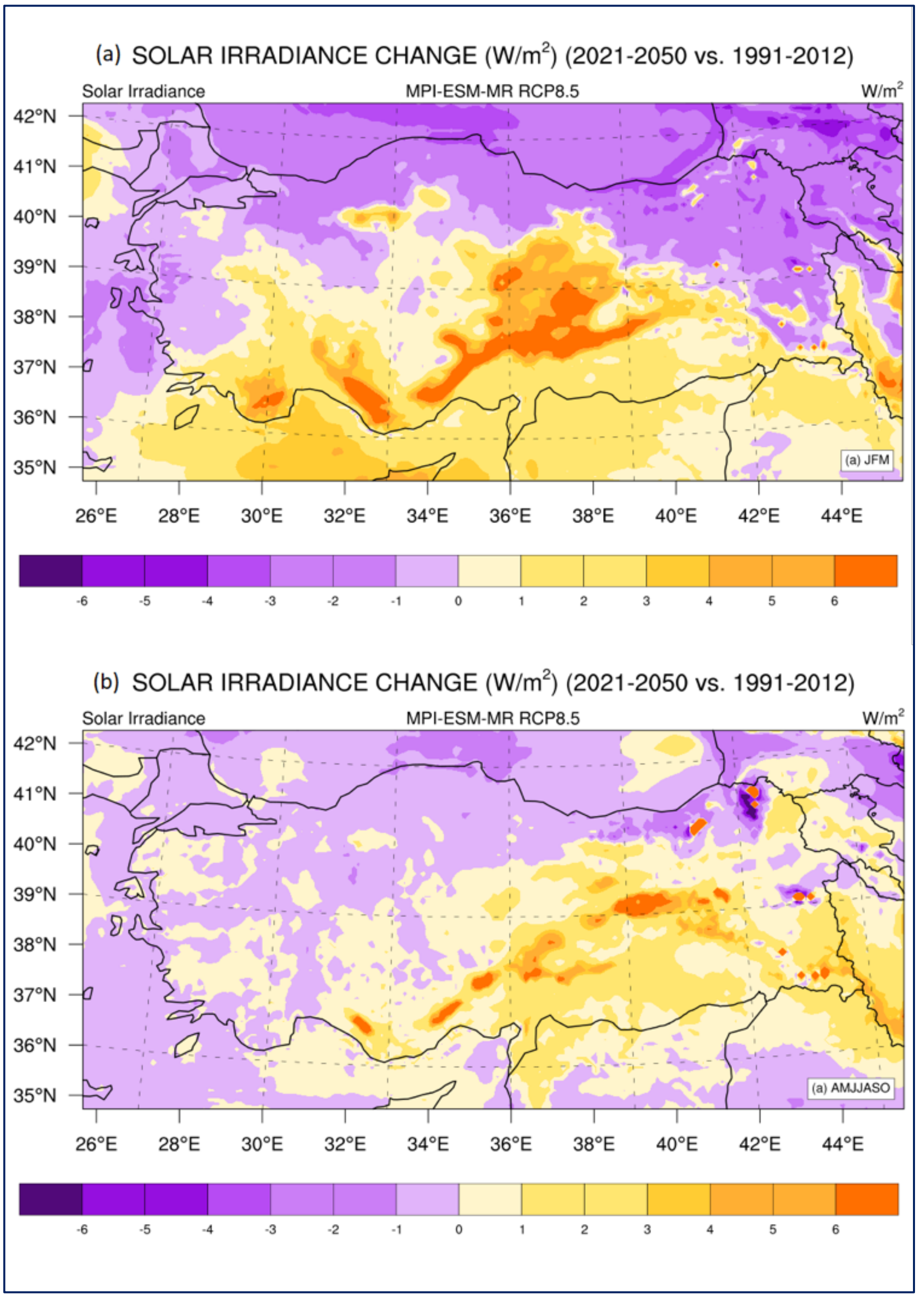


Figure 4.19. Projected grape phenological changes in **daily solar radiation** (W/m^2) (a) vegetation period covering January-February-March (b) development period covering April-May-June-July-August-September-October under RCP8.5 scenario with MPI-ESM-MR climate model for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled model outputs.

Considering the changes in climate parameters during the vegetation and development period of the grapes, it is observed that the optimum conditions necessary for the development of the grapes will be affected.

It is estimated that there will be an increase between 0.5-1 °C in Central Anatolia, partly in the Eastern and Southeastern Anatolia, Mediterranean and in the inner parts of the Aegean during the vegetation period (January-February-March) (Figure 4.12a). In the development period of the grape, it is expected that there will be an increase in the average temperature between 0.7-1.1 °C in the Aegean and Central Anatolia regions, 0.8-1.2 °C in the Eastern and Southeastern Anatolia and the Mediterranean and an increase of 0.6-1 °C in the Marmara (Figure 4.12b). When we look at the minimum temperatures during the vegetation period, Aegean, Central Anatolia, Mediterranean and Southeastern Anatolia regions are generally in the range of increase between 0.5-0.7 °C, and an increase of 0.8 °C is expected in the eastern inner parts of the Mediterranean region. In Eastern Anatolia, these increases are expected to reach 1.2 °C (Figure 4.13a). In the development period, these increases are expected to reach up to 1.3 °C in Aegean, Mediterranean, partially in Central Anatolia, Eastern and Southeastern Anatolia (Figure 4.13b). By looking at the mean temperature, the increase in the mean temperature across Turkey, compared with the minimum and maximum temperature is expected to be less with 0.6-0.7 °C during vegetation (Figure 4.14a). In the development period, it is predicted that the increases can reach 1.3 °C in Aegean, Mediterranean, Central Anatolia, Eastern and Southeastern Anatolia and the north of Marmara (Figure 4.14b).

When precipitation is analyzed in terms of phenological periods, it is estimated that there will be a 10-15 % decrease in the Mediterranean and Southeastern Anatolia, whereas other places generally increase up to 15 % (Figure 4.15a) during vegetation. Even while Western Mediterranean, south of the Marmara, northwest of and coastal areas of Aegean and the inner parts of eastern Anatolia may experience an increase of 10 %, throughout Turkey particularly the southeast Anatolia may run into a decrease up to 40 % (Figure 4.15b) in the development period. When we look at the vegetation period for evapotranspiration, it is foreseen that there will be increases up to 30 % in general except for the inner and eastern parts of the eastern Black Sea and the inner and the eastern parts of eastern Anatolia (Figure 4.16a). In the development period, decreases are expected to reach 15 % in Aegean, Mediterranean and southeast Anatolia, and it is estimated that there will be an increase of 15 % in the inner parts of the Mediterranean and eastern Anatolia (Figure 4.16b).

The relative humidity is another important parameter in the development of grapes. In vegetation period, decreases of up to 1.5-2 % are predicted in relative humidity in the south and inner Aegean, the Mediterranean and locally in the east, southeast and Central Anatolia, whereas in other places, an increase of up to 1.5 % is expected (Figure 4.17a). A decline of up to 2.5 % is projected throughout Turkey, especially in eastern and southeastern Anatolia except the Marmara and partially Aegean in the development period (Figure 4.17b).

Wind speed is another essential parameter in the development of grape. Accordingly, while a decrease of up to 4 % is expected in Aegean, Mediterranean, and an increase of 4 % in general but up to 7 % are specifically expected specifically in Central Anatolia, East, and southeast Anatolia, in the north of Marmara, the western Mediterranean and eastern Anatolia during vegetation (Figure 4.18a). In the development period, it is expected that there will be decreases of 6 % especially in the eastern and southeastern Anatolia and the eastern Mediterranean, while an increase of up to 3 % is expected in Aegean, Central Anatolia, western Mediterranean and Marmara and this increase will reach 4 % in the inner Aegean (Figure 4.18b).

Solar irradiance is one of the most crucial parameters to model grape development. The photosynthesis depends on the incoming energy from sun and STICS crop model uses solar irradiance parameter to compute development process. Solar irradiance is expected to increase up to 8 W/m^2 in Central Anatolia and Mediterranean and decrease 6 W/m^2 in Aegean, north of Marmara and Black Sea region during vegetation (Figure 4.19a). Also, it is expected that there may be up to 5 W/m^2 in Mediterranean, East, and Southeast Anatolia regions. Beside of that, on average 2 W/m^2 decrease is expected in Aegean, North Anatolia, Marmara, and Black Sea regions (Figure 4.19b).

4.2. The results of the statistical model for Hazelnut

In the study, a hybrid approach is employed by integrating dynamical climate model outputs with a statistical model. Thus, the analysis of the relationship between climate variables and hazelnut yield is carried out in two parts after determining micro-optimal conditions considering the thresholds and optimum conditions required for hazelnut on the basis of the growing region.

The first step in the study is to obtain the outputs from the widely used regional climate model RegCM4.4. It is preferred for the study because it is open source and user friendly as well as giving reliable results for the region. In this section, MPI-ESM-MR global climate model outputs, which have provided optimal results for the region when it is compared with observations, are dynamically downscaled to 10-km resolution using the RegCM4.4 regional climate model (Giorgi et al., 2012) developed by the Abdus Salam International Center for Theoretical Physics (ICTP) for attaining higher resolution climate data. The model's validation has been done by comparing model outputs with the observation and reanalysis datasets as applied earlier by previous studies (Turp et al., 2014; Ozturk et al., 2017, 2018). For climate projections, only the RCP8.5 pessimistic scenario (van

Vuuren et al., 2011) of the IPCC was used since it is similar to the current trend (BAU) - more realistic case - in greenhouse gas emissions. In the following step, statistical analysis (panel data-multiple regression analysis) is performed to specify the effective climate parameters on yield and the prospective yield under the effects of climate change in the period of 2021-2050 with respect to the reference period of 1991-2012. The statistical approach has been applied with the climate inputs obtained from the regional climate model RegCM4.4 under the RCP8.5 business-as-usual (BAU) scenario. Humid-temperate coastal zone (maximum 30 km to inner parts) of the Black Sea region and the eastern part of the Marmara region, where the natural habitat of hazelnut are the domains in the study. All locations having a significant share of hazelnut production with a total of 88 locations are analyzed in the study. All climate variables are considered separately for different periods (i.e., vegetative, flowering, and grain filling) in a monthly scale, which are important during the entire growth period of hazelnut to better understand the effects of climate variables on the different stages of growth. Hereunder, mean air temperature (T_{mean}), precipitation amount (Pr), actual evapotranspiration (AET), relative humidity (RH), and duration of sunshine (SunD), and diurnal temperature change (DTR) are used as the independent variables in the statistical model while the yield is the dependent variable.

In order to avoid biased results, the estimation methods are determined after the tests, as the model should be selected under appropriate assumptions (i.e., heterogeneity, cross-sectional dependency, heteroscedasticity and autocorrelation). Following the F test (Moulton and Randolph, 1989), the most likelihood test (Breusch, 1987), the Breusch-Pagan Lagrangian Multiplier Test (LM), and the Adjusted LM Test (Breusch and Pagan, 1980; Baltagi and Li, 1990) and cross-sectional dependency test (Pesaran, 2004), the second-generation unit root test (Pesaran, 2007) is performed to check the existence of unit and/or time effects in the model and to specify the random effect model preference accordingly (Hausman, 1978; Hausman and Taylor, 1981).

The climate requirements of the plant may differ according to the phenological periods. A favorable climate condition in one period may damage the plant in another period, meaning that different variables for different times become substantial (Tao et al., 2006).

Following the hybrid approach integrating dynamical climate model outputs with the multi-regression method, the results including variables, and significant levels according to phenological period are presented in Table 4.1. Totally, twenty-eight variables are statistically significant (13 variables at a 99 % confidence level, 13 variables at 95 % confidence level, 2 variables at a 90 % confidence level). The most significant ($p > 0.01$) variables are T_{mean} in October, December, March, April, and August; DTR in October and April; precipitation in August; AET in July and August; RH in January and March and duration of sunshine in November. T_{mean} in November; DTR in November, January, February, and March; Pr in October, February, and July; AET in October and February; RH in October and November; SunD in February are also significant at a level of $p > 0.05$, while T_{mean} in January and SunD in March are significant at a level of $p > 0.10$. There is a negative relationship between the hazelnut yield and T_{mean} in November, December, and August; DTR in February and April; Pr in February and August; AET in July and RH; SunD in November. There is also a positive relationship between the hazelnut yield and the other significant variables.

Table 4.1. Statistically Significant Variables according to the Phenological Periods.

Dormancy	**October**	Tmean *(+)	DTR* (+)	PR** (+)	AET** (+)	RH** (+)
	November	Tmean**(-)	DTR** (+)	RH** (-)	SunD* (-)	
	December	Tmean*(-)				
Flowering	**January**	Tmean***(+)	DTR** (+)	RH* (+)		
	February	DTR** (-)	PR** (-)	AET** (+)	SunD** (+)	
	March	Tmean*(+)	DTR** (+)	RH* (+)	SunD*** (+)	
	April	Tmean*(+)	DTR* (-)			
Grain Filling	**May**					
	June					
	July	PR** (+)	AET* (-)			
	August	Tmean*(-)	PR* (-)	AET* (+)		

p > 0.01*, p > 0.05, p > 0.10*****

Tmean : Mean Air Temperature
DTR : Diurnal Temperature Range
PR : Total Precipitation
AET : Total Actual Evapotranspiration
RH : Relative Humidity
SunD : Duration of Sunshine

Hazelnut trees generally resist up to -25 or -30 °C during the dormancy period. It has been detected those low temperatures have no adverse effect on the fruit until the development stage begins.

With the start of development, low temperatures reaching the negative degrees have a direct negative impact on fruit development and also prevent bud burst and flowering (Özbek, 1978; Köksal, 2002). Considering the ecological requirements that provide a transition from the dormancy to bud-burst and flowering, the change in precipitation, evapotranspiration, and minimum and maximum temperatures becomes important. Hazelnut phenology differs from other fruit species because hazelnut comes into flowers in winter. During the dormancy period, fruit buds are able to protect themselves up to -10 °C, but they are damaged after -15 °C. Temperatures are not tolerated to fall below -4 °C when the buds start to open. Depending on the species, the sensitivity of the fruit to cold differs from the end of February to the end of March (Hummer et al., 1986; Köksal, 2002).

The flowering period is the longest phenological period of hazelnut. In order not to be exposed to agricultural frost, especially late spring frosts, very low temperatures under 0 ºC, should not be seen towards the end of flowering and particularly towards the end of the spring period. Besides, high temperature will be a threatening factor for hazelnut because of the risk of early blooming.

During the flowering period, a statistically significant (99 % confidence level) positive correlation is observed between average temperatures and the yield in March and April so that the projected increase in the average temperatures in the future is expected to have a positive effect on the yield. Although the increase in monthly average temperatures is considered to have a positive influence on the yield, the effect of changes in daily temperature values should not be ignored meaning that the extremely hot or cold conditions may have more impact on the yield. Late frosts in the spring season are one of the most significant factors affecting the productivity of hazelnuts. In this period, a statistically significant negative correlation is observed between DTR and yield in April (99 % confidence level). In the future, the projected increase in DTR in April is not remarkable on average. The increase in DTR can be explained by either an increase in the T_{max} or a decrease in the T_{min}. However, the expected increase in T_{min} should not mislead us, because this does not prevent the increase in the number of extremely cold days that can occur during that month even if T_{min} increases. In other words, rather than increases or decreases in T_{mean}, changes in the number of extremely hot or cold days that may occur temporally and spatially may have been influential on productivity. Therefore, a possible increase in the number of frost days, particularly in April, may adversely affect the yield. The expected increase in Pr in the winter months of flowering may have a negative effect on the yield (95 % confidence level) but it can be balanced with the positive effect of the expected increase in AET which is statistically significant (95 % confidence level) in the same period. Another statistically significant variable for the flowering period is SunD. There is a positive relationship between SunD and yield during flowering. A negligible reduction in SunD is foreseen, and this is not expected to have a substantial impact on yield in the future.

Grain filling is divided into two parts, one (bearing) in May and June and the other (ripening) in July and August. At the beginning of the second half of the grain filling period, a statistically significant (95 % confidence level) positive relationship is observed between Pr and yield. In the same period, AET is found to have a statistically significant (99 % confidence level) negative relationship on yield. The two variables agree with each other in terms of their effect on yield. Since hazelnut requires regular precipitation, dry summers damage hazelnut development. Although the decrease in AET may seem to be an advantage at first glance, it is predicted that the yield may decrease due to the decline in Pr. Since the projected decrease in AET is less than the decrease in Pr, the positive effect of the decrease in AET may disappear.

According to Turkish Statistical Institute, almost all of hazelnut in Turkey is produced in the Black Sea region and the eastern Marmara sub-region. Approximately 80 % of the total hazelnut production is provided by the cities of Düzce (western Black Sea) (12 %), Giresun (eastern Black Sea) (15 %), Ordu (eastern Black Sea) (28 %), Trabzon (eastern Black Sea) (9 %) and Sakarya (eastern Marmara) (16%) (TURKSTAT, n.d.-b). The proportional distribution of only 88 locations in the study is consistent with general distribution including all hazelnut growing locations (Figure 4.20).

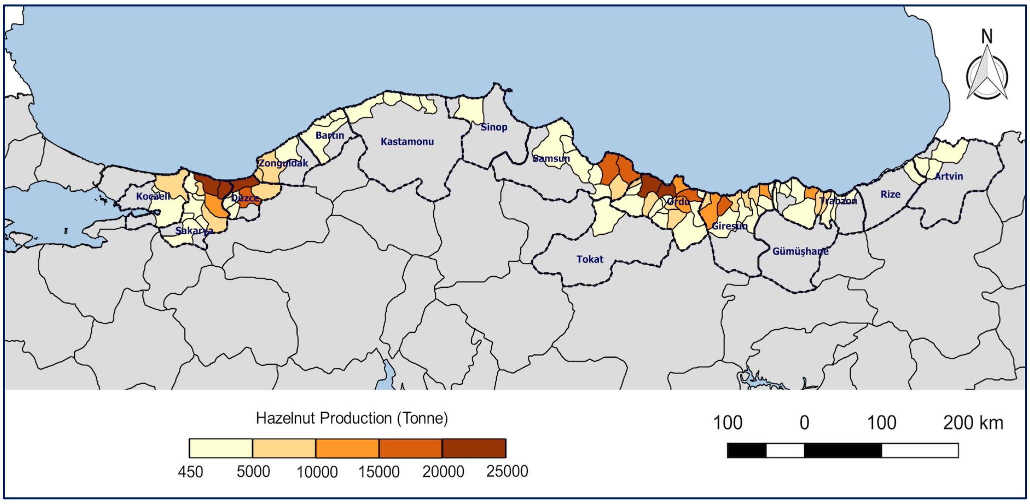


Figure 4.20. Spatial distribution of the hazelnut production and cultivated area for selected locations for the period of 2021-2050 with respect to the period of 1991-2012.

Based on the model results considering phenological periods, hazelnut yield in Turkey might be affected by future climate change. It is projected that the change in hazelnut yield varies spatially in the future. Accordingly, yield may decrease in 42 of the 88 selected locations up to 13 % while hazelnut yield may increase in the remaining 38 locations up to 14 % in 2021-2050 compared to the period of 1991-2012 (Figure 4.21). There will be almost no change in yield for 8 locations. Of the 42 locations foreseen to decrease, 26 are in the eastern Black Sea sub-region. The eastern Black Sea sub-region having a significant portion of total hazelnut production is projected to be the region most affected by the decrease.

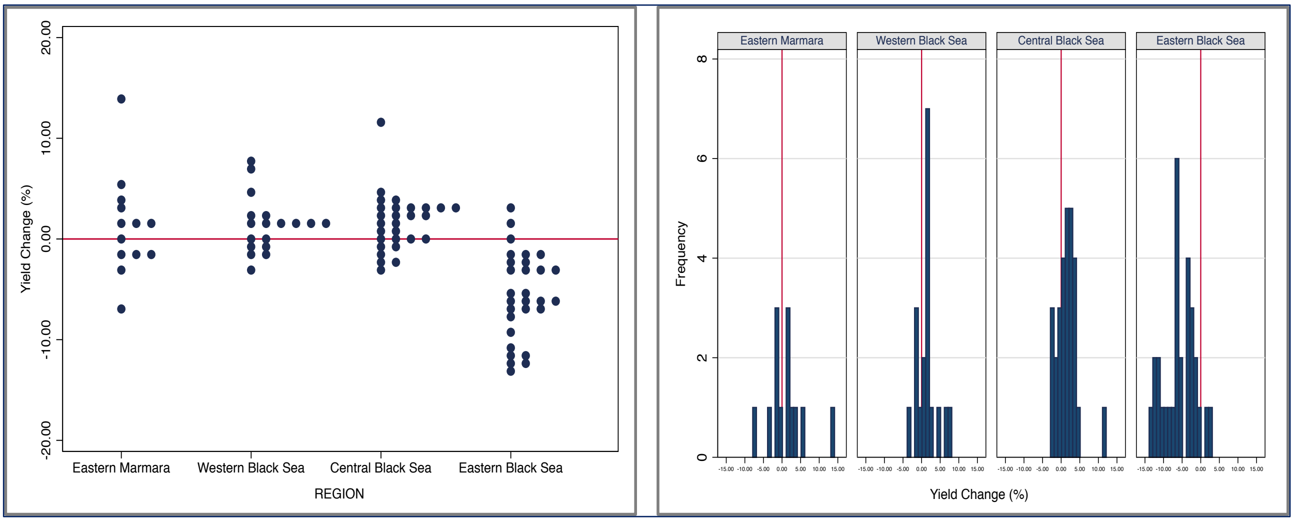


Figure 4.21. Spatial distribution of percentage changes in yield. On the left, the values on the vertical axis are the percentage changes, whereas the navy-blue dots represent each location within the related region given on the horizontal axis. On the right, the relationship between the number of locations and the percentage ranges of the regional changes are illustrated.

In the eastern Black Sea sub-region, which has the highest share in the decrease (1 % to 13 %) with 26 locations (out of 42), an increase of up to 3 % is projected in only 2 locations. The decrease rate is above 10 % in 6 locations. A decrease up to 3 % in 6 locations and an increase (1 % to 12 %) in 18 locations of the central Black Sea sub-region; a decrease up to 3 % in only 5 counties, an increase with a range of 1 % to 8 % in 11 locations of the western Black Sea sub-region; a decrease (1 % to 7 %) in 5 locations and an increase (1 % to 14 %) in 7 locations of the eastern Marmara sub-region have been projected for the period of 2021-2050. Besides, there is almost no change in 8 locations of 88. The number of locations expected to decrease in hazelnut yield increase from west to east (Figure 4.22).

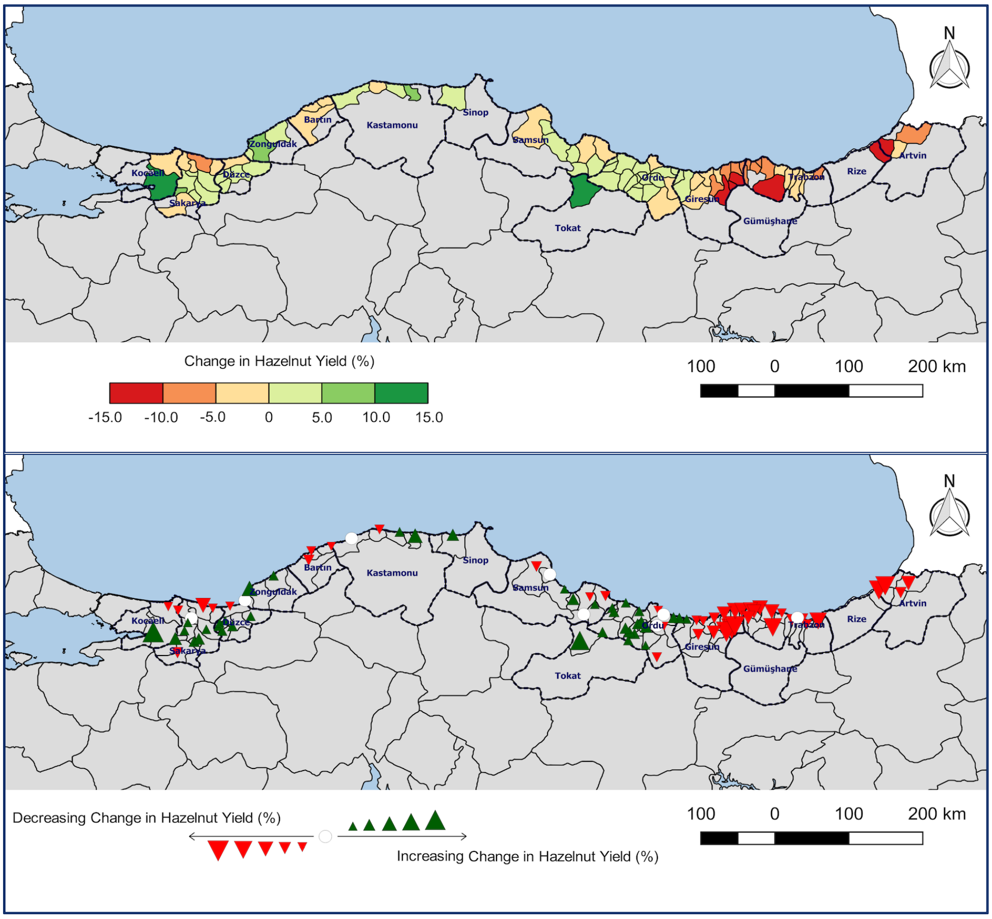


Figure 4.22. Location-basis spatial distribution of the projected yield change under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the statistical model, panel data analysis.

Projected yield change by province is illustrated in Figure 4.23. Hence, Ordu, which has the highest hazelnut production, is predicted to have an increase of 1 % to 4 % in 14 locations and a decrease of 1-2 % in 3 out of 19 locations. The projection results show that climate change is more likely to affect hazelnut yield in Giresun (eastern Black Sea) with a wider range between -13 % and 3 %. In 6 locations of Sakarya (western Black Sea), hazelnut yield will rise by 1-5 %, while 4 locations have a decrease of 1-7 %. In Düzce (western Black Sea), one of the most important cities for hazelnut production after Ordu, Giresun, and Sakarya, an increase with a range of 1-2 % is predicted in all locations except Akçakoca. A decrease of up to 11 % is projected in all locations (12 locations in total) of Trabzon.

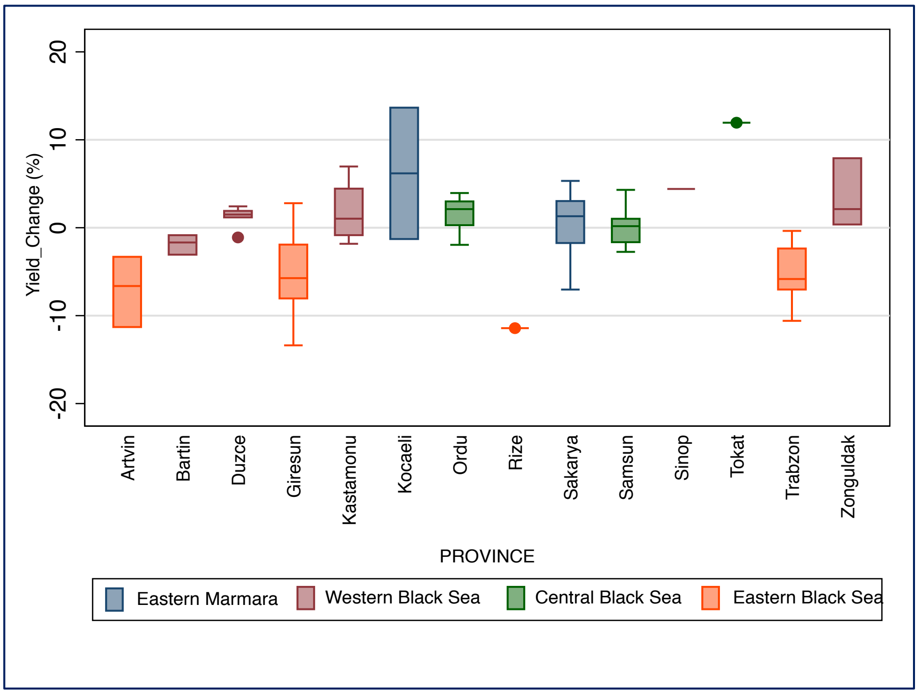


Figure 4.23. Projected yield change by province based on RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model outputs.

4.3. The results of the crop growth simulation model, STICS

With the values obtained after parameterization, the model was run for the past and future periods on a location basis for 96 locations. According to the results, decreases in the grape yield up to 35 % on a location basis and up to 36.22 % over the grape type is foreseen in the next 2021-2050 period. Considering locations (Figure 4.24), the most significant decrease is expected in Arıcak of Elazığ with 35.27 %. Arıcak is a location that has a height of 1092 meters and has a climate classification with temperature, dry summer, hot summer (Csa), unlike the harsh continental climate type of the region. It is foreseen that the most prominent decrease will be in Boğazkere on a grape type basis, in Elazığ on a province basis and in Eastern Anatolia on a regional basis. According to regions, the highest decrease in yield is expected in the Eastern Anatolia Region with 30.34 %, and the following regions are respectively South-East Anatolia with 23.55 %, Central Anatolia with 15.01 %, Aegean with 14.37 %, the Mediterranean with 11.65 %, the Black Sea with 8.53 % and Marmara with 6.28 %.

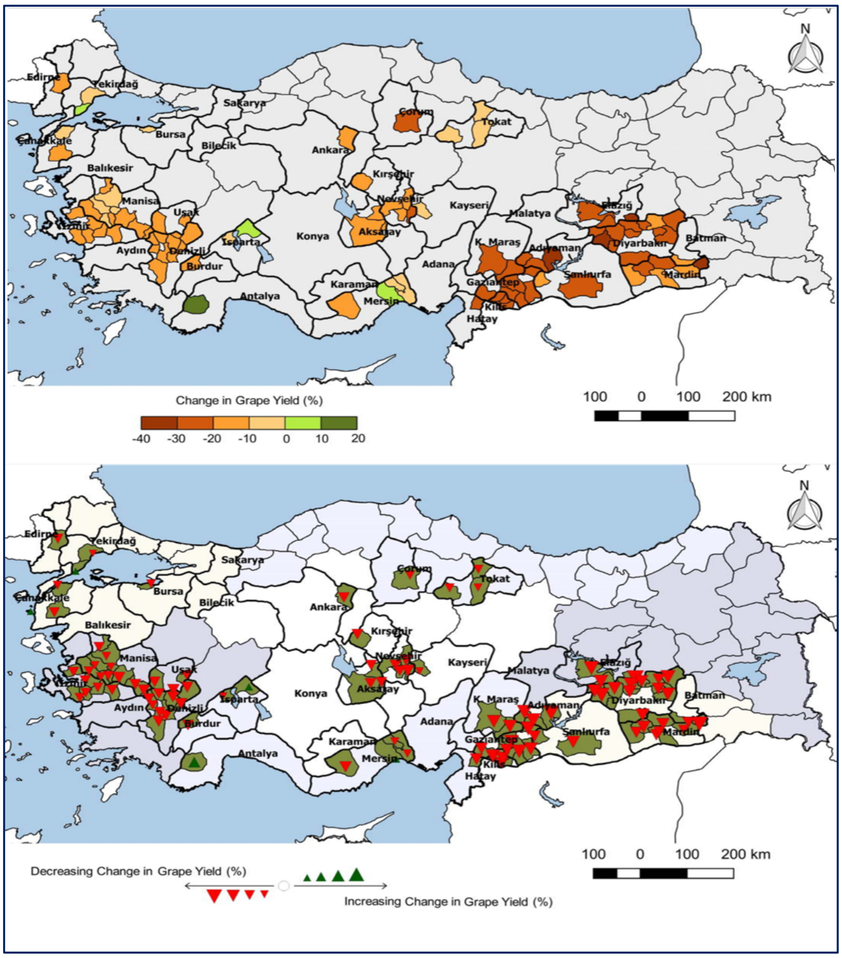


Figure 4.24. Location-basis spatial distribution of the projected yield change under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the crop growth simulation model, STICS.

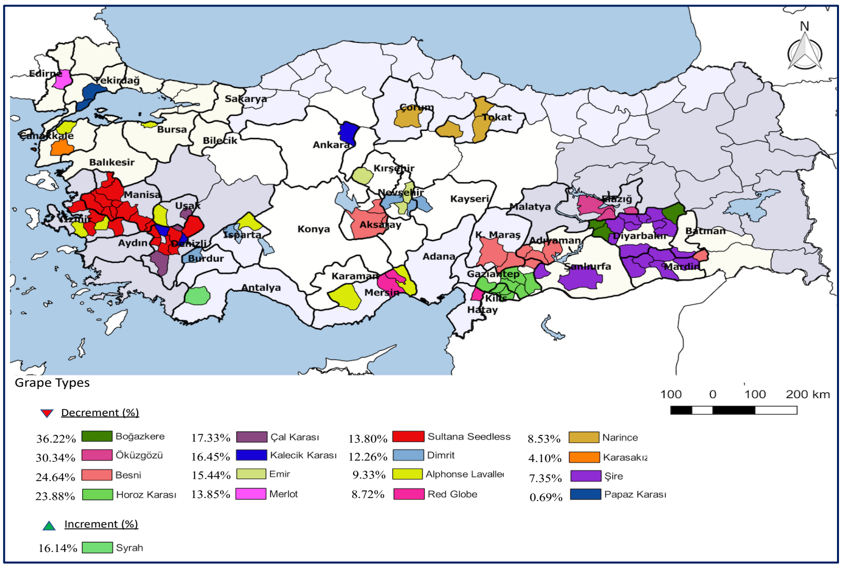


Figure 4.25. Grape type-basis spatial distribution of the projected yield change under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the crop growth simulation model, STICS.

When the yield change according to grape types is analyzed (Figure 4.25), it is predicted that the highest decrease will be 36.22 %, in the Boğazkere grape grown mainly in the locations of KULP, ÇERMİK, and ÇÜNGÜŞ of **DİYARBAKIR** province in the Southeastern Anatolia region. It can be expected that the partial decrease expectation in future climatic suitability conditions in these locations will be effective in the decrease in yield. Although this grape type has a low share (well below 1 %) in total production, it is a vital grape in wine production. The Öküzgözü follows Bogazkere with 30.34 %. Öküzgözü, which is also an important grape type in wine production, has a low share in total production, although it is produced at approximately twice of Bogazkere. It grows mainly in the locations of ARICAK, MADEN, and MERKEZ of **ELAZIĞ** in the Eastern Anatolia Region. Once again, this expected decrease in Elazig, especially the location of ARICAK, may be associated with a partial decrease in future climatic suitability conditions.

Besni, which has an 8% share in total production in the average of 1991-2015, draws attention as the third grape type that is expected to decrease the most. This grape type grows in the provinces of **ADIYAMAN**, **GAZİANTEP**, and **MARDİN** in Southeastern Anatolia, the province of **AKSARAY** in Central Anatolia Region and the province of **KAHRAMANMARAŞ** in the Mediterranean Region. Horoz karası is following Besni with a decrease of 23.88 %. It grows in the province of **HATAY** in the Mediterranean, the provinces of **GAZİANTEP** and **KİLİS** in Southeastern Anatolia, which is included in the climate classification of temperate, dry summer, hot summer (Csa), and has a 5 % share in total production. A decrease of 17.33 % is foreseen in the Çal karası, which is another grape type. The percentage of Çal karası in total production is around 3 %. It grows in the provinces of **DENİZLİ** and **UŞAK** in the Aegean side, which is generally classified as temperate, dry summer, hot summer (Csa) in our country. It may be related to the change in the suitable climatic conditions required by the grape in the locations of SİVASLI of **UŞAK** and ÇAL of **DENİZLİ**.

Kalecik karası grape, which grows in **DENİZLİ** in the Aegean and **ANKARA** in the Central Anatolia, has a share of about 2 % in total production. The decrease foreseen for 2021-2050 in this grape type is 16.45 %. Generally, a decrease in climatic suitability conditions is foreseen in the locations of **DENİZLİ** in the future, and it is estimated that this decline will be the highest in the location of BULDAN. BULDAN, which has an altitude of 619 meters, is in the climate classification of temperate, dry summer, hot summer (Csa) as in the whole province. It is estimated that the downward change in climatic suitability conditions will lead to a decrease in yield.

The grape of EMİR follows Kalecik karası with a 15.44 % decrease. It has a share of about 3 % in total production. It grows in the locations of AVANOS and MERKEZ of **NEVŞEHİR** in Central Anatolia Region and the location of KAMAN of **KIRŞEHİR**. It is anticipated that there will be a partial decrease in climatic suitability conditions, and it might be effective on yield decrease in these locations.

Merlot is one of the critical grape types in wine production that ensue in our country. The share in total production is far below 1 %. A yield loss of 13.85 % is expected in Merlot. The UZUNKÖPRÜ location of **EDİRNE** is included in the model in terms of data suitability for Merlot. There is also a negative expectation in climatic suitability conditions in this district. In this location, there is a negative expectation in climatic suitability conditions in the future once again.

Sultana seedless is the grape type that grows the most in our country and has the highest commercial value. It is responsible for about half of the total production. It grows widely in the Aegean region, especially in the provinces of **MANİSA**, **DENİZLİ**, **İZMİR**, and **UŞAK**. It is also partially grown in the location of YEŞİLOVA of **BURDUR** in the Mediterranean and the location of ISLAHIYE of **GAZİANTEP** in the Southeastern Anatolia. A decrease of 13.80 % is predicted in Sultana grape yield. In the next period of 2021-2050, a reduction in climatic suitability conditions is expected in all locations of **MANİSA**, and it is estimated that this decrease will be the most in the location of GÖLMARMARA. Once again, in all locations of **DENİZLİ**, there are negative expectations in climatic suitability conditions in the future, and it is expected to be the most in the location of SARAYKÖY. A decrease is foreseen in climatic suitability conditions in **İZMİR**, and it is estimated that these decreases will be the highest in the locations of MENEMEN, TORBALI, and MENDERES, respectively. In the province of **UŞAK**, the suitable climate conditions in the future are once more expected to decrease. There is also a decrease in expectations in the locations of Burdur and Gaziantep.

Dimrit grape type grows in the provinces of **NEVŞEHIR** and **KAYSERI** in the Central Anatolia, in the provinces of **BURDUR** and **ISPARTA** in the Mediterranean, and its share in total production is about 3 %. A decrease of 12.26 % is predicted in Dimrit grape yield. The partial decline is foreseen in climatic suitability conditions in the locations of GÜLŞEHIR of **NEVŞEHİR** and YEŞİLOVA of **BURDUR**. In contrast, partial increase is expected in the location of ÜRGÜP of **NEVŞEHİR**, İNCESU of **KAYSERİ**, and SENIRKENT of **ISPARTA**.

Alphonse Lavelle grapes are grown in the locations of BAYINDIR and MENDERES of **İZMİR**, BOZCAADA, LAPSEKI and BAYRAMİÇ of **ÇANAKKALE**, YALVAÇ of **ISPARTA**, MUDANYA of **BURSA**, MUT and TARSUS of **MERSİN** and EŞME of **UŞAK**. In this grape type with a 7 % share in total production, the projected yield loss is 9.33 %. Some improvements are expected in the future climatic suitability conditions in the location of YALVAÇ of **ISPARTA**, while a decrease is expected in other locations.

Red globe grape type is grown in the provinces of **HATAY** and **MERSİN** in the Mediterranean Region with a share of approximately 4 % in total production. The yield loss expectation in this grape type is 8.72 %. It is estimated that there will be a decrease in climatic suitability conditions except for the central location of **MERSİN**, and the Central location is expected to maintain the climatic suitability conditions.

Narince grape type, which has a share of approximately 1.5 % in total production, is grown in the provinces of **TOKAT** and **ÇORUM**. The yield loss expectation in Narince is 8.53 %. There is an upward expectation in climatic suitability conditions in these provinces in the future. Still, despite this expectation of increase, it is thought that it will not prevent the loss of yield, especially since it does not reach the adequate suitability level.

Şire grape type is grown in our country in high quantity and widely. It has a share of approximately 9 % in total production. It grows mainly in the provinces of **DİYARBAKIR, MARDİN, ŞANLIURFA**, and **BATMAN** in the Southeastern Anatolia. The yield loss expectation is very high with 20.65 %. Significant decreases are predicted in climatic suitability conditions in all locations of **MARDİN**, **ŞANLURFA**, all locations of **DİYARBAKIR**, but specifically in the locations of EĞIL and HAZRO and the location of GERCÜŞ of **BATMAN**.

Karasakız grape type, which has a share of less than 1 % in total production, grows in the locations of BAYRAMİÇ and BOZCAADA of **ÇANAKKALE**. The yield loss expectation in this grape is 4.10 %. The yield loss expectation may get along with the expectations in climatic suitability conditions.

Papazkarası grape grows in ŞARKÖY and Central location of **TEKİRDAĞ**. It has a share of about 2 % in total production. It is expected that there will be a yield loss of 0.69 %. Climatic suitability conditions get along with this result.

ANTALYA ELMALI was taken into consideration for Shiraz grape type. Although its share in total production is meager, it is a preferred grape type in wine production. In parallel with the improvements in climatic suitability conditions in the location, it is expected to have an increase in yield of 16.14 %. ELMALI is a location with an altitude of 1085 meters, which is included in the climate classification of temperate, dry summer, hot summer (Csa) as in the whole **ANTALYA**. In temperate climatic zones, altitudes up to 1000 m are suitable for grape production.

Along with yield change, some other essential outputs obtained from the model will also be examined in terms of future change. The first of these outputs is the difference between the number of hot and cold days between 1991-2012 and 2021-2050 (Figure 4.26). This value gives us the change in the frequency of the temperatures that are not suitable for the development of grapes in the future. The number of hot-cold days refers to the number of days between the date when the fruit first appeared (IDRP) and the date of harvest, which get through a temperature under “0” and above 37 degrees. The change in the difference between the number of hot and cold days averaged was examined together with the change in yield by location, province, region, and grape type. Considering the correlation between the change in the average number of hot-cold days and the yield change, the correlation value is 0.75 on a location basis, 0.86 on a province basis, 0.88 on a regional basis, and 0.90 on a grape type basis.

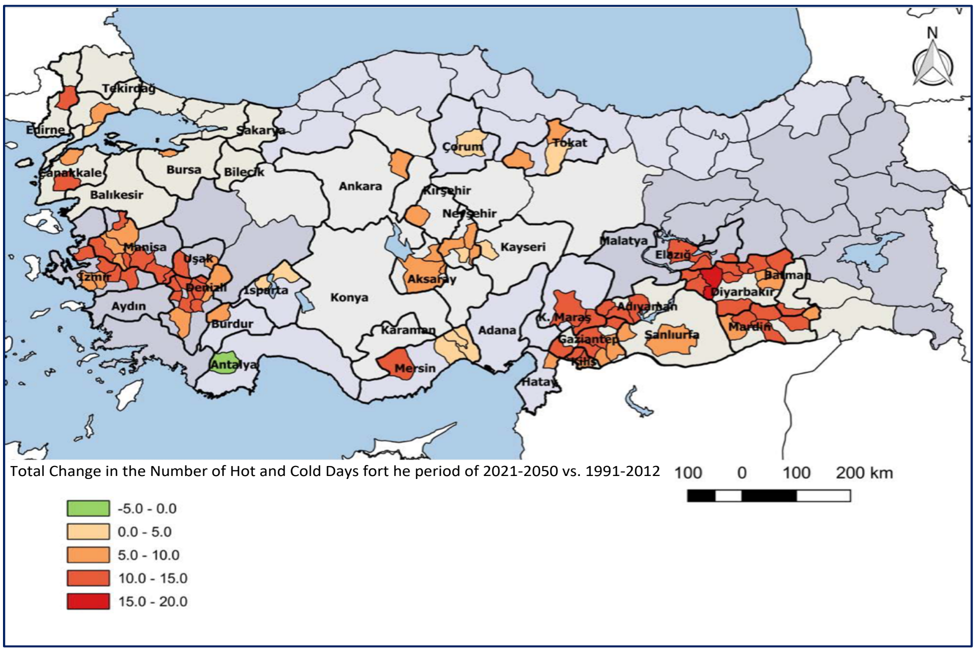


Figure 4.26. Location-basis spatial distribution of the projected **change in the total number of hot and cold days** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the crop growth simulation model, STICS.

Hereunder, it can be mentioned that there is a strong relationship between, in the number of hot and cold days average change and the yield change on a province basis, on a regional basis and relatively on a location basis, on the other hand, a solid relationship between the yield change and the number of hot and cold days average change on a grape type basis. According to the results, as the frequency in the temperatures above or below the appropriate temperature ranges for grapes increases, the grape yield decreases and accordingly, the frequency of unsuitable temperatures for grape is expected to increase in the future.

Another factor that is important for grape producers and grape quality is the harvest date. Countries in different hemispheres differ phenologically from each other. Harvest date is also one of the factors that differ phenologically between countries. Harvest time covering the months of August and September in the northern hemisphere countries such as Turkey, USA, Iran differs from the southern hemisphere countries such as Australia, South Africa covering the earlier months from March (KGM, 2018).

Table 4.2. Harvest time change (day) by grape type and region.

GRAPE TYPE	**HARVEST TIME CHANGE (day)**
Alphonse Lavelle	-8
Besni	-8
Boğazkere	-7
Çal Karası	-8
Dimrit	-8
Emir	-8
Horoz Karası	-8
Kalecik Karası	-7
Karasakız	-8
Merlot	-8
Narince	-7
Öküzgözü	-8
Papaz Karası	-8
Redglobe	-8
Sultana	-7
Syrah	-9
Şire	-8
REGION	**HARVEST TIME CHANGE (day)**
Mediterranean	-8
East Anatolia	-8
Aegean	-7
South-East Anatolia	-8
Central Anatolia	-8
Black Sea	-7
Marmara	-8

In the study, it is examined how the harvest date will change in the future according to the reference period. Regarding the data created by taking the average of the locations according to the region and grape type, the harvest is expected to occur one week earlier in the future than the past. (Table 4.2)

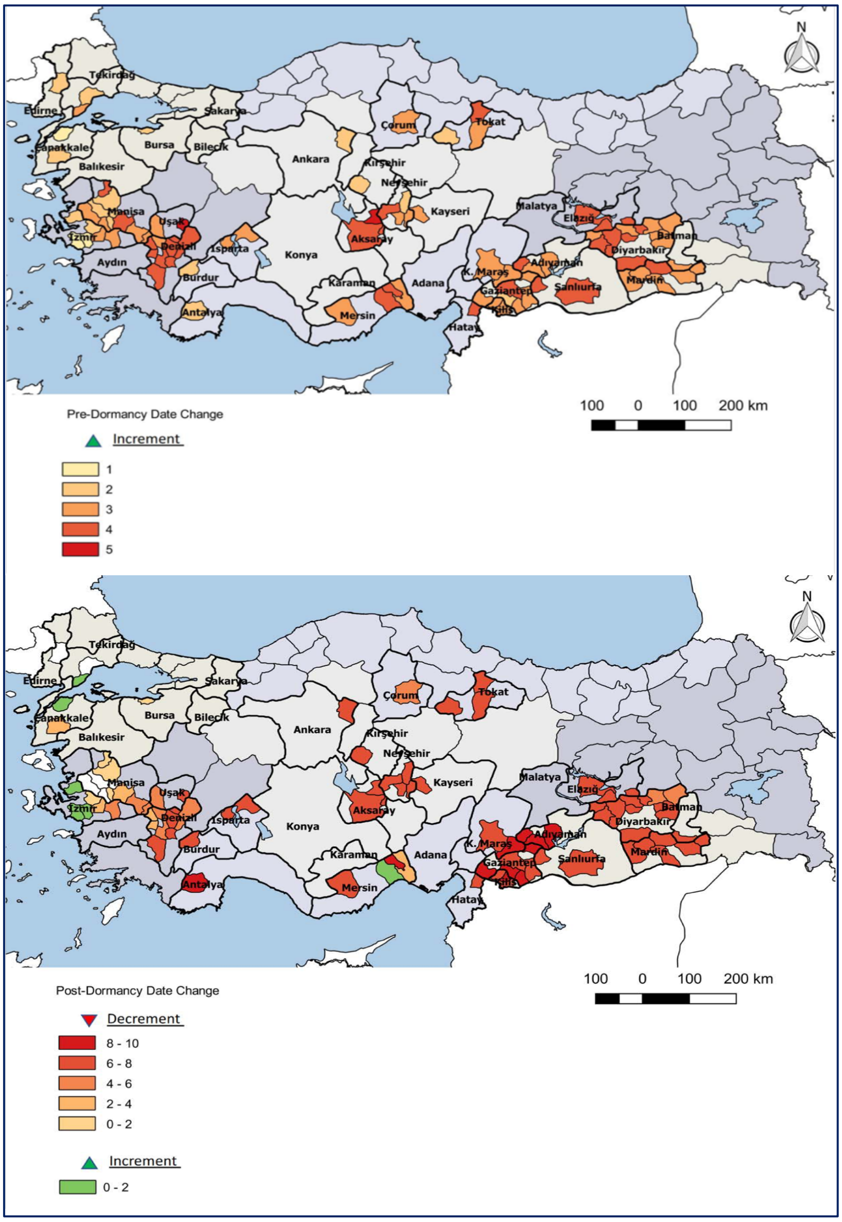


Figure 4.27. Location-basis spatial distribution of the projected the **change in pre-dormancy and post-dormancy** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the crop growth simulation model, STICS.

The method used in the STICS for dormancy period (Bidabe approach) divides the dormancy into two i.e., Pre-dormancy and Post-dormancy. The pre-dormancy period starts on August 1 in the model (For pre-dormancy, the date of August 1 has been set independently of the air temperatures since colds have not yet started on this date and are included in the model by default) and continues until the plant meets the required cooling needs. After taking the necessary cooling in pre-dormancy, the post-dormancy starts, and the plant should accumulate a certain amount of temperature. After the required temperature accumulation is during the post-dormancy, the plant is budding and comes out of dormancy. Therefore, the pre-dormancy exits, and budding dates were examined. Considering output data, the pre dormancy is expected on average 3 days longer in the future than in the past. Budding is also likely to occur 7 days earlier by region and 9 days earlier by grape type according to high temperatures (Figure 4.27).

Besides, the relationship between the yield change by location and the geographical position of the locations was examined. When looking at the correlation between longitude and yield change, a medium level relationship was obtained with -0.60. Hereunder, it is noticed that there is a decrease in yield from west to east (Figure 4.28). In the first half of the 21st century in Turkey, it is expected that the increases on average up to 4 °C. These increases are expected to be higher in the hot season. It is clearly observed that the rate of increase in air temperatures, which is expected to be higher in the hot seasons, will strengthen from the west of the country, which is dominated by Mediterranean climate and to the east which is dominated by the dry and hot subtropical in general (Turp et al., 2014). This change, which increases its effect from west to east of Turkey, is in accordance with the longitudinal yield changes as for our model results.

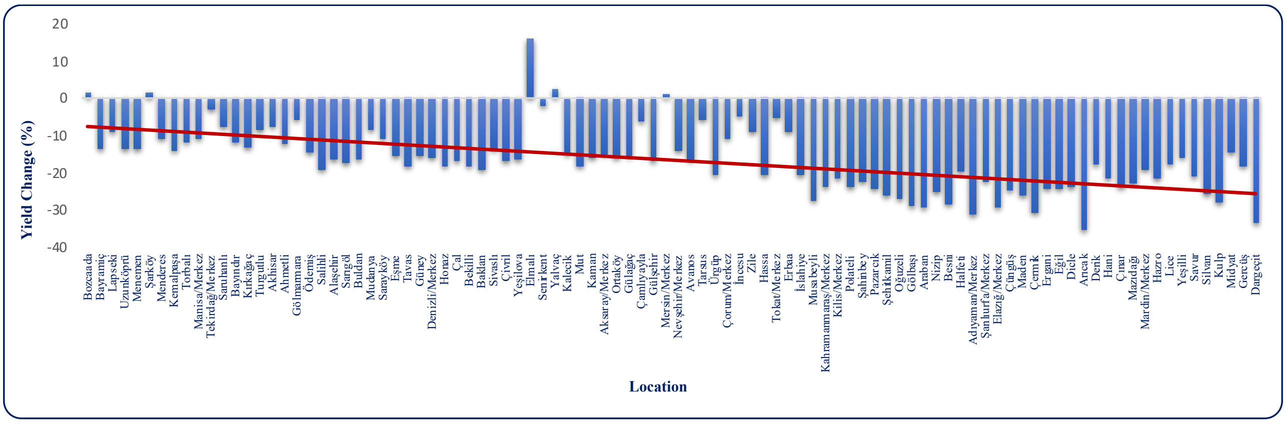


Figure 4.28. Projected longitudinal yield change by the location under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the crop growth simulation model, STICS.

4.4. Membership Function Results for Hazelnut and Grape

When determining variable weights in the membership function with the panel data method (multi-regression), the Hausman test suggested the use of the Random Effect (RE) model, even though the locations are included in the model as cross-sectional data. Although the locations have similar climatic characteristics, they are located in different regions, Eastern Marmara and the Black Sea Region and varying altitudes. Considering they have been in different regions and in different elevation, it was decided that it would be appropriate to include the Fixed Effect (FE) model in the analysis. For this reason, the effect of each variable was determined by considering both models and the final calculation was made according to these weights for hazelnut and grape. During the interval determination, 3 different approaches i.e., Equal Interval (EIC), Percentile (PC) and Natural Break (NBC) were made to classify the overall scores obtained between 0 and 1 and climate suitability degrees were created accordingly. Additionally, 5 categories i.e., “extremely suitable (ES), “very suitable” (VS), “suitable (SU)”, “acceptable (AC)”, “marginal suitable (MS)” were determined in terms of land suitability level for each approach.

4.4.1. Hazelnut Results for 88 Locations

In this part, 88 locations are included in the Black Sea Region and East Marmara for hazelnut, thresholds are specified by considering the climatic conditions of the region, which is regarded as the natural habitat of hazelnut, and a trapezoidal membership function is applied. Within this scope, for the variables of T_{max}, T_{min}, T_{mean}, Pr, AET, RH, SunD in the October-August interval, 4 different thresholds were determined, upper, lower, and optimum for each variable monthly. Classification interval is given in Table 4.3 and Table 4.4, specified in reference to three approaches i.e., EIC, PC and NBC with two different model weighting for hazelnut.

Table 4.3. The relationship between climate suitability classes and overall scores with the variables FE weighted for hazelnut.

Suitability Class	EIC Overall Scores	PC Overall Scores	NBC Overall Scores
Marginal Suitability (MS)	0.00-0.20	0.00-0.62*	0.00-0.60
Acceptable (AC)	0.20-0.40	0.62-0.81	0.60-0.74
Suitable (SU)	0.40-0.60	0.81-0.93	0.74-0.83
Very Suitable (VS)	0.60-0.80	0.93-0.97	0.83-0.90
Extremely Suitable (ES)	0.80-1.00	0.97-1.00	0.90-1.00

Table 4.4. The relationship between climate suitability classes and overall scores with the variables RE weighted for hazelnut.

Suitability Class	EIC Overall Scores	PC Overall Scores	NBC Overall Scores
Marginal Suitability (MS)	0.00-0.20	0.58-0.00	0.50-0.00
Acceptable (AC)	0.20-0.40	0.58-0.85	0.50-0.79
Suitable (SU)	0.40-0.60	0.85-0.94	0.79-0.85
Very Suitable (VS)	0.60-0.80	0.94-0.97	0.85-0.91
Extremely Suitable (ES)	0.80-1.00	0.97-1.00	0.91-1.00

*The values given in the table are rounded to 2 decimals.

The results were interpreted taking into account two separate evaluation criteria. Firstly, the climate suitability index and climate suitability classifications changes determined by the variables weighted according to the FE and RE panel data model for 88 locations where the hazelnut grows are given in detail in Table 4.5 and Table 4.6 respectively. Besides, the classifications distribution by locations and how these classifications may change in the future period of 2021-2050 from the past 1991-2012 with variables weighted according to the FE, in Figure 4.29 for the EIC approach, in Figure 4.30 for the PC approach and in Figure 4.31 for the NBC approach. With variables weighted according to the FE, it is mapped in Figure 4.32 for the EIC, Figure 4.33 for the PC and Figure 4.34 for the NBC approach. In the other case, still with variables weighted according to the FE and RE models are examined whether the favorable climate conditions in the 2021-2050 period for hazelnut in 923 locations in Turkey. Accordingly, the distributions by EIC, PC and NBC are given in Figure 4.41 and Figure 4.42 respectively.

Accordingly, the current climatic suitability was determined for the 88 locations in the Black Sea and East Marmara, taking into consideration the period of 1991-2012. Moreover, within the next 2021-2050 period, climatic suitability is determined from the membership function for all 923 locations in Turkey. According to the results, the classifications made between both with variables weighted according to the FE and RE (between 0 and 1) were compared for 88 locations where the hazelnut grew.

EIC, which is the first method used to determine the interval in FE, can be expressed as the thresholding of the overall scores at equal intervals. Accordingly, considering the EIC classification (Figure 4.28), the number of “ES” locations, which was 71 during the period of 1991-2012, decreased to 50 in 2021-2050, and the number of 13 “VS” increased to 21. In the past, only 3 “SU” and 1 “AC” locations have changed to 13 and 4, respectively. The point to be considered here is that according to the EIC approach, favorable conditions continue throughout the region in the future, but their degree of suitability decreases.

The second method used to determine the interval is the PC method. PC method is a statistical measure showing the value that a certain percentage of observation corresponds to within the observation values. For example, the 25th percentile means that 25 % of observations are below this value. Or we can say that 75 % of the observations are above the 25th percentile. According to the results of this method (Figure 4.29), the number of “extremely suitable” locations, which was 22 in the period of 1991-2012, decreased to 14 in 2021-2050, and the number of 22 “very suitable” locations decreased to 14. The number of “suitable” locations, which were 22 in the past, remained the same in the future, but the locations that showed “suitable” characteristics in the past differed in the future. According to this, the distribution in “suitable” locations in the past, has shifted to 2 ES, 4 VS, 2 SU, 7 AC, 7 MS. The number of “acceptable” locations, which was 18, increased 20 in the future. “Marginal suitability” seen in only 4 locations in the past is seen in 18 locations in the future. Still, as in the previous method, favorable conditions continue throughout the region in the future, but their degree of suitability decreases.

Another method used to determine the interval is the NBC method. In this method, where the data is jumped is determined and the range values are thresholded from those points. According to the NBC classification (Figure 4.30), the number of “ES” locations, which was 46 in the period of

1991-2012, decreased to 36 in 2021-2050, and the number of 15 “VS” locations decreased to 12. The number of “SU” locations from 14 in the past and “AC” locations from 10 in the future changed to 9 and 15, respectively. “MS”, which was seen only in 3 locations in the past, is seen in 16 locations in the future.

In this method, as in the previous ones, it is observed that the region will still have favorable climatic conditions for hazelnut cultivation in the future, but the degree of suitability decreases. According to all three approaches i.e., the overall assessment of EIC, PC and NBC is “ES” “suitable” and “VS” for hazelnut cultivation in the region, decreasing to “SU”, “AC” and “MS” conditions in the period of 2021-2050, reducing by approximately 15 %, 36 % and 21 %, respectively. This situation can be considered as an indicator of the adverse effects of climate change on agricultural production in the future.

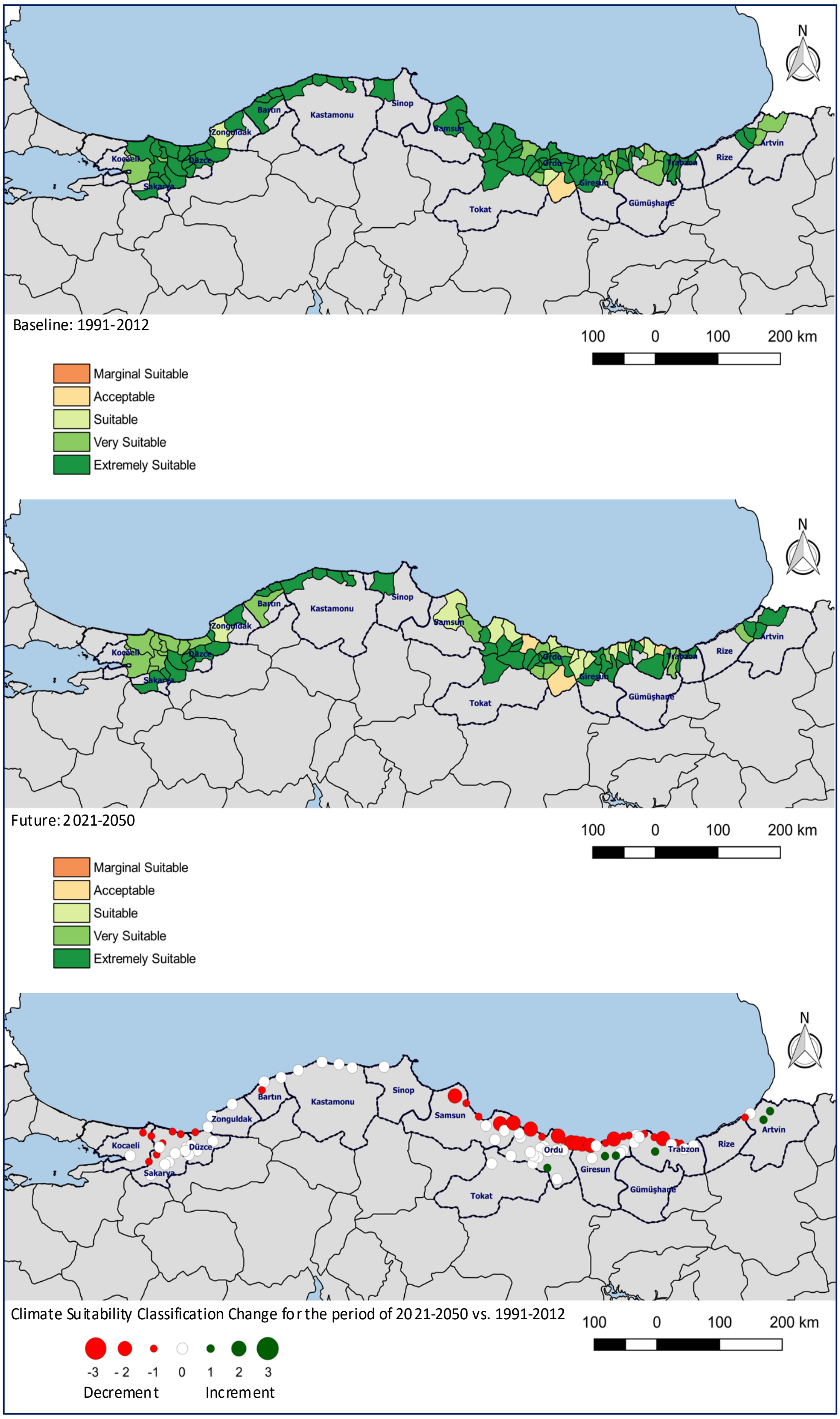


Figure 4.29. Location-basis spatial distribution of the projected **hazelnut climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **EIC approach** with the variables weighted of **FE model**.

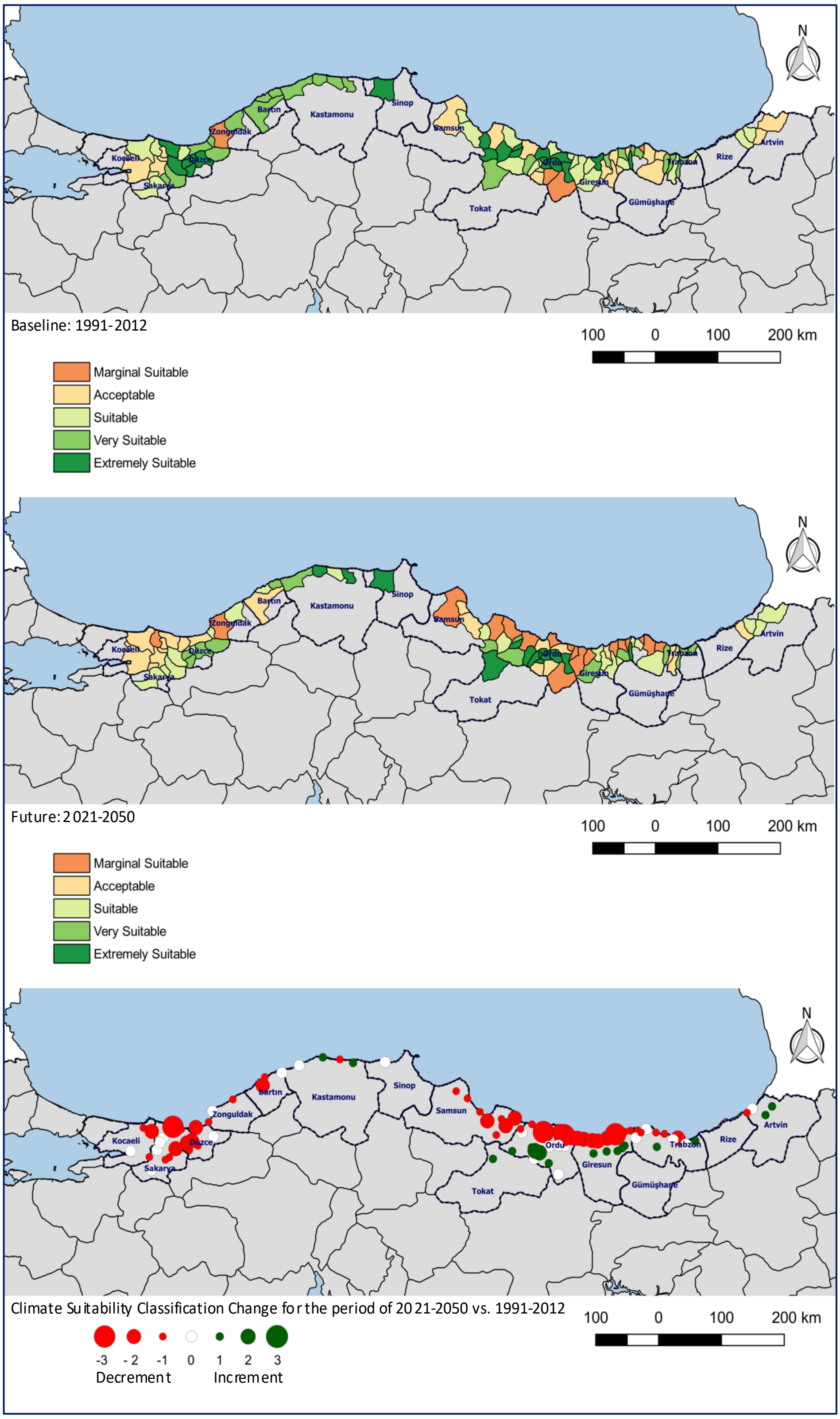


Figure 4.30. Location-basis spatial distribution of the projected **hazelnut climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **PC approach** with the variables weighted of **FE model**.

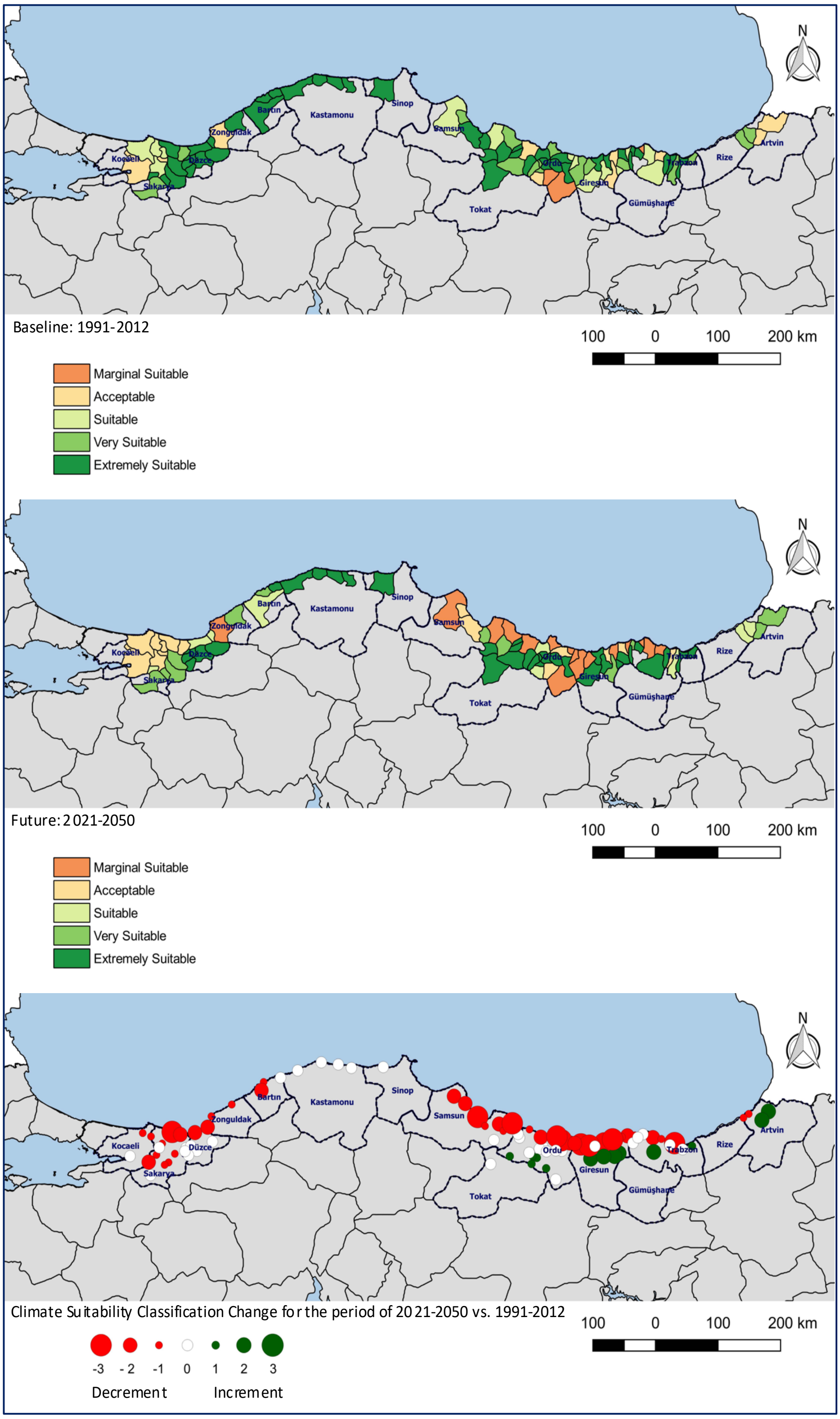


Figure 4.31. Location-basis spatial distribution of the projected **hazelnut climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **NBC approach** with the variables weighted of **FE model**.

According to EIC, in **ORDU**, the number of “extremely suitable” locations, which was 15 in the past, has decreased to 11, and three of these locations have declined to “very suitable” and 1 to “suitable” conditions. According to the PC, the number of “extremely suitable” locations, which is 9, remained 9; yet, one of these locations, which showed “extremely suitable” conditions in the past, fell to “very suitable”, and two of them fell to “acceptable” conditions. On the other hand, it increased from 2 locations from “suitable” to “extremely suitable” and 1 location from “very suitable” to “extremely suitable”. Also, “marginal suitable” conditions seen in only 1 location may increase to 4 locations in the future. According to the NBC method, the number of “extremely suitable” locations, which was 10 in the past, increases to 11 in the future, but the locations, where this feature is seen, differ from the past and there is a district that comes to “acceptable” conditions by regressing 3 steps from “extremely suitable” conditions. According to NBC, “very suitable” conditions seen in 4 locations in the past are not seen in **ORDU** locations in the future. The number of locations in the “marginal suitable” range, which was 2 in the past, increases to 4 in the future.

If we look at it in more detail by locations; The location of GÜLYALI of **ORDU** decreased by 2 steps in the suitability classification according to all three methods and from the “extremely suitable” to “suitable” in the EIC method, in PC and NBC methods, it decreases from “suitable” to “marginal suitable”. **ORDU**/MERKEZ has become one of the locations that declined sharply. In the EIC method, only one step decreases from “extremely suitable” to “very suitable”. When using PC and NBC methods, it decreases 3 steps from “extremely suitable” to the “acceptable” classification. The location of PERŞEMBE is also emerging as one of the locations with a sharp decline. In the district, according to EIC, two steps decrease from “extremely suitable” to “suitable”, in PC from “suitable” to “marginal suitable”. In contrast, in NBC, it decreases 3 steps from “very suitable” to “marginal suitable”. The location of FATSA also decreases one step from “extremely suitable” to “very suitable” in EIC, 3 steps from “extremely suitable” to “acceptable” in PC and two steps from “extremely suitable” to “suitable” in NBC. The location of AYBASTI varies with different results in each of the three methods, while two steps decrease in EIC, remain the same in PC, and increase one step from “acceptable” to “suitable” in NBC. On the other hand, the locations of KORGAN and KABATAŞ remain the same in EIC and emerge as two locations with two steps in PC and one-step increase in NBC. The location of GÖLKÖY as a district, which is generally in the low classification level, it is becoming a bit more climatic-suitable by increasing one step in all three methods in the future. The location of AKKUŞ also remains the same in EIC in the future and increases one step in PC and NBC. The locations of ÇATALPINAR, ÇAYBAŞI, GÜRGENTEPE, KABADÜZ, MESUDİYE, ULUBEY, and ÇAMAŞ are among the districts that do not change in terms of climate suitability in the future.

In **SAMSUN**, the locations of TERME, BAFRA, ÇARŞAMBA, MERKEZ, TEKKEKÖY, SALIPAZARI are among the decreasing locations. The biggest reduction in Samsun is in the location of TERME, with two steps from “extremely suitable” to “suitable” in EIC, two steps from “suitable” to “marginal suitable” in PC and 3 steps from “very suitable” to “marginal suitable” in NBC.

In **ARTVİN**, in the locations of BORÇKA and MURGUL, an increase is observed in all three methods, with one step in EIC and PC and two steps in NBC.

GİRESUN is emerging as one of the provinces, such as **ORDU**, where climatic suitability conditions will decrease the most. According to EIC, the number of “extremely suitable” locations in **GİRESUN**, which was 9 in the past, has decreased to 6, four of these locations have regressed to “suitable”, and one is “very suitable”, and 3 new locations are added to these locations in the future. “Extremely suitable” conditions seen in 1 location on the PC in the past are not expected in the future, and “marginal suitable” conditions that have never been in the past are foreseen in 6 locations in the future. On the other hand, one step improvement is observed in 6 locations of **GiRESUN**. According to the NBC approach, the number of “extremely suitable” locations, which was 3 in the past, increases to 5 in the future, but the number of “marginal suitable” locations, which has never been seen in the past, is also observed as 5. If we look at it in more detail by location; In the locations of BULANCAK and MERKEZ of **GİRESUN**, according to EIC and PC, two steps decrease from “extremely suitable” to “suitable” and “suitable” to “marginal suitable”, respectively. In NBC, 3 steps decline from “very suitable” to “marginal suitable” in the future. According to EIC, the conditions in the location of ESPİYE are one step back from “extremely suitable” to “very suitable”, two steps back from “very suitable” to “acceptable” in PC and 3 steps back from “extremely suitable” to “acceptable” in NBC. In the location of PİRAZİZ of **GİRESUN**, it is predicted that there will be two steps back from “extremely suitable” to suitable in EIC and two steps back from “suitable” to “marginal suitability” in PC and NBC. On the other hand, looking at all three approaches, the location of TIREBOLU, emerges as the location where the most reduction is foreseen, with two steps back from “extremely suitable” to “suitable” in EIC, 3 steps back from “very suitable” to “marginal suitability” in PC, and there will be a 3-step back from “extremely suitable” to “acceptable” in NBC. It is estimated that there will be an increase in all three methods in the location of GÜCE and YAĞLIDERE of **GİRESUN**, and this increase is predicted as one step in EIC and PC, and two steps in NBC. Besides, no change is expected in the locations of ÇANAKÇI, DERELİ, and DOĞANKENT in EIC in the future, one step increase is expected in all three locations as regards to PC, and one step increase in ÇANAKÇI, two steps increase in DERELİ and DOĞANKENT in NBC. It is predicted that there will be no change in the location of KEŞAP as regards to EIC and NBC, and two steps decrease is expected from “extremely suitable” to “suitable” in PC.

In the location of FINDIKLI, which is the only location of **RİZE** included in the study, there will be a decrease in each of the three approaches, and the lowest classification level is considered “acceptable”, where climatic suitability will decrease.

According to EIC, the number of “extremely suitable” locations in **TRABZON** in the past decreased to 7, but the locations with “extremely suitable” conditions differ in the future from the past. In PC, “extremely” conditions seen in 1 location in the past are observed in the same location in the future and “marginal suitable” conditions in 1 location in the past are foreseen in 3 locations in the future. According to the NBC approach, the number of “extremely suitable” locations, which was 6 in the past, remains as 6 in the future, but the locations with these conditions differ from the past, and significant decreases are observed in the locations that meet these conditions in the past. Once more, the number of “marginal suitable” locations, which was 1 in the past, is observed as 3 in the future. If we look at it in more detail by location; In three locations of SÜRMENE, ŞALPAZARI and YOMRA of **GİRESUN** are not foreseen to change in all three approaches, while another three of them, BEŞİKDÜZÜ, ÇARŞIBAŞI, VAKFIKEBİR, are foreseen to change according to one or two approaches. However, the location of ARSİN as the location, where the most decrease will be achieved from “extremely suitable” to “very suitable” in EIC, from “very suitable” to “acceptable” in PC and from “extremely suitable” to “acceptable” in EBC.

In the location of ARAKLI, climatic suitability decreases by one step in all three approaches, still in the location of AKÇAABAT, it decreases by one step in EIC, PC and two steps in NBC, respectively from “very suitable” to “suitable” and “acceptable” to “marginal suitable”, and “suitable” to “marginal suitable”. It is predicted that the locations of Trabzon with an increase in climatic suitability conditions will be MAÇKA and OF. Accordingly, it is estimated that there will be one step increase from “very suitable” to “extremely suitable” in EIC, one step from “acceptable” to “suitable” in PC and two steps from “suitable” to “extremely suitable” in NBC. In the location of OF, no change is expected in EIC, and one step increase is expected from “suitable” to “very suitable” in PC and from “very suitable” to “extremely suitable” on NBC.

It is estimated that there will be one step decrease in all three approaches in the location of KANDIRA of **KOCAELİ**. This decrease will be from "extremely suitable" to "very suitable" in EIC, from "suitable" to "acceptable" in PC and from "suitable" to "acceptable" in NBC. In the location of MERKEZ, it is envisaged that there will be no changes for all three approaches.

SAKARYA also emerges as one of the provinces where the reductions will be highest in its locations. Thereafter, the location with the greatest decrease in **SAKARYA** is estimated as KARASU, and it is predicted that this decrease will be one step back from "extremely suitable" to "very suitable" in EIC, and three steps back from "extremely suitable" to "acceptable" in PC and NBC. It is estimated that there will be a decrease in three approaches in the location of KAYNARCA, one step back to "very suitable" in EIC, two steps back to "marginal suitable" in PC, and one step back to "acceptable" in NBC. The location of KOCAALİ is one of the locations where climate suitability decreases. Accordingly, it is estimated that it will decrease one step to "very suitable" in EIC, one step to "acceptable" in PC and two steps to "acceptable" in NBC. Another location that is expected to decrease climate suitability is SAPANCA. Accordingly, as regards to EIC, to "very suitable" with one step, to "acceptable" with one step in PC, and to "suitable" with two steps in NBC. It is estimated that there will be no change in the locations of GEYVE and SÖĞÜTLÜ according to all three approaches. In the location of KARAPÜRÇEK, it is expected that there will be no change according to EIC, and it is likely to decrease by one step to "suitable" and "very suitable", respectively, as regards to PC and NBC. In the location of HENDEK, no change of climate suitability is expected in EIC, and it is predicted that there will be a decrease to "suitable" with two steps in the PC, and to "very suitable" with one step in NBC.

It is predicted that there will be a decrease in all three approaches in the location of MERKEZ of **BARTIN**. There will be a decrease to "very suitable" with one step in EIC, to "acceptable" with two steps in PC and to "suitable" with also two steps in NBC.

It is estimated that there will be no change in the other locations except for the AKÇAKOCA of **DÜZCE.** In AKÇAKOCA, according to the EIC method, it is expected to "very suitable" with one step back, to "acceptable" with two steps back in PC and to "suitable" with also two steps back in NBC. No change is expected in the locations of CUMAYERİ and ÇİLİMLİ as regards to EIC and NBC, while it is predicted that there will be a decrease from "extremely suitable" to "suitable" with two steps in PC. Once again, it is estimated that there will be no change in the locations of GÖLYAKA, GÜMÜŞOVA, and MERKEZ of **DÜZCE** according to EIC and NBC, and it is expected that there will be a decrease with a one-step in the PC.

It is estimated that there will be no change in the locations of **KASTAMONU** as regards to EIC and NBC, and there will be an increase in the locations of BOZKURT and DOĞANYURT to “extremely suitable” with a step towards in PC, whereas in the locations of İNEBOLU there is a step back to the “suitable” in PC. In the location of CİDE, no change is foreseen according to all three approaches.

It is estimated that there will be no change in the location of AYANCIK, which is the only location of **SİNOP** included in the study, according to all three approaches.

In the locations of **ZONGULDAK**, no change is expected according to EIC, and it is estimated that there will be a decrease in the location of ALAPLI to “suitable” with one step in PC and to “suitable” with two steps in NBC. In the location of MERKEZ of **ZONGULDAK**, it is predicted that there will be a decline towards “suitable” and “very suitable”, respectively, by one step as regards to PC and NBC. In the location of EREĞLİ, no change is foreseen according to EIC and PC, while it is estimated that there will be a decrease to “marginal suitable” in NBC.

Table 4.5. Projected Hazelnut Climate Suitability Index (HCSI) and Classification Change by location for the reference period of 1991-2012 and future period of 2021-2050 based on 3 approaches i.e., EIC, PC, and NBC with the variables weighted of FE model. Red down-arrow indicates decreases and green up-arrow indicates increases. Sole arrow, two-arrow, three- arrow, four-arrow indicate the change respectively one class, two class, three class, four-class change.

HAZELNUT CLIMATE SUITABLITY INDEX (HCSI) AND CLIMATE SUITABILITY CLASSIFICATION														
LOCATION ID	REGION	PROVINCE	LOCATION	BASELINE (1991-2012)				FUTURE (2021-2050)				CLASSIFICATION CHANGE (2021-2050 vs 1991-2012)		
				HCSI	EIC	PC	NBC	HCSI	EIC	PC	NBC	EIC	PC	NBC
344	Central Black Sea	Ordu	Fatsa	0.999614	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.743500	Very Suitable	Acceptable	Suitable	↓	↓↓↓	↓↓
506	Central Black Sea	Ordu	Kabadüz	0.998314	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.981643	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	⇔	⇔
859	Central Black Sea	Ordu	Ulubey/Ordu	0.997611	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.981874	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	⇔	⇔
186	Central Black Sea	Ordu	Çamaş	0.997608	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.985100	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	⇔	⇔
204	Central Black Sea	Ordu	Çatalpınar	0.997359	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.986235	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	⇔	⇔
209	Central Black Sea	Ordu	Çaybaşı	0.996314	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.972526	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	⇔	⇔
406	Central Black Sea	Ordu	Gürgentepe	0.996002	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.983241	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	⇔	⇔
460	Central Black Sea	Ordu	İkizce	0.993550	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.932652	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
672	Central Black Sea	Ordu	Ordu/Merkez	0.984434	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.658047	Very Suitable	Acceptable	Acceptable	↓	↓↓↓	↓↓↓
595	Central Black Sea	Ordu	Kumru	0.948484	Extremely Suitable	Very Suitable	Extremely Suitable	0.985199	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	↑	⇔
29	Central Black Sea	Ordu	Akkuş	0.886261	Extremely Suitable	Suitable	Very Suitable	0.960751	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↑	↑
576	Central Black Sea	Ordu	Korgan	0.871381	Extremely Suitable	Suitable	Very Suitable	0.973455	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	↑↑	↑
484	Central Black Sea	Ordu	Kabataş	0.868426	Extremely Suitable	Suitable	Very Suitable	0.972056	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	↑↑	↑
700	Central Black Sea	Ordu	Perşembe	0.858184	Extremely Suitable	Suitable	Very Suitable	0.453074	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓↓	↓↓↓
396	Central Black Sea	Ordu	Gülyalı	0.809317	Extremely Suitable	Suitable	Suitable	0.493527	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓↓	↓↓
866	Central Black Sea	Ordu	Ünye	0.726199	Very Suitable	Acceptable	Acceptable	0.391167	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓
88	Central Black Sea	Ordu	Aybastı	0.645827	Very Suitable	Acceptable	Acceptable	0.786720	Very Suitable	Acceptable	Suitable	⇔	⇔	↑
378	Central Black Sea	Ordu	Gölköy	0.563353	Suitable	Marginal Suitable	Marginal Suitable	0.669421	Very Suitable	Acceptable	Acceptable	↑	↑	↑
636	Central Black Sea	Ordu	Mesudiye	0.284122	Acceptable	Marginal Suitable	Marginal Suitable	0.381200	Acceptable	Marginal Suitable	Marginal Suitable	⇔	⇔	⇔
96	Central Black Sea	Samsun	Ayvacık/samsun	0.995540	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.962557	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
725	Central Black Sea	Samsun	Salıpazarı	0.981817	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.877543	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
829	Central Black Sea	Samsun	Tekkeköy	0.978836	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.893498	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
729	Central Black Sea	Samsun	Samsun/Merkez	0.931194	Extremely Suitable	Suitable	Extremely Suitable	0.726774	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓↓
833	Central Black Sea	Samsun	Terme	0.899961	Extremely Suitable	Suitable	Very Suitable	0.556423	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓↓	↓↓↓
1	Central Black Sea	Samsun	19 Mayıs	0.893498	Extremely Suitable	Suitable	Very Suitable	0.643788	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
199	Central Black Sea	Samsun	Çarşamba	0.808295	Extremely Suitable	Acceptable	Suitable	0.474804	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓↓
101	Central Black Sea	Samsun	Bafra	0.805068	Extremely Suitable	Acceptable	Suitable	0.519830	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓↓
318	Central Black Sea	Tokat	Erbaa	0.955970	Extremely Suitable	Very Suitable	Extremely Suitable	0.973758	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	↑	⇔
72	Eastern Black Sea	Artvin	Arhavi	0.871160	Extremely Suitable	Suitable	Very Suitable	0.820429	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
647	Eastern Black Sea	Artvin	Murgul	0.737708	Very Suitable	Acceptable	Acceptable	0.878989	Extremely Suitable	Suitable	Very Suitable	↑	↑	↑↑
159	Eastern Black Sea	Artvin	Borçka	0.720168	Very Suitable	Acceptable	Acceptable	0.895724	Extremely Suitable	Suitable	Very Suitable	↑	↑	↑↑
548	Eastern Black Sea	Giresun	Keşap	0.976030	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.910313	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
336	Eastern Black Sea	Giresun	Espiye	0.948342	Extremely Suitable	Very Suitable	Extremely Suitable	0.719119	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
835	Eastern Black Sea	Giresun	Tirebolu	0.931633	Extremely Suitable	Very Suitable	Extremely Suitable	0.599133	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓↓	↓↓↓
174	Eastern Black Sea	Giresun	Bulancak	0.903835	Extremely Suitable	Suitable	Very Suitable	0.561459	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓↓	↓↓↓
193	Eastern Black Sea	Giresun	Çanakçı	0.886901	Extremely Suitable	Suitable	Very Suitable	0.937653	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↑	↑
369	Eastern Black Sea	Giresun	Giresun/Merkez	0.875414	Extremely Suitable	Suitable	Very Suitable	0.526395	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓↓	↓↓↓
703	Eastern Black Sea	Giresun	Piraziz	0.832409	Extremely Suitable	Suitable	Suitable	0.501875	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓↓	↓↓
263	Eastern Black Sea	Giresun	Dereli	0.826158	Extremely Suitable	Suitable	Suitable	0.937235	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↑	↑↑
283	Eastern Black Sea	Giresun	Doğankent	0.806011	Extremely Suitable	Acceptable	Suitable	0.927020	Extremely Suitable	Suitable	Extremely Suitable	⇔	↑	↑↑
881	Eastern Black Sea	Giresun	Yağlıdere	0.794914	Very Suitable	Acceptable	Suitable	0.922012	Extremely Suitable	Suitable	Extremely Suitable	↑	↑	↑↑
340	Eastern Black Sea	Giresun	Eynesil	0.792159	Very Suitable	Acceptable	Suitable	0.481656	Suitable	Marginal Suitable	Marginal Suitable	↓	↓	↓↓
387	Eastern Black Sea	Giresun	Görele	0.699513	Very Suitable	Acceptable	Acceptable	0.438528	Suitable	Marginal Suitable	Marginal Suitable	↓	↓	↓
390	Eastern Black Sea	Giresun	Güce	0.648997	Very Suitable	Acceptable	Acceptable	0.839553	Extremely Suitable	Suitable	Very Suitable	↑	↑	↑↑

One-class decrement	Two-class decrement	Three-class decrement	Four-class decrement	No change	One-class increment	Two-class increment	Three-class increment	Four-class increment
↓	↓↓	↓↓↓	↓↓↓↓	⇔	↑	↑↑	↑↑↑	↑↑↑↑

HAZELNUT CLIMATE SUITABLITY INDEX (HCSI) AND CLIMATE SUITABILITY CLASSIFICATION														
LOCATION ID	REGION	PROVINCE	LOCATION	BASELINE (1991-2012)				FUTURE (2021-2050)				CLASSIFICATION CHANGE (2021-2050 vs 1991-2012)		
				HCSI	EIC	PC	NBC	HCSI	EIC	PC	NBC	EIC	PC	NBC
350	Eastern Black Sea	Rize	Fındıklı	0.859346	Extremely Suitable	Suitable	Very Suitable	0.752962	Very Suitable	Acceptable	Suitable	↓	↓	↓
726	Eastern Black Sea	Trabzon	Şalpazarı	0.982166	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.973616	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	⇔	⇔
76	Eastern Black Sea	Trabzon	Arsin	0.965384	Extremely Suitable	Very Suitable	Extremely Suitable	0.738073	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
875	Eastern Black Sea	Trabzon	Vakfıkebir	0.958553	Extremely Suitable	Very Suitable	Extremely Suitable	0.927192	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓	⇔
133	Eastern Black Sea	Trabzon	Beşikdüzü	0.951649	Extremely Suitable	Very Suitable	Extremely Suitable	0.841557	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
913	Eastern Black Sea	Trabzon	Yomra	0.941467	Extremely Suitable	Very Suitable	Extremely Suitable	0.960479	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	⇔	⇔
811	Eastern Black Sea	Trabzon	Sürmene	0.938586	Extremely Suitable	Very Suitable	Extremely Suitable	0.951167	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	⇔	⇔
65	Eastern Black Sea	Trabzon	Araklı	0.881867	Extremely Suitable	Suitable	Very Suitable	0.783891	Very Suitable	Acceptable	Suitable	↓	↓	↓
666	Eastern Black Sea	Trabzon	Of	0.868029	Extremely Suitable	Suitable	Very Suitable	0.937582	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↑	↑
19	Eastern Black Sea	Trabzon	Akçaabat	0.797811	Very Suitable	Acceptable	Suitable	0.434864	Suitable	Marginal Suitable	Marginal Suitable	↓	↓	↓↓
611	Eastern Black Sea	Trabzon	Maçka	0.795147	Very Suitable	Acceptable	Suitable	0.919393	Extremely Suitable	Suitable	Extremely Suitable	↑	↑	↑↑
844	Eastern Black Sea	Trabzon	Trabzon/Merkez	0.640679	Very Suitable	Acceptable	Acceptable	0.399917	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓
200	Eastern Black Sea	Trabzon	Çarşıbaşı	0.553279	Suitable	Marginal Suitable	Marginal Suitable	0.324920	Acceptable	Marginal Suitable	Marginal Suitable	↓	⇔	⇔
499	Marmara	Kocaeli	Kandira	0.823957	Extremely Suitable	Suitable	Suitable	0.628916	Very Suitable	Acceptable	Acceptable	↓	↓	↓
566	Marmara	Kocaeli	Kocaeli/Merkez	0.709379	Very Suitable	Acceptable	Acceptable	0.679503	Very Suitable	Acceptable	Acceptable	⇔	⇔	⇔
443	Marmara	Sakarya	Hendek	0.984023	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.901279	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
517	Marmara	Sakarya	Karasu	0.967461	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.670234	Very Suitable	Acceptable	Acceptable	↓	↓↓↓	↓↓↓
37	Marmara	Sakarya	Akyazı	0.958276	Extremely Suitable	Very Suitable	Extremely Suitable	0.891499	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
516	Marmara	Sakarya	Karapürçek	0.952340	Extremely Suitable	Very Suitable	Extremely Suitable	0.854724	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
731	Marmara	Sakarya	Sapanca	0.922912	Extremely Suitable	Suitable	Extremely Suitable	0.799367	Very Suitable	Acceptable	Suitable	↓	↓	↓↓
368	Marmara	Sakarya	Geyve	0.870675	Extremely Suitable	Suitable	Very Suitable	0.848767	Extremely Suitable	Suitable	Very Suitable	⇔	⇔	⇔
565	Marmara	Sakarya	Kocaali	0.861751	Extremely Suitable	Suitable	Very Suitable	0.617513	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
532	Marmara	Sakarya	Kaynarca	0.810656	Extremely Suitable	Suitable	Suitable	0.605579	Very Suitable	Marginal Suitable	Acceptable	↓	↓↓	↓
347	Marmara	Sakarya	Ferizli	0.808090	Extremely Suitable	Acceptable	Suitable	0.651502	Very Suitable	Acceptable	Acceptable	↓	⇔	↓
723	Marmara	Sakarya	Sakarya/Merkez	0.805607	Extremely Suitable	Acceptable	Suitable	0.672070	Very Suitable	Acceptable	Acceptable	↓	⇔	↓
796	Marmara	Sakarya	Söğütlü	0.743186	Very Suitable	Acceptable	Acceptable	0.621834	Very Suitable	Acceptable	Acceptable	⇔	⇔	⇔
600	Western Black Sea	Bartın	Kurucaşile	0.961930	Extremely Suitable	Very Suitable	Extremely Suitable	0.959799	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	⇔	⇔
58	Western Black Sea	Bartın	Amasra	0.958449	Extremely Suitable	Very Suitable	Extremely Suitable	0.848153	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
116	Western Black Sea	Bartın	Bartın/Merkez	0.946216	Extremely Suitable	Very Suitable	Extremely Suitable	0.794838	Very Suitable	Acceptable	Suitable	↓	↓↓	↓↓
234	Western Black Sea	Düzce	Çilimli	0.996427	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.923664	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
246	Western Black Sea	Düzce	Cumayeri	0.996122	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.927109	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
399	Western Black Sea	Düzce	Gümüşova	0.992928	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.936264	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
382	Western Black Sea	Düzce	Gölyaka	0.978269	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.960760	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
295	Western Black Sea	Düzce	Düzce/Merkez	0.971555	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.959328	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
23	Western Black Sea	Düzce	Akçakoca	0.961279	Extremely Suitable	Very Suitable	Extremely Suitable	0.795379	Very Suitable	Acceptable	Suitable	↓	↓↓	↓↓
910	Western Black Sea	Düzce	Yığılca	0.949634	Extremely Suitable	Very Suitable	Extremely Suitable	0.947777	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	⇔	⇔
166	Western Black Sea	Kastamonu	Bozkurt/Kastamonu	0.963892	Extremely Suitable	Very Suitable	Extremely Suitable	0.971391	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	↑	⇔
228	Western Black Sea	Kastamonu	Cide	0.959133	Extremely Suitable	Very Suitable	Extremely Suitable	0.959210	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	⇔	⇔
287	Western Black Sea	Kastamonu	Doğanyurt	0.933180	Extremely Suitable	Very Suitable	Extremely Suitable	0.973246	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	↑	⇔
470	Western Black Sea	Kastamonu	İnebolu	0.931832	Extremely Suitable	Very Suitable	Extremely Suitable	0.919912	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓	⇔
86	Western Black Sea	Sinop	Ayancık	0.985677	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.983092	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	⇔	⇔
923	Western Black Sea	Zonguldak	Zonguldak/Merkez	0.953474	Extremely Suitable	Very Suitable	Extremely Suitable	0.870600	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
44	Western Black Sea	Zonguldak	Alaplı	0.951452	Extremely Suitable	Very Suitable	Extremely Suitable	0.827785	Extremely Suitable	Suitable	Suitable	⇔	↓	↓↓
323	Western Black Sea	Zonguldak	Ereğli/Zonguldak	0.597064	Suitable	Marginal Suitable	Acceptable	0.407782	Suitable	Marginal Suitable	Marginal Suitable	⇔	⇔	↓

One-class decrement	Two-class decrement	Three-class decrement	Four-class decrement	No change	One-class increment	Two-class increment	Three-class increment	Four-class increment
↓	↓↓	↓↓↓	↓↓↓↓	⇔	↑	↑↑	↑↑↑	↑↑↑↑

The first method to determine the interval in RE is EIC. Accordingly, considering the EIC classification, the number of “extremely suitable” locations, which was 72 from 1991 to 2012, decreased to 55 in 2021-2050, and the number of “very suitable” locations, which was 11, increased to 21. The number of “suitable” locations, which was only 4 in the past, increased to 11 in the future and the number of “acceptable” locations, which was 1, remained the same (Figure 4.32). The point to be considered here is that the favorable conditions continue throughout the region in the future, but their degree of suitability decreases.

According to the results of another approach of PC in determining the interval, the “extremely suitable” classification observed in 22 locations in the period of 1991-2012 may observe in only 1 location in 2021-2050. The number of “very suitable” locations declined from 22 to 11. The number of “suitable” locations, which were 22 in the past, increased to 35 locations in the future. The number of “acceptable” locations, which is 18, has also increased to 29 in the future. The total number of locations of the “suitable” and “acceptable” classification in the total of 88 locations will be 64 in the future and it constitutes approximately 73 % of the total number of locations. On the other hand, the “marginal suitable” classification seen in only 4 locations in the past is seen in 12 locations in the future (Figure 4.33). Once again, as in the previous approach, it is observed that the region has favorable climatic conditions for hazelnut cultivation in the future, but the degree of suitability decreases, and it continues to be more suitable for medium levels.

Another approach is NBC. According to the NBC classification, the number of “extremely suitable” locations, which was 50 in the period of 1991-2012, decreased to 32 in 2021-2050, and the number of 16 “very suitable” locations which was 16 in the past, reduced to 14 in the future. The number of “suitable” and “acceptable” locations, which was 7 and 14 in the past, increased by 12 and 25, respectively. “Marginal suitable” conditions, which were seen only in 2 locations in the past, is seen in 5 locations with a slight increase in the future (Figure 4.34). In this approach, as in the previous ones, it is observed that the region has “suitable” climatic conditions for hazelnut cultivation in the future, but the degree of suitability decreases. This situation can be considered as an indicator of the negative effects of climate change on agricultural production in the future.

The common characteristic observed in all three approaches is that, in general, the climatic conditions that are “extremely suitable” and “very suitable” in many locations in the region turn into generally “suitable” and “acceptable” climatic conditions in the future. In addition, the number of locations with “marginal suitable” conditions, which is currently observed to be very low throughout the region, is becoming approximately 3 times higher.

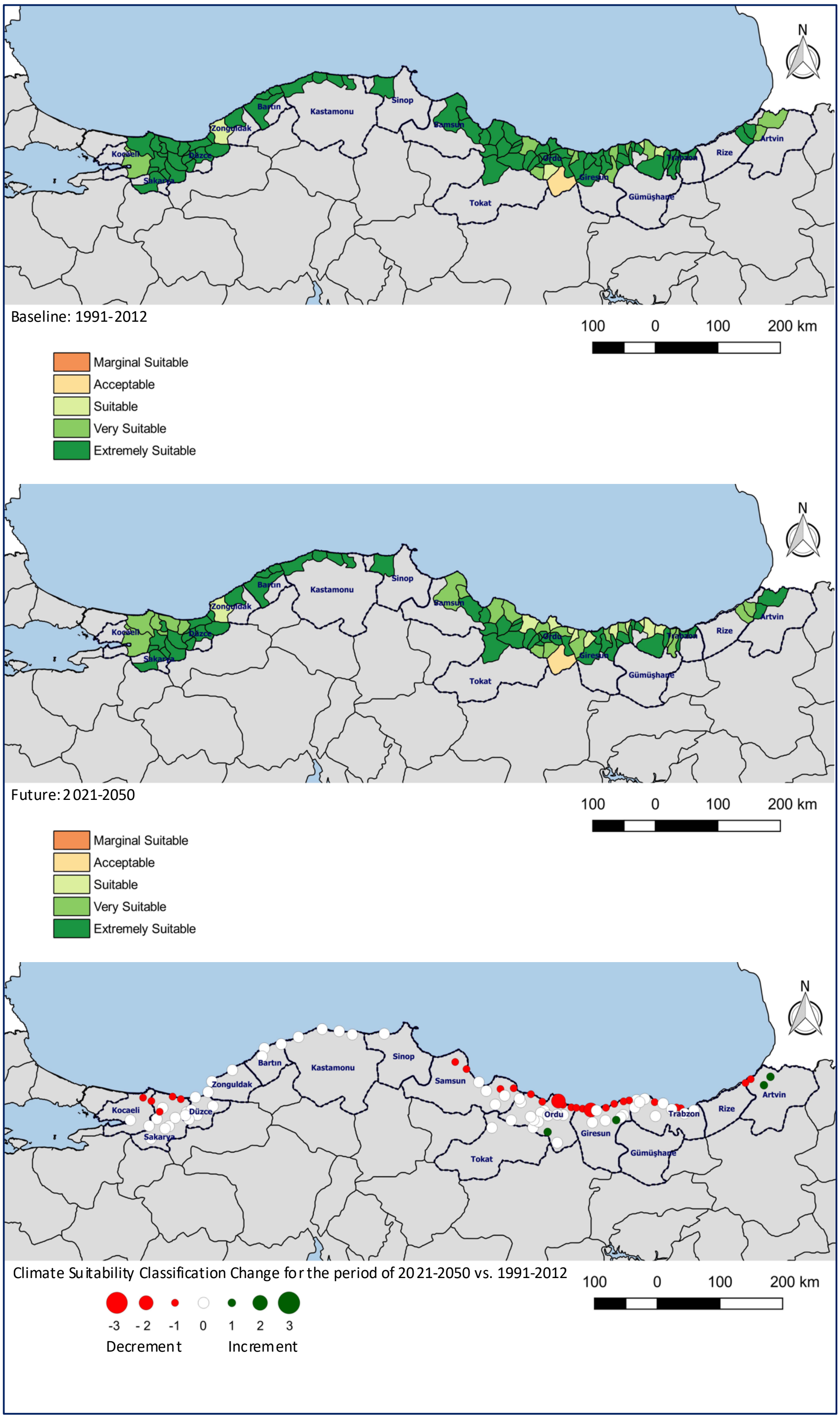


Figure 4.32. Location-basis spatial distribution of the projected **hazelnut climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **EIC approach** with the variables weighted of **RE model**.

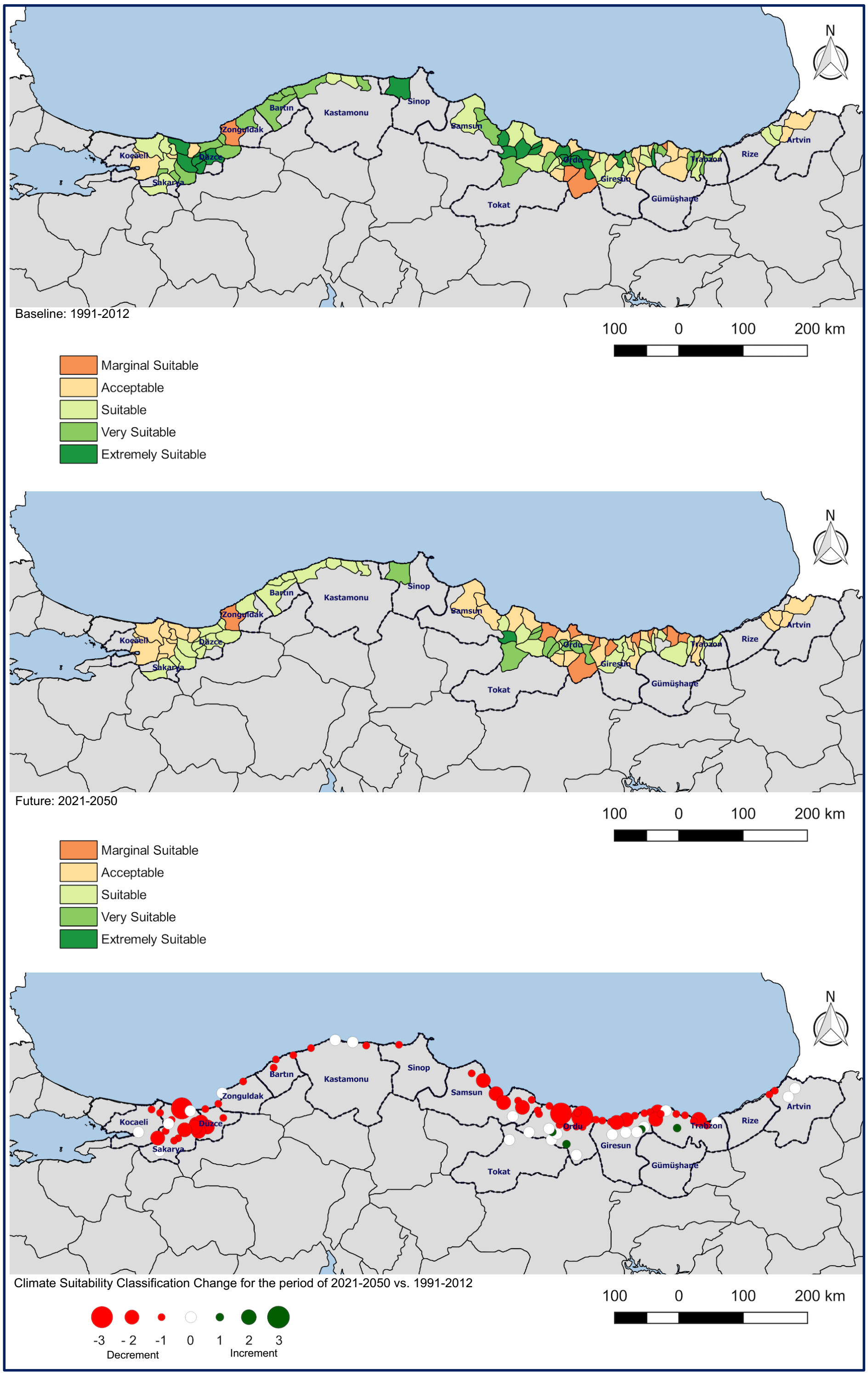


Figure 4.33. Location-basis spatial distribution of the projected **hazelnut climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **PC approach** with the variables weighted of **RE model**.

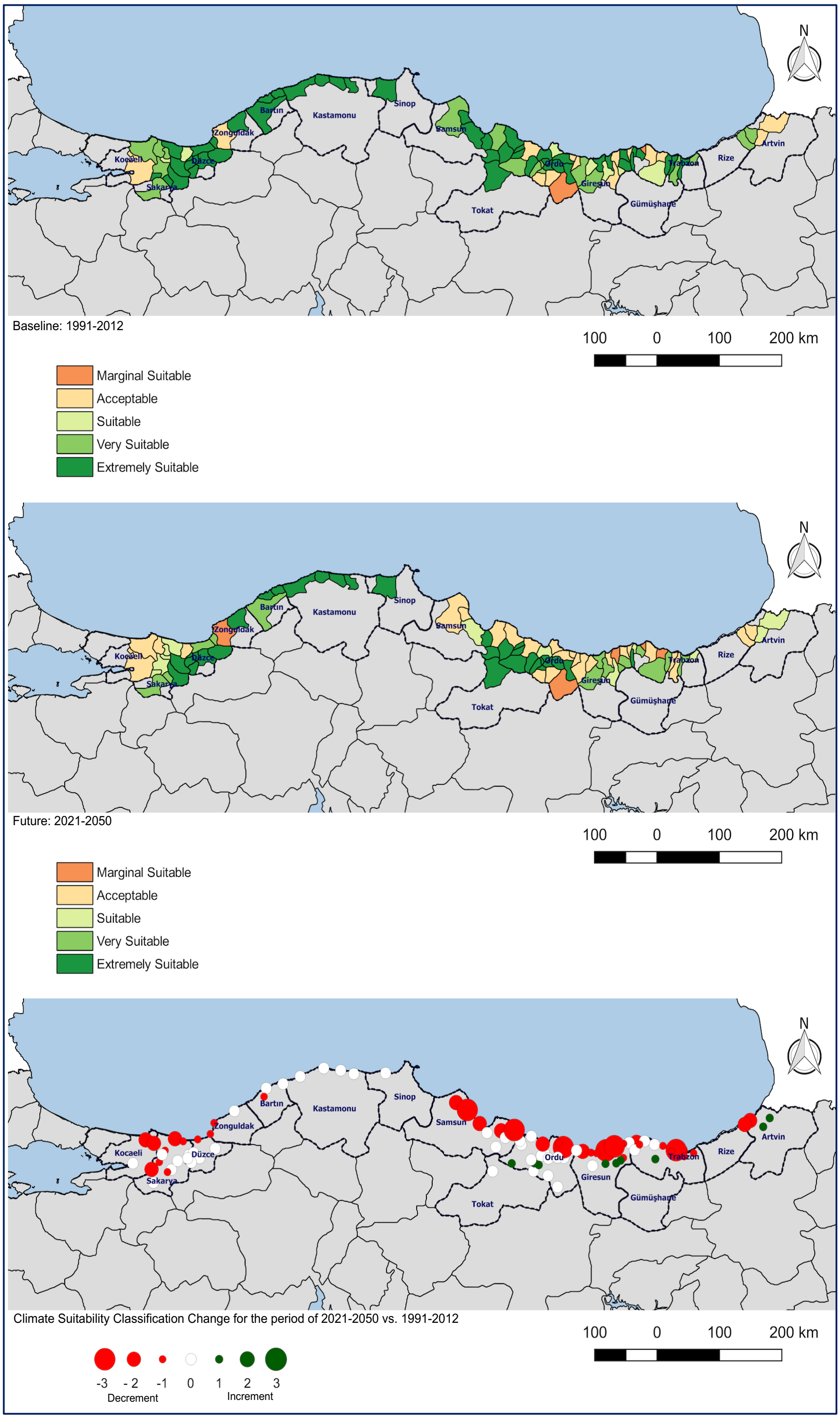


Figure 4.34. Location-basis spatial distribution of the projected **hazelnut climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **NBC approach** with the variables weighted of **RE model**.

According to EIC, the number of “extremely suitable” locations in **ORDU**, which was 14 in the past, decreases to 11 in the future, and three of these locations show a decline towards “very suitable” and 1 to “suitable “conditions. “Extremely suitable” conditions seen in 9 locations in PC in the past are not expected in the future, the number of “very suitable” locations, which is only 1 in the past, increases to 9 in the future. On the other hand, the number of “marginal suitable” locations, which was 2 in the past, increases to 4 in the future. According to the NBC approach, the number of “extremely suitable” locations, which was 10 in the past, increases to 11 in the future, but the locations with “extremely suitable” are seen differ according to the past and there are locations with 3 steps back from “extremely suitable” to “acceptable”. “Acceptable” conditions seen in 4 locations in the past are seen in 6 locations in the future.

If we look at the locations in more detail; the locations of MERKEZ and FATSA of **ORDU** are among the locations that declined sharply in the climate suitability conditions. Accordingly, in MERKEZ location, it is envisaged that one step back from “extremely suitable” to “very suitable” in EIC, while three steps back from “extremely suitable” to “acceptable” as regards to PC and NBC. The location of FATSA tends to decrease in climatic suitability with one step from “extremely suitable” to “very suitable” in EIC, three steps from “extremely suitable” to “acceptable” in PC and two steps from “extremely suitable” to “suitable” in NBC. The location of PERŞEMBE is the third location, where the highest decrease is expected following these two locations. Hereunder, it is expected that two steps back from “extremely suitable” to “suitable” in EIC, one step back from “acceptable” to “marginal suitable” in PC and one step back from “suitable” to “acceptable” in NBC. The locations of AYBASTI, MESUDİYE, and KUMRU do not show any change in all three approaches. On the other hand, in the locations of ÇAMAŞ, GÜRGENTEPE, İKİZCE, and KABADÜZ, it is expected to maintain the “extremely suitable” range in EIC and NBC and to decrease with a one-step from “extremely suitable” to “very suitable” in PC. The location of KABATAŞ, it is predicted that there will be no change as regards to EIC and PC in the future, and it will maintain the “extremely suitable” and “suitable” range, respectively. It is expected that it will increase to “extremely suitable” with one step in NBC. The location of KORGAN remains as “extremely suitable” in EIC and increases one step towards to “very suitable” in PC and one step towards to “extremely suitable” in NBC. Although the GÖLKÖY has relatively lower suitable conditions, it is estimated that there will be some increase in climate conditions, while it is not expected to change in “acceptable” conditions in NBC, whereas there may be an increase to “very suitable” and “acceptable”, respectively in EIC and PC. In the locations of GÜLYALI and ÜNYE, it is estimated that there will be no change in NBC, and a decrease is expected towards “suitable” and “marginal suitable”, respectively, in EIC and PC.

In the locations of TERME, BAFRA, ÇARŞAMBA, and ONDOKUZ MAYIS of **SAMSUN** are among the decreasing locations in all three approaches. Accordingly, the location of ONDOKUZ MAYIS shows a decline to the "very suitable" range with one step in the EIC, to the "acceptable" with two steps in PC and to "acceptable" with three steps in NBC. The locations of BAFRA and ÇARŞAMBA are similar with one step to "very suitable" in EIC, with one step to "acceptable" in PC and with two steps to "acceptable" in NBC. In the location of TERME, according to the EIC, it decreases to "very suitable" with one step in EIC, to "acceptable" with one step in PC, and to "acceptable" with three steps in NBC. It is foreseen that while there will be no change as regards to EIC in the CENTRAL location of **SAMSUN**, a decrease towards "acceptable" and "suitable" with two steps similarly in PC and NBC.

No changes are expected in the location of ERBAA of **TOKAT** according to all three approaches.

In the location of ARHAVİ of **ARTVİN**, a decrease is expected to be "very suitable" with one step in EIC, and to "acceptable" in PC and NBC with one and two steps, respectively. On the other hand, in the locations of BORÇKA and MURGUL, it is expected that an increase to "extremely suitable" and "suitable", respectively with one step in EIC and NBC and no change with "acceptable" conditions in PC.

Still, **GİRESUN** is emerging as one of the provinces such as **ORDU**, where climate suitability conditions will decrease the most. According to EIC, the number of "extremely suitable" locations in Giresun, which was 9 in the past, decreases to 6 in the future, three of these locations may experience a decrease towards "very suitable", one towards "suitable", and 1 new location is added to the "extremely suitable" locations in the future. Extremely conditions seen in 1 location in the past, according to PC, are not expected in the future, and "marginal suitable" conditions that have never been in the past are foreseen in 4 locations in the future. As regards the NBC, the number of "extremely suitable" locations, which were 4 in the past, will disappear completely in the future, but the "very suitable" conditions seen in 2 locations in the past increase to 5 locations. "Acceptable" conditions are seen in 4 locations in the past increase to 6 locations in the future, and the number of "marginal suitable" locations that are not seen in the past is observed as 1 in the future.

If we look at it in more detail by location; the location of ESPİYE is the location, which is predicted to have the most significant decrease in **GİRESUN**. Climatic suitability conditions in

ESPIYE decrease towards “very suitable” by one step according to the EIC approach, towards “acceptable” by two steps as regards to PC and towards “acceptable” by three steps in NBC. Following ESPIYE, in the location of TİREBOLU, it is expected that it may decrease to “very suitable” with one step in the EIC, to “acceptable” with one step in PC, and to an “acceptable” with a decrease of three steps in NBC. The CENTRAL location of **GİRESUN** is one of the locations with the expectation of a decrease, Hereunder, according to EIC, it is predicted that there will be a decrease towards “suitable” with two steps, and towards “marginal suitable” with one step in PC and towards “acceptable” with one step in NBC. In the location of BULANCAK, there is an expectation of a decrease with one step towards “very suitable” in the EIC, with one step towards “acceptable” in the PC, and with two steps towards “acceptable” in the NBC. In the location of GÖRELE, one step decrease is predicted according to all three approaches. Accordingly, it decreases to “suitable” in EIC and to “marginal suitable” in PC and NBC. In the location of KEŞAP, it is estimated that there will be no change with “extremely suitable” conditions as regards to EIC, it towards to “suitable” with two steps back in PC and towards “very suitable” with one step back in NBC. In the location of PİRAZİZ, as regards to EIC and PC, a decrease is expected to “suitable” and “marginal suitable”, respectively, by one-step, and while the “acceptable” conditions are maintained on NBC. In the location of GÜCE, it is estimated that there will be one step improvement towards “extremely suitable” and “suitable”, respectively, in climate suitability conditions according to two approaches, EIC and NBC, and no change in the PC. In the location of YAĞLIDERE, it is foreseen that there will be no change in EIC and PC, and “extremely suitable” and “suitable” ranges will be preserved respectively, while it is predicted that an increase to “very suitable” with one step in NBC. In the location of DERELİ, no change is foreseen in all three approaches, while in the location of ÇANAKÇI, there is no change in EIC and PC, and a decrease is expected to “very suitable” conditions in NBC. In the location of DOĞANKENT, it is predicted that there will be no change according to EIC, and the “extremely suitable” will be sustained, and there will be an increase to “suitable” in PC and to “very suitable” in NBC with one step.

In the location of FINDIKLI of **RİZE**, a decrease is predicted to “very suitable” and “acceptable”, respectively, with one step in EIC and PC and to “acceptable” with two steps in NBC.

TRABZON is one of the cities where hazelnut grows most. According to EIC, the number of “extremely suitable” locations, which was 9 in the past, drops to 7, and there is a decline to “very suitable” in these two locations. In the PC approach, “extreme suitable” conditions seen in 1 location in the past are not expected in the future, and “marginal suitable” conditions seen in 1 location in the past are foreseen in 3 locations in the future. The future conditions of climate in the

PC are generally “suitable”, “acceptable”, and “marginal suitable” for **TRABZON**. According to the NBC method, the number of “extremely suitable” locations, which was 6 in the past, decreases to 1 in the future, but the number of “marginal suitable” locations, which is 1 in the past, is also observed as 2 in the future. If we look at it in more detail by the location, there is no change in all three approaches in the location of ÇARŞIBAŞI. Similarly, no change in EIC and a decrease is projected towards “suitable” and “very suitable”, respectively, similar to one step back in PC and NBC in the location of SÜRMENE and YOMRA. It is predicted that there will be no change, and the “extremely suitable” conditions will be preserved in EIC and NBC in the location of ŞALPAZARI, and there will be a decrease from “extremely suitable” to the “suitable” with two steps in the PC. It is estimated that the “extremely suitable” conditions will be sustained in the location of BEŞİKDÜZÜ without any change in EIC, and it will decrease to “acceptable” and “suitable” respectively by two steps back in PC and NBC. The location of MAÇKA draws attention as the only location in **TRABZON** that is expected to increase, the “extremely suitable” conditions are preserved without any change in the EIC, and it is expected that there will be an increase in climatic suitability conditions towards the “suitable” and “very suitable” in PC and NBC, respectively. In the location of OF, it is estimated that there will be no change in EIC and PC, and “extremely suitable” and “suitable” will be preserved respectively, while in NBC there will be a step decline towards “suitable”. In the location of AKÇAABAT, a decline to “suitable” and “marginal suitable”, respectively, with a decrease of one step in the EIC and PC, while the “acceptable” conditions are maintained in NBC without any changes. ARSİN is a location with the highest decrease in expectation. Accordingly, it is expected that there will be a decline to “very suitable” with a step, to “acceptable” with two steps in the PC, and to “acceptable” with three steps in NBC. Once again, in the location of ARAKLI, a decrease is expected in climate suitability, it is predicted that there will be a decline to “very suitable” and “acceptable”, respectively in EIC and PC, and two steps back to “acceptable” in NBC. It is estimated that the “suitable” conditions will be preserved in the CENTRAL location of **TRABZON** without any change in EIC, and there will be a decrease to “marginal suitability”, similarly with one step back in PC and NBC. In the location of VAKFIKEBİR, it is estimated that the “extremely suitable” range will be preserved without any change in the EIC, and there will be a decline towards “suitable” and “very suitable”, respectively, with a decrease of one step in the PC and NBC.

In the location of KANDIRA of **KOCAELİ**, there will be one step back to “very suitable” in both approaches, EIC and PC, to “very suitable” and “acceptable”, respectively, and with two steps back to “acceptable” in NBC. In the CENTRAL location of **KOCAELİ**, no changes are foreseen for all three approaches.

SAKARYA also emerges as one of the provinces where the reductions will be the highest in its locations. Accordingly, it is estimated that Karasu will be the location with the greatest decrease in **SAKARYA**. It is predicted that this decrease will be one step from “extremely suitable” to “very suitable” in EIC, 3 steps from “extremely suitable” to “acceptable” in PC, and two from” extremely suitable” to “suitable” in NBC. It is estimated that there will be a decrease in three approaches in the location of KAYNARCA, a decline to “very suitable” with a step in EIC, to “acceptable” with a step in PC and to “acceptable” with two steps in NBC. Another decrease is foreseen as the location of SAPANCA. Accordingly, it is predicted that there will be no change with “extremely suitable” according to EIC, and there will be a decrease towards “acceptable” and “suitable”, respectively, by decreasing two steps as regards to PC and NBC. It is estimated that there will be no change in the location of GEYVE according to all three approaches. In the location of KARAPÜRÇEK, it is expected that there will be no change according to EIC, and it is expected to decrease to “suitable” and “very suitable”, respectively, with one step back, according to PC and NBC. In the location of HENDEK, no change is expected in EIC and NBC, and it is predicted that there will be a decrease towards “suitable” with two steps in the PC. In the CENTRAL location of **SAKARYA**, it is estimated that there will be no change with “extremely suitable” in climate suitability as regards to EIC and it will decrease towards “acceptable” and “suitable”, respectively, by one step decrease in PC and NBC. The location of KOCAALİ of **SAKARYA** is one of the locations where climate suitability decreases. Accordingly, it is predicted that there will be a decrease to “very suitable” and “acceptable”, respectively, with one step decrease in the EIC and NBC, while the “acceptable” conditions will be maintained in the PC without any changes.

Similarly, the locations of AMASRA and KURUCAŞİLE of **BARTIN**, are not foreseen to change and remain “extremely suitable” in EIC and NBC, whereas a decrease to “suitable” with one step back. In the CENTRAL location of **BARTIN**, it is estimated that there will be no change in EIC, and there will be a decrease in PC and NBC towards “suitable” with one step.

It is estimated that there will be no change in other locations except AKÇAKOCA of **DÜZCE**, according to the NBC approach. Whereas in AKÇAKOCA, no change is expected in EIC and a decline towards “suitable” and “very suitable”, respectively with one step back in the PC and NBC. In the locations of CUMAYERİ, ÇİLİMLİ, GÖLYAKA, GÜMÜŞOVA and the CENTRAL location of **DÜZCE**, no change is expected as regards to EIC and NBC, and it is expected that there will be a decrease from “extremely suitable” to “suitable” with two steps in the PC. In the location of YIĞILCA, it is estimated that there will be no change according to EIC and NBC, and a decrease is expected from “very suitable” to “suitable” with a reduction by one step in PC.

In the location of DOĞANYURT and İNEBOLU of **KASTAMONU**, there will be no change with “extremely suitable”, “suitable”, and once again “extremely suitable” according to all three approaches, EIC, PC, and NBC. In the location of CİDE and BOZKURT, it is estimated that there will be no change as regards to EIC and NBC, and it is predicted that there will be a decline towards “suitable” with one step according to the PC.

It is estimated that there will be no change in the location of AYANCIK of **SİNOP** according to EIC and NBC, and a decline towards “very suitable” with one step back in PC.

No changes are expected in the locations of **ZONGULDAK** as regards to EIC, and it is estimated that in the location of ALAPLI, one step decrease will be to “suitable” and “very suitable” in PC and NBC, respectively. In the CENTRAL location of **ZONGULDAK**, it is predicted that the “extremely suitable” conditions will be sustained as regards to PC and NBC, and there will be a decline towards “suitable” conditions with a step decrease in PC. In the location of EREĞLİ, no change is foreseen according to EIC and PC, while it is estimated that there will be one step decrease towards “marginal suitable” in NBC.

Table 4.6. Projected Hazelnut Climate Suitability Index (HCSI) and Classification Change by location for the reference period of 1991-2012 and future period of 2021-2050 based on 3 approaches i.e., EIC, PC, and NBC with the variable weighted of RE model. Red down-arrow indicates decreases and green up-arrow indicates increases. Sole arrow, two-arrow, three- arrow, four-arrow indicate the change respectively one class, two class, three class, four-class change.

HAZELNUT CLIMATE SUITABLITY INDEX (HCSI) AND CLIMATE SUITABILITY CLASSIFICATION														
LOCATION ID	REGION	PROVINCE	LOCATION	BASELINE (1991-2012)				FUTURE (2021-2050)				CLASSIFICATION CHANGE (2021-2050 vs 1991-2012)		
				HCSI	EIC	PC	NBC	HCSI	EIC	PC	NBC	EIC	PC	NBC
344	Central Black Sea	Ordu	Fatsa	0.999594	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.791979	Very Suitable	Acceptable	Suitable	↓	↓↓↓	↓↓
506	Central Black Sea	Ordu	Kabadüz	0.998216	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.946445	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
186	Central Black Sea	Ordu	Çamaş	0.997461	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.958351	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
859	Central Black Sea	Ordu	Ulubey/Ordu	0.997436	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.947297	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
204	Central Black Sea	Ordu	Çatalpınar	0.997196	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.963282	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
209	Central Black Sea	Ordu	Çaybaşı	0.996024	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.965476	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
406	Central Black Sea	Ordu	Gürgentepe	0.995804	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.949937	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
460	Central Black Sea	Ordu	İkizce	0.992897	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.942932	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
672	Central Black Sea	Ordu	Ordu/Merkez	0.984888	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.725942	Very Suitable	Acceptable	Acceptable	↓	↓↓↓	↓↓↓
595	Central Black Sea	Ordu	Kumru	0.948957	Extremely Suitable	Very Suitable	Extremely Suitable	0.964293	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	⇔	⇔
576	Central Black Sea	Ordu	Korgan	0.873166	Extremely Suitable	Suitable	Very Suitable	0.939653	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↑	↑
29	Central Black Sea	Ordu	Akkuş	0.870368	Extremely Suitable	Suitable	Very Suitable	0.920463	Extremely Suitable	Suitable	Extremely Suitable	⇔	⇔	↑
484	Central Black Sea	Ordu	Kabataş	0.867733	Extremely Suitable	Suitable	Very Suitable	0.932452	Extremely Suitable	Suitable	Extremely Suitable	⇔	⇔	↑
700	Central Black Sea	Ordu	Perşembe	0.832838	Extremely Suitable	Acceptable	Suitable	0.574427	Suitable	Marginal Suitable	Acceptable	↓↓	↓	↓
396	Central Black Sea	Ordu	Gülyalı	0.764878	Very Suitable	Acceptable	Acceptable	0.548143	Suitable	Marginal Suitable	Acceptable	↓	↓	⇔
866	Central Black Sea	Ordu	Ünye	0.673239	Very Suitable	Acceptable	Acceptable	0.507053	Suitable	Marginal Suitable	Acceptable	↓	↓	⇔
88	Central Black Sea	Ordu	Aybastı	0.636092	Very Suitable	Acceptable	Acceptable	0.771376	Very Suitable	Acceptable	Acceptable	⇔	⇔	⇔
378	Central Black Sea	Ordu	Gölköy	0.562646	Suitable	Marginal Suitable	Acceptable	0.673044	Very Suitable	Acceptable	Acceptable	↑	↑	⇔
636	Central Black Sea	Ordu	Mesudiye	0.238358	Acceptable	Marginal Suitable	Marginal Suitable	0.389435	Acceptable	Marginal Suitable	Marginal Suitable	⇔	⇔	⇔
96	Central Black Sea	Samsun	Ayvacık/Samsun	0.995291	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.967741	Extremely Suitable	Extremely Suitable	Extremely Suitable	⇔	⇔	⇔
829	Central Black Sea	Samsun	Tekkeköy	0.984273	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.931172	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
725	Central Black Sea	Samsun	Salıpazarı	0.980842	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.921313	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
729	Central Black Sea	Samsun	Samsun/Merkez	0.959867	Extremely Suitable	Very Suitable	Extremely Suitable	0.824887	Extremely Suitable	Acceptable	Suitable	⇔	↓↓	↓↓
1	Central Black Sea	Samsun	19 Mayıs	0.939135	Extremely Suitable	Very Suitable	Extremely Suitable	0.774450	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
833	Central Black Sea	Samsun	Terme	0.925686	Extremely Suitable	Suitable	Extremely Suitable	0.680419	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓↓
199	Central Black Sea	Samsun	Çarşamba	0.886344	Extremely Suitable	Suitable	Very Suitable	0.649453	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
101	Central Black Sea	Samsun	Bafra	0.879561	Extremely Suitable	Suitable	Very Suitable	0.679461	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
318	Central Black Sea	Tokat	Erbaa	0.953465	Extremely Suitable	Very Suitable	Extremely Suitable	0.959234	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	⇔	⇔
72	Eastern Black Sea	Artvin	Arhavi	0.864191	Extremely Suitable	Suitable	Very Suitable	0.742265	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
647	Eastern Black Sea	Artvin	Murgul	0.774970	Very Suitable	Acceptable	Acceptable	0.822517	Extremely Suitable	Acceptable	Suitable	↑	⇔	↑
159	Eastern Black Sea	Artvin	Borçka	0.772365	Very Suitable	Acceptable	Acceptable	0.823336	Extremely Suitable	Acceptable	Suitable	↑	⇔	↑
548	Eastern Black Sea	Giresun	Keşap	0.976830	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.871556	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
336	Eastern Black Sea	Giresun	Espiye	0.944500	Extremely Suitable	Very Suitable	Extremely Suitable	0.705533	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
835	Eastern Black Sea	Giresun	Tirebolu	0.926708	Extremely Suitable	Suitable	Extremely Suitable	0.626659	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓↓
193	Eastern Black Sea	Giresun	Çanakçı	0.907234	Extremely Suitable	Suitable	Extremely Suitable	0.863854	Extremely Suitable	Suitable	Very Suitable	⇔	⇔	↓
174	Eastern Black Sea	Giresun	Bulancak	0.878532	Extremely Suitable	Suitable	Very Suitable	0.604787	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
263	Eastern Black Sea	Giresun	Dereli	0.871928	Extremely Suitable	Suitable	Very Suitable	0.900370	Extremely Suitable	Suitable	Very Suitable	⇔	⇔	⇔
881	Eastern Black Sea	Giresun	Yağlıdere	0.850337	Extremely Suitable	Suitable	Suitable	0.881003	Extremely Suitable	Suitable	Very Suitable	⇔	⇔	↑
369	Eastern Black Sea	Giresun	Giresun/Merkez	0.846606	Extremely Suitable	Acceptable	Suitable	0.569437	Suitable	Marginal Suitable	Acceptable	↓↓	↓	↓
283	Eastern Black Sea	Giresun	Doğankent	0.844981	Extremely Suitable	Acceptable	Suitable	0.855186	Extremely Suitable	Suitable	Very Suitable	⇔	↑	↑
42	Eastern Black Sea	Giresun	Piraziz	0.789475	Very Suitable	Acceptable	Acceptable	0.551916	Suitable	Marginal Suitable	Acceptable	↓	↓	⇔
340	Eastern Black Sea	Giresun	Eynesil	0.737894	Very Suitable	Acceptable	Acceptable	0.512794	Suitable	Marginal Suitable	Acceptable	↓	↓	⇔
390	Eastern Black Sea	Giresun	Güce	0.722523	Very Suitable	Acceptable	Acceptable	0.801585	Extremely Suitable	Acceptable	Suitable	↑	⇔	↑
387	Eastern Black Sea	Giresun	Görele	0.626155	Very Suitable	Acceptable	Acceptable	0.463829	Suitable	Marginal Suitable	Marginal Suitable	↓	↓	↓

One-class decrement	Two-class decrement	Three-class decrement	Four-class decrement	No change	One-class increment	Two-class increment	Three-class increment	Four-class increment
↓	↓↓	↓↓↓	↓↓↓↓	⇔	↑	↑↑	↑↑↑	↑↑↑↑

LOCATION ID	REGION	PROVINCE	LOCATION	BASELINE (1991-2012)				FUTURE (2021-2050)				CLASSIFICATION CHANGE (2021-2050 vs 1991-2012)		
				HCSI	EIC	PC	NBC	HCSI	EIC	PC	NBC	EIC	PC	NBC
350	Eastern Black Sea	Rize	Fındıklı	0.871795	Extremely Suitable	Suitable	Very Suitable	0.681812	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
726	Eastern Black Sea	Trabzon	Şalpazarı	0.982071	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.932533	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
76	Eastern Black Sea	Trabzon	Arsin	0.965997	Extremely Suitable	Very Suitable	Extremely Suitable	0.732297	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
875	Eastern Black Sea	Trabzon	Vakfıkebir	0.956240	Extremely Suitable	Very Suitable	Extremely Suitable	0.885687	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
133	Eastern Black Sea	Trabzon	Beşikdüzü	0.948616	Extremely Suitable	Very Suitable	Extremely Suitable	0.820568	Extremely Suitable	Acceptable	Suitable	⇔	↓↓	↓↓
913	Eastern Black Sea	Trabzon	Yomra	0.948576	Extremely Suitable	Very Suitable	Extremely Suitable	0.900985	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
811	Eastern Black Sea	Trabzon	Sürmene	0.948052	Extremely Suitable	Very Suitable	Extremely Suitable	0.880772	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
65	Eastern Black Sea	Trabzon	Araklı	0.899011	Extremely Suitable	Suitable	Very Suitable	0.749549	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
666	Eastern Black Sea	Trabzon	Of	0.874914	Extremely Suitable	Suitable	Very Suitable	0.850330	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
611	Eastern Black Sea	Trabzon	Maçka	0.829369	Extremely Suitable	Acceptable	Suitable	0.885244	Extremely Suitable	Suitable	Very Suitable	⇔	↑	↑
19	Eastern Black Sea	Trabzon	Akçaabat	0.786259	Very Suitable	Acceptable	Acceptable	0.541591	Suitable	Marginal Suitable	Acceptable	↓	↓	⇔
844	Eastern Black Sea	Trabzon	Trabzon/Merkez	0.593349	Suitable	Acceptable	Acceptable	0.484666	Suitable	Marginal Suitable	Marginal Suitable	⇔	↓	↓
200	Eastern Black Sea	Trabzon	Çarşıbaşı	0.463069	Suitable	Marginal Suitable	Marginal Suitable	0.449825	Suitable	Marginal Suitable	Marginal Suitable	⇔	⇔	⇔
499	Marmara	Kocaeli	Kandıra	0.885679	Extremely Suitable	Suitable	Very Suitable	0.771619	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
566	Marmara	Kocaeli	Kocaeli/Merkez	0.697121	Very Suitable	Acceptable	Acceptable	0.661332	Very Suitable	Acceptable	Acceptable	⇔	⇔	⇔
443	Marmara	Sakarya	Hendek	0.984753	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.910595	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
517	Marmara	Sakarya	Karasu	0.966469	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.790068	Very Suitable	Acceptable	Suitable	↓	↓↓↓	↓↓
37	Marmara	Sakarya	Akyazı	0.962505	Extremely Suitable	Very Suitable	Extremely Suitable	0.914446	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓	⇔
516	Marmara	Sakarya	Karapürçek	0.962277	Extremely Suitable	Very Suitable	Extremely Suitable	0.891347	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
731	Marmara	Sakarya	Sapanca	0.939770	Extremely Suitable	Very Suitable	Extremely Suitable	0.846335	Extremely Suitable	Acceptable	Suitable	⇔	↓↓	↓↓
347	Marmara	Sakarya	Ferizli	0.884753	Extremely Suitable	Suitable	Very Suitable	0.812570	Extremely Suitable	Acceptable	Suitable	⇔	↓	↓
723	Marmara	Sakarya	Sakarya/Merkez	0.882843	Extremely Suitable	Suitable	Very Suitable	0.826781	Extremely Suitable	Acceptable	Suitable	⇔	↓	↓
368	Marmara	Sakarya	Geyve	0.881327	Extremely Suitable	Suitable	Very Suitable	0.868309	Extremely Suitable	Suitable	Very Suitable	⇔	⇔	⇔
532	Marmara	Sakarya	Kaynarca	0.880182	Extremely Suitable	Suitable	Very Suitable	0.765853	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
796	Marmara	Sakarya	Söğütlü	0.842211	Extremely Suitable	Acceptable	Suitable	0.790651	Very Suitable	Acceptable	Suitable	↓	⇔	⇔
565	Marmara	Sakarya	Kocaali	0.824082	Extremely Suitable	Acceptable	Suitable	0.689911	Very Suitable	Acceptable	Acceptable	↓	⇔	↓
58	Western Black Sea	Bartın	Amasra	0.961652	Extremely Suitable	Very Suitable	Extremely Suitable	0.913183	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓	⇔
600	Western Black Sea	Bartın	Kurucaşile	0.960539	Extremely Suitable	Very Suitable	Extremely Suitable	0.927291	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓	⇔
116	Western Black Sea	Bartın	Bartın/Merkez	0.952372	Extremely Suitable	Very Suitable	Extremely Suitable	0.879157	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
234	Western Black Sea	Düzce	Çilimli	0.996360	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.917321	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
246	Western Black Sea	Düzce	Cumayeri	0.995855	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.921221	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
399	Western Black Sea	Düzce	Gümüşova	0.992438	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.929259	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
382	Western Black Sea	Düzce	Gölyaka	0.976713	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.933979	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
295	Western Black Sea	Düzce	Düzce/Merkez	0.969406	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.927517	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓↓	⇔
23	Western Black Sea	Düzce	Akçakoca	0.966403	Extremely Suitable	Very Suitable	Extremely Suitable	0.882922	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
910	Western Black Sea	Düzce	Yığılca	0.946912	Extremely Suitable	Very Suitable	Extremely Suitable	0.910416	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓	⇔
166	Western Black Sea	Kastamonu	Bozkurt/Kastamonu	0.962509	Extremely Suitable	Very Suitable	Extremely Suitable	0.924002	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓	⇔
228	Western Black Sea	Kastamonu	Cide	0.958016	Extremely Suitable	Very Suitable	Extremely Suitable	0.932126	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓	⇔
287	Western Black Sea	Kastamonu	Doğanyurt	0.937062	Extremely Suitable	Suitable	Extremely Suitable	0.931518	Extremely Suitable	Suitable	Extremely Suitable	⇔	⇔	⇔
470	Western Black Sea	Kastamonu	İnebolu	0.936829	Extremely Suitable	Suitable	Extremely Suitable	0.907429	Extremely Suitable	Suitable	Extremely Suitable	⇔	⇔	⇔
86	Western Black Sea	Sinop	Ayancık	0.984918	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.953521	Extremely Suitable	Very Suitable	Extremely Suitable	⇔	↓	⇔
923	Western Black Sea	Zonguldak	Zonguldak/Merkez	0.956963	Extremely Suitable	Very Suitable	Extremely Suitable	0.924321	Extremely Suitable	Suitable	Extremely Suitable	⇔	↓	⇔
44	Western Black Sea	Zonguldak	Alaplı	0.955657	Extremely Suitable	Very Suitable	Extremely Suitable	0.897498	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
323	Western Black Sea	Zonguldak	Ereğli/Zonguldak	0.503206	Suitable	Marginal Suitable	Acceptable	0.421003	Suitable	Marginal Suitable	Marginal Suitable	⇔	⇔	↓

One-class decrement	Two-class decrement	Three-class decrement	Four-class decrement	No change	One-class increment	Two-class increment	Three-class increment	Four-class increment
↓	↓↓	↓↓↓	↓↓↓↓	⇔	↑	↑↑	↑↑↑	↑↑↑↑

4.4.2. Grape Results for 96 Locations

Overall scores and climate suitability classifications regarding climate suitability index under membership function are given in Table 4.7 and Table 4.8, according to both weighting methods i.e., FE and RE.

Table 4.7. The relationship between climate suitability classes and overall scores with the variables FE weighted for grape.

Suitability Class	EIC Overall Scores	PC Overall Scores	NBC Overall Scores
Marginal Suitability	0.00-0.20	0.00-0.50*	0.00-0.47
Acceptable	0.20-0.40	0.50-0.74	0.47-0.72
Suitable	0.40-0.60	0.74-0.89	0.72-0.86
Very Suitable	0.60-0.80	0.89-0.93	0.86-0.93
Extremely Suitable	0.80-1.00	0.93-1.00	0.93-1.00

Table 4.8. The relationship between climate suitability classes and overall scores with the variables RE weighted for grape.

Suitability Class	EIC Overall Scores	PC Overall Scores	NBC Overall Scores
Marginal Suitability	0.00-0.20	0.00-0.55	0.00-0.43
Acceptable	0.20-0.40	0.55-0.80	0.43-0.71
Suitable	0.40-0.60	0.80-0.95	0.71-0.86
Very Suitable	0.60-0.80	0.95-0.99	0.86-0.96
Extremely Suitable	0.80-1.00	0.99-1.00	0.96-1.00

*The values given in the table are rounded to 2 decimals.

In this part, 96 locations are considered in different regions of Turkey for grape, thresholds are specified by considering the climatic conditions of the region. Within this scope, for the variables of T_{max}, T_{min}, T_{mean}, Pr, AET, RH, WS in the January-October interval, 4 different thresholds were determined, upper, lower, and optimum for each variable monthly.

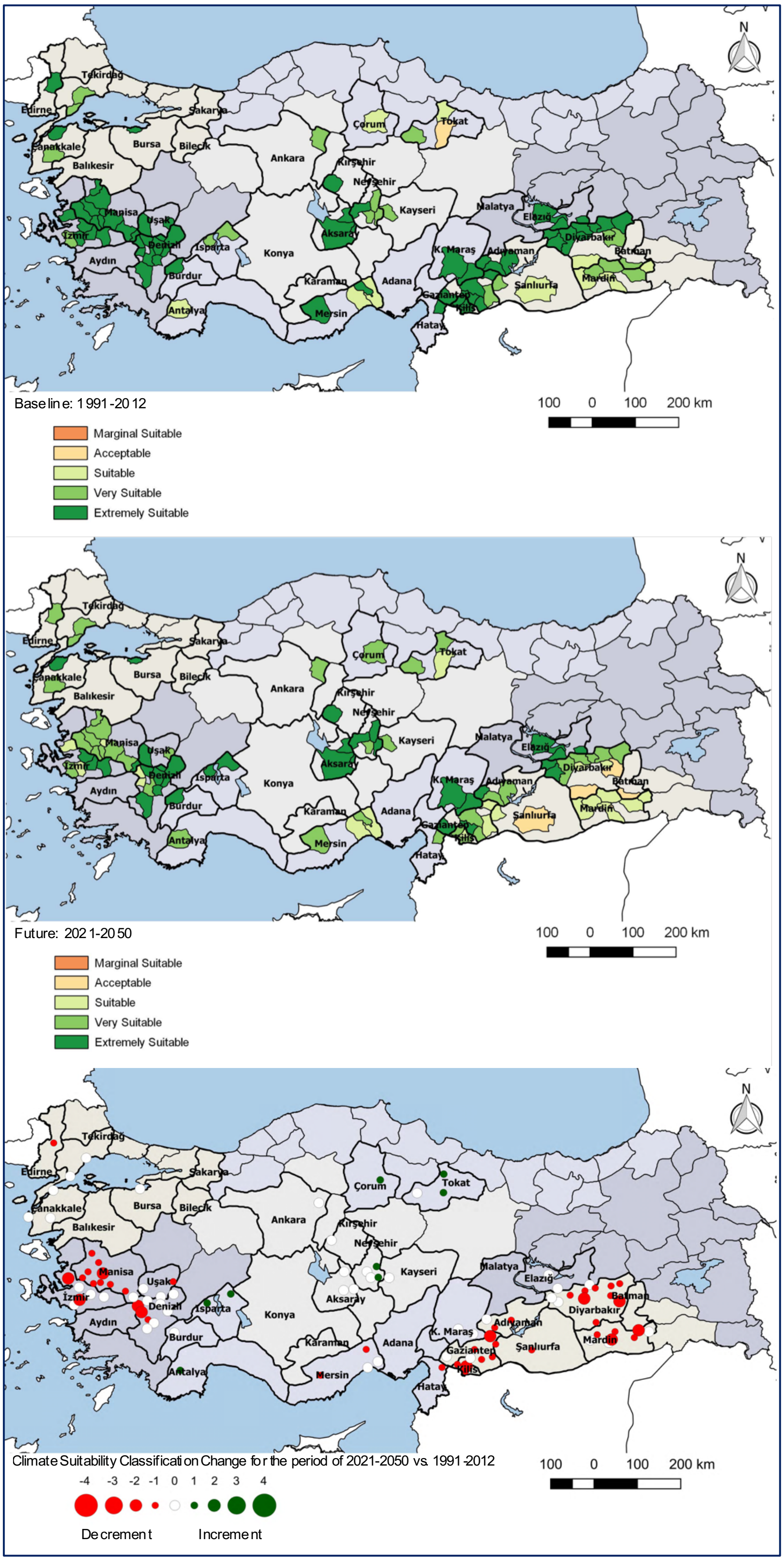


Figure 4.35. Location-basis spatial distribution of the projected **grape climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **EIC approach** with the variables weighted of **FE model**.

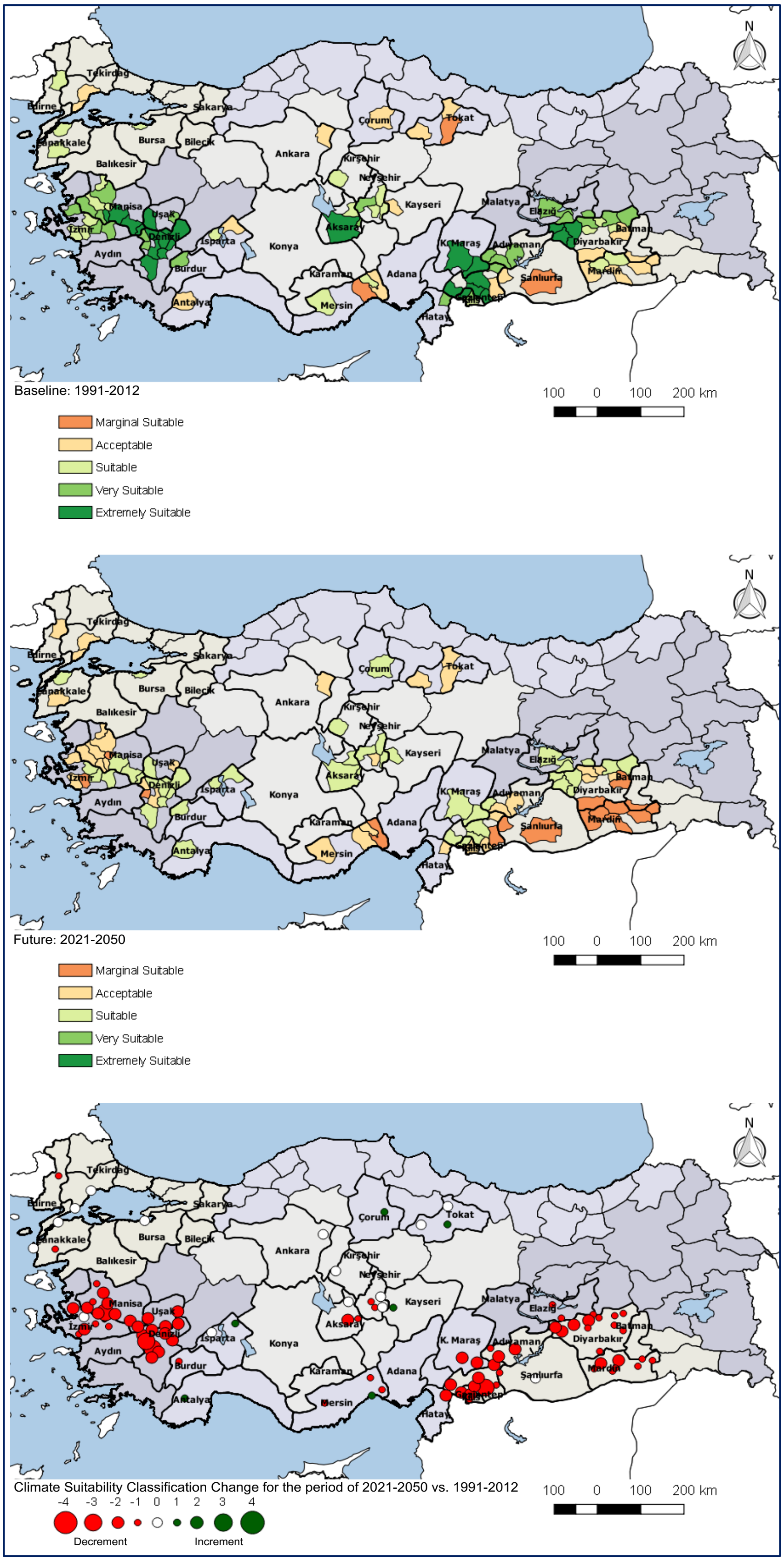


Figure 4.36. Location-basis spatial distribution of the projected **grape climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **PC approach** with the variables weighted of **FE model**.

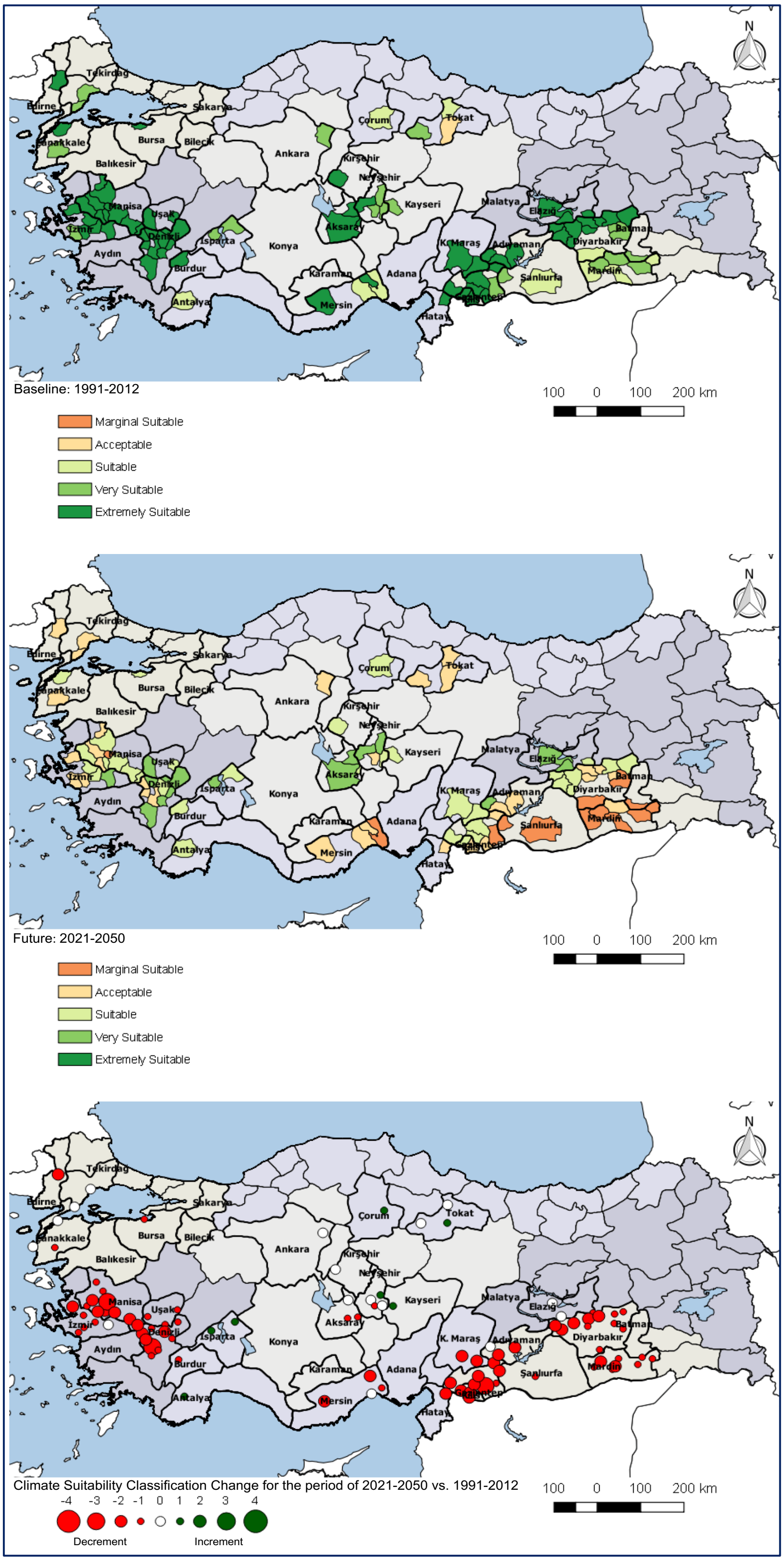


Figure 4.37. Location-basis spatial distribution of the projected **grape climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **NBC approach** with the variables weighted of **FE model**.

Grape climate suitability index and climate suitability classification changes by location with variables weighted as for the FE model are given in detail in Table 4.9. In addition, the classifications distribution by location and the classification change for the period of 2021-2050 vs. 1991-2012 are presented in Figure 4.35 for the EIC approach, Figure 4.36 for the PC approach and Figure 4.37 for the NBC approach. Hereunder, let's examine 96 locations in which 16 grape varieties are produced in terms of climatic suitability conditions.

According to all three approaches, in Besni and Central location of **ADIYAMAN**, a similar decrease is observed in climatic suitability conditions, and it is seen that these two draw attention as the most decreasing locations. Accordingly, it is estimated that as for PC and NBC, it will decrease towards "acceptable" conditions by two steps and in EIC it will decrease to "very suitable" by one step. In the location of Gölbaşı, it is estimated that "extremely suitable" in EIC and "very suitable" conditions in NBC are protected, while there will be a step back towards "suitable" in PC.

In the central location of **AKSARAY**, "extremely suitable" conditions are preserved at EIC, and it is estimated that there will be a decrease to "suitable" with two steps in the PC and "very suitable" with one step in the NBC. In the location of ORTAKÖY, "extremely suitable", "very suitable" and "suitable" conditions are expected to continue, respectively in EIC, PC and NBC. In the location of GÜLAĞAÇ, it is estimated that "extremely suitable" conditions will maintain as for EIC, a decrease with a step back in PC and NBC.

It is observed that in the location of KALECİK of **AKSARAY, "**very suitable" conditions in EIC and "acceptable" conditions in PC and NBC will be preserved.

It is estimated that "very suitable" conditions will be seen with one step forward in EIC and "suitable" conditions will be seen with one step forward once again in PC and NBC in the location of ELMALI of **ANTALYA**.

A decrease is expected to "acceptable" with two steps back in EIC, and to "marginal suitable" with one step back in PC and NBC in the location of GERCÜŞ of **BATMAN**.

In the location of YEŞİLOVA of **BURDUR**, while "extremely suitable" conditions are maintained in EIC, a decrease is expected towards "suitable" with a one-step-back in PC and NBC.

In the location of MUDANYA of **BURSA**, it is expected the “extremely suitable” conditions to continue in EIC, “suitable” conditions to continue in PC, and a decrease wit one step back towards “suitable” in NBC.

While the very suitable conditions are maintained as for EIC, it is estimated that “acceptable” conditions will occur with a step back in PC and NBC in the location of BAYRAMİÇ of **ÇANAKKALE**. In the location of BOZCAADA, it is expected to protect “suitable” conditions according to EIC, “marginal suitable” conditions in PC, and “acceptable” conditions according to NBC. In the location of LAPSEKİ, it is foreseen that “extremely suitable” conditions in EIC, and “suitable” conditions will be preserved in PC and NBC.

It is expected that the climatic suitability conditions go to “very suitable” with one step forward in EIC and to “suitable “with one step forward in PC and NBC in the CENTRAL location of **ÇORUM**.

The location of SARAYKÖY of **DENİZLİ** draws attention as the location with the highest expectation of decrease. Accordingly, it is expected that there will be a decrease in EIC and NBC, respectively, towards “suitable” and “acceptable” conditions with two steps back, and towards “marginal suitability” with three steps back in PC. Following Sarayköy, the location of BULDAN is one of the locations that is expected to decrease the most. Accordingly, in Buldan, it is expected to decrease to “suitable” with two-step back in EIC, while to “acceptable” conditions with two steps back in PC and NBC. The locations of BAKLAN, BEKİLLİ, ÇİVRİL, GÜNEY, HONAZ, and TAVAS show similar characteristics, and “extremely suitable” conditions are preserved in the EIC. It is expected that the “suitable” conditions with a two-step decline in the PC and the “very suitable” conditions with one step decline in the NBC. “Extremely suitable” conditions continue in the location of ÇAL in EIC, and it is estimated that there will be a decrease to “suitable” conditions with two steps back in PC and NBC. In the CENTRAL location of **DENİZLİ**, it is expected to decrease to a “very suitable” with one step back in EIC and to “acceptable” with three steps back in PC and NBC.

A decrease expectation is observed in all locations of **DİYARBAKIR,** and it is predicted that these decreases will be stronger in some locations. The locations of ÇERMİK and ÇÜNGÜŞ show similar characteristics with “extremely suitable” in EIC, and a two-step back to “suitable” conditions is expected in PC and NBC. In the location of DICLE, a decline is foreseen to “suitable” with one step back in EIC and to “acceptable” with two steps back in PC and NBC. In the location of SİLVAN, It is estimated that there will be a decrease to “acceptable” with two steps back in EIC and to “marginal suitable” with a step in PC and NBC. The locations of KULP and LİCE Kulp show a decrease to “very suitable” with one step in EIC, and into “suitable” conditions with a step in PC and NBC. In the location of EĞİL, it decreases to “suitable” conditions with two steps in EIC and to “acceptable” conditions with one step in PC and NBC. In the location of HAZRO, a decline is expected in all three approaches, and this decline is expected towards “suitable” in EIC and towards “acceptable” in PC and NBC. In the location of ÇINAR, a decline is foreseen in all three approaches, and it is estimated that this decline will be towards “acceptable” in EIC and towards “marginal suitable” conditions in PC and NBC. The location of ERGANİ shows a decline towards “very suitable” with one step back and towards “suitable” with two steps back as for PC and NBC.

In the location of UZUNKÖPRÜ of **EDİRNE**, it is predicted that there will be a decrease to “very suitable” with one step in the EIC and to “acceptable” conditions with one step in the PC and NBC.

While the “extremely suitable” conditions are maintained in EIC, it is expected to decline towards “suitable” conditions in PC and NBC in the location of ARICAK of **ELAZIĞ.** On the other hand, the “extremely suitable” and “very suitable” conditions are maintained respectively in EIC and NBC in the CENTRAL location of **ELAZIĞ**, it is expected that there will be a step reduction towards “suitable” in PC. In the location of MADEN, “extremely suitable” and “very suitable” conditions are preserved respectively in EIC and NBC, while “suitable” conditions are expected to occur with a decline in the PC.

The province of **GAZİANTEP** is emerging as one of the provinces with a decrease in all locations. The location of OĞUZELİ attracts attention as the location with the most decrease in climatic suitability. Accordingly, a decline is expected to “very suitable” wit one step back in the EIC, to “acceptable” conditions with three steps back in the PC and NBC. The location of ARABAN is among the locations expected to decrease the most, and the climatic suitability in the location is expected to decrease to “suitable” with two steps in the EIC and to “acceptable” with once again two steps in the PC and NBC. Similarly, in the locations of ŞAHİNBEY and ISLAHİYE, it is expected to decrease to “suitable” conditions with two steps as regards to PC and NBC, while in EIC, they maintain “extremely suitable” conditions. In the location of ŞEHİTKAMİL, a decline is expected to “very suitable” with one step in EIC and to “very suitable” with two steps in PC and NBC. It is estimated that there will be one step reduction to “suitable” in the EIC and two steps reduction to the “marginal suitable” in the PC and NBC in the location of NİZİP.

In the location of HASSA of **HATAY**, it is expected to decrease to “very suitable” conditions with one step back in EIC, and to “acceptable” conditions with two stes back as regards to PC and NBC.

In the location of YALVAÇ of **ISPARTA**, it is foreseen to improve to “extremely suitable” with one step forward in EIC projection, and to “suitable” conditions with a step forward in PC and NBC. In the location of SENİRKENT, it is expected that “suitable” conditions will continue in EIC, and one step forward towards to “extremely suitable” and “very suitable” conditions, respectively in PC and NBC.

In the locations of MENEMEN and TORBALI of **İZMİR**, two steps decrease is foreseen for all three projections, but it is towards “suitable” in EIC, towards “acceptable” in PC and NBC in MENEMEN, and it is towards to “suitable” in EIC, towards “marginal suitable” in PC and towards “acceptable” in NBC in TORBALI. In the location of BAYINDIR “extremely suitable” conditions are expected to continue in EIC, while it is expected to decrease to “suitable” by one-step reduction in PC and NBC. In the location of ÖDEMİŞ, “extremely suitable” and “very suitable” conditions are preserved in EIC and NBC, respectively and “suitable” conditions with one step back are envisaged in NBC. In the location of KEMALPAŞA, “extremely suitable” and “suitable” conditions are preserved in EIC and PC, respectively, a step reduction is expected towards “suitable” conditions according to the NBC approach. In the location of MENDERES, while “very suitable” conditions are maintained in EIC, one step reduction is expected in PC and NBC towards “acceptable” conditions.

Similarly, in the CENTRAL location and PAZARCIK of **KAHRAMANMARAŞ**, “extremely suitable” conditions are maintained in EIC, and it is foreseen that “suitable” conditions will be constituted with two steps decrease in PC and NBC.

It is expected that the conditions will become “suitable” with one step forward in PC and NBC, while maintaining “very suitable” conditions in EIC in the location of İNCESU of **KAYSERİ**.

The location of KAMAN of **KIRŞEHİR** maintains its conditions in all three approaches, “extremely suitable” in EIC, and “suitable” in PC and NBC.

The location of POLATELİ of KİLİS draws attention as one of the locations to be the most reduced. Accordingly, a two-step decreases to “suitable” in the EIC, and a two-step decrease to “acceptable” in PC and NBC are expected. In the location of MUSABEYLİ, it is expected that there will be a decrease towards “suitable” conditions with a one-step decline in EIC and with a two-step decline in the PC and NBC. A reduction is foreseen in the CENTRAL location, and accordingly, it is predicted that there will be a decrease in EIC with one step towards “very suitable” and with one step in PC and two steps in NBC to “acceptable”.

MANİSA is the most critical province in grape production. Therefore, it is also important as it will experience expected reductions in climatic suitability in the future. Accordingly, the location of AHMETLİ of **MANİSA** has the highest expectation of decreasing in all three approaches, accordingly, it is expected that there will be “very suitable” conditions with one step back in EIC, “acceptable” conditions with three steps back in PC and “suitable” conditions with two steps back in NBC. It is estimated that in the locations of ALAŞEHİR and SALİHLİ, “suitable” conditions may decrease in all three approaches with similar behavior, to “very suitable” with one step in EIC and to “suitable” conditions with two steps in PC and NBC. Similarly, AKHİSAR and CENTRAL locations are expected to decline to “very suitable” with one step in EIC, towards “acceptable” with two steps according to PC, and towards “suitable” with one step back as regards to NBC. The location of KIRKAĞAÇ shows a decline to “very suitable” with one step in EIC, and it decreases to “acceptable” with one step in PC and NBC. It is estimated that there will be a decrease towards “very suitable” with one step back in EIC and with one step towards “acceptable” with two steps back in PC and NBC in the location of TURGUTLU. In the location of SARUHANLI, it is expected that there will be a decrease towards “very suitable” with one step in EIC, towards “acceptable” conditions with one step in PC, and one again towards “acceptable” with two steps back in NBC. The location of SARIGÖL while maintaining “extremely suitable” conditions in EIC, shows a decline to “suitable” with two steps in PC and NBC.

Similar behavior is observed in the locations of DARGEÇİT, DERİK, and CENTRAL of **MARDİN**. “Suitable” conditions are preserved according to EIC, and it is expected to decrease to “marginal suitable” with one step back in PC and NBC. In the location of YEŞİLLİ, it is expected to decrease to “acceptable” with two steps in EIC, to “marginal suitable” with one step in PC and with two steps in NBC. In the location of MAZIDAĞI, it is expected that there will be a decrease towards “suitable” with one step, and towards “marginal suitable” with two steps in PC and NBC. The climate suitability conditions decrease to “suitable” in EIC and to “marginal suitable” in PC and NBC by one step back in the location of MİDYAT. On the other hand, in the location of SAVUR it decreases to “suitable” in EIC, to “marginal suitable” in PC, and to “acceptable” in NBC by one step back.

In the location of ÇAMLIYAYLA of **MERSİN**, a decline is expected with a step in EIC to “very suitable”, with a step in PC and with two steps in NBC towards “acceptable”. It is predicted that there will be a decrease towards “very suitable” with one step in the EIC, towards “acceptable” with one in the PC and “acceptable” with two in the NBC in the location of MUT. While “suitable” conditions are preserved in EIC in the location of TARSUS, a decline is expected in PC and NBC with a step towards “marginal suitable”. In the CENTRAL location while “suitable” and “acceptable” conditions are maintained in EIC and NBC respectively, a rise with a step forward in PC is expected towards “acceptable”.

In the location of AVANOS of **NEVŞEHİR**, it is expected to increase towards “extremely suitable” and “very suitable” conditions in EIC and NBC, respectively, and to maintain “suitable” conditions in PC. While “very suitable” and “suitable” conditions are expected to continue in PC and NBC respectively in the location of ÜRGÜP, it is estimated that there will be a one-step forward to “extremely suitable” in EIC. In the location of GÜLŞEHİR, while “extremely suitable” and “very suitable” conditions are preserved in EIC and NBC respectively, “suitable” conditions are expected to occur with a step reduction in the PC. In the CENTRAL location, while “acceptable” conditions occur in PC and NBC wit a one step back, it is estimated that “very suitable” conditions will continue in the same way in EIC.

It is predicted that there will be a reduction to “acceptable” and “marginal suitable” in EIC and NBC, respectively by one step back and while “marginal suitable” conditions will be preserved in the PC in the CENTRAL location of **ŞANLIURFA**. The locatioın of HALFETİ, on the other hand, shows a decrease to “suitable” with one step in EIC and, one and two steps back, respectively, towards “marginal suitable” in PC and NBC.

“Very suitable” and “acceptable” conditions are maintained in EIC, PC and NBC respectively “very suitable”, “acceptable” and “acceptable” in all three approaches in the locations of ŞARKÖY and CENTRAL of **TEKİRDAĞ**.

In the location of ZİLE of **TOKAT**, it is expected that the existing conditions in PC and NBC will be maintained in an “acceptable” range, and “very suitable” conditions will also be preserved in

EIC. On the other hand, it is expected that there will be a step forward to “suitable” conditions in EIC in the CENTRAL location, and an increase to “acceptable” conditions with a step forward in PC and NBC. In the location of ERBAA, it is expected that “very suitable” conditions will occur with one step forward in EIC, while “acceptable” conditions will continue according to PC and NBC.

In the location of SİVASLI of **UŞAK**, it is expected to occur “very suitable” and “suitable” conditions, in EIC and NBC respectively, with a decrease in one step, while a decrease in the PC is expected to “acceptable” by two steps. In the location of EŞME, while “extremely suitable” conditions are preserved in EIC, it is expected that a decrease to “suitable” conditions with two-step back in PC and “very suitable” conditions will occur with a one-step reduction in NBC

Table 4.9. Projected Grape Climate Suitability Index (GCSI) and Classification Change by location for the reference period of 1991-2012 and future period of 2021-2050 based on 3 approaches i.e., EIC, PC, and NBC with the variables weighted of FE model. Red down-arrow indicates decreases and green up-arrow indicates increases. Sole arrow, two-arrow, three- arrow, four-arrow indicate the change respectively one class, two class, three class, four-class change.

GRAPE CLIMATE SUITABLITY INDEX (GCSI) AND CLIMATE SUITABILITY CLASSIFICATION															
LOCATION ID	REGION	PROVINCE	LOCATION	BASELINE (1991-2012)				FUTURE (2021-2050)				CLASSIFICATION CHANGE (2021-2050 vs 1991-2012)		
				GCSI	EIC	PC	NBC	GCSI	EIC	PC	NBC	EIC	PC	NBC
108	Aegean	Denizli	Baklan	0.936109	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.865849	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
131	Aegean	Denizli	Bekilli	0.936109	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.885230	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
183	Aegean	Denizli	Çal	0.936109	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.811417	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
236	Aegean	Denizli	Çivril	0.936109	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.868936	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
825	Aegean	Denizli	Tavas	0.936109	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.883555	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
449	Aegean	Denizli	Honaz	0.935851	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.859983	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
260	Aegean	Denizli	Denizli/Merkez	0.935213	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.707123	Very Suitable	Acceptable	Acceptable	↓	↓↓↓	↓↓↓
401	Aegean	Denizli	Güney	0.931421	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.862135	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
176	Aegean	Denizli	Buldan	0.930986	Extremely Suitable	Very Suitable	Very Suitable	0.585140	Suitable	Acceptable	Acceptable	↓↓	↓↓	↓↓
737	Aegean	Denizli	Sarayköy	0.917504	Extremely Suitable	Very Suitable	Very Suitable	0.473874	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓↓	↓↓
665	Aegean	İzmir	Ödemiş	0.918939	Extremely Suitable	Very Suitable	Very Suitable	0.869175	Extremely Suitable	Suitable	Very Suitable	⇔	↓	⇔
126	Aegean	İzmir	Bayındır	0.910250	Extremely Suitable	Very Suitable	Very Suitable	0.823105	Extremely Suitable	Suitable	Suitable	⇔	↓	↓
631	Aegean	İzmir	Menemen	0.893659	Extremely Suitable	Very Suitable	Very Suitable	0.592516	Suitable	Acceptable	Acceptable	↓↓	↓↓	↓↓
543	Aegean	İzmir	Kemalpaşa/İzmir	0.874054	Extremely Suitable	Suitable	Very Suitable	0.813494	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
840	Aegean	İzmir	Torbalı	0.859576	Extremely Suitable	Suitable	Suitable	0.473159	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓	↓
630	Aegean	İzmir	Menderes	0.780982	Very Suitable	Suitable	Suitable	0.702610	Very Suitable	Acceptable	Acceptable	⇔	↓	↓
45	Aegean	Manisa	Alaşehir	0.936109	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.785384	Very Suitable	Suitable	Suitable	↓	↓↓	↓↓
740	Aegean	Manisa	Sarıgöl	0.936109	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.814858	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
724	Aegean	Manisa	Salihli	0.936042	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.787449	Very Suitable	Suitable	Suitable	↓	↓↓	↓↓
18	Aegean	Manisa	Ahmetli	0.935142	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.717566	Very Suitable	Acceptable	Suitable	↓	↓↓↓	↓↓
847	Aegean	Manisa	Turgutlu	0.927539	Extremely Suitable	Very Suitable	Very Suitable	0.712954	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓
25	Aegean	Manisa	Akhisar	0.926558	Extremely Suitable	Very Suitable	Very Suitable	0.718867	Very Suitable	Acceptable	Suitable	↓	↓↓	↓
620	Aegean	Manisa	Manisa/Merkez	0.893513	Extremely Suitable	Very Suitable	Very Suitable	0.724684	Very Suitable	Acceptable	Suitable	↓	↓↓	↓
750	Aegean	Manisa	Saruhanlı	0.878194	Extremely Suitable	Suitable	Very Suitable	0.653023	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
379	Aegean	Manisa	Gölmarmara	0.875429	Extremely Suitable	Suitable	Very Suitable	0.435375	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓↓	↓↓↓
558	Aegean	Manisa	Kırkağaç	0.832806	Extremely Suitable	Suitable	Suitable	0.658261	Very Suitable	Acceptable	Acceptable	↓	↓	↓
335	Aegean	Uşak	Eşme	0.935569	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.865043	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
788	Aegean	Uşak	Sivaslı	0.926102	Extremely Suitable	Very Suitable	Very Suitable	0.723720	Very Suitable	Acceptable	Suitable	↓	↓↓	↓
243	Black Sea	Çorum	Çorum/Merkez	0.534936	Suitable	Acceptable	Acceptable	0.751624	Very Suitable	Suitable	Suitable	↑	↑	↑
922	Black Sea	Tokat	Zile	0.664335	Very Suitable	Acceptable	Acceptable	0.640655	Very Suitable	Acceptable	Acceptable	⇔	⇔	⇔
318	Black Sea	Tokat	Erbaa	0.585845	Suitable	Acceptable	Acceptable	0.698018	Very Suitable	Acceptable	Acceptable	↑	⇔	⇔
836	Black Sea	Tokat	Tokat/Merkez	0.292419	Acceptable	Marginal Suitable	Marginal Suitable	0.502314	Suitable	Acceptable	Acceptable	↑	↑	↑
32	Central Anatolia	Aksaray	Aksaray/Merkez	0.932503	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.881327	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
393	Central Anatolia	Aksaray	Gülağaç	0.892084	Extremely Suitable	Very Suitable	Very Suitable	0.824437	Extremely Suitable	Suitable	Suitable	⇔	↓	↓
677	Central Anatolia	Aksaray	Ortaköy/Aksaray	0.868054	Extremely Suitable	Suitable	Very Suitable	0.885912	Extremely Suitable	Suitable	Very Suitable	⇔	⇔	⇔
496	Central Anatolia	Ankara	Kalecik	0.605896	Very Suitable	Acceptable	Acceptable	0.663831	Very Suitable	Acceptable	Acceptable	⇔	⇔	⇔
468	Central Anatolia	Kayseri	İncesu	0.626151	Very Suitable	Acceptable	Acceptable	0.756857	Very Suitable	Suitable	Suitable	⇔	↑	↑
498	Central Anatolia	Kırşehir	Kaman	0.833216	Extremely Suitable	Suitable	Suitable	0.830137	Extremely Suitable	Suitable	Suitable	⇔	⇔	⇔
395	Central Anatolia	Nevşehir	Gülşehir	0.888029	Extremely Suitable	Very Suitable	Very Suitable	0.865720	Extremely Suitable	Suitable	Very Suitable	⇔	↓	⇔
84	Central Anatolia	Nevşehir	Avanos	0.789575	Very Suitable	Suitable	Suitable	0.859976	Extremely Suitable	Suitable	Very Suitable	↑	⇔	↑
657	Central Anatolia	Nevşehir	Nevşehir/Merkez	0.768029	Very Suitable	Suitable	Suitable	0.712245	Very Suitable	Acceptable	Acceptable	⇔	↓	↓
868	Central Anatolia	Nevşehir	Ürgüp	0.739955	Very Suitable	Suitable	Suitable	0.840308	Extremely Suitable	Suitable	Suitable	↑	⇔	⇔
73	East Anatolia	Elazığ	Arıcak	0.917262	Extremely Suitable	Very Suitable	Very Suitable	0.853370	Extremely Suitable	Suitable	Suitable	⇔	↓	↓
612	East Anatolia	Elazığ	Maden	0.909225	Extremely Suitable	Very Suitable	Very Suitable	0.866168	Extremely Suitable	Suitable	Very Suitable	⇔	↓	⇔
306	East Anatolia	Elazığ	Elazığ/Merkez	0.893457	Extremely Suitable	Very Suitable	Very Suitable	0.865755	Extremely Suitable	Suitable	Very Suitable	⇔	↓	⇔
642	Marmara	Bursa	Mudanya	0.864565	Extremely Suitable	Suitable	Very Suitable	0.833468	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
607	Marmara	Çanakkale	Lapseki	0.827029	Extremely Suitable	Suitable	Suitable	0.816047	Extremely Suitable	Suitable	Suitable	⇔	⇔	⇔
128	Marmara	Çanakkale	Bayramiç	0.780875	Very Suitable	Suitable	Suitable	0.704351	Very Suitable	Acceptable	Acceptable	⇔	↓	↓

One-class decrement	Two-class decrement	Three-class decrement	Four-class decrement	No change	One-class increment	Two-class increment	Three-class increment	Four-class increment
↓	↓↓	↓↓↓	↓↓↓↓	⇔	↑	↑↑	↑↑↑	↑↑↑↑

GRAPE CLIMATE SUITABLITY INDEX (GCSI) AND CLIMATE SUITABILITY CLASSIFICATION														
LOCATION ID	REGION	PROVINCE	LOCATION	BASELINE (1991-2012)				FUTURE (2021-2050)				CLASSIFICATION CHANGE (2021-2050 vs 1991-2012)		
				GCSI	EIC	PC	NBC	GCSI	EIC	PC	NBC	EIC	PC	NBC
162	Marmara	Çanakkale	Bozcaada	0.480506	Suitable	Marginal Suitable	Acceptable	0.488931	Suitable	Marginal Suitable	Acceptable	⇔	⇔	⇔
874	Marmara	Edirne	Uzunköprü	0.872851	Extremely Suitable	Suitable	Very Suitable	0.671451	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
828	Marmara	Tekirdağ	Tekirdağ/Merkez	0.715385	Very Suitable	Acceptable	Acceptable	0.607960	Very Suitable	Acceptable	Acceptable	⇔	⇔	⇔
749	Marmara	Tekirdağ	Şarköy	0.638726	Very Suitable	Acceptable	Acceptable	0.699746	Very Suitable	Acceptable	Acceptable	⇔	⇔	⇔
312	Mediterranean	Antalya	Elmalı	0.593703	Suitable	Acceptable	Acceptable	0.799428	Very Suitable	Suitable	Suitable	↑	↑	↑
907	Mediterranean	Burdur	Yeşilova	0.923540	Extremely Suitable	Very Suitable	Very Suitable	0.855045	Extremely Suitable	Suitable	Suitable	⇔	↓	↓
431	Mediterranean	Hatay	Hassa	0.927580	Extremely Suitable	Very Suitable	Very Suitable	0.685651	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓
764	Mediterranean	Isparta	Senirkent	0.780601	Very Suitable	Suitable	Suitable	0.869876	Extremely Suitable	Suitable	Very Suitable	↑	⇔	↑
887	Mediterranean	Isparta	Yalvaç	0.631537	Very Suitable	Acceptable	Acceptable	0.820930	Extremely Suitable	Suitable	Suitable	↑	↑	↑
694	Mediterranean	Kahramanmaraş	Pazarcık	0.936080	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.850711	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
491	Mediterranean	Kahramanmaraş	Kahramanmaraş/Merkez	0.934759	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.852294	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
190	Mediterranean	Mersin	Çamlıyayla	0.884583	Extremely Suitable	Suitable	Very Suitable	0.711189	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
650	Mediterranean	Mersin	Mut	0.862653	Extremely Suitable	Suitable	Very Suitable	0.616427	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
819	Mediterranean	Mersin	Tarsus	0.529591	Suitable	Acceptable	Acceptable	0.458047	Suitable	Marginal Suitable	Marginal Suitable	⇔	↓	↓
455	Mediterranean	Mersin	İçel/Mersin	0.472364	Suitable	Marginal Suitable	Acceptable	0.596948	Suitable	Acceptable	Acceptable	⇔	↑	⇔
136	South East Anatolia	Adıyaman	Besni	0.926704	Extremely Suitable	Very Suitable	Very Suitable	0.654952	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓
374	South East Anatolia	Adıyaman	Gölbaşı/Adıyaman	0.917549	Extremely Suitable	Very Suitable	Very Suitable	0.864479	Extremely Suitable	Suitable	Very Suitable	⇔	↓	⇔
8	South East Anatolia	Adıyaman	Adıyaman/Merkez	0.910521	Extremely Suitable	Very Suitable	Very Suitable	0.648771	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓
362	South East Anatolia	Batman	Gercüş	0.656452	Very Suitable	Acceptable	Acceptable	0.383316	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓
325	South East Anatolia	Diyarbakır	Ergani	0.936109	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.791701	Very Suitable	Suitable	Suitable	↓	↓↓	↓↓
248	South East Anatolia	Diyarbakır	Çüngüş	0.935170	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.829915	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
223	South East Anatolia	Diyarbakır	Çermik	0.935013	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.823362	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
272	South East Anatolia	Diyarbakır	Dicle	0.909396	Extremely Suitable	Very Suitable	Very Suitable	0.668638	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓
608	South East Anatolia	Diyarbakır	Lice	0.903538	Extremely Suitable	Very Suitable	Very Suitable	0.785912	Very Suitable	Suitable	Suitable	↓	↓	↓
590	South East Anatolia	Diyarbakır	Kulp	0.896732	Extremely Suitable	Very Suitable	Very Suitable	0.792044	Very Suitable	Suitable	Suitable	↓	↓	↓
424	South East Anatolia	Diyarbakır	Hani	0.886970	Extremely Suitable	Suitable	Very Suitable	0.674769	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
303	South East Anatolia	Diyarbakır	Eğil	0.823877	Extremely Suitable	Suitable	Suitable	0.540129	Suitable	Acceptable	Acceptable	↓↓	↓	↓
440	South East Anatolia	Diyarbakır	Hazro	0.799815	Very Suitable	Suitable	Suitable	0.547308	Suitable	Acceptable	Acceptable	↓	↓	↓
778	South East Anatolia	Diyarbakır	Silvan	0.600046	Very Suitable	Acceptable	Acceptable	0.322639	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓
239	South East Anatolia	Diyarbakır	Çınar	0.555849	Suitable	Acceptable	Acceptable	0.389504	Acceptable	Marginal Suitable	Marginal Suitable	↓	↓	↓
758	South East Anatolia	Gaziantep	Şehitkamil	0.935289	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.755304	Very Suitable	Suitable	Suitable	↓	↓↓	↓↓
721	South East Anatolia	Gaziantep	Şahinbey	0.934724	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.821398	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
478	South East Anatolia	Gaziantep	Islahiye	0.934008	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.809621	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
667	South East Anatolia	Gaziantep	Oğuzeli	0.932800	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.609587	Very Suitable	Acceptable	Acceptable	↓	↓↓↓	↓↓↓
63	South East Anatolia	Gaziantep	Araban	0.915572	Extremely Suitable	Very Suitable	Very Suitable	0.572921	Suitable	Acceptable	Acceptable	↓↓	↓↓	↓↓
661	South East Anatolia	Gaziantep	Nizip	0.652386	Very Suitable	Acceptable	Acceptable	0.445526	Suitable	Marginal Suitable	Marginal Suitable	↓	↓	↓
649	South East Anatolia	Kilis	Musabeyli	0.933588	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.758564	Very Suitable	Suitable	Suitable	↓	↓↓	↓↓
707	South East Anatolia	Kilis	Polateli	0.926873	Extremely Suitable	Very Suitable	Very Suitable	0.596188	Suitable	Acceptable	Acceptable	↓↓	↓↓	↓↓
552	South East Anatolia	Kilis	Kilis/Merkez	0.880164	Extremely Suitable	Suitable	Very Suitable	0.652450	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
627	South East Anatolia	Mardin	Mazıdağı	0.780744	Very Suitable	Suitable	Suitable	0.466740	Suitable	Marginal Suitable	Marginal Suitable	↓	↓↓	↓↓
754	South East Anatolia	Mardin	Savur	0.764989	Very Suitable	Suitable	Suitable	0.500688	Suitable	Marginal Suitable	Acceptable	↓	↓↓	↓
906	South East Anatolia	Mardin	Yeşilli	0.728254	Very Suitable	Acceptable	Suitable	0.365213	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓↓
637	South East Anatolia	Mardin	Midyat	0.681660	Very Suitable	Acceptable	Acceptable	0.421694	Suitable	Marginal Suitable	Marginal Suitable	↓	↓	↓
622	South East Anatolia	Mardin	Mardin/Merkez	0.540757	Suitable	Acceptable	Acceptable	0.423577	Suitable	Marginal Suitable	Marginal Suitable	⇔	↓	↓
265	South East Anatolia	Mardin	Derik	0.538094	Suitable	Acceptable	Acceptable	0.443953	Suitable	Marginal Suitable	Marginal Suitable	⇔	↓	↓
253	South East Anatolia	Mardin	Dargeçit	0.502394	Suitable	Acceptable	Acceptable	0.457290	Suitable	Marginal Suitable	Marginal Suitable	⇔	↓	↓
418	South East Anatolia	Şanlıurfa	Halfeti	0.738771	Very Suitable	Acceptable	Suitable	0.452094	Suitable	Marginal Suitable	Marginal Suitable	↓	↓	↓↓
867	South East Anatolia	Şanlıurfa	Şanlıurfa/Merkez	0.498833	Suitable	Marginal Suitable	Acceptable	0.325962	Acceptable	Marginal Suitable	Marginal Suitable	↓	⇔	↓

One-class decrement	Two-class decrement	Three-class decrement	Four-class decrement	No change	One-class increment	Two-class increment	Three-class increment	Four-class increment
↓	↓↓	↓↓↓	↓↓↓↓	⇔	↑	↑↑	↑↑↑	↑↑↑↑

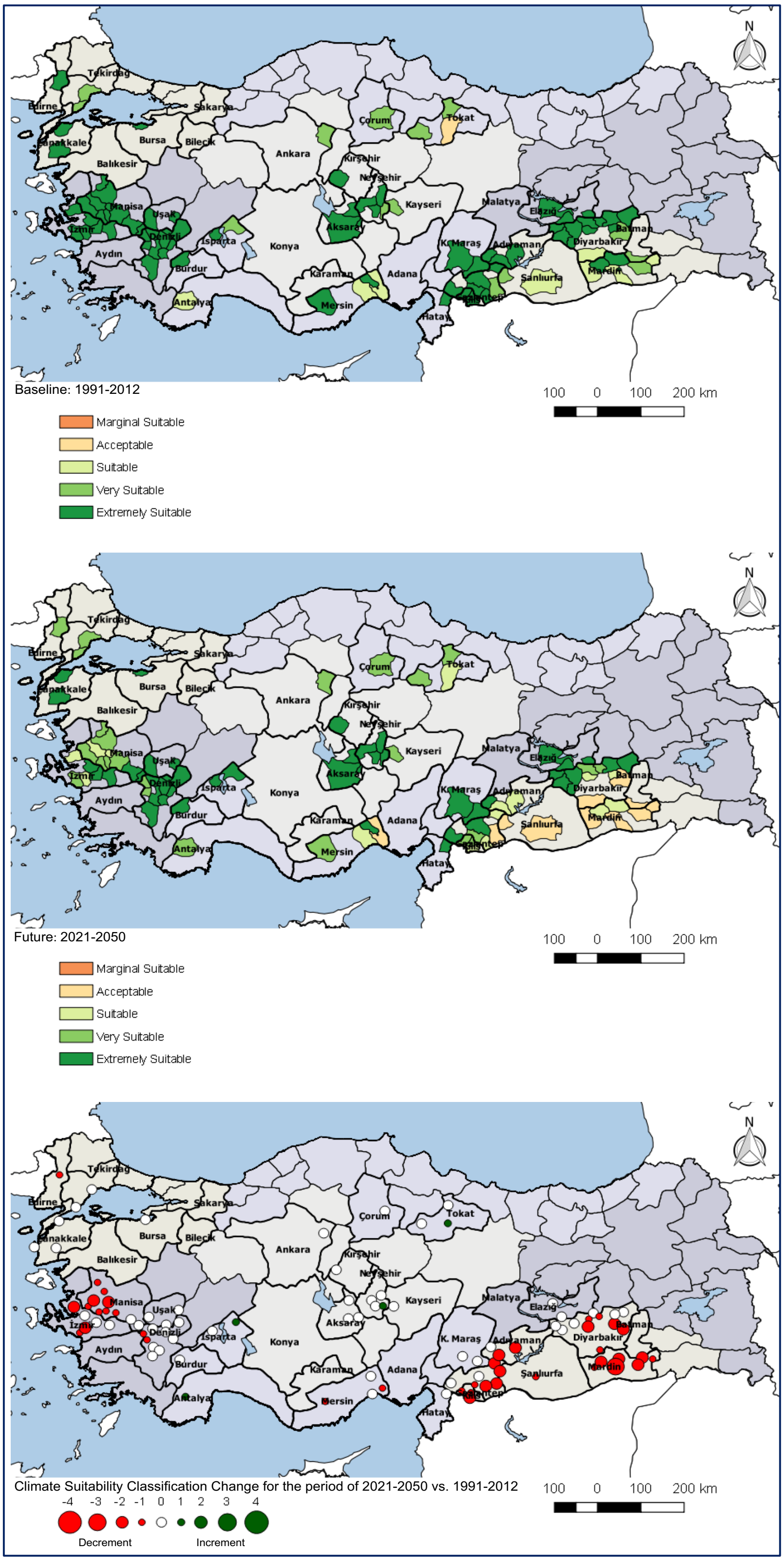


Figure 4.38. Location-basis spatial distribution of the projected **grape climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **EIC approach** with the variables weighted of **RE model**.

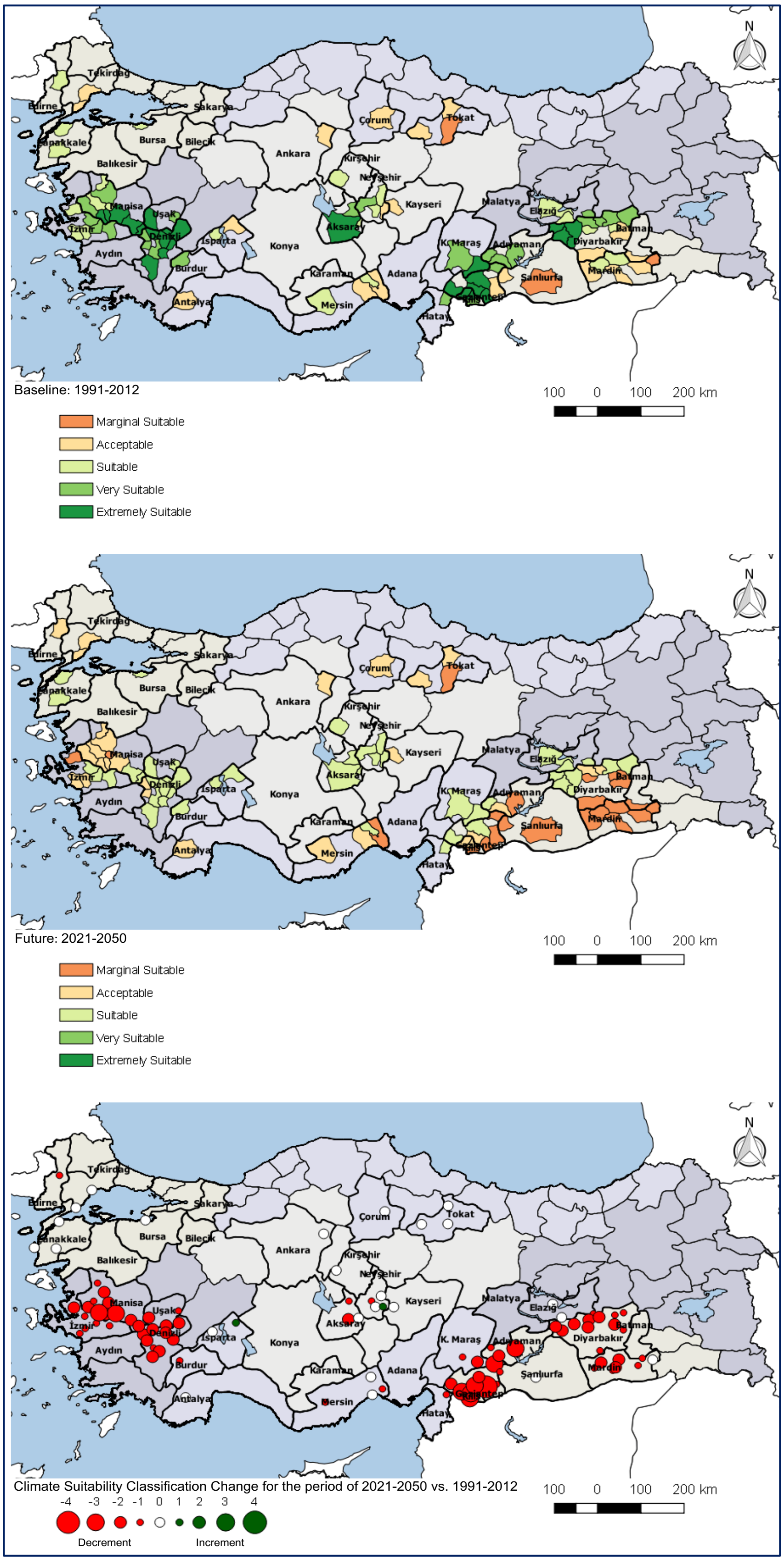


Figure 4.39. Location-basis spatial distribution of the projected **grape climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **PC approach** with the variables weighted of **RE model**.

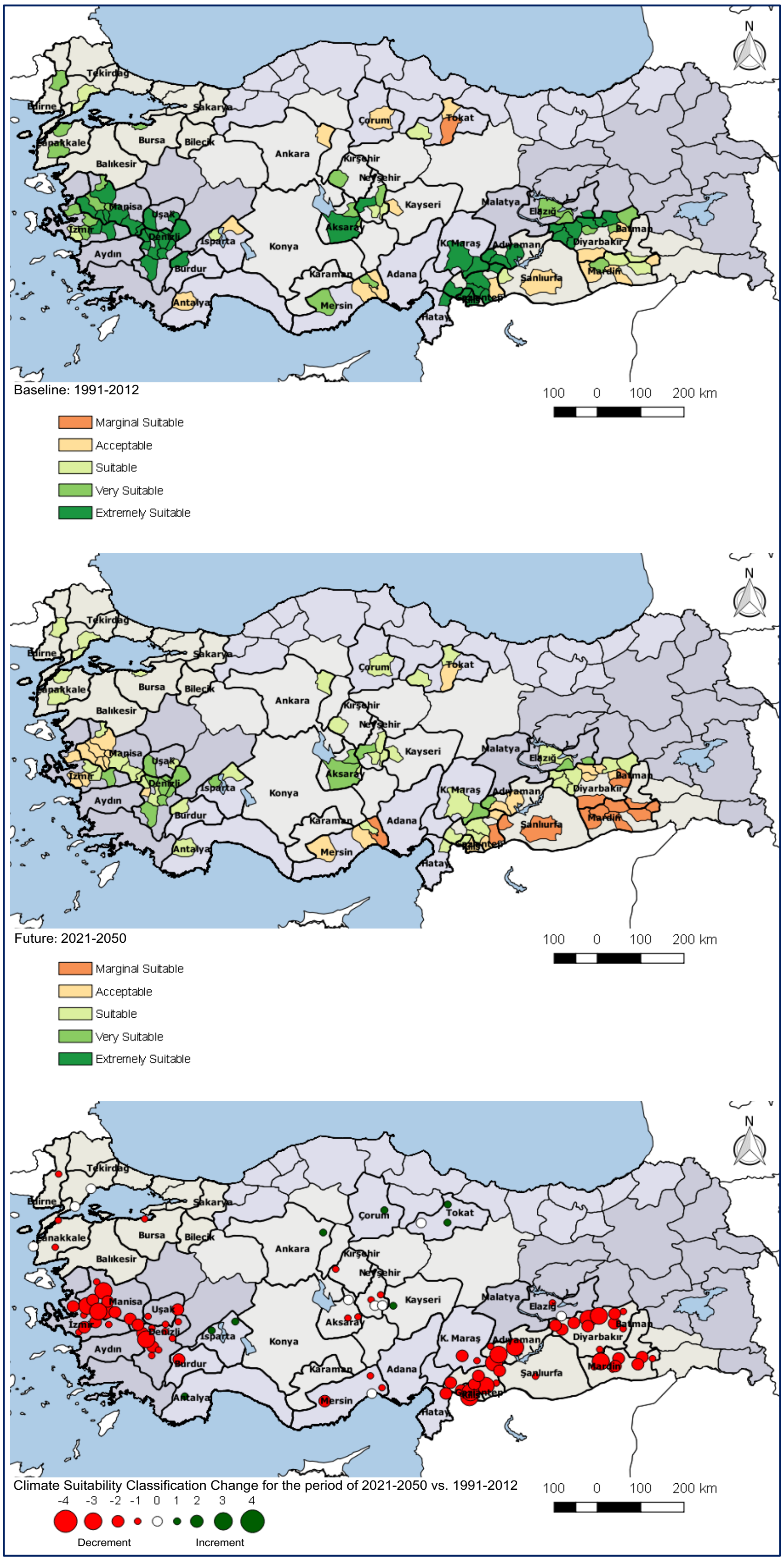


Figure 4.40. Location-basis spatial distribution of the projected **grape climate suitability classification** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on **NBC approach** with the variables weighted of **RE model**.

Climate suitability index and climate suitability classification changes by location with RE model weighting are given in detail in Table 4.10. In addition, the classifications distribution by location and how these classifications will change in the future of 2021-2050 concerning 1991-2012 are given in Figure 4.38 for the EIC approach, Figure 4.39 for the PC approach, and Figure 4.40 for the NBC approach. Accordingly, let's examine 96 locations in which 16 grape varieties in terms of climatic suitability conditions.

According to all three approaches, it is observed that the CENTRAL location of **ADIYAMAN** attracts attention as the location, which decreases the most in climatic suitability conditions. Accordingly, it is predicted that there will be a decrease to “marginal suitable” and “acceptable” conditions respectively by a three-step in PC and NBC, and a decrease to “suitable” by a two-step in EIC. The location of BESNİ is observed as the location where a high decrease is expected. Accordingly, it is expected that a decline is expected to “suitable” and “acceptable” by a two-step in EIC and PC, respectively, whereas it will be stretched to “acceptable” by a three-step back in NBC. In the location of GÖLBAŞI, it is expected that “extremely suitable” conditions will be preserved without any change in EIC and a decrease to “suitable” and “very suitable” by a step, respectively in PC and NBC.

In the CENTRAL location of **AKSARAY**, it is expected that “extremely suitable” conditions will continue in EIC, it will be a decline to “suitable” with a two-step in PC and “very suitable” with a step in NBC. It is predicted that “extremely suitable” conditions will continue in EIC and “very suitable” conditions in NBC in the location of ORTAKÖY, and “suitable” conditions will be created in the PC with a step reduction. In the location of GÜLAĞAÇ “extremely suitable” conditions will continue in EIC and “suitable” conditions in PC, and there will be a decrease to “suitable” conditions with a step in NBC.

“Very suitable” and “acceptable” conditions are preserved regarding EIC and PC, and “suitable” conditions came into sight with one step forward in NBC in the location of KALECİK of **ANKARA**.

In the location of ELMALI of **ANTALYA**, it is expected that there will be an increase to “very suitable” with a step forward in EIC and to “suitable” with a step forward in NBC, while “acceptable” conditions will maintain in PC.

A decrease with a two-step back is expected to “acceptable” conditions in EIC in the location of GERCÜŞ of **BATMAN**, while a decrease with a two-step back to “marginal suitable” conditions in NBC.

It is anticipated that the “extremely suitable” range will continue in EIC in the location of YEŞİLOVA of **BURDUR** and a decrease towards “suitable” with a step back in PC and a two-step back in NBC.

It is anticipated that, in the location of BAYRAMİÇ of **ÇANAKKALE**, it is expected to maintain “very suitable” conditions in EIC, “suitable” conditions without any changes in PC, and a decrease to “suitable” in NBC by decreasing one step. In the location of BOZCAADA, it is expected that “suitable” conditions according to EIC “marginal suitable” according to PC, and “acceptable” conditions regarding NBC will be preserved. In the location of LAPSEKİ, it is estimated that “extremely suitable” in EIC and suitable in PC will be preserved, and in NBC there will be a decline towards “suitable” with one step.

It is expected that climatic suitability conditions the CENTRAL location of **ÇORUM** will protect “very suitable” conditions in EIC, “acceptable” conditions in PC, and will go forward with one step towards “suitable” in NBC.

The location of SARAYKÖY of **DENİZLİ** draws attention as the location with the highest expectation of decrease. Accordingly, it is expected that there will be a decrease towards “very suitable” with a step back in EIC and “acceptable” conditions with a two-step back in PC, and towards “marginal suitability” with a three-step back in NBC. Following Sarayköy, the location of BULDAN is one of the locations that are expected to decrease the most. Accordingly, in Buldan, it is expected to decrease to “suitable” with a step back in EIC, while to “acceptable” conditions in PC and to “suitable” conditions in NBC with a two-step back. The locations of BAKLAN, BEKİLLİ, ÇAL, ÇİVRİL, GÜNEY, HONAZ, and TAVAS show similar characteristics, and “extremely suitable” conditions are preserved in the EIC. It is expected that the “suitable” conditions with a two-step decline in the PC and “very suitable” conditions with one step decline in the NB. In the CENTRAL location of **DENİZLİ**, it is anticipated that “extremely suitable” conditions will be preserved in EIC, and “suitable” conditions will come into sight by regressing one step in PC and two steps in NBC.

A decrease expectation is observed in all locations of **DİYARBAKIR,** and it is predicted that these decreases will be stronger in some locations. The locations of ÇERMİK, ÇÜNGÜŞ, ERGANİ show similar characteristics with “extremely suitable” in EIC, and “suitable” conditions with a two-step back is expected in PC and NBC. In the location of DICLE and HANİ, a decline is foreseen to “very suitable” with a step back in EIC and to “acceptable” with a two-step back in PC and with a three-step back in NBC. In the location of SİLVAN, it is estimated that there will be a decrease to “acceptable” with two steps back in EIC and to “marginal suitable” conditions with a step in PC and NBC. The location of KULP maintain its “extremely suitable” conditions in EIC and show a decrease towards “suitable” with a step back in PC and NBC. LİCE also maintain its “extremely suitable” conditions in EIC and show a decrease to “suitable” with a step back in PC, and with a two-step back in NBC. In the location of ÇINAR, it decreases with a step back to “acceptable” conditions in EIC and to “marginal suitable” conditions in PC and to “marginal suitable” conditions with a step back in NBC. In the locations of HAZRO and EĞİL, a decline is expected in all three approaches, and this decline is expected towards “suitable” in EIC and towards “acceptable” in PC and NBC wit a two-step back.

In the location of UZUNKÖPRÜ of **EDİRNE**, it is estimated that there will be a decrease to “very suitable” with a step decline in EIC and a decrease to “acceptable” and “suitable” conditions, respectively, with one step decline in PC and NBC.

In the CENTRAL location of **ELAZIĞ**, “extremely suitable” in EIC and “suitable” conditions in PC are preserved, while a decrease is expected to “suitable” conditions with a step back in NBC. In the location of MADEN in **ELAZIĞ**, it is expected that “extremely suitable” and “suitable” and “very suitable” conditions will be preserved in EIC, PC and NBC, respectively. In the location of ARICAK, it is expected that “extremely suitable” conditions will be preserved in EIC and a decrease in PC and NBC will decrease towards “suitable” and “very suitable” conditions, respectively with a step back.

In the results of these models, the location of OĞUZELİ of **GAZİANTEP** attracts attention as the location with the highest decrease in climatic suitability conditions. Accordingly, the EIC projection envisages a decline to “suitable” with a two-step back, to “marginal suitable” from “extremely suitable” with a four-step back in PC and to “acceptable” from “extremely suitable” with a three-step back in NBC The location of ARABAN is one of the locations expected to decrease the most, and it is expected that the climatic suitability in the location will decrease to “suitable” with a two-step back in EIC, and to “marginal suitable” in PC and to “acceptable” in

NBC with a three-step back. In the location of ŞAHİNBEY, it is predicted that there will be a one-step decline to “very suitable” in the EIC, and a decline towards “acceptable” and “suitable” with a three and two-step back, respectively, according to the PC and NBC. It seems that the location of ŞEHİTKAMİL will have the same experience with “extremely suitable” conditions in EIC, while the PC and NBC will experience a decrease towards “suitable” with a two-step reduction. In the location of ISLAHİYE, “extremely suitable” conditions will be preserved in EIC, while it is predicted to decrease to “suitable” conditions with a two-step back in PC and NBC. In the location of NİZİP, it is expected that the “acceptable” conditions will be formed with a two-step back in EIC, and “marginal suitable” conditions will come into sight with one-step- back in PC and NBC.

It is envisaged “extremely suitable” conditions to protect in EIC, and to be a decrease to “suitable” conditions with a two-step back in PC and NBC in the location of HASSA of **HATAY**.

According to the EIC projection, in the location of YALVAÇ of **ISPARTA**, it is foreseen to be an increase to “extremely suitable” conditions with a step forward, according to PC and NBC to “suitable” conditions with a step forward. In the location of SENİRKENT, while “extremely suitable” and “suitable” are protected in EIC and PC, respectively, it is expected that “very suitable” conditions will ensue with a step forward in NBC.

In the location of MENEMEN of **İZMİR**, it is expected that a decline to “suitable” conditions with a two-step back in EIC and to “marginal suitable” and “acceptable”, respectively with a two-step back in PC and NBC. A decrease is predicted in the location of TORBALI according to all three projections, and it is expected to decrease to “suitable” with a two-step back in the EIC, to “acceptable” conditions with one step back in the PC, and with a two-step back in NBC. It is estimated that “extremely suitable” conditions will be preserved in EIC in the location of KEMALPAŞA, and “suitable” conditions will be seen with one step decrease according to PC and NBC approaches. In the location of MENDERES, a decline is expected towards “very suitable” with one step in EIC, and towards “acceptable” conditions with a step decline in PC and NBC. While the “extremely suitable” range continues in EIC in the location of ÖDEMİŞ, a decrease is expected in PC and NBC with a decline to “suitable” and “very suitable” conditions, respectively.

In the location of PAZARCIK of **KAHRAMANMARAŞ**, it is expected that “extremely suitable” conditions will be preserved in EIC, and there will be a decrease to “very suitable” conditions with a two-step back in PC and a step back in NBC. In the CENTRAL location, "extremely suitable" conditions are preserved in EIC, and it is predicted a decrease of a two- step back to "suitable" conditions in PC and NBC.

In the location of INCESU of **KAYSERİ**, "very suitable" conditions in EIC and "acceptable" conditions in PC are maintained, and it is expected that conditions will become "suitable" with one step forward in NBC.

It is expected "extremely suitable" in EIC and "suitable" conditions in PC will be protected in the location of KAMAN of **KIRŞEHİR**, and "suitable" conditions with one step back will come in sight according to NBC.

The location of POLATELİ of **KİLİS** draws attention as one of the locations which are expected to decrease the most. Accordingly, it is expected that the "very suitable" conditions will be created with one step decrease in EIC, and "acceptable" conditions with three steps decrease in PC and NBC. A higher decrease is also foreseen in the CENTRAL location of KİLİS. Hereunder, it is estimated that there will be a decrease to "suitable" in the EIC with two steps, to "marginal suitable" with three steps in the PC and to "acceptable" conditions, with three steps once again in NBC. In the location of MUSABEYLİ, it is expected that there will be a decline towards "very suitable" conditions according to the EIC approach and a three-step back towards "acceptable" in PC and a two-step decline towards to "suitable" in NBC.

As it is mentioned before, **MANİSA** is the most important province in grape production. Therefore, it is also important as it will experience expected reductions in climatic suitability in the future. Accordingly, the location of AHMETLİ of **MANİSA** has the highest expectation of decreasing in all three approaches, accordingly, it is expected that there will be "very suitable" conditions with one step back in EIC, "acceptable" conditions with a three-step back in PC and NBC. It is estimated that in the locations of ALAŞEHİR, while "extremely suitable" conditions in EIC will be preserved, there will be a decline to "suitable" conditions with a two-step back in PC and NBC. The location of SALİHLİ, climate suitability conditions may decrease in all three approaches, towards "very suitable" with one step in EIC and towards "acceptable" conditions with three steps in PC and towards "suitable" conditions with two steps in NBC. Similarly, AKHİSAR and CENTRAL locations are expected to decline to "very suitable" with one step in EIC, towards "acceptable" with a two-step according to PC, and towards "acceptable" once again with a three-step back in regard to NBC. The location of KIRKAĞAÇ shows a decline to "very suitable" with one step in EIC, and it decreases to "acceptable" in PC and to "suitable" in NBC with one step. It is estimated that there will be a decrease towards “very suitable” with one step back in EIC and with three steps towards “acceptable” in PC and NBC in the location of TURGUTLU.

In the location of SARUHANLI, it is expected that there will be a decrease towards “suitable” with two steps in EIC, and towards “acceptable” conditions with one step in PC, and with two steps in NBC. The location of SARIGÖL while maintaining “extremely suitable” conditions in EIC, shows a decline to “suitable” with two steps in PC and NBC.

Similar behavior is observed in the location of DERİK of **MARDİN** and CENTRAL, according to EIC, it is expected that there will be a step-down to “acceptable” conditions and to “marginal suitable” in PC and NBC. In the location of YEŞİLLİ, it is expected to decrease to “acceptable” with three steps in EIC, to “marginal suitable” with two steps in regard to PC and NBC. In the location of MAZIDAĞI, it is expected that there will be a decrease in EIC with two steps towards “suitable”, and with two steps in PC and three steps in NBC towards “marginal suitable” conditions. The location of MİDYAT decreases to “acceptable” with two steps in the EIC, and to “marginal suitable” with two steps in PC and NBC. On the other hand, the location of SAVUR decreases towards “suitable” with a two-step back in EIC and towards “marginal suitable” with a two-step back in regard to PC and NBC. In the location of DARGEÇİT, in EIC and NBC, climate suitability conditions have decreased by one step to “acceptable” and “marginal suitable” conditions respectively, while it maintains “marginal suitable” conditions in the PC.

In the location of ÇAMLIYAYLA of **MERSİN**, “extremely suitable” and “suitable” conditions are preserved in EIC and PC, respectively, and “suitable” conditions are expected to occur with a decrease in NBC. It is anticipated that there will be a decrease in EIC, one step in PC and two steps in NBC to “very suitable”, “acceptable” and “acceptable”, respectively. A decline is expected in the location of TARSUS towards “acceptable” conditions in EIC and towards “marginal suitable” in PC and NBC with a step-down. In the CENTRAL location, “suitable”, “acceptable” and “acceptable” conditions are maintained in EIC, PC and NBC respectively.

In the location of AVANOS of **NEVŞEHİR**, “extremely suitable” and “suitable” conditions are preserved in EIC and PC, and it is expected that one step-down to “suitable” conditions in NBC. In the location of ÜRGÜP, while “suitable” conditions are expected to continue in NBC, and there will an increase with one step forward towards “extremely suitable” and “suitable” conditions, respectively in EIC and PC. In GÜLŞEHİR, while “extremely suitable” conditions are maintained in EIC, “suitable” conditions are expected with one step decrease in PC and “very suitable” conditions with a step decrease in NBC. In the CENTRAL location, it is estimated that “extremely suitable”, “suitable” and once again “suitable” conditions will continue in the same way in EIC, PC, and NBC respectively.

It is predicted that there will be a reduction with one step-down to “acceptable” and “marginal suitable”, respectively in EIC and NBC in the CENTRAL location of **ŞANLIURFA**, while “marginal suitable” conditions will be preserved in the PC. On the other hand, the location of **HALFETİ** is expected to decrease to “acceptable” in EIC and to “marginal suitable” in NBC with one step, and “marginal suitable” conditions will be preserved according to the PC.

In the locations of ŞARKÖY and CENTRAL of **TEKİRDAĞ** “very suitable”, “acceptable” and “suitable” conditions are maintained in EIC, PC and NBC, respectively, in all three approaches.

In the location of ZİLE of **TOKAT**, “very suitable”, “acceptable” and “suitable” conditions are maintained in EIC, PC and NBC, respectively, in all three approaches. On the other hand, in the CENTRAL location, it is expected to rise to “suitable” and “acceptable” with a step forward in EIC and NBC, while the PC is expected to maintain “marginal suitable” conditions. In the location of ERBAA, it is envisaged “very suitable” and “acceptable” conditions to protect in EIC and PC, and “suitable” conditions to create in NBC with one step forward.

In the location of SİVASLI of **UŞAK**, “extremely suitable” conditions continue in the same way in EIC, and “suitable” conditions are envisaged with one-step reduction in PC and two steps reduction in NBC. In the location of EŞME, while “extremely suitable” conditions are preserved in EIC, it is expected that “suitable” conditions with a two-step decrease will come in sight in the PC and “very suitable” conditions with a one-step reduction in NBC.

Table 4.10. Projected Grape Climate Suitability Index (GCSI) and Classification Change by location for the reference period of 1991-2012 and future period of 2021-2050 based on 3 approaches i.e., EIC, PC, and NBC with the variables weighted of RE model. Red down-arrow indicates decreases and green up-arrow indicates increases. Sole arrow, two-arrow, three- arrow, four-arrow indicate the change respectively one class, two class, three class, four-class change.

GRAPE CLIMATE SUITABLITY INDEX (GCSI) AND CLIMATE SUITABILITY CLASSIFICATION															
LOCATION ID	REGION	PROVINCE	LOCATION	BASELINE (1991-2012)				FUTURE (2021-2050)				CLASSIFICATION CHANGE (2021-2050 vs 1991-2012)		
				GCSI	EIC	PC	NBC	GCSI	EIC	PC	NBC	EIC	PC	NBC
108	Aegean	Denizli	Baklan	1.000000	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.866468	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
131	Aegean	Denizli	Bekilli	1.000000	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.881693	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
183	Aegean	Denizli	Çal	1.000000	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.866353	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
236	Aegean	Denizli	Çivril	1.000000	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.869166	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
825	Aegean	Denizli	Tavas	1.000000	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.879182	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
401	Aegean	Denizli	Güney	0.996262	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.865902	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
449	Aegean	Denizli	Honaz	0.995152	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.861647	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
176	Aegean	Denizli	Buldan	0.992402	Extremely Suitable	Very Suitable	Extremely Suitable	0.715017	Very Suitable	Acceptable	Suitable	↓	↓↓	↓↓
260	Aegean	Denizli	Denizli/Merkez	0.988799	Extremely Suitable	Very Suitable	Extremely Suitable	0.820049	Extremely Suitable	Suitable	Suitable	⇔	↓	↓↓
737	Aegean	Denizli	Sarayköy	0.971449	Extremely Suitable	Very Suitable	Extremely Suitable	0.618784	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
665	Aegean	İzmir	Ödemiş	0.986602	Extremely Suitable	Very Suitable	Extremely Suitable	0.870503	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
126	Aegean	İzmir	Bayındır	0.980797	Extremely Suitable	Very Suitable	Extremely Suitable	0.838267	Extremely Suitable	Suitable	Suitable	⇔	↓	↓↓
543	Aegean	İzmir	Kemalpaşa/İzmir	0.949837	Extremely Suitable	Very Suitable	Very Suitable	0.818225	Extremely Suitable	Suitable	Suitable	⇔	↓	↓
631	Aegean	İzmir	Menemen	0.949366	Extremely Suitable	Suitable	Very Suitable	0.521613	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓	↓↓
840	Aegean	İzmir	Torbalı	0.902179	Extremely Suitable	Suitable	Very Suitable	0.555292	Suitable	Acceptable	Acceptable	↓↓	↓	↓↓
630	Aegean	İzmir	Menderes	0.839066	Extremely Suitable	Suitable	Suitable	0.677557	Very Suitable	Acceptable	Acceptable	↓	↓	↓
45	Aegean	Manisa	Alaşehir	1.000000	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.840411	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
740	Aegean	Manisa	Sarıgöl	1.000000	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.832753	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
724	Aegean	Manisa	Salihli	0.999922	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.782304	Very Suitable	Acceptable	Suitable	↓	↓↓↓	↓↓
18	Aegean	Manisa	Ahmetli	0.998911	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.703275	Very Suitable	Acceptable	Acceptable	↓	↓↓↓	↓↓↓
847	Aegean	Manisa	Turgutlu	0.992644	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.660277	Very Suitable	Acceptable	Acceptable	↓	↓↓↓	↓↓↓
25	Aegean	Manisa	Akhisar	0.992473	Extremely Suitable	Very Suitable	Extremely Suitable	0.666758	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
620	Aegean	Manisa	Manisa/Merkez	0.967754	Extremely Suitable	Very Suitable	Extremely Suitable	0.691857	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
750	Aegean	Manisa	Saruhanlı	0.929414	Extremely Suitable	Suitable	Very Suitable	0.568416	Suitable	Acceptable	Acceptable	↓↓	↓	↓↓
558	Aegean	Manisa	Kırkağaç	0.924845	Extremely Suitable	Suitable	Very Suitable	0.787903	Very Suitable	Acceptable	Suitable	↓	↓	↓
379	Aegean	Manisa	Gölmarmara	0.924421	Extremely Suitable	Suitable	Very Suitable	0.449495	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓	↓↓
335	Aegean	Uşak	Eşme	0.999584	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.866927	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
788	Aegean	Uşak	Sivaslı	0.991190	Extremely Suitable	Very Suitable	Extremely Suitable	0.832366	Extremely Suitable	Suitable	Suitable	⇔	↓	↓↓
243	Black Sea	Çorum	Çorum/Merkez	0.600337	Very Suitable	Acceptable	Acceptable	0.753559	Very Suitable	Acceptable	Suitable	⇔	⇔	↑
922	Black Sea	Tokat	Zile	0.714416	Very Suitable	Acceptable	Suitable	0.746184	Very Suitable	Acceptable	Suitable	⇔	⇔	⇔
318	Black Sea	Tokat	Erbaa	0.634440	Very Suitable	Acceptable	Acceptable	0.724523	Very Suitable	Acceptable	Suitable	⇔	⇔	↑
836	Black Sea	Tokat	Tokat/Merkez	0.267708	Acceptable	Marginal Suitable	Marginal Suitable	0.473751	Suitable	Marginal Suitable	Acceptable	↑	⇔	↑
32	Central Anatolia	Aksaray	Aksaray/Merkez	0.994377	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.880086	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
677	Central Anatolia	Aksaray	Ortaköy/Aksaray	0.960377	Extremely Suitable	Very Suitable	Very Suitable	0.881837	Extremely Suitable	Suitable	Very Suitable	⇔	↓	⇔
393	Central Anatolia	Aksaray	Gülağaç	0.942450	Extremely Suitable	Suitable	Very Suitable	0.854981	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
496	Central Anatolia	Ankara	Kalecik	0.707566	Very Suitable	Acceptable	Acceptable	0.771676	Very Suitable	Acceptable	Suitable	⇔	⇔	↑
468	Central Anatolia	Kayseri	İncesu	0.646772	Very Suitable	Acceptable	Acceptable	0.794907	Very Suitable	Acceptable	Suitable	⇔	⇔	↑
498	Central Anatolia	Kırşehir	Kaman	0.946625	Extremely Suitable	Suitable	Very Suitable	0.846175	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
395	Central Anatolia	Nevşehir	Gülşehir	0.967476	Extremely Suitable	Very Suitable	Extremely Suitable	0.865150	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
84	Central Anatolia	Nevşehir	Avanos	0.874693	Extremely Suitable	Suitable	Very Suitable	0.853943	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
657	Central Anatolia	Nevşehir	Nevşehir/Merkez	0.821772	Extremely Suitable	Suitable	Suitable	0.805813	Extremely Suitable	Suitable	Suitable	⇔	⇔	⇔
868	Central Anatolia	Nevşehir	Ürgüp	0.795277	Very Suitable	Acceptable	Suitable	0.842557	Extremely Suitable	Suitable	Suitable	↑	↑	⇔
73	East Anatolia	Elazığ	Arıcak	0.984770	Extremely Suitable	Very Suitable	Extremely Suitable	0.863032	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
612	East Anatolia	Elazığ	Maden	0.938091	Extremely Suitable	Suitable	Very Suitable	0.859419	Extremely Suitable	Suitable	Very Suitable	⇔	⇔	⇔
306	East Anatolia	Elazığ	Elazığ/Merkez	0.919569	Extremely Suitable	Suitable	Very Suitable	0.855403	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
642	Marmara	Bursa	Mudanya	0.931525	Extremely Suitable	Suitable	Very Suitable	0.826888	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
607	Marmara	Çanakkale	Lapseki	0.907814	Extremely Suitable	Suitable	Very Suitable	0.835199	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
128	Marmara	Çanakkale	Bayramiç	0.877174	Extremely Suitable	Suitable	Very Suitable	0.811647	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓

One-class decrement	Two-class decrement	Three-class decrement	Four-class decrement	No change	One-class increment	Two-class increment	Three-class increment	Four-class increment
↓	↓↓	↓↓↓	↓↓↓↓	⇔	↑	↑↑	↑↑↑	↑↑↑↑

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GRAPE CLIMATE SUITABLITY INDEX (GCSI) AND CLIMATE SUITABILITY CLASSIFICATION															
LOCATION ID	REGION	PROVINCE	LOCATION	BASELINE (1991-2012)				FUTURE (2021-2050)				CLASSIFICATION CHANGE (2021-2050 vs 1991-2012)		
				GCSI	EIC	PC	NBC	GCSI	EIC	PC	NBC	EIC	PC	NBC
162	Marmara	Çanakkale	Bozcaada	0.522096	Suitable	Marginal Suitable	Acceptable	0.537200	Suitable	Marginal Suitable	Acceptable	⇔	⇔	⇔
874	Marmara	Edirne	Uzunköprü	0.937672	Extremely Suitable	Suitable	Very Suitable	0.737045	Very Suitable	Acceptable	Suitable	↓	↓	↓
828	Marmara	Tekirdağ	Tekirdağ/Merkez	0.798715	Very Suitable	Acceptable	Suitable	0.710019	Very Suitable	Acceptable	Suitable	⇔	⇔	⇔
749	Marmara	Tekirdağ	Şarköy	0.737434	Very Suitable	Acceptable	Suitable	0.707734	Very Suitable	Acceptable	Suitable	⇔	⇔	⇔
312	Mediterranean	Antalya	Elmalı	0.577974	Suitable	Acceptable	Acceptable	0.733743	Very Suitable	Acceptable	Suitable	↑	⇔	↑
907	Mediterranean	Burdur	Yeşilova	0.974148	Extremely Suitable	Very Suitable	Extremely Suitable	0.855879	Extremely Suitable	Suitable	Suitable	⇔	↓	↓↓
431	Mediterranean	Hatay	Hassa	0.991884	Extremely Suitable	Very Suitable	Extremely Suitable	0.807495	Extremely Suitable	Suitable	Suitable	⇔	↓	↓↓
764	Mediterranean	Isparta	Senirkent	0.811227	Extremely Suitable	Suitable	Suitable	0.869056	Extremely Suitable	Suitable	Very Suitable	⇔	⇔	↑
887	Mediterranean	Isparta	Yalvaç	0.667027	Very Suitable	Acceptable	Acceptable	0.802007	Extremely Suitable	Suitable	Suitable	↑	↑	↑
694	Mediterranean	Kahramanmaraş	Pazarcık	0.999972	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.867818	Extremely Suitable	Suitable	Very Suitable	⇔	↓↓	↓
491	Mediterranean	Kahramanmaraş	Kahramanmaraş/Merkez	0.978387	Extremely Suitable	Very Suitable	Extremely Suitable	0.856424	Extremely Suitable	Suitable	Suitable	⇔	↓	↓↓
190	Mediterranean	Mersin	Çamlıyayla	0.940944	Extremely Suitable	Suitable	Very Suitable	0.819349	Extremely Suitable	Suitable	Suitable	⇔	⇔	↓
650	Mediterranean	Mersin	Mut	0.904986	Extremely Suitable	Suitable	Very Suitable	0.616523	Very Suitable	Acceptable	Acceptable	↓	↓	↓↓
455	Mediterranean	Mersin	İçel/Mersin	0.579139	Suitable	Acceptable	Acceptable	0.579767	Suitable	Acceptable	Acceptable	⇔	⇔	⇔
819	Mediterranean	Mersin	Tarsus	0.577682	Suitable	Acceptable	Acceptable	0.358249	Acceptable	Marginal Suitable	Marginal Suitable	↓	↓	↓
136	South East Anatolia	Adıyaman	Besni	0.992122	Extremely Suitable	Very Suitable	Extremely Suitable	0.562534	Suitable	Acceptable	Acceptable	↓↓	↓↓	↓↓↓
374	South East Anatolia	Adıyaman	Gölbaşı/Adıyaman	0.984129	Extremely Suitable	Very Suitable	Extremely Suitable	0.865679	Extremely Suitable	Suitable	Very Suitable	⇔	↓	↓
8	South East Anatolia	Adıyaman	Adıyaman/Merkez	0.977170	Extremely Suitable	Very Suitable	Extremely Suitable	0.534574	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓↓	↓↓↓
362	South East Anatolia	Batman	Gercüş	0.732605	Very Suitable	Acceptable	Suitable	0.349696	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓↓
325	South East Anatolia	Diyarbakır	Ergani	1.000000	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.826049	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
223	South East Anatolia	Diyarbakır	Çermik	0.998906	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.843714	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
248	South East Anatolia	Diyarbakır	Çüngüş	0.996688	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.857964	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
272	South East Anatolia	Diyarbakır	Dicle	0.979079	Extremely Suitable	Very Suitable	Extremely Suitable	0.706536	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
608	South East Anatolia	Diyarbakır	Lice	0.973496	Extremely Suitable	Very Suitable	Extremely Suitable	0.843756	Extremely Suitable	Suitable	Suitable	⇔	↓	↓↓
424	South East Anatolia	Diyarbakır	Hani	0.960811	Extremely Suitable	Very Suitable	Extremely Suitable	0.683465	Very Suitable	Acceptable	Acceptable	↓	↓↓	↓↓↓
590	South East Anatolia	Diyarbakır	Kulp	0.952282	Extremely Suitable	Very Suitable	Very Suitable	0.837299	Extremely Suitable	Suitable	Suitable	⇔	↓	↓
303	South East Anatolia	Diyarbakır	Eğil	0.904635	Extremely Suitable	Suitable	Very Suitable	0.489108	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓	↓↓
440	South East Anatolia	Diyarbakır	Hazro	0.890769	Extremely Suitable	Suitable	Very Suitable	0.476580	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓	↓↓
778	South East Anatolia	Diyarbakır	Silvan	0.648325	Very Suitable	Acceptable	Acceptable	0.315571	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓
239	South East Anatolia	Diyarbakır	Çınar	0.599964	Suitable	Acceptable	Acceptable	0.335062	Acceptable	Marginal Suitable	Marginal Suitable	↓	↓	↓
721	South East Anatolia	Gaziantep	Şahinbey	0.998455	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.798927	Very Suitable	Acceptable	Suitable	↓	↓↓↓	↓↓
758	South East Anatolia	Gaziantep	Şehitkamil	0.998128	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.804652	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
478	South East Anatolia	Gaziantep	Islahiye	0.998037	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.837135	Extremely Suitable	Suitable	Suitable	⇔	↓↓	↓↓
667	South East Anatolia	Gaziantep	Oğuzeli	0.996729	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.498683	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓↓↓	↓↓↓
63	South East Anatolia	Gaziantep	Araban	0.984350	Extremely Suitable	Very Suitable	Extremely Suitable	0.467763	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓↓	↓↓↓
661	South East Anatolia	Gaziantep	Nizip	0.632749	Very Suitable	Acceptable	Acceptable	0.336367	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓
649	South East Anatolia	Kilis	Musabeyli	0.998968	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.707824	Very Suitable	Acceptable	Suitable	↓	↓↓↓	↓↓
707	South East Anatolia	Kilis	Polateli	0.997064	Extremely Suitable	Extremely Suitable	Extremely Suitable	0.603291	Very Suitable	Acceptable	Acceptable	↓	↓↓↓	↓↓↓
552	South East Anatolia	Kilis	Kilis/Merkez	0.964109	Extremely Suitable	Very Suitable	Extremely Suitable	0.510024	Suitable	Marginal Suitable	Acceptable	↓↓	↓↓↓	↓↓↓
627	South East Anatolia	Mardin	Mazıdağı	0.884961	Extremely Suitable	Suitable	Very Suitable	0.418049	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓↓	↓↓↓
754	South East Anatolia	Mardin	Savur	0.858791	Extremely Suitable	Suitable	Suitable	0.412542	Suitable	Marginal Suitable	Marginal Suitable	↓↓	↓↓	↓↓
906	South East Anatolia	Mardin	Yeşilli	0.800774	Extremely Suitable	Suitable	Suitable	0.375341	Acceptable	Marginal Suitable	Marginal Suitable	↓↓↓	↓↓	↓↓
637	South East Anatolia	Mardin	Midyat	0.760587	Very Suitable	Acceptable	Suitable	0.384756	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓↓
265	South East Anatolia	Mardin	Derik	0.559370	Suitable	Acceptable	Acceptable	0.332546	Acceptable	Marginal Suitable	Marginal Suitable	↓	↓	↓
622	South East Anatolia	Mardin	Mardin/Merkez	0.558180	Suitable	Acceptable	Acceptable	0.310205	Acceptable	Marginal Suitable	Marginal Suitable	↓	↓	↓
253	South East Anatolia	Mardin	Dargeçit	0.525312	Suitable	Marginal Suitable	Acceptable	0.336360	Acceptable	Marginal Suitable	Marginal Suitable	↓	⇔	↓
418	South East Anatolia	Şanlıurfa	Halfeti	0.727776	Very Suitable	Acceptable	Suitable	0.348175	Acceptable	Marginal Suitable	Marginal Suitable	↓↓	↓	↓↓
867	South East Anatolia	Şanlıurfa	Şanlıurfa/Merkez	0.430959	Suitable	Marginal Suitable	Acceptable	0.284954	Acceptable	Marginal Suitable	Marginal Suitable	↓	⇔	↓

One-class decrement	Two-class decrement	Three-class decrement	Four-class decrement	No change	One-class increment	Two-class increment	Three-class increment	Four-class increment
↓	↓↓	↓↓↓	↓↓↓↓	⇔	↑	↑↑	↑↑↑	↑↑↑↑

4.4.3. Results for 923 Locations in Turkey

Climate suitability index and classifications for 923 locations have been calculated using 2 different weighting methods i.e FE and RE and determine the classification intervals according to 3 approaches i.e., EIC, PC, NBC (ArcGIS, n.d.). In the NBC approach, classes are determined with the boundaries where there are relatively big differences in the data (Jenks and Caspall, 1971). Therefore, it might be accepted more realistic than other approaches.

Accordingly, there are 5 different classification ranges i.e., “extremely suitable”, “very suitable”, “suitable”, “acceptable” and “marginal suitable”. The marginal suitable range also includes unsuitable conditions. As the climate suitability index (CSI) value approaches “0”, the less likely the crop will grow in that location. In other words, most of the locations in marginal suitable are not suitable for hazelnut cultivation in terms of climatic and geographical conditions. Theoretically every value that does not have a “0” always has the potential to grow, therefore, it has been decided that it would be appropriate for unsuitable locations to be in the marginal suitable range.

4.4.3.1. Hazelnut results for 923 locations. The climate suitability classfication made by the first weighting method (FE) is given in Figure 4.40. Hereunder, (a) the distribution of 923 locations classified is provided by the EIC approach, (b) distribution of 923 locations classified by PC approach, (c) distribution of 923 locations classified by NBC approach.

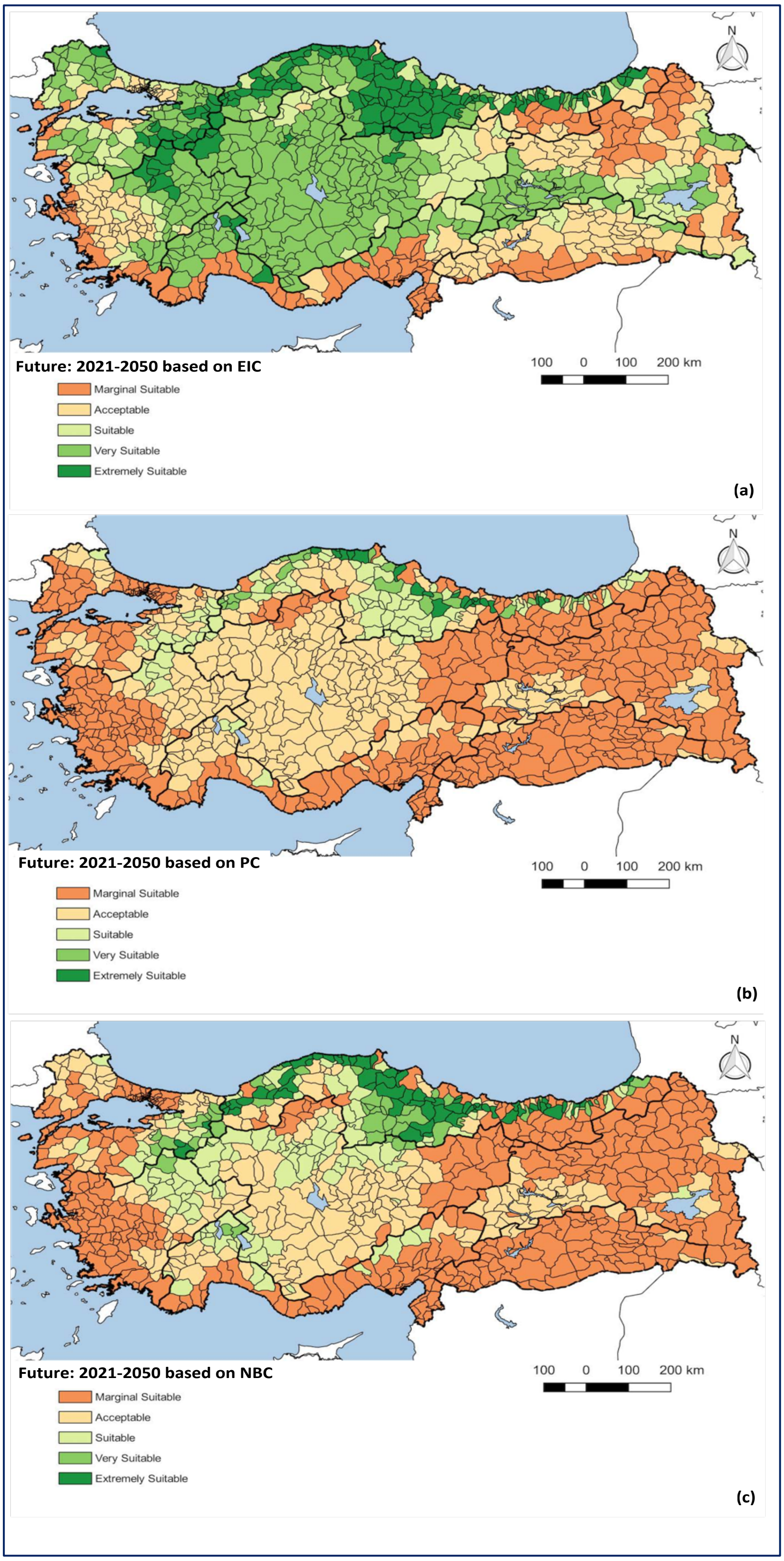

Figure 4.41. Projected **Hazelnut Climate Suitability Index (HCSI)** and **Classification Change for 923 locations** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on 3 approaches i.e., **EIC, PC,** and **NBC** with the variables weighted of **FE model**.

When we look at the distribution of 923 locations across Turkey in the EIC approach for the next period of 2021-2050 with FE model weighting, it is expected that there will be “extremely suitable” conditions in 150 locations, “very suitable” in 337 locations, “suitable” in 115, “acceptable” in 192, and “marginal suitable” conditions in 129 locations (for details please see Appendix C). Hereunder, it is predicted that in the Black Sea region in the 2021-2050 period, “extremely suitable” and “very suitable” conditions continue in general, and “very suitable” conditions will occur in Marmara and Central Anatolia, inner parts of the Aegean and the Mediterranean and Eastern Anatolia. The coastal areas of the Mediterranean and Aegean, the northeastern parts of Eastern Anatolia generally indicate “marginal suitable” conditions. It is predicted that “marginal suitable” conditions will occur in the southern part of Southeastern Anatolia and “acceptable” conditions in the inner part. Again, it is estimated that “acceptable” conditions can be observed in the middle-inner parts of the Aegean and “very suitable” in the inner parts towards Central Anatolia and “extremely suitable” conditions even towards the north (Figure 4.41a).

When we look at the distribution of 923 locations for the future period of 2021-2050 in the PC approach, it is expected that there will be “extremely suitable” conditions in 22 locations, “very suitable” in 23 locations, “suitable” in 98, “acceptable” in 322, and “marginal suitable” conditions in 458 (for details please see Appendix C). In this approach, the number of “marginal suitable” locations is remarkable. Accordingly, it is estimated that “extremely suitable” and “very suitable” conditions will be seen in the Black Sea Region, but the number of locations with “extremely suitable” and “very suitable” may decrease. Looking at the map (Figure 4.41b), it can be said that “marginal suitable” and “acceptable” conditions will generally prevail. Almost all of Eastern Anatolia and Southeastern Anatolia will experience “marginal suitable” conditions in terms of hazelnut growing in the future. “Suitable” and “acceptable” conditions are expected to occur in the southeast and northeastern parts of the Marmara, and “marginal suitable” conditions are expected in some locations of **ORDU, GIRESUN, TRABZON**, and **SAMSUN** in the coastal parts of the central and eastern Black Sea with “extremely suitable” or “very suitable” conditions in the past (Figure 4.41b).

According to the NBC approach, when we look at the distribution of 923 locations for the next 2021-2050 period, it is expected that “extremely suitable” in 71 locations, “very suitable” in 50 locations, “suitable” in 132, “acceptable” in 236, and “marginal suitable” conditions in 434 (for details please see Appendix C). Accordingly, it is foreseen that “marginal suitable” conditions will generally prevail for hazelnut growing as in PC, and “acceptable” conditions will occur in Central

Anatolia, in the southwestern part of Eastern Anatolia, in the inner and partially eastern parts of Aegean, and in the inner western parts of the Mediterranean. In the Black Sea Region, it is expected that “marginal suitable” conditions may occur in the coastal areas of the central and eastern Black Sea, and “extremely suitable” and “very suitable” conditions are expected to occur in the inner parts of the central Black Sea and just behind the coastal areas in the eastern Black Sea. It is expected that “extremely suitable”, and “very suitable” conditions will be seen relatively more in the coastal and inland parts of the western black sea compared to other suitability conditions. In the meantime, “suitable” conditions are expected to be seen in the Aegean and Central Anatolia regions and partly in the Mediterranean region (Figure 4.41c).

Hereunder, the climate suitability classfication made by the weighting method (RE) is given in Figure 4.42. Thereafter, (a) the distribution of 923 locations classified is provided by the EIC approach, (b) distribution of 923 locations classified by PC approach, (c) distribution of 923 locations classified by NBC approach.

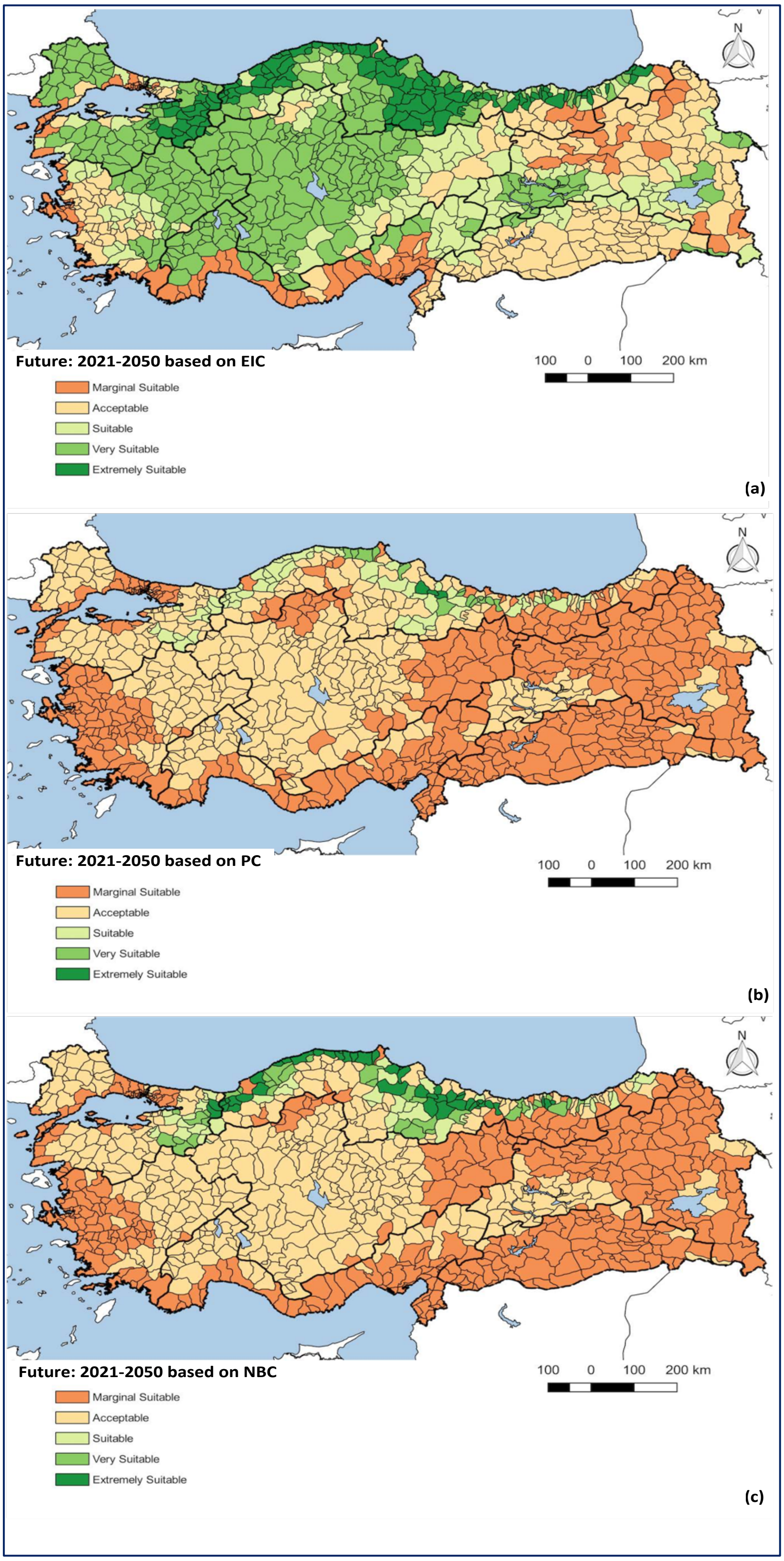

Figure 4.42. Projected **Hazelnut Climate Suitability Index (HCSI)** and **Classification Change for 923 locations** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on 3 approaches i.e., **EIC, PC,** and **NBC** with the variables weighted of **RE model**.

Looking at the climate suitability distribution of 923 locations with RE model weigthing for the future period of 2021-2050 in the EIC approach, it is predicted that “extremely suitable” conditions in 120 locations, “very suitable” in 337 locations, “suitable” in 158 locations, “acceptable” in 209, and “marginal suitable” conditions in 99 (for details please see Appendix D). Hereunder, for the next period of 2021-2050 in the Black Sea, “extremely suitable” and “very suitable” conditions sustain in general. Besides, it is anticipated that there will be “extremely suitable” locations in Marmara and the Aegean, and “very suitable” conditions in the southwestern parts of Eastern Anatolia, across Marmara and Central Anatolia. The coastal areas of the Mediterranean and Aegean, the northeastern parts of Eastern Anatolia generally indicate “marginal suitable” conditions. In the Southeastern Anatolia it is predicted that “marginal suitable” conditions in the southern parts and “acceptable” conditions in the inner parts will occur. Also, “acceptable” conditions are estimated to observe in the middle-inner parts of the Aegean, and “very suitable” conditions towards the central Anatolia and even “extremely suitable” conditions towards the north (Figure 4.42a).

According to the PC approach, when we look at the distribution of 923 locations for the future period of 2021-2050, it is expected that “extremely suitable” conditions in 3 locations, “very suitable” in 19 locations, “suitable” in 61, “acceptable” in 400, and “marginal suitable” conditions in 440 (for details please see Appendix D). Accordingly, it is estimated that “extremely suitable”, and “very suitable” conditions will be seen in the Black Sea Region, but there will be a decrease in the number of locations with “extremely suitable” and “very suitable” over the past. Looking at the map (Figure 4.42b), it can be said that “marginal suitable” and “acceptable” conditions will generally prevail. Almost all of Eastern Anatolia and Southeastern Anatolia will experience “marginal suitable” conditions in the future. “Suitable” and “acceptable” conditions are expected to occur in the southeast and northeastern parts of the Marmara, and “marginal suitable” conditions are expected in some locations of **ORDU, GIRESUN, TRABZON**, and **SAMSUN** in the coastal parts of the central and eastern Black Sea with “extremely suitable” or “very suitable” conditions in the past. Almost all of Central Anatolia is observed as “acceptable”, while the eastern part is considered as “marginal suitable”. The point to be considered in terms of hazelnut cultivation here are the locations where the mountainous and elevation is high and the locations with high temperatures in the coastal areas are seen as “marginal suitable” (Figure 4.42b).

As for the NBC approach, it is expected that “extremely suitable” conditions in 47 locations, “very suitable” in 34 locations, “suitable” in 46, “acceptable” in 413, and “marginal suitable” conditions in 383 (for details please see Appendix D). According to this, “marginal suitable” conditions will generally prevail for hazelnut as in PC. Besides, “acceptable” conditions are expected to occur in some locations in Central Anatolia, in the southwestern part of Eastern Anatolia, in the inner and partially eastern parts of the Aegean, in the western part of the Mediterranean, in the northernmost part of Marmara. It is expected that “marginal suitable” conditions may occur in the coastal parts of the central and eastern Black Sea, “extremely suitable” and “very suitable” conditions are estimated in the inner parts of the central Black Sea, and “extremely suitable” and “very suitable” conditions are predicted just behind the coastal areas in the western, central, and eastern Black Sea. “Suitable” conditions are expected to be seen in the Aegean and Central Anatolia and partly in the Mediterranean (Figure 4.42c).

4.4.3.2. Grape results for 923 locations. The climate suitability classfication for grape made by the first weighting method (FE) is given in Figure 4.43. Hereunder, (a) the distribution of 923 locations classified is provided by the EIC approach, (b) distribution of 923 locations classified by PC approach, (c) distribution of 923 locations classified by NBC approach.

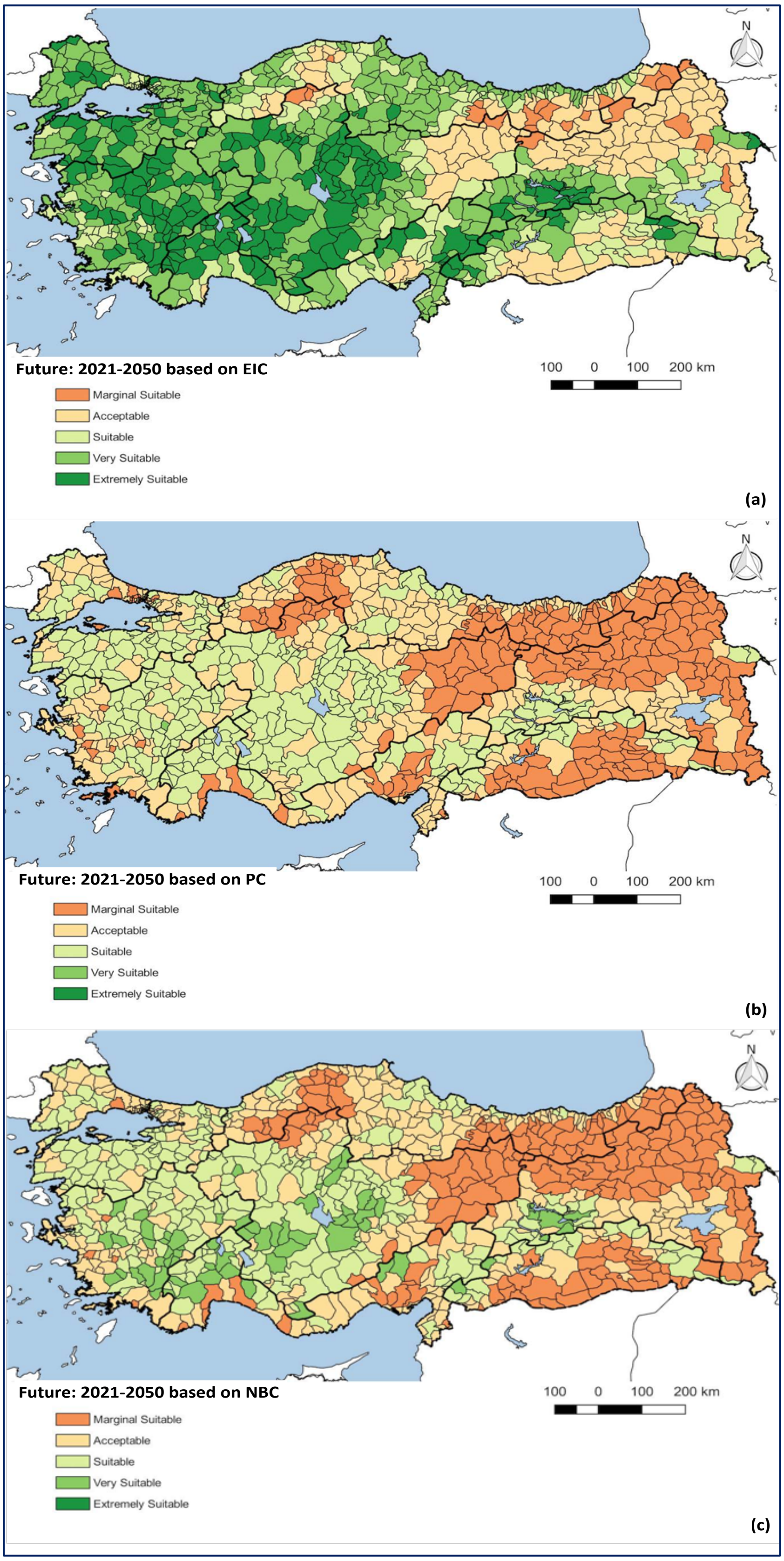

Figure 4.43. Projected **Grape Climate Suitability Index (GCSI)** and **Classification Change for 923 locations** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on 3 approaches i.e., **EIC, PC,** and **NBC** with the variables weighted of **FE model**.

Looking at the climate suitability distribution of 923 locations with FE model weigthing for the future period of 2021-2050 in the EIC approach, it is predicted that “extremely suitable” conditions in 214 locations, “very suitable” in 374 locations, and “suitable” in 177 locations, “acceptable” in 135, and “marginal suitable” conditions in 23 locations (for details please see Appendix E). Accordingly, in the next 2021-2050 period, it is observed that there will be “very suitable” and “extremely suitable” conditions in the Aegean, most of the Central Anatolia, throughout the Mediterranean and partly in Eastern and Southeastern Anatolia. Most of the locations in the Western and Central Black Sea, while the northeastern parts of Eastern Anatolia generally indicate “acceptable” conditions, in the inner parts of Eastern Black Sea show the “acceptable” and “marginal suitable” conditions. (Figure 4.43a).

When we look at the distribution of 923 districts for the future period of 2021-2050 in the PC approach, it is expected that “very suitable” in 1 location, “suitable” in 336, “acceptable” in 351, “marginal suitable” conditions in 235 locations (for details please see Appendix E). It is anticipated that “suitable” conditions will occur in the Central Anatolia, and it is observed that “marginal suitable” conditions will prevail in the West and East Black Sea and in the east of Central Anatolia, in the north and east and locally inner parts of East Anatolia, in most of Southeast Anatolia. It is estimated that the north of the Marmara will be under the effect of “acceptable” conditions and other locations will be under “suitable” conditions in general (Figure 4.43b).

According to the NBC approach, when we look at the distribution of 923 locations for the future period of 2021-2050, it is expected that it is observed that “very suitable” conditions in 66 locations, “suitable” in 311, “acceptable” in 335, and “marginal suitable” conditions in 211 (for details please see Appendix E). Accordingly, it is predicted that “marginal suitable” conditions will prevail in the same regions for grapes as in PC, and there will be “very suitable” conditions in Central Anatolia, in the southern part of the Aegean, in the inner west and north-western parts of the Mediterranean, in Eastern and Southeastern Anatolia. Suitable conditions are expected to occur throughout Marmara, Aegean and Central Anatolia, east of the Mediterranean and a part of Eastern and Southeastern Anatolia (Figure 4.43c).

Hereunder, the climate suitability classfication for grape made by the first weighting method (RE) is given in Figure 4.44. Thereafter, (a) the distribution of 923 locations classified is provided by the EIC approach, (b) distribution of 923 locations classified by PC approach, (c) distribution of 923 locations classified by NBC approach.

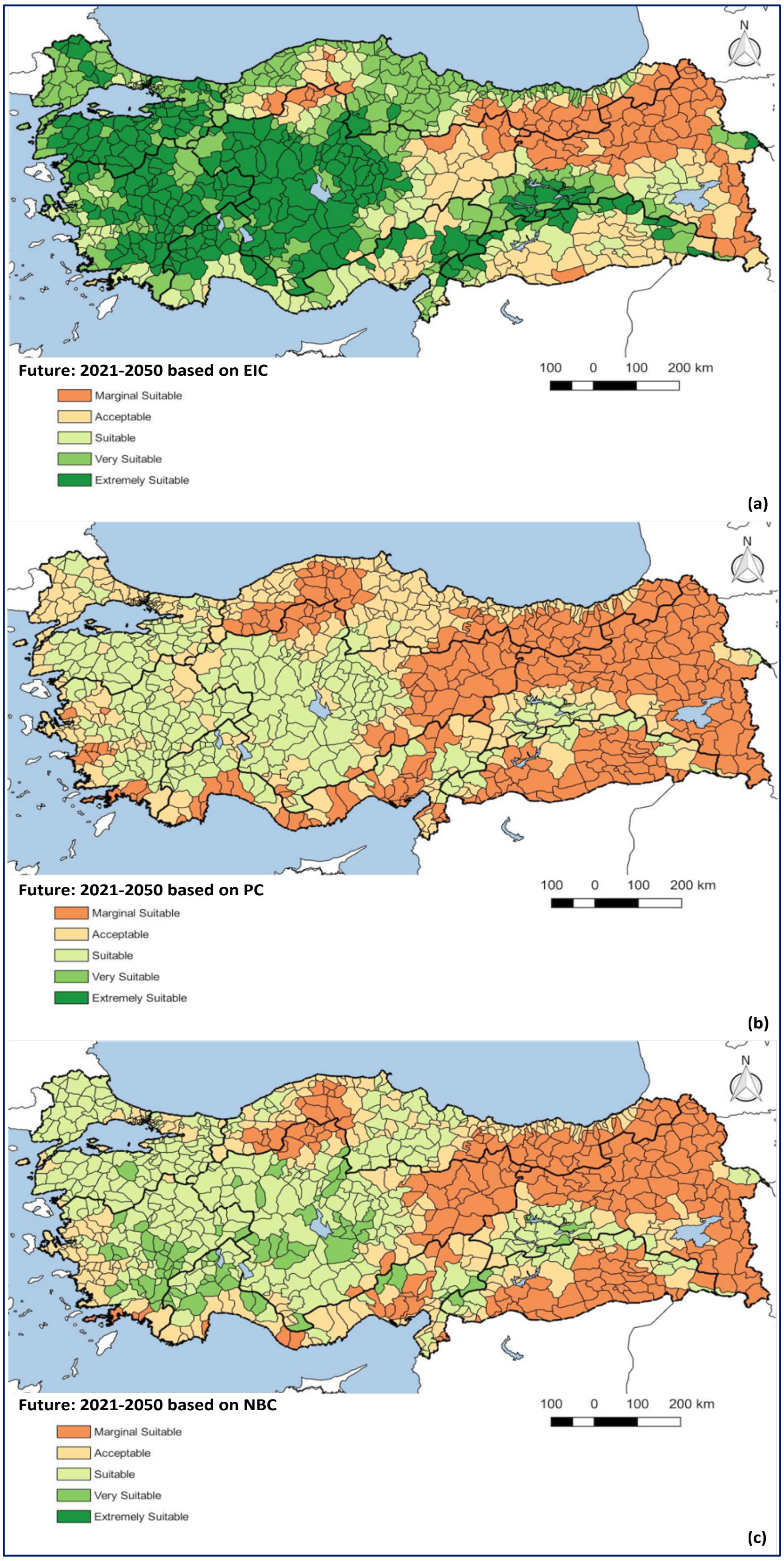

Figure 4.44. Projected **Grape Climate Suitability Index (GCSI)** and **Classification Change for 923 locations** under RCP8.5 for the period of 2021-2050 with respect to the period of 1991-2012 using dynamically downscaled MPI-ESM-MR model inputs to the membership function based on 3 approaches i.e., **EIC, PC,** and **NBC** with the variables weighted of **RE model**.

Looking at the climate suitability distribution of 923 locations with RE model weigthing for the future period of 2021-2050 in the EIC approach, it is observed that “extremely suitable” conditions in 285 locations, “very suitable” in 295 locations, “suitable” in 142, “acceptable” in 107, while “marginal suitable” conditions in 94 in the next period of 2021-2050 (for details please see Appendix F). Accordingly, except “marginal suitable” conditions in inner parts of the Eastern Black Sea inner and the northeastern parts of East Anatolia, the map seems quite green, in other words, “extremely suitable” and “very suitable” conditions take attention to be more in the future. Especially the north of Marmara, Aegean, Central Anatolia, Mediterranean and the north of Southeastern Anatolia and the south of Eastern Anatolia have become quite green (Figure 4.44a).

When we look at the distribution of 923 districts for the future period of 2021-2050 in the PC approach, it is expected that “very suitable” in 1 location, “suitable” in 336, “acceptable” in 351, “marginal suitable” conditions in 235 (for details please see Appendix F). It is anticipated that “suitable” conditions will mainly occur in the Aegean and Central Anatolia, and it is observed that “marginal suitable” conditions will prevail in the West and East Black Sea and in the east of Central Anatolia, in the north, east and inner parts locally of East Anatolia, and most of Southeast Anatolia. It is estimated that there will be “acceptable” conditions in the north of Marmara and “suitable” conditions in other locations. In the meantime, “suitable” conditions are expected to occur in the West Mediterranean and locally East and Southeast Anatolia (Figure 4.44b).

According to the NBC approach, when we look at the distribution of 923 locations for the future period of 2021-2050, it is expected that there will be “very suitable” conditions in 66 locations, “suitable” in 311, “acceptable” in 335, and “marginal suitable” conditions in 211 (for details please see Appendix F). Hereunder, it is predicted that “marginal suitable” conditions will prevail in the same regions for grapes, as in PC, and “very suitable” conditions will occur in Central Anatolia, the southern parts of the Aegean, the inner west, and north-western parts of the Mediterranean, and in Eastern and Southeastern Anatolia locally. Besides, “suitable” conditions are expected to occur in throughout Marmara, Aegean, and Central Anatolia, in the east of the Mediterranean and in parts of Eastern and Southeastern Anatolia and the coastal and inland parts of the Central Black Sea (Figure 4.44c).

5. DISCUSSION

In the study, while the statistical model focuses on observing the relationship between climate change and yield by ignoring any changes in other factors (e.g., management and technology options, economic indicators), the crop growth simulation model focuses this relationship by considering changes in other factors i.e., management options and by ignoring the information from the field. Hence, assuming that the effects of climate change may vary greatly on a regional and temporal scale, working at higher resolution both temporally and spatially considering the changes in other factors can yield more reliable and effective results. A more comprehensive study requires a much larger data set and field study, which may limit the work to be done in many regions. For example, although the motivation of this study focuses only on examining the climate impact on the yield, it may be difficult to access the data of the specified non-climatic factors in the region. Although detailed studies involving all factors will make clearer results for the future, studies dealing with each factor separately will also be useful in predicting the future about the climate change-yield relationship (Lobell et al., 2006).

Hazelnut yield per area and per tree in Turkey is lower compared to other countries (TURKSTAT, n.d.-a; Beyhan and Odabaş, 1996a) which may be a result of management and technology options. Moreover, in 2021-2050 future period with respect to 1991-2012 reference period, the results indicate that changes in hazelnut yield may be increased (up to 14 %) or decreased (up to 13 %) depending on location. Most of the decrease is expected to be in the eastern Black Sea sub-region, which is the most important area of Turkey in terms of the high-quality hazelnut production. Particularly due to the aging of hazelnut trees, the yield of quality hazelnuts may decrease even more in the mid and distant future in the eastern Black Sea sub-region where the yield is already lower compared to the central Black Sea, the western Black Sea, and the eastern Marmara sub-regions.

Based on the phenological model results, the yield is expected to decrease in 42 of 88 locations and increase in 38 locations. Considering hazelnut phenological structure in the medium term, it is projected that the yield may decrease the most in the eastern Black Sea sub-region up to 13 %. For the growth process, it is important to see statistical significance to understand the substantial parameters and their effect on yield. In general, it can be said that the T_{mean}, DTR, Pr, AET, RH, and SunD, as mentioned earlier in the study, show significant differences about the direction of statistical relationship for different phenological periods in development process. Model findings indicate that Pr and AET are statistically significant with the different relationships at the vegetative (dormancy) and reproductive process (flowering, grain filling). Since hazelnut still needs to be chilling during dormancy period to start slightly flowering, a statistically significant positive relationship with DTR is striking. Hazelnut is known to be damaged by late spring frosts and the negative significant relationship between hazelnut yield and DTR during flowering supports this. Since hazelnut requires humid climatic conditions, it needs humidity during the whole development process and needs humidity above a certain level during the summer period for ripening. Statistically significant positive test results also support that to some extent during flowering period. There is a negative significant relationship as excessive SunD may affect the need for chilling during the dormancy, and positive relationship at the beginning of development process in flowering.

Hazelnut requires regular annual precipitation, so summer droughts damage production and reduce yields. In case of insufficient precipitation and summer drought, the fruit does not reach sufficient size and does not fully mature. Thus, the harvest time comes early, and the yield is reduced by almost half. Therefore, hazelnut should grow in humid and temperate climate in general. Under normal conditions, it does not grow in continental climate zones. However, in the subtropical regions with high temperatures (i.e., Valencia-Catalonia of Spain, the south of Italy, the Oregon region on the Pacific coast of the USA, and Washington state), economic hazelnut orchards have been established through the application of irrigated farming method in the summer months (Doğanay, 2012). These orchards are irrigated several times during the summer with an interval of about 20 days (Doğanay, 2012). This method increases the yield several times according to natural growing conditions. Compared with the yield per hectare in Italy and Spain, it is almost half of these countries in Turkey.

Increase in precipitation variability and increase in intensity, frequency and duration of extreme precipitation caused by climate change pose a risk for hazelnut that require regular precipitation throughout the year. For example, not too distant future, particularly in the eastern Black Sea sub-region -the homeland of high-quality hazelnut- it is predicted that the variability may increase in all seasons, as a possible rise in winter precipitation may lead to changes in precipitation pattern and excessive precipitation without any decrease or too many changes in other seasons. In addition, considering the topography of the region, it can be said that the possible increase in the frequency of excessive and heavy precipitation may trigger flood and landslide risk in the affected area and cause land degradation and loss. Likewise, an increase in average temperatures in the future may cause shifts in the phenological periods of hazelnut. In addition, it can cause premature flowering and early maturation and consequently decrease in quality and yield. Moreover, it is estimated that the average temperature increases, which are expected to be higher in the summer season meaning that dry summer, may lead to a decrease in yield in hazelnut growing areas by affecting grain filling phenological process. One of the most important climatic threats in hazelnuts is the late spring frosts. For example, agricultural frost in the Black Sea region in 1993, 2004, and 2014 caused serious damage to hazelnut (Balık and Kayalak Balık, 2015). All of these points to the direct effects of climate change and it should not be ignored that there may be indirect impacts of climate change. It is also important to remember negative conditions such as the spread of existing insects or the reproduction of new ones. Another point is that the locations above 600 m might not be currently suitable for hazelnut cultivation due to late spring frosts, but when considered together with the impacts of climate change in the future, higher altitudes may become suitable for hazelnut. On the other hand, the summer period i.e., June and July, of previous year may be affected for next year productivity because of vegetative affects, therefore long period analysis should be considered for understanding climate change impact on future hazelnut yield.

While T_{mean} of flowering period has a positive effect, DTR indicating the possible frost risk has a negative effect. This effect is especially noticeable in late winter and spring. Since requirement of regular annual precipitation, it is necessary to have enough precipitation during the summer months for efficient grain filling process. Therefore, it is observed that Pr has a positive effect particularly in July. Consistent with it, the increase in AET during this period also has a negative effect on yield.

Due to the need for physiological dormancy, hazelnut is followed by a less productive year (about 30-40 % less) after a productive year as in other fruits. If the hazelnut is exposed to frost in late spring that year, it is greatly damaged. Late spring frosts and summer droughts are the most important climate indicators that determine the regional distribution of hazelnut orchards. Especially in the cultivated hazelnut orchards over 600 m, it is possible to experience a significant loss of yield due to late spring frosts. In other words, the lands over 600 m altitude are less suitable for hazelnut cultivation. Ecological conditions such as regular precipitation and summer droughts are effective in hazelnut cultivation. In the Black Sea region, where natural conditions are already present, revising the hazelnut orchards by identifying the appropriate altitude will allow protection from late spring frosts. It will also contribute to the elimination of yield losses due to climate and various physiological and cultural conditions to a certain extent with appropriate management options. For instance, hoeing at regular intervals (e.g., every two years), rejuvenation pruning and sorting in the orchards can greatly contribute yield increase. Particularly, considering climatic changes, the contribution of regular maintenance practices and technical implementations become even more important.

Second fruit considered in the study is grape, which is grown quite widely in Turkey. The Aegean region is responsible for more than half of the grape cultivated areas and grape production. It is in the first place especially in raisin (dried grape) production. Therefore, adverse changes in climatic conditions that may occur in the direction required for grape in the Aegean region of Turkey will be effective on more than half of grape production. When looking the relationship between yield change and geographic location, the correlation between longitude and yield change was found to be medium level (0.60), that is, it was observed that the yield has decreased from the west to the east. Accordingly, although the Southeastern Anatolia yield the will be most affected (30-40 %), expected decrease up to the 20 % in total production in Aegegan region which is provided more than half of Turkey grape production may have more impact. During the development period, which covers the months between April and October, the furthest increase in T_{max}, T_{min} and T_{mean} is foreseen in eastern and southeastern Anatolia, followed by the Mediterranean, Central Anatolia, and Aegean regions. Accordingly, the high correlation between the increase in high limit temperature, which is also seen in the crop model outputs, to survive of the grape, and the yield signal in terms of the future for the grape. During the development period, in parallel with temperature increases, decreases of up to 40 % in PR especially in the southeast, pose a risk for the water requirement of the grape, particularly in the summer months. These decreases are expected to be around 20 % in the Aegean and Mediterranean regions. Grape, which does not require for much precipitation, needs the required rainfall especially in the summer, so it can be said that the decrease of precipitation in the summer months may affect the grape yield. Particularly in the grain formation and veraison period, in July and August, the downward change in relative humidity affects the development of grapes. When humidity drops below 50 %, drought begins for grapes and fruit quality is negatively affected. In eastern and southeastern Anatolia, decreases in the average relative humidity are estimated at around 2.5-3 %. Since wind speed is an important parameter for grape during development, increases in wind speed can damage the fruit. Each day seen above 3-4 m/s in the development period may pose a risk for the grape. In particular, the 5 % increase in the wind speed averages seen in the Aegean, Marmara, Central Anatolia, and the western Mediterranean indicate that daily increases may be higher. The projection results are in line with the expected effects of climate change on grape yield. Also, considering the future climatic suitability conditions of the locations where the grapes are grown, it is seen that the decrease pattern in the grape yield generally corresponds to the decline pattern in climatic suitability conditions. In the future, expected temperature increases and precipitation decreases are predicted to have an adverse impact on yield, and this effect is predicted to cause further decline in favorable climatic conditions for grape due to the increase in the frequency and duration of extremes. However, higher average temperatures cause the crop to catch up on the day-degree accumulation it needs earlier. This situation causes earlier bud break, early harvest and decreases in quality. Besides, the average temperature increases also lead to the delay of the exit from dormancy, as the crop does not get the cooling it needs. Both crop model outputs and climate suitability index results show us that climate change affects the phenology of grapes with climatic breakdown.

On the other hand, while calculating the climate suitability index, two different weighting methods (FE and RE) for variables are applied, and 3 different approaches are used for the range determination while classifying. Although EIC, as one of the interval determinations approaches, is one of the frequently used methods in the literature, it can be controversial in terms of its results. Therefore, in terms of the results in this study, it differs from other two approaches and shows much more positive results. The PC and NBC approaches, on the other hand, give closer results and can be interpreted as closer to reality in terms of breaking data.

Hereunder, if we look at how the 88 locations where the hazelnut grows will change in terms of climatic suitability in the next 2021-2050 period; In the EIC approach, which is determined with variables weighted according to the FE model, it is observed that it differs from 71 ES, 13 VS, 3 SU and 1 AC conditions in the past, to 50 ES, 21 VS, 13 SU and 4 AC in the future. According to the PC approach, while there are 22 ES, 22 VS, 22 SU, 18 AC and 4 MS in the past, 14 ES, 14 VS, 22 SU, 20 AC and 18 MS conditions will be expected in the future. In the NBC approach, while there were 46 ES, 15 VS, 14 SU, 10 AC and 3 MS in the past, 36 ES, 12 VS, 9 SU, 15 AC and 16 MS conditions will occur in the future. In all three approaches, it is expected that there will be a decrease in the current conditions, extremely suitable and very suitable conditions can gradually turn into suitable, acceptable and marginal suitable conditions.

In the EIC approach, which is determined with variables weighted according to the RE model, climate suitability conditions over the locations differ from 72 ES, 11 VS, 4 SU and 1 AC conditions in the past to 55 ES, 21 VS, 11 SU and 1 AC in the future. According to the PC approach, while 22 ES, 22 VS, 22 SU, 18 AC and 4 MS have been seen in the past, 1 ES, 11 VS, 35 SU, 29 AC and 12 MS conditions will be expected in the future. In the NBC approach, while there were 49 ES, 16 VS, 7 SU, 14 AC and 2 MS in the past, while 32 ES, 14 VS, 12 SU, 25 AC and 5 MS conditions will occur in the future. In all three approaches, it is expected that there will be a decrease in the current conditions, extremely suitable and very suitable conditions can gradually turn into suitable, acceptable and marginal suitable conditions. Particularly in Giresun and Trabzon, where a quarter of the total hazelnut production is provided in the eastern Black Sea region, the decline that may occur in climatic conditions carries the risk of loss of yield for many locations.

As for the grape, in the EIC approach, which is determined with variables weighted according to the FE model, it is observed that climate suitability conditions differ from 63 ES, 21 VS, 11 SU and 1 AC conditions in the past, to 34 ES, 36 VS, 21 SU and 5 AC in the future. In regard to the PC approach, while there were 24 ES, 24 VS, 24 SU, 20 AC and 4 MS in the past, 44 SU, 34 AC and 18 MS conditions are expected to occur in the future. In the NBC approach, it differs from 24 ES, 33 VS, 16 SU, 21 AC and 1 MS in the past, to 16 VS, 32 SU, 34 AC and 14 MS in the future. In all three methods, it is expected that there will be a decrease in the current conditions, extremely suitable and very suitable conditions can gradually turn into suitable, acceptable and marginal suitable conditions.

On the other hand, in the EIC approach, which is determined with variables weighted according to the RE model, it is observed that while there were 72 ES, 14 VS, 9 SU and 1 AC conditions in the past, these conditions have changed to 44 ES, 24 VS, 16 SU and 12 AC in the future. According to the PC approach, it differs from 24 ES, 24 VS, 24 SU, 20 AC and 4 MS in the past, to 44 SU, 28 AC and 24 MS in the future. In the NBC approach, 45 ES, 22 VS, 12 SU, 16 AC and 1 MS conditions have been seen in the past, 17 VS, 41 SU, 24 AC, and 14 MS conditions will be expected in the future. Also in grapes, as in hazelnuts, it is expected that there will be a decrease in general suitability conditions in all three approaches, extremely suitable and very suitable conditions can gradually turn into suitable, acceptable, and marginal suitable conditions.

According to the results evaluated in terms of both hazelnut and grape, it is noteworthy that the current climatic conditions will change negatively in the next period. This change is also expected to have a negative impact on the yield. The effects of climate change on these two crops with significant commercial value in our country should be included together with solutions in future agricultural planning. Especially the increase in minimum, maximum and mean temperature averages, and also decreases in total precipitation averages specifically in some regions also indicate temperature and precipitation extremes. In other words, for example an increase in maximum temperature averages point out that there is also an increase in maximum of maximum temperatures. In short, along with the increases in extremes, it may pose a risk on agricultural production in the future.

6. CONCLUSION

The total amount of the global hazelnut market will reach almost 9.45 billion USD in the next decade (Yu, 2018). With various production options such as dark-white and milk chocolate, sugar-free chocolate or confectionery, the consumption area of hazelnut is expanding and the demand for hazelnut is increasing worldwide. The retail market is growing day by day with the demand for chocolate producers to reach out to a wider consumer, with improved confectionery features and demand for confectionery products linked to an increasing urban lifestyle. According to general consumption, approximately 90 % of hazelnut is used as a constituent in confectionery chocolate, biscuit, bread, dessert, pastries, ice creams and meals. In other words, hazelnut is used both as a side component and as a main component in chocolate sector. Therefore, there are strong effects of Turkey's production to the global hazelnut market because of high production quantity and share.

Since the first half of the 1990s, government policies have been effective on hazelnuts and base prices have been introduced in hazelnut (Doğanay, 2012). Regardless of the quantity and quality of the product, the manufacturers are guaranteed to purchase by the government. Although this situation seems positive for the producer, many places have been transformed into hazelnut orchards irrespective of ecological conditions, and production has been made inefficient way by going out of economic production. Furthermore, the government provides technical support and incentives to hazelnut growers through cooperatives, so that both small businesses from the parents continue with traditional practices and without regular maintenance, and the number of newly opened small horticultural enterprises increases.

Hazelnut naturally grows in the mild semi-humid and humid temperate regions of Turkey. Since the seasonality and the year-to-year variability is lowest in the Black Sea coastal zone and relatively lower in the eastern Marmara in comparison with other climate regions of Turkey, these regions are well suited to climatic conditions for hazelnut development.

The relationship between climate and crop yield variability is stronger than that addressed of the widely used linear models in the literature (Zscheischler et al., 2017). Each region has different characteristics and behavior towards climate change, so each crop can be affected differently by climate change. Planting date and vegetation time may vary by crop and region. Also, in each phenological period, variables affecting yield may vary. Unlike annual crops, rooted and perennial crops are highly dependent on specific climate parameters and are highly affected by climate change in the long run. Perennial crops grow that can be directly influenced by climate change. In order to grow quality and organic hazelnut, the use of inorganic fertilizer should be abandoned, and organic farming techniques (e.g., farm manure) should be used. Farm manure used in corn fields is also used in hazelnut orchards. However, for quality hazelnuts, farm manure should be used much more than inorganic fertilizer. In other words, hazelnut spread out from economic production areas to regions where there are no ecologically adequate climatic conditions (Doğanay, 2012). Especially the hazelnut orchards spreading to the eastern parts of the Marmara are the best examples of it. Hazelnut production in the Marmara region is supported by additional irrigation in summer drought and the yield of the region is higher than the eastern Black Sea sub-region. Although the region seems to be advantageous in terms of high yield, it should be taken into consideration that the cultivation should be considered with additional and frequent irrigation compared to the regions receiving natural precipitation. In Italy and Spain, which do not have natural precipitation conditions, high quality and high yielding hazelnut are grown with additional irrigation method (Doğanay, 2012). Turkey's market share shrinks depending on highly productive hazelnut in those countries. Therefore, in order to compete with those countries, improvements (i.e., old trees should be replaced with the new ones at suitable altitudes) in the area - natural habitat of hazelnut in Turkey- should be provided. For that matter, a detailed assessment of climatic suitability for the hazelnut production in Turkey will be a follow-up study of this research.

Today, 79 million tons of grapes are produced in an area of approximately 7.2 million hectares around the world (FAOSTAT, n.d.). More than half of the world total grape production (about 59 %) is used in industry for wine and fruit juice production. Approximately 90 % of the portion used in the industry goes to wine production. In other words, more than half of the total production in the world is used for wine production. Approximately 39 % is consumed as table grape and 2 % is consumed as dried grape (about 1.5 million tons) (Çevik, 2019).

Turkey has a significant share in the world in dried and table grape production. China is the main producer of table grape production in the world. In recent years, China has created new vineyard areas and improved yields by using modern breeding methods. It has made China the largest supplier of Asia. Italy and Greece are the largest producers of the European Union.

Turkey has very favorable ecological conditions regarding viticulture. Grapes can be grown in every region, even in every province (at least 1 % of the total cultivation area) except the Black Sea coastal areas and the higher parts of the Eastern Anatolia region in the whole country (SGB, 2019). Most part of the Anatolia, which has the most favorable latitude in terms of ecological demand of grapes, has a very old and long-standing viticulture as the gene center of the grapevine (Kaya and Özdemir, 2015). According to TURKSTAT (n.d.-b), roughly annual 4.000 thousand tons grapes are obtained from 470 thousand hectares of vineyards spanning across the country. There are more than 1000 grape varieties in Turkey, but only 5-6 % of them can be cultivated economically. Grapes are divided into three main groups as table grape, dried and wine/unfermented (churchkhela, molasses etc.) grape according to their commercial position (Dilli and Kader, n.d.; Öndeş et al., 2005). In Turkey, approximately 35 % of grapes for dried, 30 % for table, 30 % for molasses, fruit pulp, sausage, must and 5 % for wine appear in total production (Esnaf, Sanatkârlar ve Kooperatifçilik Genel Müdürlüğü, 2019). Today, seedless grape ranks first in exports of Turkey and sultana seedless grape constitutes 95 % of grape exports (Esnaf, Sanatkârlar ve Kooperatifçilik Genel Müdürlüğü, 2019).

Turkey is a main producer ranking fifth with a share of 6 % in the total vineyard area and ranking sixth with a share of 6 % once again in the production (Çevik, 2019). Turkey ranks after China in the world table grape production (SGB, 2019). Production of world dried grape is about more than 1 million tons. Turkey ranks in the first place in 2017/2018 season with roughly 28 % (310 thousand tons of production). Turkey is followed by the USA with the production 216 thousand tons (KGM, 2018). However, additional vineyards were established in Italy in 2018. And particularly the seedless varieties cultivated in Italy, Turkey's market share is high, is expected to be efficient in a few years. This may affect Turkey market share of seedless varieties. After all, the world table grape production is estimated to decrease by 1.2 million tons for 2018/2019, and this in particular is expected to result from climatic conditions in China and Turkey, it is also expected to be induced yield losses from climate change in other countries. Accordingly, the expected increase of 3 million tonnes for the 2018/2019 production season in Turkey seems that will not happen because of the clusters damage from severe cold season (SGB, 2019). The expectation of loss of yield due to the change in climatic conditions in these countries including Turkey is expected to lead to a decrease in agricultural income and a decline in the grape cultivated areas (SGB, 2019).

Turkey has an important share in terms of both production area and production quantity. Grapes are grown with approximately 500 thousand producers in our country, and most of the grapes produced are table and dried varieties. In 2018, grape production provided a contribution to the national economy with a production value of over 4.5 billion TL and export revenue of over 600 million dollars (Çevik, 2019). Principally with the vineyards established after 2005, an increase of 20 % in quality and yield has been achieved. However, the yield is still low in some provinces and the yield obtained from grape cultivation is still far below the country potential with approximately

943 kg per decare in average (FAOSTAT, n.d.). In the cultivated area and production, the Aegean region ranks first and more than half of the production is provided from this region. In particular, in the production of raisins (dried grape), the Aegean region ranks first. Almost all the seedless raisins are produced in the Aegean in 3 major provinces i.e., Manisa, Izmir, Denizli (Çevik, 2019). Approximately 90 % of raisins production is provided from Manisa (SGB, 2019). Manisa is followed by Denizli (Aegean) and Mersin (Mediterranean) in terms of total production amount in Turkey. Yield in İzmir, which has a significant share in seedless fresh grape (table grape) production in the Aegean, is higher than in Manisa and Denizli. The yield per decare in 2018 in İzmir, Manisa and Denizli is 1826, 1481, and 552 kg, respectively (Esnaf, Sanatkârlar ve Kooperatifçilik Genel Müdürlüğü, 2019).

Unfortunately, cold climate conditions and frost risks due to climate change affected the grape production in the last few years (SGB, 2019). Likewise, the 2018/19 production season was also negatively affected by severe winter conditions. In particular, the late spring frosts have a negative effect on the grapevine. Correspondingly, loss of yield is expected. Therefore, adverse conditions that may occur climate requirements of grape in particularly Aegean region, may have an influence on more than half of Turkey grape production. It may be a concern for producers and the national economy. The projection of 2021-2050 in our study predicts up to 20 % yield loss in the Aegean and 40 % in the Southeastern Anatolia region. Measures involving informing the grape growers about the impact of future climate changes on yield are essential in reducing yield loss. In order for the crop to survive, producers must be informed by various heating measures such as frost propellers for spring late frosts and fire burning (SGB, 2019), or cooling measures for extreme heat waves, or measures for changes in the precipitation regime.

On the other hand, when we look at the world countries in grape consumption, we are lagging far behind in the consumption of EU countries. The reason for that grape is mainly used for table, dry, cider, fruit pulp, etc., in our country and the share of wine production in total production is limited to about 3% -5 % (Çevik, 2019; Esnaf, Sanatkârlar ve Kooperatifçilik Genel Müdürlüğü, 2019). It may have a negative impact on consumption numbers of the country. In particular, European countries bring high production value and export income to their national economy depending on wine production. Considering the suitability of our country's lands in terms of viticulture, increasing the share of wine production in terms of commercial value in regions at appropriate altitudes that are expected to be less affected by climate change in the future, will make a significant contribution to the national economy and exports income. The adaptation implementations that can be applied to increase the production value and export revenues of hazelnut, which is grown as a monoculture in an area with specific climatic conditions in Turkey and has an important place in global production, and grape, which is widely grown in the country and is a significant socio-economic product, may also reduce the agricultural vulnerability of the country to climate change by building the resilience of the country against climate change. What determines the vulnerability of countries to climate change is their socio-economic and environmental positions. In this context, Turkey has the status of a country that has important commercial trump cards in agricultural production. However, to maintain this position, although it is exposed to the effects of climate change as a Mediterranean Basin country, it should have high resilience and a strong adaptive capacity in the face of climate change shocks. While it may be possible to increase resilience by eliminating foreign dependency in food supply and ensuring transparency in the product supply chain, good agricultural practices supported by scientific research, R&D studies, knowledge, and awareness of agricultural product management are methods that can be effective in strengthening adaptive capacity. In this way, Turkey can maintain or increase its market share in the next few decades in products that it has a high global share. Because the countries that are competitive in the market, create long-term product management precaution strategies and make agricultural development plans in the face of agricultural shocks due to climate change. These countries include smart agricultural practices and technological developments in these plans and create good monitoring platforms. In the National Climate Change Adaptation Strategy and Action Plan (2011), Turkey states that it will do the following briefly; integrating agricultural production and food safety policies into climate change and, collaboration with international organizations for the adaptation process, improving the capacities with the higher number of institutions carrying out scientific studies, and updating and monitoring the data about the product management and disasters, providing agricultural diversity, land and water management, promoting the efficient use of water in agriculture-based industry, encouraging crop types suitable for climatic conditions, reducing water losses through appropriate irrigation techniques within local conditions, and transition to technological systems, implementation of modern harvest systems for the protection of soil and agricultural biodiversity and development of agroforestry, strengthening the capacities of the relevant institutions affiliated to the Ministry of Agriculture and Forestry and strengthening the inter-institutional cooperation to increase the awareness and capacity of trade unions and cooperatives, society, raising awareness of drought damage for the adaptation process, increasing the existing capacities and accessibility of flood and drought early warning systems. If Turkey can carry out all these actions declared in the national action plan in a sustainable way in the short term, it will have made an important progress in the process of agricultural production adaptation to climate change; therefore, it will prevent the socio-economic damage of climate-related disasters.

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APPENDIX A: VARIABLE DEFINITIONS BY USAGE TYPE, STICS

VARIABLE	DEFINITION	USAGE TYPE
TDMIN	Minimum temperature below which development stops	Species*
TDMAX	Maximum temperature above which development stops	Species
TDMINDEB	Minimal thermal threshold for hourly calculation of phasic duration between dormancy and bud breaks	Species
TDMAXDEB	Maximal temperature for hourly calculation of phasic duration between dormancy and bud breaks	Species
TCMIN	Minimum temperature at which growth ceases	Species
TCMAX	Maximum temperature at which growth ceases	Species
TGMIN	Minimum temperature below which emergence is stopped	Species
TEMIN	Minimum temperature for development	Species
TEMAX	Maximal temperature above which plant growth stops	Species
TEOPT	Optimal temperature (1/2) for plant growth	Species
TMINREMP	Minimal temperature below which grain filling stops	Species
TMAXREMP	Maximal temperature above which grain filling stops	Species
Q10	Q10 used for the dormancy break calculation	Species
IDEBDORM	Day of the dormancy entrance	Species
Jvc	Number of vernalising days	Variety**
STDORDEBOUR	Cumulative thermal time between the dormancy break and the bud break	Variety
STLEVAMF	Cumulative thermal time between the stages LEV (emergence) and AMF (maximum acceleration of leaf	Species
STAMFLAX	Cumulative thermal time between the stages AMF (maximum acceleration of leaf growth, end of juvenile phase) and LAX (maximum leaf area index,	Variety
STLEVDRP	Cumulative thermal time between the stages LEV (emergence) and DRP (starting date of filling of harvested organs)	Variety
STFLODRP	Cumulative thermal time between FLO (anthesis) and DRP (starting date of filling of harvested organs) (only for indication)	Variety
STDRPNOU	Cumulative thermal time between the stages DRP (starting date of filling of harvested organs) and NOU (end of setting)	Variety
STDRPDES	Cumulative thermal time between the DRP stage (starting date of filling of harvested organs) and DEBDES (date of onset of water dynamics in	Species
PHYLLOTHERME	Thermal duration between the apparition of two successive leaves on the main stem	Species
ADENS	Interplant competition parameter	Species
BDENS	Minimal density above which interplant competition starts	Species
VLAIMAX	Point of inflection of the function of Leaf Growth	Species
PENTLAIMAX	Parameter of the logistic curve of LAI growth	Species
UDLAIMAX	relative development unit for leaf area index from which the rate of leaf growth decreases	Species
DLAIMAXBRUT	Maximum rate of the setting up of LAI	Species
HAUTBASE	Basal height of crop	Size Type
INNTURGMIN*	Parameter of the N stress function active on leaf expansion (INNLAI), bilinear function vs INN passing through the point (INNmin, INNturgmin)	Species
INNSENES*	Nitrogen stress index affecting leaves death	Species
RAPSENTURG	Threshold soil water content active to simulate water senescence stress as a proportion of the turgor stress	Species
DURVIEF	Maximal lifespan of an adult leaf expressed in summation of Q10=2 (2**(T-Tbase))	Species
RATIODURVIEI	Life span of early leaves expressed as a fraction of the life span of the last leaves emitted DURVIEF	Species
PHOBASENSEN	Photoperiod under which the photoperiodic stress affects the lifespan of leaves	Species
STRPHOTMINSEN	Minimum threshold of photoperiodic stress from which the photosynthetic activity of the plant is considered to be cancels	Species
DLTAMSMAXSEN	Threshold value of growth rate from which there is no more photoperiodic effect on senescence	Species
ALPHAPHOT	Parameter of photoperiodic effect on leaf lifespan	Species
RATIOSEN	Fraction of senescent biomass (relative to total biomass)	Species
ABSCISSION	Fraction of senescent leaves falling to the soil	Species
LAICOMP	LAI above which competition between plants starts	Species
KTROU	Extinction coefficient of PAR through the crop (used in the radiative transfer module)	Species
FORME	Option to define the shape of leaf density profile	Species
RAPFORME	Ratio of thickness to /width of the crop shape (negative when the base of the form < top)	Species
ADFOL	Parameter determining the leaf density evolution within the chosen shape	Species
DFOLBAS	Minimal foliar density within the considered shape	Species
DFOLHAUT	Maximal foliar density within the considered shape	Species
EFCROIJUV	Maximum radiation use efficiency during the juvenile phase	Species
EFCROIVEG	Maximum growth efficiency during the vegetative phase (AMF-DRP). Table 1	Species
EFCROIREPRO	maximum radiation use efficiency during the grain filling phase	Species
REMOBRES	Fraction of daily remobilisable C reserves	Species
SLAMIN	Minimum SLA (specific leaf area) of green leaves	Species
SLAMAX	Maximum SLA (specific leaf area) of green leaves	Species

* Species: Variables that do not differ between grape types and are common for all grape types.
** Variety: Variables varying between grape types and analyzed accordingly

VARIABLE	DEFINITION	USAGE TYPE
TIGEFEUIL	Ratio stem (structural part)/leaf	Species
ENVFRUIT	Fraction of envelop in grainmaxi	Species
SEA	Specific area of fruit envelops	Species
SPFRMIN	Minimal sources/sinks value allowing the trophic stress calculation for fruit onset	Species
SPFRMAX	Maximal sources/sinks value allowing the trophic stress calculation for fruit onset	Species
SPLAIMIN	Minimal value of ratio sources/sinks for the leaf growth	Species
SPLAIMAX	Maximal sources/sinks value allowing the trophic stress calculation for leaf growing	Species
NBINFLO	Imposed number of inflorescences per plant	Size Type
AFRUITPOT	Maximal number of set fruits per degree-day (indeterminate growth)	Variety
PGRAINMAXI	Maximum grain weight (at 0% water content)	Variety
NBOITE	Number of boxes or age classes of fruits used to calculate fruit growth for undeterminate crops	Species
ALLOCFRMAX	Maximal daily allocation to fruits	Species
DUREEFRUIT	Total growth period of a fruit at the setting stage to the physiological maturity	Species
AFPF	Parameter of the logistic function defining sink strength of fruits (indeterminate growth) : relative fruit age at which growth is maximal	Species
BFPF	Parameter of the logistic curve defining sink strength of fruits (indeterminate growth): maximum growth rate relative to maximum fruit weight	Species
CFPF	Parameter of the first potential growth phase of fruit, corresponding to an exponential type function describing the cell division phase	Species
DFPF	Parameter of the first potential growth phase of fruit, corresponding to an exponential type function describing the cell division phase	Species
H2OFRVERT	Water content of fruits before the beginning of dehydration	Species
DESHYDBASE	Water content of fruits before the beginning of dehydration	Variety
TEMPDESHYD	Increase in fruit dehydration rate due to the increase in crop temperature (Tcult-Tair)	Species
VITPROPSUCRE	Rate of increase of sugar harvest index vs time	Species
VITIRAZO	Rate of increase of the N harvest index vs time	Species
STOPRAC	Stage when root growth stops	Species
CROIRAC	Elongation rate of the root apex	Species
LVFRONT	Root density at the root apex	Species
DRACLONG	Maximum rate of root length production per plant	Species
DEBSENRAC	Sum of degrees.days defining the beginning of root senescence (root life time)	Species
LONGSPERAC	Specific root length	Species
SENSANOX	Index of anoxia sensitivity (0 = insensitive)	Species
TLETALE	Lethal temperature for the plant	Species
TDEBGEL	Temperature below which frost affects plant growth	Species
TGELJUV10	Temperature resulting in 10% of frost damage on LAI (juvenile stage)	Species
TGELJUV90	Temperature resulting in 90% of frost damage on LAI (juvenile stage)	Species
TGELVEG10	Temperature resulting in 10% of frost damage on LAI (adult stage)	Species
TGELVEG90	Temperature resulting in 90% of frost damage on LAI (adult stage)	Species
TGELFLO10	Temperature resulting in 10% of frost damages on flowers and fruits	Species
TGELFLO90	Temperature resulting in 90% of frost damages on flowers and fruits	Species
PSISTO	Potential of stomatal closing (absolute value)	Species
PSITURG	Potential of the beginning of decrease of the cellular extension	Species
RSMIN	Minimal stomatal resistance of leaves	Species
H2OFEUILVERTE	Water content of green leaves (relative to fresh matter)	Species
H2OFEUILJAUNE	Water content of yellow leaves (relative to fresh matter)	Species
H2OTIGESTRUC	Structural stem part water content (/fresh matter)	Species
ADIL	Parameter of the critical dilution curve	Species
BDIL	Parameter of the critical dilution curve	Species
NMETA	Proportion of metabolic N in the plantlet	Species
MASECMETA	Biomass of the plantlet supposed to be composed of metabolic N	Species
NRESERVE	Maximal amount of N in plant reserves (difference between the maximal and critical dilution curves) (percentage of aerial biomass)	Species
INNMIN	Minimum value of INN possible for the crop	Species
INNGRAIN1	Minimal INN for net absorption of N during grain filling	Species
INNGRAIN2	INN minimal for null net absorption of N during grain filling	Species
INNIMIN	INNI (instantaneous INN) corresponding to INNmin	Species
VMAX1	Maximum specific N uptake rate with the low affinity transport system	Species
VMAX2	Maximum specific N uptake rate with the high affinity transport system	Species

APPENDIX B: VARIABLES, VARIABLE UNITS, LOWER AND UPPER BOUNDARIES AND THE VALUES USED IN THE STICS BY GRAPE TYPE

PARAMETER	UNIT	LOWER BOUNDARY	UPPER BOUNDARY	ALPHONSE LAVELLE	BESNİ	BOĞAZKERE	ÇAL KARASI	EMİR	DİMRİT	HOROZ KARASI	KALECİK KARASI	KARASAKIZ	MERLOT	NARİNCE	ÖKÜZGÖZÜ	PAPAZ KARASI	RED GLOBE	SULTANA	SYRAH	ŞİRE
AFRUITPOT	$1/deg*day$	0.5	20	1.15	1.25	1.25	1.65	1.15	1.15	1.45	1.15	1.15	1.15	1.15	1.15	1.65	1.15	2.05	2.35	3.15
PGRAINMAXI	$gram$	0	5	2.52	1.62	1.62	2.02	2.02	2.42	1.62	1.62	162	1.92	1.92	1.62	1.62	1.62	2.42	1.92	3.22
NBINFLO	$1/plant$	1	100	7	17	10	5	9	6	16	10	9	8	9	7	5	12	10	6	60
DENSITESEM	$1/m^2$	0.05	2000	0.14	0.19	0.14	0.13	0.19	0.11	0.11	0.11	0.27	0.25	0.11	0.27	0.33	0.27	0.15	0.33	0.13
DUREEFRUIT	$deg*day$	10	2000	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL
Development Process																				
TDMIN	°C	-10	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
TDMAX	°C	15	40	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
STLEVAMF	$deg*day$	0	6000	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
STLEVDRP	$deg*day$	0	6000	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7	347.7
STFLODRP	$deg*day$	0	500	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Q10	-	1.5	3.5	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17
IDEBDORM	day	1	999	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213
JVC	day	0	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Shoot Growth																				
PHYLLOTHERME	$deg*day$	10	150	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
BDENS	$plant/m^2$	1	200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LAICOMP	-	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HAUTBASE	$meter$	0.1	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
HAUTMAX	$meter$	0.2	5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
VLAIMAX	-	1.5	2.5	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
PENTLAIMAX	-	0	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
UDLAIMAX	-	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
RATIODURVIEI	-	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TCMIN	°C	-10	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
TCMAX	°C	10	50	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
RATIOSEN	-	0	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
ABSCISSION	-	0	100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
PARAZOFMORTE	-	10	20	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
INNTURGMIN	-	-2	1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
DLAIMAXBRUT	$m^2(leaf)/deg*day$	$5x10^{-6}$	0.5	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
DURVIEF	-	10	500	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
DURVIESUPMAX	-	0	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
INNSEN	-	-2	1	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
RAPSENTURG	-	0.5	1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
KTROU	-	0.1	2	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
FORME	-	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
RAPFORME	-	-5	5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
ADFOL	$1/metre$	-10	10	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16
DFOLBAS	$m^2(leaf)/m^3$	1	10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
DFOLHAUT	$m^2(leaf)/m^3$	1	10	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
TEMIN	°C	-10	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
TEMAX	°C	15	40	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
TEOPT	°C	10	30	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
TEOPTBIS	°C	10	30	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
ALPHACO2	-	1	2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EFCROIJUV	$gram/MJ$	1	7	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EFCROIVEG	$gram/MJ$	1	10	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
EFCROIREPRO	$gram/MJ$	1	10	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
REMOBRES	-	0	0.5	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073
SLAMAX	$cm^2/gram$	50	500	235	235	235	235	235	235	235	235	235	235	235	235	235	235	235	235	235
SLAMIN	$cm^2/gram$	50	500	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
TIGEFEUILLE	-	0	3	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

PARAMETER	UNIT	LOWER BOUNDARY	UPPER BOUNDARY	ALPHONSE LAVELLE	BESNİ	BOĞAZKERE	ÇAL KARASI	EMİR	DİMRİT	HOROZ KARASI	KALECİK KARASI	KARASAKIZ	MERLOT	NARİNCE	ÖKÜZGÖZÜ	PAPAZ KARASI	RED GLOBE	SULTANA	SYRAH	ŞİRE
ENVFRUIT	-	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEA	$cm^2/gram$	0	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TLETALE	$°C$	-30	-1	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20
TDEBGEL	$°C$	-5	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
TGELJUV10	$°C$	-25	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
TGELJUV90	$°C$	-25	0	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TGELVEG10	$°C$	-25	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
TGELVEG90	$°C$	-25	0	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TGELFLO10	$°C$	-25	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
TGELFLO90	$°C$	-25	0	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
Yield Formation																				
NBOITE	-	1	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
ALLOCAMX	-	0.05	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
AFPF	-	0.01	1	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
BFPF	-	0	30	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
CFPF	-	0.1	100	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
DFPF	-	0.01	5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
STDRPNOU	$deg * day$	0	6000	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
SPFRMIN	-	0	1	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
SPFRMAX	-	0.7	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SPLAIMIN	-	0.01	1	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
SPLAIMAX	-	0.7	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TMINREMP	$°C$	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TMAXREMP	$°C$	10	40	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
VITPROPSUCRE	$g(sugar)/g(DM) * day$	0.001	0.01	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029
VITPROPHUILE	$g(oil)/g(DM) * day$	0.001	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VITIRAZO	$g(grain)/g(plant) * day$	0.001	0.04	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Root Growth																				
SENSANOX	-	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SENSRSEC	-	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONTRDAMAX	-	0	1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
DRACLONG	$cm(root)/plant * (deg * day)$	1	1000	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
STDEBSENRAC	$deg * day$	0	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
LVFRONT	$g(root)/cm^3(soil)$	0.02	1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
LONGSPERAC	$cm/gram$	250	25000	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021
Water Balance																				
PSISTO	bar	1	25	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
PSITURG	bar	1	15	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
H2OFEUILVERTE	$g(water)/g(FM)$	0.5	1	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
H2OFEUILJAUNE	$g(water)/g(FM)$	0.05	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
H2OTIGESTRUC	$g(water)/g(FM)$	0.5	1	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
H2ORESERVE	$g(water)/g(FM)$	0.5	1	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
H2OFTVERT	$g(water)/g(FM)$	0.1	1	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925
STDRPDES	$deg * day$	0	900	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
DESHYDBASE	$g(water)/g(FM) * °C$	-0.02	0.02	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155
TEMPDESHYD	$\%water/°C$	0.0004	0.05	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016
RSMIN	$s/meter$	20	500	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
VMAX1	µmole $/cm * hectar$	0.0002	0.01	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018
KMABS1	µmole $/cm * hectar$	20	200	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
VMAX2	µmole $/cm(root)$	0.002	0.1	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058	0.0058
KMABS2	$\%DM$	4000	40000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000
ADIL	-	1	7	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
BDIL	$cm/gram$	0.01	0.8	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
MASECNMAX	$cm/gram$	0.05	5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
NMETA	$\%DM$	0	100	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
NRES	$\%DM$	0	100	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
INNIMIN	-	0	1	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49
INNMIN	-	0	1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

*DM: Dry Matter, **FM: Fresh Matter, ***MJ: Megajoule, ****DOL: Depend on Location

APPENDIX C: HAZELNUT CLIMATE SUITABILITY INDEX (GCSI) AND CLASSIFICATION CHANGE FOR 923 LOCATIONS FOR REFERENCE PERIOD OF 1991-2012 AND FUTURE PERIOD OF 2021-2050 BASED ON 3 APPROACHES I.E. EIC, PC, AND NBC WITH FE MODEL

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
448	Aegean	Afyonkarahisar	Hocalar	0.781201	Very Suitable	Acceptable	Suitable	1077	BSk	Arid, steppe, cold
781	Aegean	Afyonkarahisar	Sincanlı	0.774999	Very Suitable	Acceptable	Suitable	1125	Dsb	Cold, dry summer, warm summer
730	Aegean	Afyonkarahisar	Sandıklı	0.763083	Very Suitable	Acceptable	Suitable	1094	BSk	Arid, steppe, cold
123	Aegean	Afyonkarahisar	Bayat/Afyon	0.762278	Very Suitable	Acceptable	Suitable	698	BSk	Arid, steppe, cold
563	Aegean	Afyonkarahisar	Kızılören	0.760855	Very Suitable	Acceptable	Suitable	1112	BSk	Arid, steppe, cold
459	Aegean	Afyonkarahisar	İhsaniye	0.758392	Very Suitable	Acceptable	Suitable	1099	BSk	Arid, steppe, cold
475	Aegean	Afyonkarahisar	İscehisar	0.750731	Very Suitable	Acceptable	Suitable	1081	BSk	Arid, steppe, cold
801	Aegean	Afyonkarahisar	Şuhut	0.741402	Very Suitable	Acceptable	Acceptable	1145	BSk	Arid, steppe, cold
315	Aegean	Afyonkarahisar	Emirdağ	0.738660	Very Suitable	Acceptable	Acceptable	965	BSk	Arid, steppe, cold
208	Aegean	Afyonkarahisar	Çay	0.735463	Very Suitable	Acceptable	Acceptable	1038	BSk	Arid, steppe, cold
157	Aegean	Afyonkarahisar	Bolvadin	0.733201	Very Suitable	Acceptable	Acceptable	990	BSk	Arid, steppe, cold
10	Aegean	Afyonkarahisar	Afyon/Merkez	0.733155	Very Suitable	Acceptable	Acceptable	1012	BSk	Arid, steppe, cold
805	Aegean	Afyonkarahisar	Sultandağı	0.727616	Very Suitable	Acceptable	Acceptable	1012	BSk	Arid, steppe, cold
277	Aegean	Afyonkarahisar	Dinar	0.720974	Very Suitable	Acceptable	Acceptable	865	BSk	Arid, steppe, cold
241	Aegean	Afyonkarahisar	Çobanlar	0.706691	Very Suitable	Acceptable	Acceptable	992	BSk	Arid, steppe, cold
338	Aegean	Afyonkarahisar	Evciler	0.651019	Very Suitable	Acceptable	Acceptable	909	BSk	Arid, steppe, cold
255	Aegean	Afyonkarahisar	Dazkırı	0.561685	Suitable	Marginal Suitable	Marginal Suitable	894	BSk	Arid, steppe, cold
120	Aegean	Afyonkarahisar	Başmakçı	0.358886	Acceptable	Marginal Suitable	Marginal Suitable	858	BSk	Arid, steppe, cold
504	Aegean	Aydın	Karacasu	0.331386	Acceptable	Marginal Suitable	Marginal Suitable	518	Csa	Temperate, dry summer, hot summer
603	Aegean	Aydın	Kuyucak	0.322610	Acceptable	Marginal Suitable	Marginal Suitable	124	Csa	Temperate, dry summer, hot summer
173	Aegean	Aydın	Buharkent	0.319182	Acceptable	Marginal Suitable	Marginal Suitable	190	Csa	Temperate, dry summer, hot summer
163	Aegean	Aydın	Bozdoğan	0.314087	Acceptable	Marginal Suitable	Marginal Suitable	302	Csa	Temperate, dry summer, hot summer
655	Aegean	Aydın	Nazilli	0.310138	Acceptable	Marginal Suitable	Marginal Suitable	81	Csa	Temperate, dry summer, hot summer
806	Aegean	Aydın	Sultanhisar	0.306505	Acceptable	Marginal Suitable	Marginal Suitable	77	Csa	Temperate, dry summer, hot summer
900	Aegean	Aydın	Yenipazar/Aydın	0.297056	Acceptable	Marginal Suitable	Marginal Suitable	62	Csa	Temperate, dry summer, hot summer
581	Aegean	Aydın	Köşk	0.295308	Acceptable	Marginal Suitable	Marginal Suitable	75	Csa	Temperate, dry summer, hot summer
235	Aegean	Aydın	Çine	0.277784	Acceptable	Marginal Suitable	Marginal Suitable	82	Csa	Temperate, dry summer, hot summer
524	Aegean	Aydın	Karpuzlu	0.256656	Acceptable	Marginal Suitable	Marginal Suitable	92	Csa	Temperate, dry summer, hot summer
89	Aegean	Aydın	Aydın/Merkez	0.243102	Acceptable	Marginal Suitable	Marginal Suitable	92	Csa	Temperate, dry summer, hot summer
568	Aegean	Aydın	Koçarlı	0.206447	Acceptable	Marginal Suitable	Marginal Suitable	34	Csa	Temperate, dry summer, hot summer
469	Aegean	Aydın	İncirliova	0.200956	Acceptable	Marginal Suitable	Marginal Suitable	43	Csa	Temperate, dry summer, hot summer
365	Aegean	Aydın	Germencik	0.152860	Marginal Suitable	Marginal Suitable	Marginal Suitable	61	Csa	Temperate, dry summer, hot summer
273	Aegean	Aydın	Didim	0.152752	Marginal Suitable	Marginal Suitable	Marginal Suitable	35	Csa	Temperate, dry summer, hot summer
601	Aegean	Aydın	Kuşadası	0.131981	Marginal Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
797	Aegean	Aydın	Söke	0.100872	Marginal Suitable	Marginal Suitable	Marginal Suitable	74	Csa	Temperate, dry summer, hot summer
187	Aegean	Denizli	Çameli	0.739668	Very Suitable	Acceptable	Acceptable	1309	Csa	Temperate, dry summer, hot summer
138	Aegean	Denizli	Beyağaç	0.704535	Very Suitable	Acceptable	Acceptable	699	Csa	Temperate, dry summer, hot summer
4	Aegean	Denizli	Acıpayam	0.683631	Very Suitable	Acceptable	Acceptable	937	Csa	Temperate, dry summer, hot summer
236	Aegean	Denizli	Çivril	0.678202	Very Suitable	Acceptable	Acceptable	831	BSk	Arid, steppe, cold
768	Aegean	Denizli	Serinhisar	0.677791	Very Suitable	Acceptable	Acceptable	972	Csa	Temperate, dry summer, hot summer
825	Aegean	Denizli	Tavas	0.646355	Very Suitable	Acceptable	Acceptable	933	Csa	Temperate, dry summer, hot summer
493	Aegean	Denizli	Kale/Denizli	0.641245	Very Suitable	Acceptable	Acceptable	1050	Csa	Temperate, dry summer, hot summer
108	Aegean	Denizli	Baklan	0.639745	Very Suitable	Acceptable	Acceptable	964	Csa	Temperate, dry summer, hot summer
165	Aegean	Denizli	Bozkurt/Denizli	0.637257	Very Suitable	Acceptable	Acceptable	860	Csa	Temperate, dry summer, hot summer
198	Aegean	Denizli	Çardak	0.637194	Very Suitable	Acceptable	Acceptable	857	Csa	Temperate, dry summer, hot summer
131	Aegean	Denizli	Bekilli	0.612103	Very Suitable	Marginal Suitable	Acceptable	830	Csa	Temperate, dry summer, hot summer
183	Aegean	Denizli	Çal	0.582891	Suitable	Marginal Suitable	Marginal Suitable	838	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
449	Aegean	Denizli	Honaz	0.501058	Suitable	Marginal Suitable	Marginal Suitable	502	Csa	Temperate, dry summer, hot summer
401	Aegean	Denizli	Güney	0.358046	Acceptable	Marginal Suitable	Marginal Suitable	822	Csa	Temperate, dry summer, hot summer
260	Aegean	Denizli	Denizli/Merkez	0.342228	Acceptable	Marginal Suitable	Marginal Suitable	392	Csa	Temperate, dry summer, hot summer
99	Aegean	Denizli	Babadağ	0.327027	Acceptable	Marginal Suitable	Marginal Suitable	758	Csa	Temperate, dry summer, hot summer
176	Aegean	Denizli	Buldan	0.325945	Acceptable	Marginal Suitable	Marginal Suitable	619	Csa	Temperate, dry summer, hot summer
28	Aegean	Denizli	Akköy	0.319474	Acceptable	Marginal Suitable	Marginal Suitable	392	Csa	Temperate, dry summer, hot summer
737	Aegean	Denizli	Sarayköy	0.313146	Acceptable	Marginal Suitable	Marginal Suitable	165	Csa	Temperate, dry summer, hot summer
555	Aegean	İzmir	Kınık	0.455346	Suitable	Marginal Suitable	Marginal Suitable	85	Csa	Temperate, dry summer, hot summer
553	Aegean	İzmir	Kiraz	0.445909	Suitable	Marginal Suitable	Marginal Suitable	305	Csa	Temperate, dry summer, hot summer
132	Aegean	İzmir	Bergama	0.439141	Suitable	Marginal Suitable	Marginal Suitable	61	Csa	Temperate, dry summer, hot summer
139	Aegean	İzmir	Beydağ	0.347196	Acceptable	Marginal Suitable	Marginal Suitable	215	Csa	Temperate, dry summer, hot summer
665	Aegean	İzmir	Ödemiş	0.337166	Acceptable	Marginal Suitable	Marginal Suitable	133	Csa	Temperate, dry summer, hot summer
126	Aegean	İzmir	Bayındır	0.313664	Acceptable	Marginal Suitable	Marginal Suitable	87	Csa	Temperate, dry summer, hot summer
543	Aegean	İzmir	Kemalpaşa/İzmir	0.304133	Acceptable	Marginal Suitable	Marginal Suitable	167	Csa	Temperate, dry summer, hot summer
834	Aegean	İzmir	Tire	0.261151	Acceptable	Marginal Suitable	Marginal Suitable	112	Csa	Temperate, dry summer, hot summer
171	Aegean	İzmir	Buca	0.249796	Acceptable	Marginal Suitable	Marginal Suitable	78	Csa	Temperate, dry summer, hot summer
160	Aegean	İzmir	Bornova	0.224503	Acceptable	Marginal Suitable	Marginal Suitable	78	Csa	Temperate, dry summer, hot summer
840	Aegean	İzmir	Torbalı	0.200383	Acceptable	Marginal Suitable	Marginal Suitable	39	Csa	Temperate, dry summer, hot summer
631	Aegean	İzmir	Menemen	0.179004	Marginal Suitable	Marginal Suitable	Marginal Suitable	12	Csa	Temperate, dry summer, hot summer
352	Aegean	İzmir	Gaziemir	0.176943	Marginal Suitable	Marginal Suitable	Marginal Suitable	135	Csa	Temperate, dry summer, hot summer
224	Aegean	İzmir	Çeşme	0.158037	Marginal Suitable	Marginal Suitable	Marginal Suitable	24	Csa	Temperate, dry summer, hot summer
502	Aegean	İzmir	Karaburun	0.139597	Marginal Suitable	Marginal Suitable	Marginal Suitable	45	Csa	Temperate, dry summer, hot summer
351	Aegean	İzmir	Foça	0.117445	Marginal Suitable	Marginal Suitable	Marginal Suitable	12	Csa	Temperate, dry summer, hot summer
526	Aegean	İzmir	Karşıyaka	0.087151	Marginal Suitable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
653	Aegean	İzmir	Narlıdere	0.086567	Marginal Suitable	Marginal Suitable	Marginal Suitable	25	Csa	Temperate, dry summer, hot summer
757	Aegean	İzmir	Seferihisar	0.070798	Marginal Suitable	Marginal Suitable	Marginal Suitable	36	Csa	Temperate, dry summer, hot summer
411	Aegean	İzmir	Güzelbahçe	0.065865	Marginal Suitable	Marginal Suitable	Marginal Suitable	23	Csa	Temperate, dry summer, hot summer
275	Aegean	İzmir	Dikili	0.060285	Marginal Suitable	Marginal Suitable	Marginal Suitable	4	Csa	Temperate, dry summer, hot summer
630	Aegean	İzmir	Menderes	0.059972	Marginal Suitable	Marginal Suitable	Marginal Suitable	130	Csa	Temperate, dry summer, hot summer
571	Aegean	İzmir	Konak	0.059150	Marginal Suitable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
869	Aegean	İzmir	Urla	0.058559	Marginal Suitable	Marginal Suitable	Marginal Suitable	70	Csa	Temperate, dry summer, hot summer
232	Aegean	İzmir	Çiğli	0.053525	Marginal Suitable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
759	Aegean	İzmir	Selçuk	0.052151	Marginal Suitable	Marginal Suitable	Marginal Suitable	18	Csa	Temperate, dry summer, hot summer
110	Aegean	İzmir	Balçova	0.051391	Marginal Suitable	Marginal Suitable	Marginal Suitable	34	Csa	Temperate, dry summer, hot summer
46	Aegean	İzmir	Aliağa	0.051130	Marginal Suitable	Marginal Suitable	Marginal Suitable	7	Csa	Temperate, dry summer, hot summer
826	Aegean	Kütahya	Tavşanlı	0.854160	Extremely Suitable	Suitable	Very Suitable	836	Csb	Temperate, dry summer, warm summer
313	Aegean	Kütahya	Emet	0.829877	Extremely Suitable	Suitable	Suitable	910	Csb	Temperate, dry summer, warm summer
289	Aegean	Kütahya	Domaniç	0.828463	Extremely Suitable	Suitable	Suitable	873	Csb	Temperate, dry summer, warm summer
445	Aegean	Kütahya	Hisarcık	0.822847	Extremely Suitable	Suitable	Suitable	752	Csb	Temperate, dry summer, warm summer
779	Aegean	Kütahya	Simav	0.817815	Extremely Suitable	Suitable	Suitable	808	Csb	Temperate, dry summer, warm summer
356	Aegean	Kütahya	Gediz	0.813060	Extremely Suitable	Suitable	Suitable	730	Csa	Temperate, dry summer, hot summer
732	Aegean	Kütahya	Şaphane	0.803916	Extremely Suitable	Acceptable	Suitable	985	Csb	Temperate, dry summer, warm summer
206	Aegean	Kütahya	Çavdarhisar	0.793639	Very Suitable	Acceptable	Suitable	1007	BSk	Arid, steppe, cold
54	Aegean	Kütahya	Altıntaş	0.788833	Very Suitable	Acceptable	Suitable	1039	BSk	Arid, steppe, cold

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
602	Aegean	Kütahya	Kütahya/Merkez	0.787077	Very Suitable	Acceptable	Suitable	958	BSk	Arid, steppe, cold
292	Aegean	Kütahya	Dumlupınar	0.785891	Very Suitable	Acceptable	Suitable	1228	Dsb	Cold, dry summer, warm summer
81	Aegean	Kütahya	Aslanapa	0.780943	Very Suitable	Acceptable	Suitable	1031	Dsb	Cold, dry summer, warm summer
695	Aegean	Kütahya	Pazarlar	0.775486	Very Suitable	Acceptable	Suitable	925	Csb	Temperate, dry summer, warm summer
257	Aegean	Manisa	Demirci	0.717516	Very Suitable	Acceptable	Acceptable	881	Csa	Temperate, dry summer, hot summer
761	Aegean	Manisa	Selendi	0.661060	Very Suitable	Acceptable	Acceptable	437	Csa	Temperate, dry summer, hot summer
386	Aegean	Manisa	Gördes	0.618369	Very Suitable	Acceptable	Acceptable	668	Csa	Temperate, dry summer, hot summer
799	Aegean	Manisa	Soma	0.534936	Suitable	Marginal Suitable	Marginal Suitable	172	Csa	Temperate, dry summer, hot summer
558	Aegean	Manisa	Kırkağaç	0.462474	Suitable	Marginal Suitable	Marginal Suitable	187	Csa	Temperate, dry summer, hot summer
589	Aegean	Manisa	Kula	0.390424	Acceptable	Marginal Suitable	Marginal Suitable	665	Csa	Temperate, dry summer, hot summer
572	Aegean	Manisa	Köprübaşı/Manisa	0.385222	Acceptable	Marginal Suitable	Marginal Suitable	247	Csa	Temperate, dry summer, hot summer
740	Aegean	Manisa	Sarıgöl	0.357474	Acceptable	Marginal Suitable	Marginal Suitable	214	Csa	Temperate, dry summer, hot summer
45	Aegean	Manisa	Alaşehir	0.354813	Acceptable	Marginal Suitable	Marginal Suitable	201	Csa	Temperate, dry summer, hot summer
724	Aegean	Manisa	Salihli	0.316830	Acceptable	Marginal Suitable	Marginal Suitable	119	Csa	Temperate, dry summer, hot summer
25	Aegean	Manisa	Akhisar	0.311612	Acceptable	Marginal Suitable	Marginal Suitable	106	Csa	Temperate, dry summer, hot summer
18	Aegean	Manisa	Ahmetli	0.302982	Acceptable	Marginal Suitable	Marginal Suitable	91	Csa	Temperate, dry summer, hot summer
750	Aegean	Manisa	Saruhanlı	0.302320	Acceptable	Marginal Suitable	Marginal Suitable	40	Csa	Temperate, dry summer, hot summer
620	Aegean	Manisa	Manisa/Merkez	0.293388	Acceptable	Marginal Suitable	Marginal Suitable	79	Csa	Temperate, dry summer, hot summer
379	Aegean	Manisa	Gölmarmara	0.292698	Acceptable	Marginal Suitable	Marginal Suitable	115	Csa	Temperate, dry summer, hot summer
847	Aegean	Manisa	Turgutlu	0.292267	Acceptable	Marginal Suitable	Marginal Suitable	95	Csa	Temperate, dry summer, hot summer
531	Aegean	Muğla	Kavaklıdere	0.556097	Suitable	Marginal Suitable	Marginal Suitable	877	Csa	Temperate, dry summer, hot summer
644	Aegean	Muğla	Muğla/Merkez	0.448575	Suitable	Marginal Suitable	Marginal Suitable	659	Csa	Temperate, dry summer, hot summer
889	Aegean	Muğla	Yatağan	0.359360	Acceptable	Marginal Suitable	Marginal Suitable	390	Csa	Temperate, dry summer, hot summer
857	Aegean	Muğla	Ula	0.293037	Acceptable	Marginal Suitable	Marginal Suitable	610	Csa	Temperate, dry summer, hot summer
583	Aegean	Muğla	Köyceğiz	0.125604	Marginal Suitable	Marginal Suitable	Marginal Suitable	15	Csa	Temperate, dry summer, hot summer
640	Aegean	Muğla	Milas	0.112325	Marginal Suitable	Marginal Suitable	Marginal Suitable	59	Csa	Temperate, dry summer, hot summer
153	Aegean	Muğla	Bodrum	0.092571	Marginal Suitable	Marginal Suitable	Marginal Suitable	4	Csa	Temperate, dry summer, hot summer
348	Aegean	Muğla	Fethiye	0.074951	Marginal Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
625	Aegean	Muğla	Marmaris	0.053320	Marginal Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
254	Aegean	Muğla	Datça	0.046987	Marginal Suitable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
676	Aegean	Muğla	Ortaca	0.035633	Marginal Suitable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
250	Aegean	Muğla	Dalaman	0.030451	Marginal Suitable	Marginal Suitable	Marginal Suitable	17	Csa	Temperate, dry summer, hot summer
114	Aegean	Uşak	Banaz	0.800406	Extremely Suitable	Acceptable	Suitable	914	Csa	Temperate, dry summer, hot summer
788	Aegean	Uşak	Sivaslı	0.766946	Very Suitable	Acceptable	Suitable	931	Csa	Temperate, dry summer, hot summer
870	Aegean	Uşak	Uşak/Merkez	0.700290	Very Suitable	Acceptable	Acceptable	915	Csa	Temperate, dry summer, hot summer
507	Aegean	Uşak	Karahallı	0.669613	Very Suitable	Acceptable	Acceptable	928	Csa	Temperate, dry summer, hot summer
860	Aegean	Uşak	Ulubey/Uşak	0.538146	Suitable	Marginal Suitable	Marginal Suitable	727	Csa	Temperate, dry summer, hot summer
335	Aegean	Uşak	Eşme	0.493832	Suitable	Marginal Suitable	Marginal Suitable	828	Csa	Temperate, dry summer, hot summer
600	Black Sea	Bartın	Kurucaşile	0.959799	Extremely Suitable	Very Suitable	Extremely Suitable	13	Cfb	Temperate, no dry season, warm summer
864	Black Sea	Bartın	Ulus	0.934244	Extremely Suitable	Very Suitable	Extremely Suitable	179	Cfb	Temperate, no dry season, warm summer
58	Black Sea	Bartın	Amasra	0.848153	Extremely Suitable	Suitable	Very Suitable	12	Cfa	Temperate, no dry season, hot summer
116	Black Sea	Bartın	Bartın/Merkez	0.794838	Very Suitable	Acceptable	Suitable	12	Cfa	Temperate, no dry season, hot summer
389	Black Sea	Bolu	Göynük	0.879807	Extremely Suitable	Suitable	Very Suitable	740	Dfb	Cold, no dry season, warm summer
632	Black Sea	Bolu	Mengen	0.868054	Extremely Suitable	Suitable	Very Suitable	616	Csb	Temperate, dry summer, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
156	Black Sea	Bolu	Bolu/Merkez	0.734714	Very Suitable	Acceptable	Acceptable	741	Cfb	Temperate, no dry season, warm summer
643	Black Sea	Bolu	Mudurnu	0.725720	Very Suitable	Acceptable	Acceptable	859	Dfb	Cold, no dry season, warm summer
755	Black Sea	Bolu	Seben	0.718758	Very Suitable	Acceptable	Acceptable	759	BSk	Arid, steppe, cold
895	Black Sea	Bolu	Yeniçağa	0.649084	Very Suitable	Acceptable	Acceptable	1002	Dsb	Cold, dry summer, warm summer
363	Black Sea	Bolu	Gerede	0.603013	Very Suitable	Marginal Suitable	Acceptable	1326	Dsb	Cold, dry summer, warm summer
290	Black Sea	Bolu	Dörtdivan	0.539557	Suitable	Marginal Suitable	Marginal Suitable	1168	Dsb	Cold, dry summer, warm summer
554	Black Sea	Bolu	Kıbrıscık	0.431163	Suitable	Marginal Suitable	Marginal Suitable	1139	Dsb	Cold, dry summer, warm summer
382	Black Sea	Düzce	Gölyaka	0.960760	Extremely Suitable	Very Suitable	Extremely Suitable	131	Cfa	Temperate, no dry season, hot summer
295	Black Sea	Düzce	Düzce/Merkez	0.959328	Extremely Suitable	Very Suitable	Extremely Suitable	149	Cfa	Temperate, no dry season, hot summer
533	Black Sea	Düzce	Kaynaşlı	0.956870	Extremely Suitable	Very Suitable	Extremely Suitable	314	Cfa	Temperate, no dry season, hot summer
910	Black Sea	Düzce	Yığılca	0.947777	Extremely Suitable	Very Suitable	Extremely Suitable	326	Cfb	Temperate, no dry season, warm summer
399	Black Sea	Düzce	Gümüşova	0.936264	Extremely Suitable	Very Suitable	Extremely Suitable	195	Cfa	Temperate, no dry season, hot summer
246	Black Sea	Düzce	Cumayeri	0.927109	Extremely Suitable	Suitable	Extremely Suitable	133	Cfa	Temperate, no dry season, hot summer
234	Black Sea	Düzce	Çilimli	0.923664	Extremely Suitable	Suitable	Extremely Suitable	184	Cfb	Temperate, no dry season, warm summer
23	Black Sea	Düzce	Akçakoca	0.795379	Very Suitable	Acceptable	Suitable	7	Cfb	Temperate, no dry season, warm summer
897	Black Sea	Karabük	Yenice/Karabük	0.953119	Extremely Suitable	Very Suitable	Extremely Suitable	150	Cfa	Temperate, no dry season, hot summer
501	Black Sea	Karabük	Karabük/Merkez	0.922262	Extremely Suitable	Suitable	Extremely Suitable	264	Cfa	Temperate, no dry season, hot summer
720	Black Sea	Karabük	Safranbolu	0.910217	Extremely Suitable	Suitable	Extremely Suitable	544	Cfb	Temperate, no dry season, warm summer
685	Black Sea	Karabük	Ovacık/Karabük	0.820754	Extremely Suitable	Suitable	Suitable	1111	Dfb	Cold, no dry season, warm summer
302	Black Sea	Karabük	Eflani	0.769631	Very Suitable	Acceptable	Suitable	907	Dfb	Cold, no dry season, warm summer
333	Black Sea	Karabük	Eskipazar	0.695485	Very Suitable	Acceptable	Acceptable	748	Dsb	Cold, dry summer, warm summer
205	Black Sea	Kastamonu	Çatalzeytin	0.982995	Extremely Suitable	Extremely Suitable	Extremely Suitable	11	Csa	Temperate, dry summer, hot summer
2	Black Sea	Kastamonu	Abana	0.978512	Extremely Suitable	Extremely Suitable	Extremely Suitable	11	Cfa	Temperate, no dry season, hot summer
287	Black Sea	Kastamonu	Doğanyurt	0.973246	Extremely Suitable	Extremely Suitable	Extremely Suitable	13	Cfa	Temperate, no dry season, hot summer
166	Black Sea	Kastamonu	Bozkurt/Kastamonu	0.971391	Extremely Suitable	Extremely Suitable	Extremely Suitable	39	Cfb	Temperate, no dry season, warm summer
228	Black Sea	Kastamonu	Cide	0.959210	Extremely Suitable	Very Suitable	Extremely Suitable	14	Cfa	Temperate, no dry season, hot summer
766	Black Sea	Kastamonu	Şenpazar	0.941423	Extremely Suitable	Very Suitable	Extremely Suitable	373	Dfb	Cold, no dry season, warm summer
470	Black Sea	Kastamonu	İnebolu	0.919912	Extremely Suitable	Suitable	Extremely Suitable	17	Cfa	Temperate, no dry season, hot summer
704	Black Sea	Kastamonu	Pınarbaşı/Kastamonu	0.882338	Extremely Suitable	Suitable	Very Suitable	672	Cfb	Temperate, no dry season, warm summer
425	Black Sea	Kastamonu	Hanönü	0.847863	Extremely Suitable	Suitable	Very Suitable	427	Cfb	Temperate, no dry season, warm summer
596	Black Sea	Kastamonu	Küre	0.824338	Extremely Suitable	Suitable	Suitable	976	Dfb	Cold, no dry season, warm summer
821	Black Sea	Kastamonu	Taşköprü	0.787067	Very Suitable	Acceptable	Suitable	559	Cfa	Temperate, no dry season, hot summer
529	Black Sea	Kastamonu	Kastamonu/Merkez	0.777369	Very Suitable	Acceptable	Suitable	814	BSk	Arid, steppe, cold
98	Black Sea	Kastamonu	Azdavay	0.731415	Very Suitable	Acceptable	Acceptable	834	Dfb	Cold, no dry season, warm summer
64	Black Sea	Kastamonu	Araç	0.714867	Very Suitable	Acceptable	Acceptable	676	Dfb	Cold, no dry season, warm summer
271	Black Sea	Kastamonu	Devrekani	0.671944	Very Suitable	Acceptable	Acceptable	1108	Dfb	Cold, no dry season, warm summer
14	Black Sea	Kastamonu	Ağlı	0.667074	Very Suitable	Acceptable	Acceptable	1174	Dfb	Cold, no dry season, warm summer
249	Black Sea	Kastamonu	Daday	0.655671	Very Suitable	Acceptable	Acceptable	868	Dfb	Cold, no dry season, warm summer
769	Black Sea	Kastamonu	Seydiler	0.648871	Very Suitable	Acceptable	Acceptable	1043	Dfb	Cold, no dry season, warm summer
843	Black Sea	Kastamonu	Tosya	0.539100	Suitable	Marginal Suitable	Marginal Suitable	833	BSk	Arid, steppe, cold
458	Black Sea	Kastamonu	İhsangazi	0.524843	Suitable	Marginal Suitable	Marginal Suitable	870	Dfb	Cold, no dry season, warm summer
86	Black Sea	Sinop	Ayancık	0.983092	Extremely Suitable	Extremely Suitable	Extremely Suitable	9	Cfa	Temperate, no dry season, hot summer
849	Black Sea	Sinop	Türkeli	0.978844	Extremely Suitable	Extremely Suitable	Extremely Suitable	12	Cfb	Temperate, no dry season, warm summer
276	Black Sea	Sinop	Dikmen	0.965877	Extremely Suitable	Very Suitable	Extremely Suitable	193	Cfb	Temperate, no dry season, warm summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
324	Black Sea	Sinop	Erfelek	0.961134	Extremely Suitable	Very Suitable	Extremely Suitable	185	Cfb	Temperate, no dry season, warm summer
161	Black Sea	Sinop	Boyabat	0.927079	Extremely Suitable	Suitable	Extremely Suitable	329	Cfa	Temperate, no dry season, hot summer
735	Black Sea	Sinop	Saraydüzü	0.919262	Extremely Suitable	Suitable	Extremely Suitable	415	BSk	Arid, steppe, cold
293	Black Sea	Sinop	Durağan	0.914977	Extremely Suitable	Suitable	Extremely Suitable	213	Cfa	Temperate, no dry season, hot summer
366	Black Sea	Sinop	Gerze	0.809009	Extremely Suitable	Suitable	Suitable	31	Cfa	Temperate, no dry season, hot summer
783	Black Sea	Sinop	Sinop/Merkez	0.328085	Acceptable	Marginal Suitable	Marginal Suitable	27	Cfa	Temperate, no dry season, hot summer
270	Black Sea	Zonguldak	Devrek	0.920892	Extremely Suitable	Suitable	Extremely Suitable	103	Cfa	Temperate, no dry season, hot summer
923	Black Sea	Zonguldak	Zonguldak/Merkez	0.870600	Extremely Suitable	Suitable	Very Suitable	10	Cfa	Temperate, no dry season, hot summer
371	Black Sea	Zonguldak	Gökçebey	0.854201	Extremely Suitable	Suitable	Very Suitable	62	Cfa	Temperate, no dry season, hot summer
44	Black Sea	Zonguldak	Alaplı	0.827785	Extremely Suitable	Suitable	Suitable	18	Cfb	Temperate, no dry season, warm summer
210	Black Sea	Zonguldak	Çaycuma	0.791093	Very Suitable	Acceptable	Suitable	36	Cfa	Temperate, no dry season, hot summer
323	Black Sea	Zonguldak	Ereğli/Zonguldak	0.407782	Suitable	Marginal Suitable	Marginal Suitable	12	Cfa	Temperate, no dry season, hot summer
823	Black Sea	Amasya	Taşova	0.957203	Extremely Suitable	Very Suitable	Extremely Suitable	240	BSk	Arid, steppe, cold
635	Black Sea	Amasya	Merzifon	0.904185	Extremely Suitable	Suitable	Extremely Suitable	746	BSk	Arid, steppe, cold
59	Black Sea	Amasya	Amasya/Merkez	0.885556	Extremely Suitable	Suitable	Very Suitable	400	BSk	Arid, steppe, cold
807	Black Sea	Amasya	Suluova	0.877267	Extremely Suitable	Suitable	Very Suitable	542	BSk	Arid, steppe, cold
388	Black Sea	Amasya	Göynücek	0.869278	Extremely Suitable	Suitable	Very Suitable	522	BSk	Arid, steppe, cold
420	Black Sea	Amasya	Hamamözü	0.847410	Extremely Suitable	Suitable	Very Suitable	691	BSk	Arid, steppe, cold
397	Black Sea	Amasya	Gümüşhacıköy	0.839491	Extremely Suitable	Suitable	Very Suitable	822	BSk	Arid, steppe, cold
628	Black Sea	Çorum	Mecitözü	0.878515	Extremely Suitable	Suitable	Very Suitable	811	BSk	Arid, steppe, cold
678	Black Sea	Çorum	Ortaköy/Çorum	0.871451	Extremely Suitable	Suitable	Very Suitable	809	BSk	Arid, steppe, cold
281	Black Sea	Çorum	Dodurga	0.868337	Extremely Suitable	Suitable	Very Suitable	624	BSk	Arid, steppe, cold
679	Black Sea	Çorum	Osmancık	0.868154	Extremely Suitable	Suitable	Very Suitable	425	BSk	Arid, steppe, cold
243	Black Sea	Çorum	Çorum/Merkez	0.856359	Extremely Suitable	Suitable	Very Suitable	822	BSk	Arid, steppe, cold
668	Black Sea	Çorum	Oğuzlar	0.854477	Extremely Suitable	Suitable	Very Suitable	680	Dfb	Cold, no dry season, warm summer
604	Black Sea	Çorum	Laçin	0.854458	Extremely Suitable	Suitable	Very Suitable	729	BSk	Arid, steppe, cold
39	Black Sea	Çorum	Alaca	0.844870	Extremely Suitable	Suitable	Very Suitable	926	BSk	Arid, steppe, cold
477	Black Sea	Çorum	İskilip	0.831465	Extremely Suitable	Suitable	Suitable	734	BSk	Arid, steppe, cold
154	Black Sea	Çorum	Boğazkale	0.831359	Extremely Suitable	Suitable	Suitable	995	Dsb	Cold, dry summer, warm summer
521	Black Sea	Çorum	Kargı	0.788997	Very Suitable	Acceptable	Suitable	387	BSk	Arid, steppe, cold
124	Black Sea	Çorum	Bayat/Çorum	0.787736	Very Suitable	Acceptable	Suitable	698	BSk	Arid, steppe, cold
810	Black Sea	Çorum	Sungurlu	0.759102	Very Suitable	Acceptable	Suitable	762	BSk	Arid, steppe, cold
856	Black Sea	Çorum	Uğurludağ	0.753241	Very Suitable	Acceptable	Suitable	806	BSk	Arid, steppe, cold
204	Black Sea	Ordu	Çatalpınar	0.986235	Extremely Suitable	Extremely Suitable	Extremely Suitable	139	Cfb	Temperate, no dry season, warm summer
595	Black Sea	Ordu	Kumru	0.985199	Extremely Suitable	Extremely Suitable	Extremely Suitable	457	Cfb	Temperate, no dry season, warm summer
186	Black Sea	Ordu	Çamaş	0.985100	Extremely Suitable	Extremely Suitable	Extremely Suitable	588	Cfb	Temperate, no dry season, warm summer
406	Black Sea	Ordu	Gürgentepe	0.983241	Extremely Suitable	Extremely Suitable	Extremely Suitable	1238	Cfb	Temperate, no dry season, warm summer
859	Black Sea	Ordu	Ulubey/Ordu	0.981874	Extremely Suitable	Extremely Suitable	Extremely Suitable	598	Cfb	Temperate, no dry season, warm summer
506	Black Sea	Ordu	Kabadüz	0.981643	Extremely Suitable	Extremely Suitable	Extremely Suitable	578	Cfb	Temperate, no dry season, warm summer
576	Black Sea	Ordu	Korgan	0.973455	Extremely Suitable	Extremely Suitable	Extremely Suitable	781	Cfb	Temperate, no dry season, warm summer
209	Black Sea	Ordu	Çaybaşı	0.972526	Extremely Suitable	Extremely Suitable	Extremely Suitable	494	Cfb	Temperate, no dry season, warm summer
484	Black Sea	Ordu	Kabataş	0.972056	Extremely Suitable	Extremely Suitable	Extremely Suitable	436	Cfb	Temperate, no dry season, warm summer
29	Black Sea	Ordu	Akkuş	0.960751	Extremely Suitable	Very Suitable	Extremely Suitable	1236	Dsb	Cold, dry summer, warm summer
460	Black Sea	Ordu	İkizce	0.932652	Extremely Suitable	Very Suitable	Extremely Suitable	141	Cfb	Temperate, no dry season, warm summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
88	Black Sea	Ordu	Aybastı	0.786720	Very Suitable	Acceptable	Suitable	741	Dfb	Cold, no dry season, warm summer
344	Black Sea	Ordu	Fatsa	0.743500	Very Suitable	Acceptable	Suitable	17	Cfa	Temperate, no dry season, hot summer
378	Black Sea	Ordu	Gölköy	0.669421	Very Suitable	Acceptable	Acceptable	829	Dsb	Cold, dry summer, warm summer
672	Black Sea	Ordu	Ordu/Merkez	0.658047	Very Suitable	Acceptable	Acceptable	25	Cfa	Temperate, no dry season, hot summer
396	Black Sea	Ordu	Gülyalı	0.493527	Suitable	Marginal Suitable	Marginal Suitable	6	Cfb	Temperate, no dry season, warm summer
700	Black Sea	Ordu	Perşembe	0.453074	Suitable	Marginal Suitable	Marginal Suitable	7	Cfa	Temperate, no dry season, hot summer
866	Black Sea	Ordu	Ünye	0.391167	Acceptable	Marginal Suitable	Marginal Suitable	11	Cfa	Temperate, no dry season, hot summer
636	Black Sea	Ordu	Mesudiye	0.381200	Acceptable	Marginal Suitable	Marginal Suitable	1139	Dsb	Cold, dry summer, warm summer
79	Black Sea	Samsun	Asarcık	0.975478	Extremely Suitable	Extremely Suitable	Extremely Suitable	802	Csb	Temperate, dry summer, warm summer
530	Black Sea	Samsun	Kavak	0.970711	Extremely Suitable	Extremely Suitable	Extremely Suitable	603	Csb	Temperate, dry summer, warm summer
41	Black Sea	Samsun	Alaçam	0.967597	Extremely Suitable	Extremely Suitable	Extremely Suitable	38	Cfb	Temperate, no dry season, warm summer
96	Black Sea	Samsun	Ayvacık/Samsun	0.962557	Extremely Suitable	Very Suitable	Extremely Suitable	69	Cfb	Temperate, no dry season, warm summer
878	Black Sea	Samsun	Vezirköprü	0.946352	Extremely Suitable	Very Suitable	Extremely Suitable	349	BSk	Arid, steppe, cold
884	Black Sea	Samsun	Yakakent	0.936852	Extremely Suitable	Very Suitable	Extremely Suitable	12	Cfb	Temperate, no dry season, warm summer
436	Black Sea	Samsun	Havza	0.926630	Extremely Suitable	Suitable	Extremely Suitable	625	BSk	Arid, steppe, cold
605	Black Sea	Samsun	Ladik	0.920679	Extremely Suitable	Suitable	Extremely Suitable	940	Dsb	Cold, dry summer, warm summer
829	Black Sea	Samsun	Tekkeköy	0.893498	Extremely Suitable	Suitable	Very Suitable	21	Cfa	Temperate, no dry season, hot summer
725	Black Sea	Samsun	Salıpazarı	0.877543	Extremely Suitable	Suitable	Very Suitable	84	Cfa	Temperate, no dry season, hot summer
729	Black Sea	Samsun	Samsun/Merkez	0.726774	Very Suitable	Acceptable	Acceptable	10	Cfa	Temperate, no dry season, hot summer
1	Black Sea	Samsun	19 Mayıs	0.643788	Very Suitable	Acceptable	Acceptable	16	Csa	Temperate, dry summer, hot summer
833	Black Sea	Samsun	Terme	0.556423	Suitable	Marginal Suitable	Marginal Suitable	12	Cfa	Temperate, no dry season, hot summer
101	Black Sea	Samsun	Bafra	0.519830	Suitable	Marginal Suitable	Marginal Suitable	26	Csa	Temperate, dry summer, hot summer
199	Black Sea	Samsun	Çarşamba	0.474804	Suitable	Marginal Suitable	Marginal Suitable	22	Cfa	Temperate, no dry season, hot summer
318	Black Sea	Tokat	Erbaa	0.973758	Extremely Suitable	Extremely Suitable	Extremely Suitable	237	BSk	Arid, steppe, cold
659	Black Sea	Tokat	Niksar	0.920934	Extremely Suitable	Suitable	Extremely Suitable	346	Csa	Temperate, dry summer, hot summer
693	Black Sea	Tokat	Pazar/Tokat	0.912834	Extremely Suitable	Suitable	Extremely Suitable	576	BSk	Arid, steppe, cold
922	Black Sea	Tokat	Zile	0.910249	Extremely Suitable	Suitable	Extremely Suitable	743	BSk	Arid, steppe, cold
848	Black Sea	Tokat	Turhal	0.906241	Extremely Suitable	Suitable	Extremely Suitable	588	BSk	Arid, steppe, cold
836	Black Sea	Tokat	Tokat/Merkez	0.858824	Extremely Suitable	Suitable	Very Suitable	630	BSk	Arid, steppe, cold
117	Black Sea	Tokat	Başçiftlik	0.844195	Extremely Suitable	Suitable	Very Suitable	1.395	Dsb	Cold, dry summer, warm summer
808	Black Sea	Tokat	Sulusaray	0.825120	Extremely Suitable	Suitable	Suitable	1.035	BSk	Arid, steppe, cold
77	Black Sea	Tokat	Artova	0.822549	Extremely Suitable	Suitable	Suitable	1.184	BSk	Arid, steppe, cold
47	Black Sea	Tokat	Almus	0.782054	Very Suitable	Acceptable	Suitable	853	BSk	Arid, steppe, cold
909	Black Sea	Tokat	Yeşilyurt/Tokat	0.769856	Very Suitable	Acceptable	Suitable	999	BSk	Arid, steppe, cold
714	Black Sea	Tokat	Reşadiye	0.701519	Very Suitable	Acceptable	Acceptable	538	BSk	Arid, steppe, cold
450	Black Sea	Artvin	Hopa	0.928898	Extremely Suitable	Suitable	Extremely Suitable	65	Cfa	Temperate, no dry season, hot summer
159	Black Sea	Artvin	Borçka	0.895724	Extremely Suitable	Suitable	Very Suitable	123	Cfa	Temperate, no dry season, hot summer
647	Black Sea	Artvin	Murgul	0.878989	Extremely Suitable	Suitable	Very Suitable	390	Dfb	Cold, no dry season, warm summer
72	Black Sea	Artvin	Arhavi	0.820429	Extremely Suitable	Suitable	Suitable	11	Cfb	Temperate, no dry season, warm summer
78	Black Sea	Artvin	Artvin/Merkez	0.569372	Suitable	Marginal Suitable	Marginal Suitable	530	Cfa	Temperate, no dry season, hot summer
919	Black Sea	Artvin	Yusufeli	0.338648	Acceptable	Marginal Suitable	Marginal Suitable	603	Dfb	Cold, no dry season, warm summer
69	Black Sea	Artvin	Ardanuç	0.183699	Marginal Suitable	Marginal Suitable	Marginal Suitable	499	Dfb	Cold, no dry season, warm summer
753	Black Sea	Artvin	Şavşat	0.072906	Marginal Suitable	Marginal Suitable	Marginal Suitable	1127	Dfb	Cold, no dry season, warm summer
259	Black Sea	Bayburt	Demirözü	0.213618	Acceptable	Marginal Suitable	Marginal Suitable	1685	Dsb	Cold, dry summer, warm summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
125	Black Sea	Bayburt	Bayburt/Merkez	0.184059	Marginal Suitable	Marginal Suitable	Marginal Suitable	1555	BSk	Arid, steppe, cold
93	Black Sea	Bayburt	Aydıntepe	0.109065	Marginal Suitable	Marginal Suitable	Marginal Suitable	1627	Dsc	Cold, dry summer, cold summer
193	Black Sea	Giresun	Çanakçı	0.937653	Extremely Suitable	Very Suitable	Extremely Suitable	176	Cfb	Temperate, no dry season, warm summer
263	Black Sea	Giresun	Dereli	0.937235	Extremely Suitable	Very Suitable	Extremely Suitable	282	Cfb	Temperate, no dry season, warm summer
283	Black Sea	Giresun	Doğankent	0.927020	Extremely Suitable	Suitable	Extremely Suitable	195	Csb	Temperate, dry summer, warm summer
881	Black Sea	Giresun	Yağlıdere	0.922012	Extremely Suitable	Suitable	Extremely Suitable	104	Cfb	Temperate, no dry season, warm summer
548	Black Sea	Giresun	Keşap	0.910313	Extremely Suitable	Suitable	Extremely Suitable	11	Cfa	Temperate, no dry season, hot summer
390	Black Sea	Giresun	Güce	0.839553	Extremely Suitable	Suitable	Very Suitable	342	Cfb	Temperate, no dry season, warm summer
336	Black Sea	Giresun	Espiye	0.719119	Very Suitable	Acceptable	Acceptable	9	Cfa	Temperate, no dry season, hot summer
835	Black Sea	Giresun	Tirebolu	0.599133	Suitable	Marginal Suitable	Acceptable	13	Cfa	Temperate, no dry season, hot summer
174	Black Sea	Giresun	Bulancak	0.561459	Suitable	Marginal Suitable	Marginal Suitable	15	Cfa	Temperate, no dry season, hot summer
369	Black Sea	Giresun	Giresun/Merkez	0.526395	Suitable	Marginal Suitable	Marginal Suitable	14	Cfa	Temperate, no dry season, hot summer
703	Black Sea	Giresun	Piraziz	0.501875	Suitable	Marginal Suitable	Marginal Suitable	3	Cfa	Temperate, no dry season, hot summer
340	Black Sea	Giresun	Eynesil	0.481656	Suitable	Marginal Suitable	Marginal Suitable	9	Cfa	Temperate, no dry season, hot summer
387	Black Sea	Giresun	Görele	0.438528	Suitable	Marginal Suitable	Marginal Suitable	11	Cfa	Temperate, no dry season, hot summer
717	Black Sea	Giresun	Şebinkarahisar	0.359105	Acceptable	Marginal Suitable	Marginal Suitable	1372	Dsb	Cold, dry summer, warm summer
191	Black Sea	Giresun	Çamoluk	0.247415	Acceptable	Marginal Suitable	Marginal Suitable	1062	Dsb	Cold, dry summer, warm summer
57	Black Sea	Giresun	Alucra	0.178688	Marginal Suitable	Marginal Suitable	Marginal Suitable	1477	Dsb	Cold, dry summer, warm summer
540	Black Sea	Gümüşhane	Kelkit	0.227801	Acceptable	Marginal Suitable	Marginal Suitable	1408	BSk	Arid, steppe, cold
580	Black Sea	Gümüşhane	Köse	0.206938	Acceptable	Marginal Suitable	Marginal Suitable	1577	Dsb	Cold, dry summer, warm summer
784	Black Sea	Gümüşhane	Şiran	0.193658	Marginal Suitable	Marginal Suitable	Marginal Suitable	1409	Dsb	Cold, dry summer, warm summer
599	Black Sea	Gümüşhane	Kürtün	0.188810	Marginal Suitable	Marginal Suitable	Marginal Suitable	629	Dsb	Cold, dry summer, warm summer
842	Black Sea	Gümüşhane	Torul	0.119303	Marginal Suitable	Marginal Suitable	Marginal Suitable	940	Dsb	Cold, dry summer, warm summer
398	Black Sea	Gümüşhane	Gümüşhane/Merkez	0.113152	Marginal Suitable	Marginal Suitable	Marginal Suitable	1174	Dsb	Cold, dry summer, warm summer
497	Black Sea	Rize	Kalkandere	0.904736	Extremely Suitable	Suitable	Extremely Suitable	167	Cfa	Temperate, no dry season, hot summer
403	Black Sea	Rize	Güneysu	0.902780	Extremely Suitable	Suitable	Very Suitable	169	Cfb	Temperate, no dry season, warm summer
442	Black Sea	Rize	Hemşin	0.877822	Extremely Suitable	Suitable	Very Suitable	315	Cfb	Temperate, no dry season, warm summer
189	Black Sea	Rize	Çamlıhemşin	0.831007	Extremely Suitable	Suitable	Suitable	311	Cfb	Temperate, no dry season, warm summer
350	Black Sea	Rize	Fındıklı	0.752962	Very Suitable	Acceptable	Suitable	11	Cfa	Temperate, no dry season, hot summer
692	Black Sea	Rize	Pazar/Rize	0.653831	Very Suitable	Acceptable	Acceptable	34	Cfa	Temperate, no dry season, hot summer
482	Black Sea	Rize	İyidere	0.572271	Suitable	Marginal Suitable	Marginal Suitable	7	Cfa	Temperate, no dry season, hot summer
716	Black Sea	Rize	Rize/Merkez	0.547764	Suitable	Marginal Suitable	Marginal Suitable	11	Cfa	Temperate, no dry season, hot summer
211	Black Sea	Rize	Çayeli	0.531424	Suitable	Marginal Suitable	Marginal Suitable	10	Cfa	Temperate, no dry season, hot summer
264	Black Sea	Rize	Derepazarı	0.502292	Suitable	Marginal Suitable	Marginal Suitable	8	Cfa	Temperate, no dry season, hot summer
70	Black Sea	Rize	Ardeşen	0.485150	Suitable	Marginal Suitable	Marginal Suitable	5	Cfa	Temperate, no dry season, hot summer
461	Black Sea	Rize	İkizdere	0.274071	Acceptable	Marginal Suitable	Marginal Suitable	556	Dfb	Cold, no dry season, warm summer
838	Black Sea	Trabzon	Tonya	0.979159	Extremely Suitable	Extremely Suitable	Extremely Suitable	742	Csb	Temperate, dry summer, warm summer
297	Black Sea	Trabzon	Düzköy	0.977023	Extremely Suitable	Extremely Suitable	Extremely Suitable	780	Dsb	Cold, dry summer, warm summer
726	Black Sea	Trabzon	Şalpazarı	0.973616	Extremely Suitable	Extremely Suitable	Extremely Suitable	325	Csb	Temperate, dry summer, warm summer
913	Black Sea	Trabzon	Yomra	0.960479	Extremely Suitable	Very Suitable	Extremely Suitable	10	Cfa	Temperate, no dry season, hot summer
811	Black Sea	Trabzon	Sürmene	0.951167	Extremely Suitable	Very Suitable	Extremely Suitable	11	Cfa	Temperate, no dry season, hot summer
666	Black Sea	Trabzon	Of	0.937582	Extremely Suitable	Very Suitable	Extremely Suitable	11	Cfa	Temperate, no dry season, hot summer
875	Black Sea	Trabzon	Vakfıkebir	0.927192	Extremely Suitable	Suitable	Extremely Suitable	13	Csa	Temperate, dry summer, hot summer
611	Black Sea	Trabzon	Maçka	0.919393	Extremely Suitable	Suitable	Extremely Suitable	364	Dsb	Cold, dry summer, warm summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
439	Black Sea	Trabzon	Hayrat	0.896161	Extremely Suitable	Suitable	Very Suitable	202	Cfb	Temperate, no dry season, warm summer
268	Black Sea	Trabzon	Dernekpazarı	0.858776	Extremely Suitable	Suitable	Very Suitable	199	Cfb	Temperate, no dry season, warm summer
133	Black Sea	Trabzon	Beşikdüzü	0.841557	Extremely Suitable	Suitable	Very Suitable	8	Cfa	Temperate, no dry season, hot summer
65	Black Sea	Trabzon	Araklı	0.783891	Very Suitable	Acceptable	Suitable	6	Cfa	Temperate, no dry season, hot summer
573	Black Sea	Trabzon	Köprübaşı/Trabzon	0.761749	Very Suitable	Acceptable	Suitable	307	Dfb	Cold, no dry season, warm summer
76	Black Sea	Trabzon	Arsin	0.738073	Very Suitable	Acceptable	Acceptable	24	Cfa	Temperate, no dry season, hot summer
214	Black Sea	Trabzon	Çaykara	0.449141	Suitable	Marginal Suitable	Marginal Suitable	317	Dfb	Cold, no dry season, warm summer
19	Black Sea	Trabzon	Akçaabat	0.434864	Suitable	Marginal Suitable	Marginal Suitable	16	Cfa	Temperate, no dry season, hot summer
844	Black Sea	Trabzon	Trabzon/Merkez	0.399917	Acceptable	Marginal Suitable	Marginal Suitable	36	Cfa	Temperate, no dry season, hot summer
200	Black Sea	Trabzon	Çarşıbaşı	0.324920	Acceptable	Marginal Suitable	Marginal Suitable	17	Csa	Temperate, dry summer, hot summer
11	Central Anatolia	Aksaray	Ağaçören	0.733729	Very Suitable	Acceptable	Acceptable	964	BSk	Arid, steppe, cold
412	Central Anatolia	Aksaray	Güzelyurt	0.726620	Very Suitable	Acceptable	Acceptable	1502	BSk	Arid, steppe, cold
393	Central Anatolia	Aksaray	Gülağaç	0.710322	Very Suitable	Acceptable	Acceptable	1172	BSk	Arid, steppe, cold
745	Central Anatolia	Aksaray	Sarıyahşi	0.709207	Very Suitable	Acceptable	Acceptable	968	BSk	Arid, steppe, cold
677	Central Anatolia	Aksaray	Ortaköy/Aksaray	0.704567	Very Suitable	Acceptable	Acceptable	1227	BSk	Arid, steppe, cold
32	Central Anatolia	Aksaray	Aksaray/Merkez	0.689161	Very Suitable	Acceptable	Acceptable	1228	BSk	Arid, steppe, cold
332	Central Anatolia	Aksaray	Eskil	0.650727	Very Suitable	Acceptable	Acceptable	940	BSk	Arid, steppe, cold
899	Central Anatolia	Ankara	Yenimahalle	0.802621	Extremely Suitable	Acceptable	Suitable	880	BSk	Arid, steppe, cold
143	Central Anatolia	Ankara	Beypazarı	0.799524	Very Suitable	Acceptable	Suitable	676	BSk	Arid, steppe, cold
337	Central Anatolia	Ankara	Etimesgut	0.795644	Very Suitable	Acceptable	Suitable	819	BSk	Arid, steppe, cold
496	Central Anatolia	Ankara	Kalecik	0.784266	Very Suitable	Acceptable	Suitable	718	BSk	Arid, steppe, cold
196	Central Anatolia	Ankara	Çankaya	0.783626	Very Suitable	Acceptable	Suitable	881	BSk	Arid, steppe, cold
780	Central Anatolia	Ankara	Sincan	0.780035	Very Suitable	Acceptable	Suitable	798	BSk	Arid, steppe, cold
87	Central Anatolia	Ankara	Ayaş	0.777476	Very Suitable	Acceptable	Suitable	955	BSk	Arid, steppe, cold
373	Central Anatolia	Ankara	Gölbaşı/Ankara	0.776632	Very Suitable	Acceptable	Suitable	1006	BSk	Arid, steppe, cold
538	Central Anatolia	Ankara	Keçiören	0.772123	Very Suitable	Acceptable	Suitable	865	BSk	Arid, steppe, cold
652	Central Anatolia	Ankara	Nallıhan	0.771998	Very Suitable	Acceptable	Suitable	633	BSk	Arid, steppe, cold
311	Central Anatolia	Ankara	Elmadağ	0.768575	Very Suitable	Acceptable	Suitable	1100	BSk	Arid, steppe, cold
618	Central Anatolia	Ankara	Mamak	0.766849	Very Suitable	Acceptable	Suitable	909	BSk	Arid, steppe, cold
437	Central Anatolia	Ankara	Haymana	0.760146	Very Suitable	Acceptable	Suitable	1251	BSk	Arid, steppe, cold
392	Central Anatolia	Ankara	Güdül	0.759916	Very Suitable	Acceptable	Suitable	738	BSk	Arid, steppe, cold
38	Central Anatolia	Ankara	Akyurt	0.757007	Very Suitable	Acceptable	Suitable	1027	BSk	Arid, steppe, cold
49	Central Anatolia	Ankara	Altındağ	0.750881	Very Suitable	Acceptable	Suitable	892	BSk	Arid, steppe, cold
109	Central Anatolia	Ankara	Bala	0.745263	Very Suitable	Acceptable	Suitable	1309	BSk	Arid, steppe, cold
534	Central Anatolia	Ankara	Kahramankazan	0.737990	Very Suitable	Acceptable	Acceptable	889	BSk	Arid, steppe, cold
339	Central Anatolia	Ankara	Evren	0.722817	Very Suitable	Acceptable	Acceptable	926	BSk	Arid, steppe, cold
708	Central Anatolia	Ankara	Polatlı	0.709266	Very Suitable	Acceptable	Acceptable	866	BSk	Arid, steppe, cold
244	Central Anatolia	Ankara	Çubuk	0.687157	Very Suitable	Acceptable	Acceptable	1002	BSk	Arid, steppe, cold
718	Central Anatolia	Ankara	Şereflikoçhisar	0.662239	Very Suitable	Acceptable	Acceptable	972	BSk	Arid, steppe, cold
188	Central Anatolia	Ankara	Çamlıdere	0.499804	Suitable	Marginal Suitable	Marginal Suitable	1243	Dsb	Cold, dry summer, warm summer
561	Central Anatolia	Ankara	Kızılcahamam	0.480314	Suitable	Marginal Suitable	Marginal Suitable	985	Dsb	Cold, dry summer, warm summer
309	Central Anatolia	Çankırı	Eldivan	0.773679	Very Suitable	Acceptable	Suitable	945	BSk	Arid, steppe, cold
197	Central Anatolia	Çankırı	Çankırı/Merkez	0.771317	Very Suitable	Acceptable	Suitable	730	BSk	Arid, steppe, cold
562	Central Anatolia	Çankırı	Kızılırmak	0.706773	Very Suitable	Acceptable	Acceptable	555	BSk	Arid, steppe, cold

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
888	Central Anatolia	Çankırı	Yapraklı	0.648648	Very Suitable	Acceptable	Acceptable	1200	Dsb	Cold, dry summer, warm summer
577	Central Anatolia	Çankırı	Korgun	0.640974	Very Suitable	Acceptable	Acceptable	925	BSk	Arid, steppe, cold
719	Central Anatolia	Çankırı	Şabanözü	0.635560	Very Suitable	Acceptable	Acceptable	1030	BSk	Arid, steppe, cold
129	Central Anatolia	Çankırı	Bayramören	0.534973	Suitable	Marginal Suitable	Marginal Suitable	868	Dfb	Cold, no dry season, warm summer
597	Central Anatolia	Çankırı	Kurşunlu	0.527136	Suitable	Marginal Suitable	Marginal Suitable	1137	Dsb	Cold, dry summer, warm summer
221	Central Anatolia	Çankırı	Çerkeş	0.515299	Suitable	Marginal Suitable	Marginal Suitable	1132	Dsb	Cold, dry summer, warm summer
83	Central Anatolia	Çankırı	Atkaracalar	0.499631	Suitable	Marginal Suitable	Marginal Suitable	1247	Dsb	Cold, dry summer, warm summer
462	Central Anatolia	Çankırı	Ilgaz	0.471127	Suitable	Marginal Suitable	Marginal Suitable	929	BSk	Arid, steppe, cold
675	Central Anatolia	Çankırı	Orta	0.384306	Acceptable	Marginal Suitable	Marginal Suitable	1257	Dsb	Cold, dry summer, warm summer
473	Central Anatolia	Eskişehir	İnönü	0.873926	Extremely Suitable	Suitable	Very Suitable	837	Dsb	Cold, dry summer, warm summer
638	Central Anatolia	Eskişehir	Mihalgazi	0.852682	Extremely Suitable	Suitable	Very Suitable	215	BSk	Arid, steppe, cold
739	Central Anatolia	Eskişehir	Sarıcakaya	0.829246	Extremely Suitable	Suitable	Suitable	216	BSk	Arid, steppe, cold
334	Central Anatolia	Eskişehir	Eskişehir/Merkez	0.807443	Extremely Suitable	Acceptable	Suitable	796	BSk	Arid, steppe, cold
422	Central Anatolia	Eskişehir	Han	0.781137	Very Suitable	Acceptable	Suitable	1224	BSk	Arid, steppe, cold
772	Central Anatolia	Eskişehir	Seyitgazi	0.778735	Very Suitable	Acceptable	Suitable	991	BSk	Arid, steppe, cold
48	Central Anatolia	Eskişehir	Alpu	0.757618	Very Suitable	Acceptable	Suitable	766	BSk	Arid, steppe, cold
141	Central Anatolia	Eskişehir	Beylikova	0.743318	Very Suitable	Acceptable	Suitable	771	BSk	Arid, steppe, cold
639	Central Anatolia	Eskişehir	Mihalıççık	0.741546	Very Suitable	Acceptable	Acceptable	1306	Dsb	Cold, dry summer, warm summer
791	Central Anatolia	Eskişehir	Sivrihisar	0.724113	Very Suitable	Acceptable	Acceptable	1109	BSk	Arid, steppe, cold
613	Central Anatolia	Eskişehir	Mahmudiye	0.722466	Very Suitable	Acceptable	Acceptable	887	BSk	Arid, steppe, cold
229	Central Anatolia	Eskişehir	Çifteler	0.711534	Very Suitable	Acceptable	Acceptable	877	BSk	Arid, steppe, cold
405	Central Anatolia	Eskişehir	Günyüzü	0.682922	Very Suitable	Acceptable	Acceptable	894	BSk	Arid, steppe, cold
137	Central Anatolia	Karaman	Başyayla	0.757860	Very Suitable	Acceptable	Suitable	1346	Csa	Temperate, dry summer, hot summer
793	Central Anatolia	Karaman	Sarıveliler	0.738487	Very Suitable	Acceptable	Acceptable	1523	Dsb	Cold, dry summer, warm summer
326	Central Anatolia	Karaman	Ermenek	0.712284	Very Suitable	Acceptable	Acceptable	1282	Csa	Temperate, dry summer, hot summer
94	Central Anatolia	Karaman	Ayrancı	0.654983	Very Suitable	Acceptable	Acceptable	1141	BSk	Arid, steppe, cold
535	Central Anatolia	Karaman	Kazımkarabekir	0.641352	Very Suitable	Acceptable	Acceptable	1052	Csa	Temperate, dry summer, hot summer
512	Central Anatolia	Karaman	Karaman/Merkez	0.632121	Very Suitable	Acceptable	Acceptable	1063	BSk	Arid, steppe, cold
629	Central Anatolia	Kayseri	Melikgazi	0.745950	Very Suitable	Acceptable	Suitable	1059	BSk	Arid, steppe, cold
414	Central Anatolia	Kayseri	Hacılar	0.738270	Very Suitable	Acceptable	Acceptable	1385	BSk	Arid, steppe, cold
569	Central Anatolia	Kayseri	Kocasinan	0.711955	Very Suitable	Acceptable	Acceptable	1056	BSk	Arid, steppe, cold
346	Central Anatolia	Kayseri	Felahiye	0.711756	Very Suitable	Acceptable	Acceptable	1308	BSk	Arid, steppe, cold
468	Central Anatolia	Kayseri	İncesu	0.701895	Very Suitable	Acceptable	Acceptable	1098	BSk	Arid, steppe, cold
177	Central Anatolia	Kayseri	Bünyan	0.698800	Very Suitable	Acceptable	Acceptable	1345	BSk	Arid, steppe, cold
744	Central Anatolia	Kayseri	Sarıoğlan	0.685560	Very Suitable	Acceptable	Acceptable	1156	BSk	Arid, steppe, cold
883	Central Anatolia	Kayseri	Yahyalı	0.683701	Very Suitable	Acceptable	Acceptable	1178	BSk	Arid, steppe, cold
269	Central Anatolia	Kayseri	Develi	0.677198	Very Suitable	Acceptable	Acceptable	1261	BSk	Arid, steppe, cold
817	Central Anatolia	Kayseri	Talas	0.661567	Very Suitable	Acceptable	Acceptable	1150	BSk	Arid, steppe, cold
905	Central Anatolia	Kayseri	Yeşilhisar	0.652141	Very Suitable	Acceptable	Acceptable	1167	BSk	Arid, steppe, cold
687	Central Anatolia	Kayseri	Özvatan	0.649592	Very Suitable	Acceptable	Acceptable	1289	BSk	Arid, steppe, cold
837	Central Anatolia	Kayseri	Tomarza	0.619653	Very Suitable	Acceptable	Acceptable	1396	BSk	Arid, steppe, cold
27	Central Anatolia	Kayseri	Akkışla	0.539270	Suitable	Marginal Suitable	Marginal Suitable	1357	Dsb	Cold, dry summer, warm summer
705	Central Anatolia	Kayseri	Pınarbaşı/Kayseri	0.414215	Suitable	Marginal Suitable	Marginal Suitable	1526	Dsb	Cold, dry summer, warm summer
747	Central Anatolia	Kayseri	Sarız	0.358382	Acceptable	Marginal Suitable	Marginal Suitable	1569	Dsb	Cold, dry summer, warm summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
112	Central Anatolia	Kırıkkale	Balışeyh	0.770472	Very Suitable	Acceptable	Suitable	870	BSk	Arid, steppe, cold
882	Central Anatolia	Kırıkkale	Yahşihan	0.763883	Very Suitable	Acceptable	Suitable	779	BSk	Arid, steppe, cold
802	Central Anatolia	Kırıkkale	Sulakyurt	0.754890	Very Suitable	Acceptable	Suitable	830	BSk	Arid, steppe, cold
106	Central Anatolia	Kırıkkale	Bahşili	0.754182	Very Suitable	Acceptable	Suitable	703	BSk	Arid, steppe, cold
557	Central Anatolia	Kırıkkale	Kırıkkale/Merkez	0.750407	Very Suitable	Acceptable	Suitable	746	BSk	Arid, steppe, cold
256	Central Anatolia	Kırıkkale	Delice	0.742654	Very Suitable	Acceptable	Acceptable	696	BSk	Arid, steppe, cold
549	Central Anatolia	Kırıkkale	Keskin	0.739106	Very Suitable	Acceptable	Acceptable	1139	BSk	Arid, steppe, cold
216	Central Anatolia	Kırıkkale	Çelebi	0.735318	Very Suitable	Acceptable	Acceptable	1241	BSk	Arid, steppe, cold
509	Central Anatolia	Kırıkkale	Karakeçili	0.724947	Very Suitable	Acceptable	Acceptable	821	BSk	Arid, steppe, cold
31	Central Anatolia	Kırşehir	Akpınar	0.783474	Very Suitable	Acceptable	Suitable	1163	BSk	Arid, steppe, cold
22	Central Anatolia	Kırşehir	Akçakent	0.781361	Very Suitable	Acceptable	Suitable	1410	BSk	Arid, steppe, cold
498	Central Anatolia	Kırşehir	Kaman	0.762692	Very Suitable	Acceptable	Suitable	1128	BSk	Arid, steppe, cold
227	Central Anatolia	Kırşehir	Çiçekdağı	0.746416	Very Suitable	Acceptable	Suitable	935	BSk	Arid, steppe, cold
168	Central Anatolia	Kırşehir	Boztepe	0.736214	Very Suitable	Acceptable	Acceptable	1167	BSk	Arid, steppe, cold
560	Central Anatolia	Kırşehir	Kırşehir/Merkez	0.734089	Very Suitable	Acceptable	Acceptable	991	BSk	Arid, steppe, cold
641	Central Anatolia	Kırşehir	Mucur	0.711984	Very Suitable	Acceptable	Acceptable	1071	BSk	Arid, steppe, cold
262	Central Anatolia	Konya	Derebucak	0.798079	Very Suitable	Acceptable	Suitable	1229	Csa	Temperate, dry summer, hot summer
144	Central Anatolia	Konya	Beyşehir	0.796744	Very Suitable	Acceptable	Suitable	1152	Dsa	Cold, dry summer, hot summer
453	Central Anatolia	Konya	Hüyük	0.791944	Very Suitable	Acceptable	Suitable	1251	Dsb	Cold, dry summer, warm summer
282	Central Anatolia	Konya	Doğanhisar	0.783808	Very Suitable	Acceptable	Suitable	1188	BSk	Arid, steppe, cold
633	Central Anatolia	Konya	Meram	0.760461	Very Suitable	Acceptable	Suitable	1027	BSk	Arid, steppe, cold
33	Central Anatolia	Konya	Akşehir	0.758605	Very Suitable	Acceptable	Suitable	1027	Csa	Temperate, dry summer, hot summer
16	Central Anatolia	Konya	Ahırlı	0.757678	Very Suitable	Acceptable	Suitable	1216	Csa	Temperate, dry summer, hot summer
770	Central Anatolia	Konya	Seydişehir	0.749821	Very Suitable	Acceptable	Suitable	1133	Csa	Temperate, dry summer, hot summer
885	Central Anatolia	Konya	Yalıhüyük	0.743159	Very Suitable	Acceptable	Acceptable	1106	Csa	Temperate, dry summer, hot summer
463	Central Anatolia	Konya	Ilgın	0.741730	Very Suitable	Acceptable	Acceptable	1039	BSk	Arid, steppe, cold
261	Central Anatolia	Konya	Derbent	0.739233	Very Suitable	Acceptable	Acceptable	1479	Dsb	Cold, dry summer, warm summer
164	Central Anatolia	Konya	Bozkır	0.732669	Very Suitable	Acceptable	Acceptable	1137	Csa	Temperate, dry summer, hot summer
917	Central Anatolia	Konya	Yunak	0.711305	Very Suitable	Acceptable	Acceptable	1101	BSk	Arid, steppe, cold
855	Central Anatolia	Konya	Tuzlukçu	0.708905	Very Suitable	Acceptable	Acceptable	994	BSk	Arid, steppe, cold
760	Central Anatolia	Konya	Selçuklu	0.698114	Very Suitable	Acceptable	Acceptable	1024	BSk	Arid, steppe, cold
487	Central Anatolia	Konya	Kadınhanı	0.697625	Very Suitable	Acceptable	Acceptable	1121	BSk	Arid, steppe, cold
591	Central Anatolia	Konya	Kulu	0.685671	Very Suitable	Acceptable	Acceptable	997	BSk	Arid, steppe, cold
738	Central Anatolia	Konya	Sarayönü	0.681652	Very Suitable	Acceptable	Acceptable	1064	BSk	Arid, steppe, cold
322	Central Anatolia	Konya	Ereğli/Konya	0.677202	Very Suitable	Acceptable	Acceptable	1053	BSk	Arid, steppe, cold
402	Central Anatolia	Konya	Güneysınır	0.674437	Very Suitable	Acceptable	Acceptable	1095	BSk	Arid, steppe, cold
218	Central Anatolia	Konya	Çeltik	0.667072	Very Suitable	Acceptable	Acceptable	852	BSk	Arid, steppe, cold
30	Central Anatolia	Konya	Akören	0.663556	Very Suitable	Acceptable	Acceptable	1108	Dsa	Cold, dry summer, hot summer
233	Central Anatolia	Konya	Cihanbeyli	0.648992	Very Suitable	Acceptable	Acceptable	963	Dsa	Cold, dry summer, hot summer
50	Central Anatolia	Konya	Altınekin	0.643550	Very Suitable	Acceptable	Acceptable	984	BSk	Arid, steppe, cold
415	Central Anatolia	Konya	Hadim	0.642974	Very Suitable	Acceptable	Acceptable	1526	Dsb	Cold, dry summer, warm summer
820	Central Anatolia	Konya	Taşkent	0.639015	Very Suitable	Acceptable	Acceptable	1409	Dsb	Cold, dry summer, warm summer
316	Central Anatolia	Konya	Emirgazi	0.636445	Very Suitable	Acceptable	Acceptable	1087	BSk	Arid, steppe, cold
519	Central Anatolia	Konya	Karatay	0.636391	Very Suitable	Acceptable	Acceptable	1023	BSk	Arid, steppe, cold

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
247	Central Anatolia	Konya	Çumra	0.617815	Very Suitable	Acceptable	Acceptable	1018	BSk	Arid, steppe, cold
515	Central Anatolia	Konya	Karapınar	0.617317	Very Suitable	Acceptable	Acceptable	997	BSk	Arid, steppe, cold
419	Central Anatolia	Konya	Halkapınar	0.412105	Suitable	Marginal Suitable	Marginal Suitable	1174	BSk	Arid, steppe, cold
657	Central Anatolia	Nevşehir	Nevşehir/Merkez	0.715747	Very Suitable	Acceptable	Acceptable	1197	BSk	Arid, steppe, cold
585	Central Anatolia	Nevşehir	Kozaklı	0.708610	Very Suitable	Acceptable	Acceptable	1054	BSk	Arid, steppe, cold
3	Central Anatolia	Nevşehir	Acıgöl	0.707640	Very Suitable	Acceptable	Acceptable	1247	BSk	Arid, steppe, cold
868	Central Anatolia	Nevşehir	Ürgüp	0.698640	Very Suitable	Acceptable	Acceptable	1060	BSk	Arid, steppe, cold
267	Central Anatolia	Nevşehir	Derinkuyu	0.698026	Very Suitable	Acceptable	Acceptable	1359	BSk	Arid, steppe, cold
413	Central Anatolia	Nevşehir	Hacıbektaş	0.693304	Very Suitable	Acceptable	Acceptable	1.288	BSk	Arid, steppe, cold
84	Central Anatolia	Nevşehir	Avanos	0.689447	Very Suitable	Acceptable	Acceptable	934	BSk	Arid, steppe, cold
395	Central Anatolia	Nevşehir	Gülşehir	0.687019	Very Suitable	Acceptable	Acceptable	923	BSk	Arid, steppe, cold
230	Central Anatolia	Niğde	Çiftlik	0.707234	Very Suitable	Acceptable	Acceptable	1546	BSk	Arid, steppe, cold
863	Central Anatolia	Niğde	Ulukışla	0.696731	Very Suitable	Acceptable	Acceptable	1447	BSk	Arid, steppe, cold
51	Central Anatolia	Niğde	Altunhisar	0.692029	Very Suitable	Acceptable	Acceptable	1200	BSk	Arid, steppe, cold
658	Central Anatolia	Niğde	Niğde/Merkez	0.687441	Very Suitable	Acceptable	Acceptable	1239	BSk	Arid, steppe, cold
158	Central Anatolia	Niğde	Bor	0.668888	Very Suitable	Acceptable	Acceptable	1130	BSk	Arid, steppe, cold
185	Central Anatolia	Niğde	Çamardı	0.461448	Suitable	Marginal Suitable	Marginal Suitable	1501	BSk	Arid, steppe, cold
359	Central Anatolia	Sivas	Gemerek	0.649874	Very Suitable	Acceptable	Acceptable	1211	BSk	Arid, steppe, cold
743	Central Anatolia	Sivas	Şarkışla	0.605282	Very Suitable	Marginal Suitable	Acceptable	1234	BSk	Arid, steppe, cold
858	Central Anatolia	Sivas	Ulaş	0.538398	Suitable	Marginal Suitable	Marginal Suitable	1391	BSk	Arid, steppe, cold
56	Central Anatolia	Sivas	Altınyayla/Sivas	0.532843	Suitable	Marginal Suitable	Marginal Suitable	1457	BSk	Arid, steppe, cold
278	Central Anatolia	Sivas	Divriği	0.531600	Suitable	Marginal Suitable	Marginal Suitable	1014	BSk	Arid, steppe, cold
912	Central Anatolia	Sivas	Yıldızeli	0.529924	Suitable	Marginal Suitable	Marginal Suitable	1370	BSk	Arid, steppe, cold
787	Central Anatolia	Sivas	Sivas/Merkez	0.526951	Suitable	Marginal Suitable	Marginal Suitable	1313	BSk	Arid, steppe, cold
410	Central Anatolia	Sivas	Gürün	0.471410	Suitable	Marginal Suitable	Marginal Suitable	1327	BSk	Arid, steppe, cold
416	Central Anatolia	Sivas	Hafik	0.469005	Suitable	Marginal Suitable	Marginal Suitable	1312	BSk	Arid, steppe, cold
26	Central Anatolia	Sivas	Akıncılar	0.448092	Suitable	Marginal Suitable	Marginal Suitable	1045	Dsa	Cold, dry summer, hot summer
284	Central Anatolia	Sivas	Doğanşar	0.446763	Suitable	Marginal Suitable	Marginal Suitable	1299	Dsb	Cold, dry summer, warm summer
500	Central Anatolia	Sivas	Kangal	0.442448	Suitable	Marginal Suitable	Marginal Suitable	1528	BSk	Arid, steppe, cold
813	Central Anatolia	Sivas	Suşehri	0.427570	Suitable	Marginal Suitable	Marginal Suitable	1073	Dsb	Cold, dry summer, warm summer
380	Central Anatolia	Sivas	Gölova	0.395645	Acceptable	Marginal Suitable	Marginal Suitable	1336	Dsb	Cold, dry summer, warm summer
920	Central Anatolia	Sivas	Zara	0.350726	Acceptable	Marginal Suitable	Marginal Suitable	1344	Dsb	Cold, dry summer, warm summer
584	Central Anatolia	Sivas	Koyulhisar	0.341354	Acceptable	Marginal Suitable	Marginal Suitable	947	Dsb	Cold, dry summer, warm summer
467	Central Anatolia	Sivas	İmranlı	0.266694	Acceptable	Marginal Suitable	Marginal Suitable	1605	Dsb	Cold, dry summer, warm summer
91	Central Anatolia	Yozgat	Aydıncık/Yozgat	0.874115	Extremely Suitable	Suitable	Very Suitable	831	BSk	Arid, steppe, cold
215	Central Anatolia	Yozgat	Çekerek	0.858469	Extremely Suitable	Suitable	Very Suitable	936	BSk	Arid, steppe, cold
488	Central Anatolia	Yozgat	Kadışehri	0.849207	Extremely Suitable	Suitable	Very Suitable	1036	BSk	Arid, steppe, cold
736	Central Anatolia	Yozgat	Saraykent	0.822312	Extremely Suitable	Suitable	Suitable	1142	BSk	Arid, steppe, cold
742	Central Anatolia	Yozgat	Sarıkaya	0.804901	Extremely Suitable	Acceptable	Suitable	1116	BSk	Arid, steppe, cold
800	Central Anatolia	Yozgat	Sorgun	0.793071	Very Suitable	Acceptable	Suitable	1083	BSk	Arid, steppe, cold
914	Central Anatolia	Yozgat	Yozgat/Merkez	0.786459	Very Suitable	Acceptable	Suitable	1317	Dsb	Cold, dry summer, warm summer
904	Central Anatolia	Yozgat	Yerköy	0.746014	Very Suitable	Acceptable	Suitable	770	BSk	Arid, steppe, cold
756	Central Anatolia	Yozgat	Şefaatli	0.739916	Very Suitable	Acceptable	Acceptable	914	BSk	Arid, steppe, cold
195	Central Anatolia	Yozgat	Çandır	0.728188	Very Suitable	Acceptable	Acceptable	1235	BSk	Arid, steppe, cold

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
155	Central Anatolia	Yozgat	Boğazlıyan	0.725263	Very Suitable	Acceptable	Acceptable	1071	BSk	Arid, steppe, cold
898	Central Anatolia	Yozgat	Yenifakılı	0.707904	Very Suitable	Acceptable	Acceptable	1012	BSk	Arid, steppe, cold
24	Central Anatolia	Yozgat	Akdağmadeni	0.683990	Very Suitable	Acceptable	Acceptable	1322	BSk	Arid, steppe, cold
212	Central Anatolia	Yozgat	Çayıralan	0.623537	Very Suitable	Acceptable	Acceptable	1362	BSk	Arid, steppe, cold
691	East Anatolia	Ağrı	Patnos	0.426721	Suitable	Marginal Suitable	Marginal Suitable	1639	Dsb	Cold, dry summer, warm summer
288	East Anatolia	Ağrı	Doğubayazıt	0.373283	Acceptable	Marginal Suitable	Marginal Suitable	1594	BSk	Arid, steppe, cold
852	East Anatolia	Ağrı	Tutak	0.346237	Acceptable	Marginal Suitable	Marginal Suitable	1567	Dsa	Cold, dry summer, hot summer
421	East Anatolia	Ağrı	Hamur	0.314113	Acceptable	Marginal Suitable	Marginal Suitable	1690	Dsb	Cold, dry summer, warm summer
15	East Anatolia	Ağrı	Ağrı/Merkez	0.273801	Acceptable	Marginal Suitable	Marginal Suitable	1630	Dsb	Cold, dry summer, warm summer
310	East Anatolia	Ağrı	Eleşkirt	0.215706	Acceptable	Marginal Suitable	Marginal Suitable	1810	Dsb	Cold, dry summer, warm summer
279	East Anatolia	Ağrı	Diyadin	0.204954	Acceptable	Marginal Suitable	Marginal Suitable	1933	Dsb	Cold, dry summer, warm summer
822	East Anatolia	Ağrı	Taşlıçay	0.196274	Marginal Suitable	Marginal Suitable	Marginal Suitable	1762	Dsb	Cold, dry summer, warm summer
709	East Anatolia	Ardahan	Posof	0.121988	Marginal Suitable	Marginal Suitable	Marginal Suitable	1546	Dfb	Cold, no dry season, warm summer
251	East Anatolia	Ardahan	Damal	0.116015	Marginal Suitable	Marginal Suitable	Marginal Suitable	2056	Dfc	Cold, no dry season, cold summer
238	East Anatolia	Ardahan	Çıldır	0.115417	Marginal Suitable	Marginal Suitable	Marginal Suitable	1911	Dfb	Cold, no dry season, warm summer
423	East Anatolia	Ardahan	Hanak	0.108222	Marginal Suitable	Marginal Suitable	Marginal Suitable	1826	Dfb	Cold, no dry season, warm summer
68	East Anatolia	Ardahan	Ardahan/Merkez	0.097760	Marginal Suitable	Marginal Suitable	Marginal Suitable	1799	Dfb	Cold, no dry season, warm summer
376	East Anatolia	Ardahan	Göle	0.095758	Marginal Suitable	Marginal Suitable	Marginal Suitable	2020	Dfb	Cold, no dry season, warm summer
361	East Anatolia	Bingöl	Genç	0.634634	Very Suitable	Acceptable	Acceptable	1018	Dsa	Cold, dry summer, hot summer
149	East Anatolia	Bingöl	Bingöl/Merkez	0.602114	Very Suitable	Marginal Suitable	Acceptable	1159	Dsa	Cold, dry summer, hot summer
798	East Anatolia	Bingöl	Solhan	0.458539	Suitable	Marginal Suitable	Marginal Suitable	1424	Dsa	Cold, dry summer, hot summer
892	East Anatolia	Bingöl	Yayladere	0.392965	Acceptable	Marginal Suitable	Marginal Suitable	1569	Dsa	Cold, dry summer, hot summer
551	East Anatolia	Bingöl	Kiğı	0.378561	Acceptable	Marginal Suitable	Marginal Suitable	1519	Dsa	Cold, dry summer, hot summer
5	East Anatolia	Bingöl	Adaklı	0.346563	Acceptable	Marginal Suitable	Marginal Suitable	1507	Dsb	Cold, dry summer, warm summer
894	East Anatolia	Bingöl	Yedisu	0.219417	Acceptable	Marginal Suitable	Marginal Suitable	1534	Dsb	Cold, dry summer, warm summer
523	East Anatolia	Bingöl	Karlıova	0.177390	Marginal Suitable	Marginal Suitable	Marginal Suitable	1824	Dsb	Cold, dry summer, warm summer
7	East Anatolia	Bitlis	Adilcevaz	0.768881	Very Suitable	Acceptable	Suitable	1683	Dsb	Cold, dry summer, warm summer
651	East Anatolia	Bitlis	Mutki	0.645084	Very Suitable	Acceptable	Acceptable	1486	Dsa	Cold, dry summer, hot summer
17	East Anatolia	Bitlis	Ahlat	0.604473	Very Suitable	Marginal Suitable	Acceptable	1703	Dsb	Cold, dry summer, warm summer
152	East Anatolia	Bitlis	Bitlis/Merkez	0.599815	Suitable	Marginal Suitable	Acceptable	1637	Dsa	Cold, dry summer, hot summer
407	East Anatolia	Bitlis	Güroymak	0.555905	Suitable	Marginal Suitable	Marginal Suitable	1308	Dsa	Cold, dry summer, hot summer
824	East Anatolia	Bitlis	Tatvan	0.529822	Suitable	Marginal Suitable	Marginal Suitable	1656	Dsb	Cold, dry summer, warm summer
446	East Anatolia	Bitlis	Hizan	0.491463	Suitable	Marginal Suitable	Marginal Suitable	1472	Dsb	Cold, dry summer, warm summer
12	East Anatolia	Elazığ	Ağın	0.703815	Very Suitable	Acceptable	Acceptable	889	Dsa	Cold, dry summer, hot summer
688	East Anatolia	Elazığ	Palu	0.671654	Very Suitable	Acceptable	Acceptable	871	Dsa	Cold, dry summer, hot summer
612	East Anatolia	Elazığ	Maden	0.669923	Very Suitable	Acceptable	Acceptable	1021	Dsa	Cold, dry summer, hot summer
582	East Anatolia	Elazığ	Kovancılar	0.665840	Very Suitable	Acceptable	Acceptable	967	Dsa	Cold, dry summer, hot summer
790	East Anatolia	Elazığ	Sivrice	0.661237	Very Suitable	Acceptable	Acceptable	1273	Dsa	Cold, dry summer, hot summer
510	East Anatolia	Elazığ	Karakoçan	0.655549	Very Suitable	Acceptable	Acceptable	1095	Dsa	Cold, dry summer, hot summer
306	East Anatolia	Elazığ	Elazığ/Merkez	0.641393	Very Suitable	Acceptable	Acceptable	1041	BSk	Arid, steppe, cold
536	East Anatolia	Elazığ	Keban	0.641217	Very Suitable	Acceptable	Acceptable	799	Dsa	Cold, dry summer, hot summer
119	East Anatolia	Elazığ	Baskil	0.627848	Very Suitable	Acceptable	Acceptable	1212	Dsa	Cold, dry summer, hot summer
40	East Anatolia	Elazığ	Alacakaya	0.566713	Suitable	Marginal Suitable	Marginal Suitable	1147	Dsa	Cold, dry summer, hot summer
73	East Anatolia	Elazığ	Arıcak	0.427266	Suitable	Marginal Suitable	Marginal Suitable	1092	Csa	Temperate, dry summer, hot summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
542	East Anatolia	Erzincan	Kemaliye	0.612850	Very Suitable	Marginal Suitable	Acceptable	947	Dsa	Cold, dry summer, hot summer
464	East Anatolia	Erzincan	İliç	0.601752	Very Suitable	Marginal Suitable	Acceptable	1104	Dsa	Cold, dry summer, hot summer
541	East Anatolia	Erzincan	Kemah	0.294795	Acceptable	Marginal Suitable	Marginal Suitable	1068	Dsa	Cold, dry summer, hot summer
831	East Anatolia	Erzincan	Tercan	0.291383	Acceptable	Marginal Suitable	Marginal Suitable	1421	Dsa	Cold, dry summer, hot summer
713	East Anatolia	Erzincan	Refahiye	0.276493	Acceptable	Marginal Suitable	Marginal Suitable	1602	Dsb	Cold, dry summer, warm summer
329	East Anatolia	Erzincan	Erzincan/Merkez	0.275256	Acceptable	Marginal Suitable	Marginal Suitable	1216	BSk	Arid, steppe, cold
213	East Anatolia	Erzincan	Çayırlı	0.269979	Acceptable	Marginal Suitable	Marginal Suitable	1527	Dsb	Cold, dry summer, warm summer
683	East Anatolia	Erzincan	Otlukbeli	0.211213	Acceptable	Marginal Suitable	Marginal Suitable	1741	Dsb	Cold, dry summer, warm summer
872	East Anatolia	Erzincan	Üzümlü	0.204810	Acceptable	Marginal Suitable	Marginal Suitable	1397	Dsb	Cold, dry summer, warm summer
505	East Anatolia	Erzurum	Karaçoban	0.395955	Acceptable	Marginal Suitable	Marginal Suitable	1549	Dsb	Cold, dry summer, warm summer
873	East Anatolia	Erzurum	Uzundere	0.314303	Acceptable	Marginal Suitable	Marginal Suitable	1098	Dfb	Cold, no dry season, warm summer
447	East Anatolia	Erzurum	Hınıs	0.287796	Acceptable	Marginal Suitable	Marginal Suitable	1713	Dsb	Cold, dry summer, warm summer
669	East Anatolia	Erzurum	Oltu	0.287062	Acceptable	Marginal Suitable	Marginal Suitable	1274	BSk	Arid, steppe, cold
451	East Anatolia	Erzurum	Horasan	0.251248	Acceptable	Marginal Suitable	Marginal Suitable	1560	BSk	Arid, steppe, cold
574	East Anatolia	Erzurum	Köprüköy	0.224192	Acceptable	Marginal Suitable	Marginal Suitable	1602	Dfb	Cold, no dry season, warm summer
80	East Anatolia	Erzurum	Aşkale	0.208074	Acceptable	Marginal Suitable	Marginal Suitable	1661	Dsb	Cold, dry summer, warm summer
465	East Anatolia	Erzurum	Ilıca	0.195552	Marginal Suitable	Marginal Suitable	Marginal Suitable	1763	Dfb	Cold, no dry season, warm summer
690	East Anatolia	Erzurum	Pasinler	0.195130	Marginal Suitable	Marginal Suitable	Marginal Suitable	1661	Dsb	Cold, dry summer, warm summer
830	East Anatolia	Erzurum	Tekman	0.186964	Marginal Suitable	Marginal Suitable	Marginal Suitable	1937	Dsb	Cold, dry summer, warm summer
520	East Anatolia	Erzurum	Karayazı	0.183736	Marginal Suitable	Marginal Suitable	Marginal Suitable	2281	Dsb	Cold, dry summer, warm summer
330	East Anatolia	Erzurum	Erzurum/Merkez	0.177682	Marginal Suitable	Marginal Suitable	Marginal Suitable	1923	Dfb	Cold, no dry season, warm summer
654	East Anatolia	Erzurum	Narman	0.175607	Marginal Suitable	Marginal Suitable	Marginal Suitable	1644	Dfb	Cold, no dry season, warm summer
670	East Anatolia	Erzurum	Olur	0.165202	Marginal Suitable	Marginal Suitable	Marginal Suitable	1334	Dfb	Cold, no dry season, warm summer
201	East Anatolia	Erzurum	Çat	0.151408	Marginal Suitable	Marginal Suitable	Marginal Suitable	1921	Dsb	Cold, dry summer, warm summer
765	East Anatolia	Erzurum	Şenkaya	0.132716	Marginal Suitable	Marginal Suitable	Marginal Suitable	1867	Dfb	Cold, no dry season, warm summer
480	East Anatolia	Erzurum	İspir	0.119254	Marginal Suitable	Marginal Suitable	Marginal Suitable	1189	Dfb	Cold, no dry season, warm summer
841	East Anatolia	Erzurum	Tortum	0.114602	Marginal Suitable	Marginal Suitable	Marginal Suitable	1618	Dfb	Cold, no dry season, warm summer
697	East Anatolia	Erzurum	Pazaryolu	0.112255	Marginal Suitable	Marginal Suitable	Marginal Suitable	1482	Dfb	Cold, no dry season, warm summer
245	East Anatolia	Hakkari	Çukurca	0.677788	Very Suitable	Acceptable	Acceptable	1312	Dsa	Cold, dry summer, hot summer
763	East Anatolia	Hakkari	Şemdinli	0.498257	Suitable	Marginal Suitable	Marginal Suitable	1391	Dsa	Cold, dry summer, hot summer
915	East Anatolia	Hakkari	Yüksekova	0.260640	Acceptable	Marginal Suitable	Marginal Suitable	1876	Dsa	Cold, dry summer, hot summer
417	East Anatolia	Hakkari	Hakkari/Merkez	0.225803	Acceptable	Marginal Suitable	Marginal Suitable	1756	Dsa	Cold, dry summer, hot summer
66	East Anatolia	Iğdır	Aralık	0.679667	Very Suitable	Acceptable	Acceptable	819	BWk	Arid, desert, cold
511	East Anatolia	Iğdır	Karakoyunlu	0.654431	Very Suitable	Acceptable	Acceptable	847	BSk	Arid, steppe, cold
457	East Anatolia	Iğdır	Iğdır/Merkez	0.643150	Very Suitable	Acceptable	Acceptable	860	BWk	Arid, desert, cold
854	East Anatolia	Iğdır	Tuzluca	0.621937	Very Suitable	Acceptable	Acceptable	1104	BSk	Arid, steppe, cold
274	East Anatolia	Kars	Digor	0.413369	Suitable	Marginal Suitable	Marginal Suitable	1650	BSk	Arid, steppe, cold
36	East Anatolia	Kars	Akyaka	0.317622	Acceptable	Marginal Suitable	Marginal Suitable	1492	Dfb	Cold, no dry season, warm summer
490	East Anatolia	Kars	Kağızman	0.244506	Acceptable	Marginal Suitable	Marginal Suitable	1.414	BSk	Arid, steppe, cold
75	East Anatolia	Kars	Arpaçay	0.226565	Acceptable	Marginal Suitable	Marginal Suitable	1695	Dfb	Cold, no dry season, warm summer
525	East Anatolia	Kars	Kars/Merkez	0.200511	Acceptable	Marginal Suitable	Marginal Suitable	1.756	Dfb	Cold, no dry season, warm summer
815	East Anatolia	Kars	Susuz	0.156965	Marginal Suitable	Marginal Suitable	Marginal Suitable	1755	Dfb	Cold, no dry season, warm summer
762	East Anatolia	Kars	Selim	0.154881	Marginal Suitable	Marginal Suitable	Marginal Suitable	1858	Dfb	Cold, no dry season, warm summer
741	East Anatolia	Kars	Sarıkamış	0.149903	Marginal Suitable	Marginal Suitable	Marginal Suitable	2103	Dfb	Cold, no dry season, warm summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
710	East Anatolia	Malatya	Pütürge	0.672765	Very Suitable	Acceptable	Acceptable	1224	Dsa	Cold, dry summer, hot summer
286	East Anatolia	Malatya	Doğanyol	0.671593	Very Suitable	Acceptable	Acceptable	929	Dsa	Cold, dry summer, hot summer
71	East Anatolia	Malatya	Arguvan	0.659199	Very Suitable	Acceptable	Acceptable	1163	BSk	Arid, steppe, cold
285	East Anatolia	Malatya	Doğanşehir	0.641140	Very Suitable	Acceptable	Acceptable	1225	Dsa	Cold, dry summer, hot summer
441	East Anatolia	Malatya	Hekimhan	0.636103	Very Suitable	Acceptable	Acceptable	1122	BSk	Arid, steppe, cold
893	East Anatolia	Malatya	Yazıhan	0.631881	Very Suitable	Acceptable	Acceptable	828	BSk	Arid, steppe, cold
495	East Anatolia	Malatya	Kale/Malatya	0.626531	Very Suitable	Acceptable	Acceptable	729	Dsa	Cold, dry summer, hot summer
67	East Anatolia	Malatya	Arapgir	0.619776	Very Suitable	Acceptable	Acceptable	1172	Dsa	Cold, dry summer, hot summer
908	East Anatolia	Malatya	Yeşilyurt/Malatya	0.615584	Very Suitable	Marginal Suitable	Acceptable	1010	Dsa	Cold, dry summer, hot summer
614	East Anatolia	Malatya	Malatya/Merkez	0.610768	Very Suitable	Marginal Suitable	Acceptable	970	BSk	Arid, steppe, cold
252	East Anatolia	Malatya	Darende	0.609916	Very Suitable	Marginal Suitable	Acceptable	1027	BSk	Arid, steppe, cold
20	East Anatolia	Malatya	Akçadağ	0.609182	Very Suitable	Marginal Suitable	Acceptable	1056	BSk	Arid, steppe, cold
122	East Anatolia	Malatya	Battalgazi	0.531531	Suitable	Marginal Suitable	Marginal Suitable	782	BSk	Arid, steppe, cold
592	East Anatolia	Malatya	Kuluncak	0.503574	Suitable	Marginal Suitable	Marginal Suitable	1276	BSk	Arid, steppe, cold
578	East Anatolia	Muş	Korkut	0.551497	Suitable	Marginal Suitable	Marginal Suitable	1315	Dsa	Cold, dry summer, hot summer
430	East Anatolia	Muş	Hasköy	0.538874	Suitable	Marginal Suitable	Marginal Suitable	1277	Dsa	Cold, dry summer, hot summer
648	East Anatolia	Muş	Muş/Merkez	0.515102	Suitable	Marginal Suitable	Marginal Suitable	1334	Dsa	Cold, dry summer, hot summer
615	East Anatolia	Muş	Malazgirt	0.488318	Suitable	Marginal Suitable	Marginal Suitable	1532	Dsa	Cold, dry summer, hot summer
175	East Anatolia	Muş	Bulanık	0.450794	Suitable	Marginal Suitable	Marginal Suitable	1488	Dsa	Cold, dry summer, hot summer
877	East Anatolia	Muş	Varto	0.315201	Acceptable	Marginal Suitable	Marginal Suitable	1519	Dsa	Cold, dry summer, hot summer
701	East Anatolia	Tunceli	Pertek	0.672440	Very Suitable	Acceptable	Acceptable	1167	Dsa	Cold, dry summer, hot summer
626	East Anatolia	Tunceli	Mazgirt	0.643409	Very Suitable	Acceptable	Acceptable	1413	Dsa	Cold, dry summer, hot summer
846	East Anatolia	Tunceli	Tunceli/Merkez	0.643358	Very Suitable	Acceptable	Acceptable	922	Dsa	Cold, dry summer, hot summer
452	East Anatolia	Tunceli	Hozat	0.630635	Very Suitable	Acceptable	Acceptable	1525	Dsa	Cold, dry summer, hot summer
656	East Anatolia	Tunceli	Nazımiye	0.578339	Suitable	Marginal Suitable	Marginal Suitable	1578	Dsa	Cold, dry summer, hot summer
220	East Anatolia	Tunceli	Çemişgezek	0.456177	Suitable	Marginal Suitable	Marginal Suitable	1013	Dsa	Cold, dry summer, hot summer
684	East Anatolia	Tunceli	Ovacık/Tunceli	0.245197	Acceptable	Marginal Suitable	Marginal Suitable	1257	Dsa	Cold, dry summer, hot summer
712	East Anatolia	Tunceli	Pülümür	0.220851	Acceptable	Marginal Suitable	Marginal Suitable	1524	Dsb	Cold, dry summer, warm summer
733	East Anatolia	Van	Saray/Van	0.704463	Very Suitable	Acceptable	Acceptable	2095	BSk	Arid, steppe, cold
319	East Anatolia	Van	Erciş	0.688949	Very Suitable	Acceptable	Acceptable	1691	Dsb	Cold, dry summer, warm summer
301	East Anatolia	Van	Edremit/Van	0.685248	Very Suitable	Acceptable	Acceptable	1736	BSk	Arid, steppe, cold
876	East Anatolia	Van	Van/Merkez	0.673813	Very Suitable	Acceptable	Acceptable	1728	BSk	Arid, steppe, cold
367	East Anatolia	Van	Gevaş	0.549446	Suitable	Marginal Suitable	Marginal Suitable	1694	Dsb	Cold, dry summer, warm summer
408	East Anatolia	Van	Gürpınar	0.394373	Acceptable	Marginal Suitable	Marginal Suitable	1748	BSk	Arid, steppe, cold
105	East Anatolia	Van	Bahçesaray	0.320345	Acceptable	Marginal Suitable	Marginal Suitable	1767	Dsb	Cold, dry summer, warm summer
686	East Anatolia	Van	Özalp	0.251822	Acceptable	Marginal Suitable	Marginal Suitable	1999	BSk	Arid, steppe, cold
645	East Anatolia	Van	Muradiye	0.211438	Acceptable	Marginal Suitable	Marginal Suitable	1705	Dsb	Cold, dry summer, warm summer
184	East Anatolia	Van	Çaldıran	0.185963	Marginal Suitable	Marginal Suitable	Marginal Suitable	2046	Dsb	Cold, dry summer, warm summer
202	East Anatolia	Van	Çatak	0.173423	Marginal Suitable	Marginal Suitable	Marginal Suitable	1500	Dsb	Cold, dry summer, warm summer
118	East Anatolia	Van	Başkale	0.152430	Marginal Suitable	Marginal Suitable	Marginal Suitable	2320	Dsb	Cold, dry summer, warm summer
294	Marmara	Balıkesir	Dursunbey	0.778637	Very Suitable	Acceptable	Suitable	638	Csa	Temperate, dry summer, hot summer
481	Marmara	Balıkesir	İvrindi	0.708643	Very Suitable	Acceptable	Acceptable	277	Csa	Temperate, dry summer, hot summer
434	Marmara	Balıkesir	Havran	0.684173	Very Suitable	Acceptable	Acceptable	43	Csa	Temperate, dry summer, hot summer
113	Marmara	Balıkesir	Balya	0.671274	Very Suitable	Acceptable	Acceptable	242	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
792	Marmara	Balıkesir	Sındırgı	0.647591	Very Suitable	Acceptable	Acceptable	228	Csa	Temperate, dry summer, hot summer
752	Marmara	Balıkesir	Savaştepe	0.634444	Very Suitable	Acceptable	Acceptable	284	Csa	Temperate, dry summer, hot summer
814	Marmara	Balıkesir	Susurluk	0.608376	Very Suitable	Marginal Suitable	Acceptable	46	Csa	Temperate, dry summer, hot summer
300	Marmara	Balıkesir	Edremit/Balıkesir	0.596733	Suitable	Marginal Suitable	Marginal Suitable	31	Csa	Temperate, dry summer, hot summer
384	Marmara	Balıkesir	Gönen/Balıkesir	0.589758	Suitable	Marginal Suitable	Marginal Suitable	41	Csa	Temperate, dry summer, hot summer
546	Marmara	Balıkesir	Kepsut	0.584843	Suitable	Marginal Suitable	Marginal Suitable	88	Csa	Temperate, dry summer, hot summer
111	Marmara	Balıkesir	Balıkesir/Merkez	0.574200	Suitable	Marginal Suitable	Marginal Suitable	145	Csa	Temperate, dry summer, hot summer
147	Marmara	Balıkesir	Bigadiç	0.567608	Suitable	Marginal Suitable	Marginal Suitable	169	Csa	Temperate, dry summer, hot summer
621	Marmara	Balıkesir	Manyas	0.556937	Suitable	Marginal Suitable	Marginal Suitable	56	Csa	Temperate, dry summer, hot summer
179	Marmara	Balıkesir	Burhaniye	0.340708	Acceptable	Marginal Suitable	Marginal Suitable	22	Csa	Temperate, dry summer, hot summer
320	Marmara	Balıkesir	Erdek	0.268263	Acceptable	Marginal Suitable	Marginal Suitable	7	Csa	Temperate, dry summer, hot summer
623	Marmara	Balıkesir	Marmara	0.252955	Acceptable	Marginal Suitable	Marginal Suitable	38	Csa	Temperate, dry summer, hot summer
97	Marmara	Balıkesir	Ayvalık	0.184372	Marginal Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
115	Marmara	Balıkesir	Bandırma	0.164020	Marginal Suitable	Marginal Suitable	Marginal Suitable	17	Csa	Temperate, dry summer, hot summer
383	Marmara	Balıkesir	Gömeç	0.155222	Marginal Suitable	Marginal Suitable	Marginal Suitable	16	Csa	Temperate, dry summer, hot summer
169	Marmara	Bilecik	Bozüyük	0.915561	Extremely Suitable	Suitable	Extremely Suitable	757	BSk	Arid, steppe, cold
696	Marmara	Bilecik	Pazaryeri	0.911213	Extremely Suitable	Suitable	Extremely Suitable	806	BSk	Arid, steppe, cold
901	Marmara	Bilecik	Yenipazar/Bilecik	0.846795	Extremely Suitable	Suitable	Very Suitable	622	BSk	Arid, steppe, cold
795	Marmara	Bilecik	Söğüt	0.837809	Extremely Suitable	Suitable	Very Suitable	682	BSk	Arid, steppe, cold
472	Marmara	Bilecik	İnhisar	0.831966	Extremely Suitable	Suitable	Suitable	208	BSk	Arid, steppe, cold
148	Marmara	Bilecik	Bilecik/Merkez	0.798199	Very Suitable	Acceptable	Suitable	513	BSk	Arid, steppe, cold
381	Marmara	Bilecik	Gölpazarı	0.793905	Very Suitable	Acceptable	Suitable	539	Csb	Temperate, dry summer, warm summer
680	Marmara	Bilecik	Osmaneli	0.737466	Very Suitable	Acceptable	Acceptable	107	BSk	Arid, steppe, cold
471	Marmara	Bursa	İnegöl	0.896093	Extremely Suitable	Suitable	Very Suitable	294	BSk	Arid, steppe, cold
539	Marmara	Bursa	Keles	0.881025	Extremely Suitable	Suitable	Very Suitable	1026	Csb	Temperate, dry summer, warm summer
550	Marmara	Bursa	Kestel	0.855988	Extremely Suitable	Suitable	Very Suitable	122	Csa	Temperate, dry summer, hot summer
673	Marmara	Bursa	Orhaneli	0.831530	Extremely Suitable	Suitable	Suitable	491	Csb	Temperate, dry summer, warm summer
409	Marmara	Bursa	Gürsu	0.804962	Extremely Suitable	Acceptable	Suitable	112	Csa	Temperate, dry summer, hot summer
911	Marmara	Bursa	Yıldırım	0.794248	Very Suitable	Acceptable	Suitable	160	Csa	Temperate, dry summer, hot summer
426	Marmara	Bursa	Harmancık	0.791388	Very Suitable	Acceptable	Suitable	689	Csa	Temperate, dry summer, hot summer
181	Marmara	Bursa	Büyükorhan	0.775216	Very Suitable	Acceptable	Suitable	799	Csb	Temperate, dry summer, warm summer
483	Marmara	Bursa	İznik	0.770902	Very Suitable	Acceptable	Suitable	103	Csa	Temperate, dry summer, hot summer
903	Marmara	Bursa	Yenişehir/Bursa	0.680687	Very Suitable	Acceptable	Acceptable	229	BSk	Arid, steppe, cold
660	Marmara	Bursa	Nilüfer	0.677559	Very Suitable	Acceptable	Acceptable	121	Csa	Temperate, dry summer, hot summer
681	Marmara	Bursa	Osmangazi	0.663807	Very Suitable	Acceptable	Acceptable	173	Csa	Temperate, dry summer, hot summer
360	Marmara	Bursa	Gemlik	0.658474	Very Suitable	Acceptable	Acceptable	7	Csa	Temperate, dry summer, hot summer
674	Marmara	Bursa	Orhangazi	0.645845	Very Suitable	Acceptable	Acceptable	115	Csa	Temperate, dry summer, hot summer
610	Marmara	Bursa	Mustafakemalpaşa	0.580541	Suitable	Marginal Suitable	Marginal Suitable	27	Csa	Temperate, dry summer, hot summer
503	Marmara	Bursa	Karacabey	0.397171	Acceptable	Marginal Suitable	Marginal Suitable	35	Csa	Temperate, dry summer, hot summer
642	Marmara	Bursa	Mudanya	0.273151	Acceptable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
896	Marmara	Çanakkale	Yenice/Çanakkale	0.745587	Very Suitable	Acceptable	Suitable	275	Csa	Temperate, dry summer, hot summer
192	Marmara	Çanakkale	Çan	0.698920	Very Suitable	Acceptable	Acceptable	83	Csa	Temperate, dry summer, hot summer
128	Marmara	Çanakkale	Bayramiç	0.668290	Very Suitable	Acceptable	Acceptable	106	Csa	Temperate, dry summer, hot summer
146	Marmara	Çanakkale	Biga	0.547677	Suitable	Marginal Suitable	Marginal Suitable	51	Csa	Temperate, dry summer, hot summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLIMATE SUITABILITY CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
607	Marmara	Çanakkale	Lapseki	0.353787	Acceptable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
342	Marmara	Çanakkale	Ezine	0.330050	Acceptable	Marginal Suitable	Marginal Suitable	50	Csa	Temperate, dry summer, hot summer
162	Marmara	Çanakkale	Bozcaada	0.206971	Acceptable	Marginal Suitable	Marginal Suitable	41	Csa	Temperate, dry summer, hot summer
370	Marmara	Çanakkale	Gökçeada	0.189285	Marginal Suitable	Marginal Suitable	Marginal Suitable	50	Csa	Temperate, dry summer, hot summer
194	Marmara	Çanakkale	Çanakkale/Merkez	0.178302	Marginal Suitable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
298	Marmara	Çanakkale	Eceabat	0.170799	Marginal Suitable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
358	Marmara	Çanakkale	Gelibolu	0.131684	Marginal Suitable	Marginal Suitable	Marginal Suitable	20	Csa	Temperate, dry summer, hot summer
95	Marmara	Çanakkale	Ayvacık/Çanakkale	0.095774	Marginal Suitable	Marginal Suitable	Marginal Suitable	288	Csa	Temperate, dry summer, hot summer
803	Marmara	Edirne	Süloğlu	0.676672	Very Suitable	Acceptable	Acceptable	151	Csa	Temperate, dry summer, hot summer
606	Marmara	Edirne	Lalapaşa	0.663054	Very Suitable	Acceptable	Acceptable	161	Cfa	Temperate, no dry season, hot summer
634	Marmara	Edirne	Meriç	0.626820	Very Suitable	Acceptable	Acceptable	42	Csa	Temperate, dry summer, hot summer
299	Marmara	Edirne	Edirne/Merkez	0.610001	Very Suitable	Marginal Suitable	Acceptable	50	Csa	Temperate, dry summer, hot summer
874	Marmara	Edirne	Uzunköprü	0.607492	Very Suitable	Marginal Suitable	Acceptable	32	Csa	Temperate, dry summer, hot summer
435	Marmara	Edirne	Havsa	0.606444	Very Suitable	Marginal Suitable	Acceptable	78	Csa	Temperate, dry summer, hot summer
474	Marmara	Edirne	İpsala	0.594330	Suitable	Marginal Suitable	Marginal Suitable	18	Csa	Temperate, dry summer, hot summer
547	Marmara	Edirne	Keşan	0.576073	Suitable	Marginal Suitable	Marginal Suitable	122	Csa	Temperate, dry summer, hot summer
317	Marmara	Edirne	Enez	0.191264	Marginal Suitable	Marginal Suitable	Marginal Suitable	18	Csa	Temperate, dry summer, hot summer
865	Marmara	İstanbul	Ümraniye	0.575872	Suitable	Marginal Suitable	Marginal Suitable	144	Csa	Temperate, dry summer, hot summer
353	Marmara	İstanbul	Gaziosmanpaşa	0.496491	Suitable	Marginal Suitable	Marginal Suitable	113	Csa	Temperate, dry summer, hot summer
203	Marmara	İstanbul	Çatalca	0.482171	Suitable	Marginal Suitable	Marginal Suitable	84	Csa	Temperate, dry summer, hot summer
746	Marmara	İstanbul	Sarıyer	0.454079	Suitable	Marginal Suitable	Marginal Suitable	81	Csa	Temperate, dry summer, hot summer
140	Marmara	İstanbul	Beykoz	0.452606	Suitable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
774	Marmara	İstanbul	Şile	0.421537	Suitable	Marginal Suitable	Marginal Suitable	49	Csa	Temperate, dry summer, hot summer
804	Marmara	İstanbul	Sultanbeyli	0.414454	Suitable	Marginal Suitable	Marginal Suitable	127	Csa	Temperate, dry summer, hot summer
786	Marmara	İstanbul	Şişli	0.394114	Acceptable	Marginal Suitable	Marginal Suitable	111	Csa	Temperate, dry summer, hot summer
489	Marmara	İstanbul	Kağıthane	0.305849	Acceptable	Marginal Suitable	Marginal Suitable	16	Csa	Temperate, dry summer, hot summer
776	Marmara	İstanbul	Silivri	0.301145	Acceptable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
134	Marmara	İstanbul	Beşiktaş	0.295828	Acceptable	Marginal Suitable	Marginal Suitable	16	Csa	Temperate, dry summer, hot summer
853	Marmara	İstanbul	Tuzla	0.288332	Acceptable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
130	Marmara	İstanbul	Bayrampaşa	0.288097	Acceptable	Marginal Suitable	Marginal Suitable	102	Csa	Temperate, dry summer, hot summer
331	Marmara	İstanbul	Esenler	0.288016	Acceptable	Marginal Suitable	Marginal Suitable	44	Csa	Temperate, dry summer, hot summer
341	Marmara	İstanbul	Eyüp	0.286851	Acceptable	Marginal Suitable	Marginal Suitable	8	Csa	Temperate, dry summer, hot summer
617	Marmara	İstanbul	Maltepe	0.282335	Acceptable	Marginal Suitable	Marginal Suitable	8	Csa	Temperate, dry summer, hot summer
142	Marmara	İstanbul	Beyoğlu	0.279120	Acceptable	Marginal Suitable	Marginal Suitable	82	Csa	Temperate, dry summer, hot summer
6	Marmara	İstanbul	Adalar	0.278411	Acceptable	Marginal Suitable	Marginal Suitable	48	Csa	Temperate, dry summer, hot summer
699	Marmara	İstanbul	Pendik	0.276865	Acceptable	Marginal Suitable	Marginal Suitable	35	Csa	Temperate, dry summer, hot summer
102	Marmara	İstanbul	Bağcılar	0.275916	Acceptable	Marginal Suitable	Marginal Suitable	34	Csa	Temperate, dry summer, hot summer
404	Marmara	İstanbul	Güngören	0.275334	Acceptable	Marginal Suitable	Marginal Suitable	69	Csa	Temperate, dry summer, hot summer
527	Marmara	İstanbul	Kartal	0.275061	Acceptable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
343	Marmara	İstanbul	Fatih	0.274853	Acceptable	Marginal Suitable	Marginal Suitable	33	Csa	Temperate, dry summer, hot summer
486	Marmara	İstanbul	Kadıköy	0.269264	Acceptable	Marginal Suitable	Marginal Suitable	32	Csa	Temperate, dry summer, hot summer
871	Marmara	İstanbul	Üsküdar	0.268763	Acceptable	Marginal Suitable	Marginal Suitable	14	Csa	Temperate, dry summer, hot summer
921	Marmara	İstanbul	Zeytinburnu	0.267936	Acceptable	Marginal Suitable	Marginal Suitable	40	Csa	Temperate, dry summer, hot summer
104	Marmara	İstanbul	Bahçelievler	0.267329	Acceptable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer

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LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
107	Marmara	İstanbul	Bakırköy	0.267194	Acceptable	Marginal Suitable	Marginal Suitable	26	Csa	Temperate, dry summer, hot summer
314	Marmara	İstanbul	Eminönü	0.266835	Acceptable	Marginal Suitable	Marginal Suitable	33	Csa	Temperate, dry summer, hot summer
588	Marmara	İstanbul	Küçükçekmece	0.266430	Acceptable	Marginal Suitable	Marginal Suitable	72	Csa	Temperate, dry summer, hot summer
85	Marmara	İstanbul	Avcılar	0.265012	Acceptable	Marginal Suitable	Marginal Suitable	85	Csa	Temperate, dry summer, hot summer
180	Marmara	İstanbul	Büyükçekmece	0.263354	Acceptable	Marginal Suitable	Marginal Suitable	2	Csa	Temperate, dry summer, hot summer
258	Marmara	Kırklareli	Demirköy	0.822852	Extremely Suitable	Suitable	Suitable	302	Cfa	Temperate, no dry season, hot summer
570	Marmara	Kırklareli	Kofçaz	0.739455	Very Suitable	Acceptable	Acceptable	434	Cfb	Temperate, no dry season, warm summer
880	Marmara	Kırklareli	Vize	0.735319	Very Suitable	Acceptable	Acceptable	174	Csa	Temperate, dry summer, hot summer
559	Marmara	Kırklareli	Kırklareli/Merkez	0.722336	Very Suitable	Acceptable	Acceptable	231	Csa	Temperate, dry summer, hot summer
706	Marmara	Kırklareli	Pınarhisar	0.720165	Very Suitable	Acceptable	Acceptable	190	Csa	Temperate, dry summer, hot summer
609	Marmara	Kırklareli	Lüleburgaz	0.610729	Very Suitable	Marginal Suitable	Acceptable	60	Csa	Temperate, dry summer, hot summer
100	Marmara	Kırklareli	Babaeski	0.592824	Suitable	Marginal Suitable	Marginal Suitable	59	Csa	Temperate, dry summer, hot summer
698	Marmara	Kırklareli	Pehlivanköy	0.583442	Suitable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
375	Marmara	Kocaeli	Gölcük	0.865312	Extremely Suitable	Suitable	Very Suitable	14	Csa	Temperate, dry summer, hot summer
514	Marmara	Kocaeli	Karamürsel	0.757928	Very Suitable	Acceptable	Suitable	15	Csa	Temperate, dry summer, hot summer
266	Marmara	Kocaeli	Derince	0.738034	Very Suitable	Acceptable	Acceptable	39	Csa	Temperate, dry summer, hot summer
566	Marmara	Kocaeli	Kocaeli/İzmit	0.679503	Very Suitable	Acceptable	Acceptable	7	Csa	Temperate, dry summer, hot summer
499	Marmara	Kocaeli	Kandıra	0.628916	Very Suitable	Acceptable	Acceptable	40	Cfa	Temperate, no dry season, hot summer
575	Marmara	Kocaeli	Körfez	0.361007	Acceptable	Marginal Suitable	Marginal Suitable	60	Csa	Temperate, dry summer, hot summer
355	Marmara	Kocaeli	Gebze	0.292952	Acceptable	Marginal Suitable	Marginal Suitable	184	Csa	Temperate, dry summer, hot summer
818	Marmara	Sakarya	Taraklı	0.911147	Extremely Suitable	Suitable	Extremely Suitable	449	Cfb	Temperate, no dry season, warm summer
443	Marmara	Sakarya	Hendek	0.901279	Extremely Suitable	Suitable	Very Suitable	167	Cfa	Temperate, no dry season, hot summer
37	Marmara	Sakarya	Akyazı	0.891499	Extremely Suitable	Suitable	Very Suitable	45	Cfa	Temperate, no dry season, hot summer
516	Marmara	Sakarya	Karapürçek	0.854724	Extremely Suitable	Suitable	Very Suitable	138	Cfa	Temperate, no dry season, hot summer
368	Marmara	Sakarya	Geyve	0.848767	Extremely Suitable	Suitable	Very Suitable	84	Csa	Temperate, dry summer, hot summer
689	Marmara	Sakarya	Pamukova	0.823514	Extremely Suitable	Suitable	Suitable	91	Csa	Temperate, dry summer, hot summer
731	Marmara	Sakarya	Sapanca	0.799367	Very Suitable	Acceptable	Suitable	43	Cfa	Temperate, no dry season, hot summer
723	Marmara	Sakarya	Sakarya/Adapazarı	0.672070	Very Suitable	Acceptable	Acceptable	30	Cfa	Temperate, no dry season, hot summer
517	Marmara	Sakarya	Karasu	0.670234	Very Suitable	Acceptable	Acceptable	5	Cfa	Temperate, no dry season, hot summer
347	Marmara	Sakarya	Ferizli	0.651502	Very Suitable	Acceptable	Acceptable	28	Cfa	Temperate, no dry season, hot summer
796	Marmara	Sakarya	Söğütlü	0.621834	Very Suitable	Acceptable	Acceptable	20	Cfa	Temperate, no dry season, hot summer
565	Marmara	Sakarya	Kocaali	0.617513	Very Suitable	Acceptable	Acceptable	35	Cfa	Temperate, no dry season, hot summer
532	Marmara	Sakarya	Kaynarca	0.605579	Very Suitable	Marginal Suitable	Acceptable	53	Cfa	Temperate, no dry season, hot summer
222	Marmara	Tekirdağ	Çerkezköy	0.671084	Very Suitable	Acceptable	Acceptable	146	Csa	Temperate, dry summer, hot summer
242	Marmara	Tekirdağ	Çorlu	0.620802	Very Suitable	Acceptable	Acceptable	168	Csa	Temperate, dry summer, hot summer
616	Marmara	Tekirdağ	Malkara	0.616218	Very Suitable	Marginal Suitable	Acceptable	222	Csa	Temperate, dry summer, hot summer
646	Marmara	Tekirdağ	Muratlı	0.607288	Very Suitable	Marginal Suitable	Acceptable	76	Csa	Temperate, dry summer, hot summer
438	Marmara	Tekirdağ	Hayrabolu	0.583981	Suitable	Marginal Suitable	Marginal Suitable	62	Csa	Temperate, dry summer, hot summer
749	Marmara	Tekirdağ	Şarköy	0.301536	Acceptable	Marginal Suitable	Marginal Suitable	15	Csa	Temperate, dry summer, hot summer
828	Marmara	Tekirdağ	Tekirdağ/Merkez	0.300387	Acceptable	Marginal Suitable	Marginal Suitable	28	BSk	Arid, steppe, cold
624	Marmara	Tekirdağ	Marmaraereğlisi	0.263533	Acceptable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
734	Marmara	Tekirdağ	Saray/Tekirdağ	0.204195	Acceptable	Marginal Suitable	Marginal Suitable	148	Csa	Temperate, dry summer, hot summer
52	Marmara	Yalova	Altınova	0.613764	Very Suitable	Marginal Suitable	Acceptable	15	Csa	Temperate, dry summer, hot summer
832	Marmara	Yalova	Termal	0.595850	Suitable	Marginal Suitable	Marginal Suitable	146	Csa	Temperate, dry summer, hot summer

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LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
231	Marmara	Yalova	Çiftlikköy	0.590529	Suitable	Marginal Suitable	Marginal Suitable	13	Csa	Temperate, dry summer, hot summer
240	Marmara	Yalova	Çınarcık	0.545645	Suitable	Marginal Suitable	Marginal Suitable	29	Csa	Temperate, dry summer, hot summer
886	Marmara	Yalova	Yalova/Merkez	0.510715	Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
74	Marmara	Yalova	Armutlu	0.269054	Acceptable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
345	Mediterranean	Adana	Feke	0.783185	Very Suitable	Acceptable	Suitable	558	Dsa	Cold, dry summer, hot summer
711	Mediterranean	Adana	Pozantı	0.763411	Very Suitable	Acceptable	Suitable	786	Csa	Temperate, dry summer, hot summer
42	Mediterranean	Adana	Aladağ	0.762819	Very Suitable	Acceptable	Suitable	858	Csa	Temperate, dry summer, hot summer
722	Mediterranean	Adana	Saimbeyli	0.744142	Very Suitable	Acceptable	Suitable	971	BSk	Arid, steppe, cold
845	Mediterranean	Adana	Tufanbeyli	0.503456	Suitable	Marginal Suitable	Marginal Suitable	1415	Dsb	Cold, dry summer, warm summer
508	Mediterranean	Adana	Karaisalı	0.146261	Marginal Suitable	Marginal Suitable	Marginal Suitable	257	Csa	Temperate, dry summer, hot summer
518	Mediterranean	Adana	Karataş	0.115877	Marginal Suitable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
916	Mediterranean	Adana	Yumurtalık	0.108383	Marginal Suitable	Marginal Suitable	Marginal Suitable	10	Csa	Temperate, dry summer, hot summer
586	Mediterranean	Adana	Kozan	0.096029	Marginal Suitable	Marginal Suitable	Marginal Suitable	137	Csa	Temperate, dry summer, hot summer
466	Mediterranean	Adana	İmamoğlu	0.085770	Marginal Suitable	Marginal Suitable	Marginal Suitable	78	Csa	Temperate, dry summer, hot summer
771	Mediterranean	Adana	Seyhan	0.068482	Marginal Suitable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
225	Mediterranean	Adana	Ceyhan	0.057469	Marginal Suitable	Marginal Suitable	Marginal Suitable	31	Csa	Temperate, dry summer, hot summer
918	Mediterranean	Adana	Yüreğir	0.048466	Marginal Suitable	Marginal Suitable	Marginal Suitable	26	Csa	Temperate, dry summer, hot summer
400	Mediterranean	Antalya	Gündoğmuş	0.826683	Extremely Suitable	Suitable	Suitable	890	Dsb	Cold, dry summer, warm summer
34	Mediterranean	Antalya	Akseki	0.789303	Very Suitable	Acceptable	Suitable	1057	Csa	Temperate, dry summer, hot summer
312	Mediterranean	Antalya	Elmalı	0.768158	Very Suitable	Acceptable	Suitable	1085	Csa	Temperate, dry summer, hot summer
454	Mediterranean	Antalya	İbradı	0.673854	Very Suitable	Acceptable	Acceptable	1038	Csa	Temperate, dry summer, hot summer
579	Mediterranean	Antalya	Korkuteli	0.656904	Very Suitable	Acceptable	Acceptable	996	Csa	Temperate, dry summer, hot summer
619	Mediterranean	Antalya	Manavgat	0.088828	Marginal Suitable	Marginal Suitable	Marginal Suitable	21	Csa	Temperate, dry summer, hot summer
43	Mediterranean	Antalya	Alanya	0.066922	Marginal Suitable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
349	Mediterranean	Antalya	Finike	0.059292	Marginal Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
528	Mediterranean	Antalya	Kaş	0.056957	Marginal Suitable	Marginal Suitable	Marginal Suitable	19	Csa	Temperate, dry summer, hot summer
354	Mediterranean	Antalya	Gazipaşa	0.052305	Marginal Suitable	Marginal Suitable	Marginal Suitable	20	Csa	Temperate, dry summer, hot summer
494	Mediterranean	Antalya	Demre	0.039882	Marginal Suitable	Marginal Suitable	Marginal Suitable	12	Csa	Temperate, dry summer, hot summer
62	Mediterranean	Antalya	Antalya/Merkez	0.039809	Marginal Suitable	Marginal Suitable	Marginal Suitable	62	Csa	Temperate, dry summer, hot summer
594	Mediterranean	Antalya	Kumluca	0.035469	Marginal Suitable	Marginal Suitable	Marginal Suitable	35	Csa	Temperate, dry summer, hot summer
545	Mediterranean	Antalya	Kemer/Antalya	0.033234	Marginal Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
767	Mediterranean	Antalya	Serik	0.027399	Marginal Suitable	Marginal Suitable	Marginal Suitable	30	Csa	Temperate, dry summer, hot summer
55	Mediterranean	Burdur	Altınyayla/Burdur	0.744640	Very Suitable	Acceptable	Suitable	1245	Csa	Temperate, dry summer, hot summer
178	Mediterranean	Burdur	Burdur/Merkez	0.727428	Very Suitable	Acceptable	Acceptable	963	BSk	Arid, steppe, cold
13	Mediterranean	Burdur	Ağlasun	0.723620	Very Suitable	Acceptable	Acceptable	1144	Csa	Temperate, dry summer, hot summer
377	Mediterranean	Burdur	Gölhisar	0.704527	Very Suitable	Acceptable	Acceptable	1009	Csa	Temperate, dry summer, hot summer
207	Mediterranean	Burdur	Çavdır	0.700676	Very Suitable	Acceptable	Acceptable	1081	Csa	Temperate, dry summer, hot summer
219	Mediterranean	Burdur	Çeltikçi	0.695359	Very Suitable	Acceptable	Acceptable	859	Csa	Temperate, dry summer, hot summer
827	Mediterranean	Burdur	Tefenni	0.686159	Very Suitable	Acceptable	Acceptable	1161	Csa	Temperate, dry summer, hot summer
513	Mediterranean	Burdur	Karamanlı	0.684425	Very Suitable	Acceptable	Acceptable	1159	Csa	Temperate, dry summer, hot summer
907	Mediterranean	Burdur	Yeşilova	0.683744	Very Suitable	Acceptable	Acceptable	1205	Csa	Temperate, dry summer, hot summer
544	Mediterranean	Burdur	Kemer/Burdur	0.683524	Very Suitable	Acceptable	Acceptable	1145	Csa	Temperate, dry summer, hot summer
172	Mediterranean	Burdur	Bucak	0.652855	Very Suitable	Acceptable	Acceptable	811	Csa	Temperate, dry summer, hot summer
431	Mediterranean	Hatay	Hassa	0.240508	Acceptable	Marginal Suitable	Marginal Suitable	416	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
432	Mediterranean	Hatay	Hatay/Merkez	0.164252	Marginal Suitable	Marginal Suitable	Marginal Suitable	89	Csa	Temperate, dry summer, hot summer
556	Mediterranean	Hatay	Kırıkhan	0.148398	Marginal Suitable	Marginal Suitable	Marginal Suitable	155	Csa	Temperate, dry summer, hot summer
53	Mediterranean	Hatay	Altınözü	0.138846	Marginal Suitable	Marginal Suitable	Marginal Suitable	258	Csa	Temperate, dry summer, hot summer
715	Mediterranean	Hatay	Reyhanlı	0.135167	Marginal Suitable	Marginal Suitable	Marginal Suitable	170	Csa	Temperate, dry summer, hot summer
593	Mediterranean	Hatay	Kumlu	0.126518	Marginal Suitable	Marginal Suitable	Marginal Suitable	91	Csa	Temperate, dry summer, hot summer
727	Mediterranean	Hatay	Samandağ	0.120522	Marginal Suitable	Marginal Suitable	Marginal Suitable	39	Csa	Temperate, dry summer, hot summer
433	Mediterranean	Hatay	Hatay/Belen	0.119936	Marginal Suitable	Marginal Suitable	Marginal Suitable	496	Csa	Temperate, dry summer, hot summer
291	Mediterranean	Hatay	Dörtyol	0.116215	Marginal Suitable	Marginal Suitable	Marginal Suitable	48	Csa	Temperate, dry summer, hot summer
476	Mediterranean	Hatay	İskenderun	0.108590	Marginal Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
891	Mediterranean	Hatay	Yayladağı	0.081193	Marginal Suitable	Marginal Suitable	Marginal Suitable	419	Csa	Temperate, dry summer, hot summer
328	Mediterranean	Hatay	Erzin	0.066974	Marginal Suitable	Marginal Suitable	Marginal Suitable	172	Csa	Temperate, dry summer, hot summer
748	Mediterranean	Isparta	Şarkıkaraağaç	0.863188	Extremely Suitable	Suitable	Very Suitable	1169	Dsb	Cold, dry summer, warm summer
357	Mediterranean	Isparta	Gelendost	0.834443	Extremely Suitable	Suitable	Very Suitable	952	Csa	Temperate, dry summer, hot summer
902	Mediterranean	Isparta	Yenişarbademli	0.804864	Extremely Suitable	Acceptable	Suitable	1181	Dsb	Cold, dry summer, warm summer
304	Mediterranean	Isparta	Eğirdir	0.796148	Very Suitable	Acceptable	Suitable	926	Csa	Temperate, dry summer, hot summer
35	Mediterranean	Isparta	Aksu/Isparta	0.795059	Very Suitable	Acceptable	Suitable	1223	Csa	Temperate, dry summer, hot summer
82	Mediterranean	Isparta	Atabey	0.786056	Very Suitable	Acceptable	Suitable	1042	Csb	Temperate, dry summer, warm summer
887	Mediterranean	Isparta	Yalvaç	0.784843	Very Suitable	Acceptable	Suitable	1103	Csb	Temperate, dry summer, warm summer
764	Mediterranean	Isparta	Senirkent	0.767275	Very Suitable	Acceptable	Suitable	961	Csa	Temperate, dry summer, hot summer
537	Mediterranean	Isparta	Keçiborlu	0.761836	Very Suitable	Acceptable	Suitable	1004	Csa	Temperate, dry summer, hot summer
861	Mediterranean	Isparta	Uluborlu	0.757507	Very Suitable	Acceptable	Suitable	1054	Csa	Temperate, dry summer, hot summer
479	Mediterranean	Isparta	Isparta/Merkez	0.756764	Very Suitable	Acceptable	Suitable	1058	Csa	Temperate, dry summer, hot summer
385	Mediterranean	Isparta	Gönen/Isparta	0.756530	Very Suitable	Acceptable	Suitable	1040	Csa	Temperate, dry summer, hot summer
816	Mediterranean	Isparta	Sütçüler	0.692048	Very Suitable	Acceptable	Acceptable	992	Csa	Temperate, dry summer, hot summer
182	Mediterranean	Kahramanmaraş	Çağlayancerit	0.709392	Very Suitable	Acceptable	Acceptable	1103	Dsa	Cold, dry summer, hot summer
663	Mediterranean	Kahramanmaraş	Nurhak	0.685585	Very Suitable	Acceptable	Acceptable	1401	Dsb	Cold, dry summer, warm summer
372	Mediterranean	Kahramanmaraş	Göksun	0.631171	Very Suitable	Acceptable	Acceptable	1347	Dsb	Cold, dry summer, warm summer
305	Mediterranean	Kahramanmaraş	Ekinözü	0.616420	Very Suitable	Marginal Suitable	Acceptable	1282	BSk	Arid, steppe, cold
308	Mediterranean	Kahramanmaraş	Elbistan	0.594360	Suitable	Marginal Suitable	Marginal Suitable	1139	BSk	Arid, steppe, cold
9	Mediterranean	Kahramanmaraş	Afşin	0.593538	Suitable	Marginal Suitable	Marginal Suitable	1237	BSk	Arid, steppe, cold
61	Mediterranean	Kahramanmaraş	Andırın	0.542692	Suitable	Marginal Suitable	Marginal Suitable	1047	Csa	Temperate, dry summer, hot summer
491	Mediterranean	Kahramanmaraş	Kahramanmaraş/Merkez	0.388586	Acceptable	Marginal Suitable	Marginal Suitable	562	Csa	Temperate, dry summer, hot summer
850	Mediterranean	Kahramanmaraş	Türkoğlu	0.377753	Acceptable	Marginal Suitable	Marginal Suitable	488	Csa	Temperate, dry summer, hot summer
694	Mediterranean	Kahramanmaraş	Pazarcık	0.368285	Acceptable	Marginal Suitable	Marginal Suitable	750	Csa	Temperate, dry summer, hot summer
190	Mediterranean	Mersin	Çamlıyayla	0.762676	Very Suitable	Acceptable	Suitable	1168	Csa	Temperate, dry summer, hot summer
650	Mediterranean	Mersin	Mut	0.290110	Acceptable	Marginal Suitable	Marginal Suitable	314	Csa	Temperate, dry summer, hot summer
394	Mediterranean	Mersin	Gülnar	0.201909	Acceptable	Marginal Suitable	Marginal Suitable	965	Csa	Temperate, dry summer, hot summer
455	Mediterranean	Mersin	İçel/Mersin	0.088925	Marginal Suitable	Marginal Suitable	Marginal Suitable	18	Csa	Temperate, dry summer, hot summer
819	Mediterranean	Mersin	Tarsus	0.064849	Marginal Suitable	Marginal Suitable	Marginal Suitable	25	Csa	Temperate, dry summer, hot summer
90	Mediterranean	Mersin	Aydıncık/Mersin	0.043945	Marginal Suitable	Marginal Suitable	Marginal Suitable	21	Csa	Temperate, dry summer, hot summer
170	Mediterranean	Mersin	Bozyazı	0.043760	Marginal Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
775	Mediterranean	Mersin	Silifke	0.024213	Marginal Suitable	Marginal Suitable	Marginal Suitable	19	Csa	Temperate, dry summer, hot summer
321	Mediterranean	Mersin	Erdemli	0.023226	Marginal Suitable	Marginal Suitable	Marginal Suitable	13	Csa	Temperate, dry summer, hot summer
60	Mediterranean	Mersin	Anamur	0.022764	Marginal Suitable	Marginal Suitable	Marginal Suitable	33	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
103	Mediterranean	Osmaniye	Bahçe	0.373045	Acceptable	Marginal Suitable	Marginal Suitable	594	Csa	Temperate, dry summer, hot summer
296	Mediterranean	Osmaniye	Düziçi	0.372836	Acceptable	Marginal Suitable	Marginal Suitable	401	Dsa	Cold, dry summer, hot summer
428	Mediterranean	Osmaniye	Hasanbeyli	0.350870	Acceptable	Marginal Suitable	Marginal Suitable	753	Csa	Temperate, dry summer, hot summer
809	Mediterranean	Osmaniye	Sumbas	0.122432	Marginal Suitable	Marginal Suitable	Marginal Suitable	130	Csa	Temperate, dry summer, hot summer
485	Mediterranean	Osmaniye	Kadirli	0.103091	Marginal Suitable	Marginal Suitable	Marginal Suitable	93	Csa	Temperate, dry summer, hot summer
682	Mediterranean	Osmaniye	Osmaniye/Merkez	0.102035	Marginal Suitable	Marginal Suitable	Marginal Suitable	121	Csa	Temperate, dry summer, hot summer
839	Mediterranean	Osmaniye	Toprakkale	0.060367	Marginal Suitable	Marginal Suitable	Marginal Suitable	57	Csa	Temperate, dry summer, hot summer
782	South-East	Adıyaman	Sincik	0.677997	Very Suitable	Acceptable	Acceptable	1373	Dsa	Cold, dry summer, hot summer
217	South-East	Adıyaman	Çelikhan	0.674699	Very Suitable	Acceptable	Acceptable	1388	Dsa	Cold, dry summer, hot summer
374	South-East	Adıyaman	Gölbaşı/Adıyaman	0.544374	Suitable	Marginal Suitable	Marginal Suitable	902	Csa	Temperate, dry summer, hot summer
851	South-East	Adıyaman	Tut	0.432170	Suitable	Marginal Suitable	Marginal Suitable	929	Csa	Temperate, dry summer, hot summer
364	South-East	Adıyaman	Gerger	0.364875	Acceptable	Marginal Suitable	Marginal Suitable	750	Csa	Temperate, dry summer, hot summer
136	South-East	Adıyaman	Besni	0.278505	Acceptable	Marginal Suitable	Marginal Suitable	902	Csa	Temperate, dry summer, hot summer
8	South-East	Adıyaman	Adıyaman/Merkez	0.267713	Acceptable	Marginal Suitable	Marginal Suitable	701	Csa	Temperate, dry summer, hot summer
492	South-East	Adıyaman	Kahta	0.237773	Acceptable	Marginal Suitable	Marginal Suitable	724	Csa	Temperate, dry summer, hot summer
728	South-East	Adıyaman	Samsat	0.052623	Marginal Suitable	Marginal Suitable	Marginal Suitable	593	Csa	Temperate, dry summer, hot summer
751	South-East	Batman	Sason	0.469934	Suitable	Marginal Suitable	Marginal Suitable	908	Dsa	Cold, dry summer, hot summer
362	South-East	Batman	Gercüş	0.282405	Acceptable	Marginal Suitable	Marginal Suitable	955	Csa	Temperate, dry summer, hot summer
429	South-East	Batman	Hasankeyf	0.276139	Acceptable	Marginal Suitable	Marginal Suitable	513	Csa	Temperate, dry summer, hot summer
135	South-East	Batman	Beşiri	0.249691	Acceptable	Marginal Suitable	Marginal Suitable	751	Csa	Temperate, dry summer, hot summer
121	South-East	Batman	Batman/Merkez	0.245120	Acceptable	Marginal Suitable	Marginal Suitable	570	Csa	Temperate, dry summer, hot summer
587	South-East	Batman	Kozluk	0.238482	Acceptable	Marginal Suitable	Marginal Suitable	874	Csa	Temperate, dry summer, hot summer
590	South-East	Diyarbakır	Kulp	0.600588	Very Suitable	Marginal Suitable	Acceptable	1015	Dsa	Cold, dry summer, hot summer
248	South-East	Diyarbakır	Çüngüş	0.471667	Suitable	Marginal Suitable	Marginal Suitable	978	Dsa	Cold, dry summer, hot summer
608	South-East	Diyarbakır	Lice	0.424320	Suitable	Marginal Suitable	Marginal Suitable	997	Dsa	Cold, dry summer, hot summer
325	South-East	Diyarbakır	Ergani	0.409877	Suitable	Marginal Suitable	Marginal Suitable	951	Csa	Temperate, dry summer, hot summer
223	South-East	Diyarbakır	Çermik	0.405947	Suitable	Marginal Suitable	Marginal Suitable	686	Csa	Temperate, dry summer, hot summer
272	South-East	Diyarbakır	Dicle	0.394078	Acceptable	Marginal Suitable	Marginal Suitable	939	Csa	Temperate, dry summer, hot summer
424	South-East	Diyarbakır	Hani	0.379085	Acceptable	Marginal Suitable	Marginal Suitable	900	Dsa	Cold, dry summer, hot summer
303	South-East	Diyarbakır	Eğil	0.346863	Acceptable	Marginal Suitable	Marginal Suitable	855	Csa	Temperate, dry summer, hot summer
440	South-East	Diyarbakır	Hazro	0.324125	Acceptable	Marginal Suitable	Marginal Suitable	1012	Dsa	Cold, dry summer, hot summer
280	South-East	Diyarbakır	Diyarbakır/Merkez	0.324002	Acceptable	Marginal Suitable	Marginal Suitable	674	Csa	Temperate, dry summer, hot summer
239	South-East	Diyarbakır	Çınar	0.322008	Acceptable	Marginal Suitable	Marginal Suitable	673	Csa	Temperate, dry summer, hot summer
567	South-East	Diyarbakır	Kocaköy	0.316253	Acceptable	Marginal Suitable	Marginal Suitable	969	Csa	Temperate, dry summer, hot summer
151	South-East	Diyarbakır	Bismil	0.286229	Acceptable	Marginal Suitable	Marginal Suitable	548	Csa	Temperate, dry summer, hot summer
778	South-East	Diyarbakır	Silvan	0.263393	Acceptable	Marginal Suitable	Marginal Suitable	840	Csa	Temperate, dry summer, hot summer
758	South-East	Gaziantep	Şehitkamil	0.383605	Acceptable	Marginal Suitable	Marginal Suitable	838	Csa	Temperate, dry summer, hot summer
662	South-East	Gaziantep	Nurdağı	0.367038	Acceptable	Marginal Suitable	Marginal Suitable	529	Csa	Temperate, dry summer, hot summer
478	South-East	Gaziantep	Islahiye	0.348235	Acceptable	Marginal Suitable	Marginal Suitable	503	Csa	Temperate, dry summer, hot summer
721	South-East	Gaziantep	Şahinbey	0.320007	Acceptable	Marginal Suitable	Marginal Suitable	875	Csa	Temperate, dry summer, hot summer
890	South-East	Gaziantep	Yavuzeli	0.274649	Acceptable	Marginal Suitable	Marginal Suitable	568	Csa	Temperate, dry summer, hot summer
63	South-East	Gaziantep	Araban	0.262391	Acceptable	Marginal Suitable	Marginal Suitable	530	Csa	Temperate, dry summer, hot summer
667	South-East	Gaziantep	Oğuzeli	0.233922	Acceptable	Marginal Suitable	Marginal Suitable	687	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
661	South-East	Gaziantep	Nizip	0.212877	Acceptable	Marginal Suitable	Marginal Suitable	535	Csa	Temperate, dry summer, hot summer
522	South-East	Gaziantep	Karkamış	0.183916	Marginal Suitable	Marginal Suitable	Marginal Suitable	358	Csa	Temperate, dry summer, hot summer
649	South-East	Kilis	Musabeyli	0.219554	Acceptable	Marginal Suitable	Marginal Suitable	745	Csa	Temperate, dry summer, hot summer
707	South-East	Kilis	Polateli	0.218007	Acceptable	Marginal Suitable	Marginal Suitable	840	Csa	Temperate, dry summer, hot summer
552	South-East	Kilis	Kilis/Merkez	0.195509	Marginal Suitable	Marginal Suitable	Marginal Suitable	660	Csa	Temperate, dry summer, hot summer
307	South-East	Kilis	Elbeyli	0.179004	Marginal Suitable	Marginal Suitable	Marginal Suitable	519	Csa	Temperate, dry summer, hot summer
754	South-East	Mardin	Savur	0.315533	Acceptable	Marginal Suitable	Marginal Suitable	877	Csa	Temperate, dry summer, hot summer
627	South-East	Mardin	Mazıdağı	0.295470	Acceptable	Marginal Suitable	Marginal Suitable	1048	Csa	Temperate, dry summer, hot summer
671	South-East	Mardin	Ömerli	0.265166	Acceptable	Marginal Suitable	Marginal Suitable	1089	Csa	Temperate, dry summer, hot summer
637	South-East	Mardin	Midyat	0.248575	Acceptable	Marginal Suitable	Marginal Suitable	944	Csa	Temperate, dry summer, hot summer
906	South-East	Mardin	Yeşilli	0.242867	Acceptable	Marginal Suitable	Marginal Suitable	822	Csa	Temperate, dry summer, hot summer
253	South-East	Mardin	Dargeçit	0.241921	Acceptable	Marginal Suitable	Marginal Suitable	902	Csa	Temperate, dry summer, hot summer
265	South-East	Mardin	Derik	0.205288	Acceptable	Marginal Suitable	Marginal Suitable	799	Csa	Temperate, dry summer, hot summer
622	South-East	Mardin	Mardin/Merkez	0.203114	Acceptable	Marginal Suitable	Marginal Suitable	938	Csa	Temperate, dry summer, hot summer
564	South-East	Mardin	Kızıltepe	0.153478	Marginal Suitable	Marginal Suitable	Marginal Suitable	485	Csa	Temperate, dry summer, hot summer
664	South-East	Mardin	Nusaybin	0.149007	Marginal Suitable	Marginal Suitable	Marginal Suitable	475	Csa	Temperate, dry summer, hot summer
702	South-East	Siirt	Pervari	0.680839	Very Suitable	Acceptable	Acceptable	1376	Dsa	Cold, dry summer, hot summer
785	South-East	Siirt	Şirvan	0.424328	Suitable	Marginal Suitable	Marginal Suitable	905	Csa	Temperate, dry summer, hot summer
127	South-East	Siirt	Baykan	0.421323	Suitable	Marginal Suitable	Marginal Suitable	720	Dsa	Cold, dry summer, hot summer
327	South-East	Siirt	Eruh	0.388508	Acceptable	Marginal Suitable	Marginal Suitable	1164	Csa	Temperate, dry summer, hot summer
92	South-East	Siirt	Aydınlar	0.248933	Acceptable	Marginal Suitable	Marginal Suitable	118	Csa	Temperate, dry summer, hot summer
773	South-East	Siirt	Siirt/Merkez	0.245725	Acceptable	Marginal Suitable	Marginal Suitable	887	Csa	Temperate, dry summer, hot summer
598	South-East	Siirt	Kurtalan	0.214638	Acceptable	Marginal Suitable	Marginal Suitable	715	Csa	Temperate, dry summer, hot summer
789	South-East	Şanlıurfa	Siverek	0.292308	Acceptable	Marginal Suitable	Marginal Suitable	788	Csa	Temperate, dry summer, hot summer
418	South-East	Şanlıurfa	Halfeti	0.268128	Acceptable	Marginal Suitable	Marginal Suitable	664	Csa	Temperate, dry summer, hot summer
444	South-East	Şanlıurfa	Hilvan	0.223326	Acceptable	Marginal Suitable	Marginal Suitable	592	Csa	Temperate, dry summer, hot summer
167	South-East	Şanlıurfa	Bozova	0.211566	Acceptable	Marginal Suitable	Marginal Suitable	582	Csa	Temperate, dry summer, hot summer
150	South-East	Şanlıurfa	Birecik	0.195947	Marginal Suitable	Marginal Suitable	Marginal Suitable	343	Csa	Temperate, dry summer, hot summer
867	South-East	Şanlıurfa	Şanlıurfa/Merkez	0.195169	Marginal Suitable	Marginal Suitable	Marginal Suitable	527	Csa	Temperate, dry summer, hot summer
812	South-East	Şanlıurfa	Suruç	0.169532	Marginal Suitable	Marginal Suitable	Marginal Suitable	500	Csa	Temperate, dry summer, hot summer
879	South-East	Şanlıurfa	Viranşehir	0.164080	Marginal Suitable	Marginal Suitable	Marginal Suitable	566	Csa	Temperate, dry summer, hot summer
427	South-East	Şanlıurfa	Harran	0.152234	Marginal Suitable	Marginal Suitable	Marginal Suitable	374	Csa	Temperate, dry summer, hot summer
21	South-East	Şanlıurfa	Akçakale	0.145959	Marginal Suitable	Marginal Suitable	Marginal Suitable	359	BSh	Arid, steppe, hot
226	South-East	Şanlıurfa	Ceylanpınar	0.143416	Marginal Suitable	Marginal Suitable	Marginal Suitable	364	Csa	Temperate, dry summer, hot summer
862	South-East	Şırnak	Uludere	0.687245	Very Suitable	Acceptable	Acceptable	1227	Dsa	Cold, dry summer, hot summer
145	South-East	Şırnak	Beytüşşebap	0.331327	Acceptable	Marginal Suitable	Marginal Suitable	1546	Dsa	Cold, dry summer, hot summer
794	South-East	Şırnak	Şırnak/Merkez	0.321719	Acceptable	Marginal Suitable	Marginal Suitable	1343	Dsa	Cold, dry summer, hot summer
391	South-East	Şırnak	Güçlükonak	0.203143	Acceptable	Marginal Suitable	Marginal Suitable	791	Csa	Temperate, dry summer, hot summer
456	South-East	Şırnak	İdil	0.178970	Marginal Suitable	Marginal Suitable	Marginal Suitable	765	Csa	Temperate, dry summer, hot summer
237	South-East	Şırnak	Cizre	0.153986	Marginal Suitable	Marginal Suitable	Marginal Suitable	374	Csa	Temperate, dry summer, hot summer
777	South-East	Şırnak	Silopi	0.138114	Marginal Suitable	Marginal Suitable	Marginal Suitable	510	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
563	Aegean	Afyonkarahisar	Kızılören	0.727056	Very Suitable	Acceptable	Acceptable	1112	BSk	Arid, steppe, cold
277	Aegean	Afyonkarahisar	Dinar	0.720922	Very Suitable	Acceptable	Acceptable	865	BSk	Arid, steppe, cold
448	Aegean	Afyonkarahisar	Hocalar	0.697491	Very Suitable	Acceptable	Acceptable	1077	BSk	Arid, steppe, cold
730	Aegean	Afyonkarahisar	Sandıklı	0.666077	Very Suitable	Acceptable	Acceptable	1094	BSk	Arid, steppe, cold
459	Aegean	Afyonkarahisar	İhsaniye	0.659547	Very Suitable	Acceptable	Acceptable	1099	BSk	Arid, steppe, cold
781	Aegean	Afyonkarahisar	Sincanlı	0.658541	Very Suitable	Acceptable	Acceptable	1125	Dsb	Cold, dry summer, warm summer
315	Aegean	Afyonkarahisar	Emirdağ	0.657930	Very Suitable	Acceptable	Acceptable	965	BSk	Arid, steppe, cold
208	Aegean	Afyonkarahisar	Çay	0.655382	Very Suitable	Acceptable	Acceptable	1038	BSk	Arid, steppe, cold
338	Aegean	Afyonkarahisar	Evciler	0.654780	Very Suitable	Acceptable	Acceptable	909	BSk	Arid, steppe, cold
157	Aegean	Afyonkarahisar	Bolvadin	0.650248	Very Suitable	Acceptable	Acceptable	990	BSk	Arid, steppe, cold
10	Aegean	Afyonkarahisar	Afyon/Merkez	0.649262	Very Suitable	Acceptable	Acceptable	1012	BSk	Arid, steppe, cold
475	Aegean	Afyonkarahisar	İscehisar	0.643575	Very Suitable	Acceptable	Acceptable	1081	BSk	Arid, steppe, cold
805	Aegean	Afyonkarahisar	Sultandağı	0.641657	Very Suitable	Acceptable	Acceptable	1012	BSk	Arid, steppe, cold
123	Aegean	Afyonkarahisar	Bayat/Afyon	0.639435	Very Suitable	Acceptable	Acceptable	698	BSk	Arid, steppe, cold
241	Aegean	Afyonkarahisar	Çobanlar	0.636494	Very Suitable	Acceptable	Acceptable	992	BSk	Arid, steppe, cold
801	Aegean	Afyonkarahisar	Şuhut	0.622429	Very Suitable	Acceptable	Acceptable	1145	BSk	Arid, steppe, cold
255	Aegean	Afyonkarahisar	Dazkırı	0.557146	Suitable	Marginal Suitable	Acceptable	894	BSk	Arid, steppe, cold
120	Aegean	Afyonkarahisar	Başmakçı	0.384600	Acceptable	Marginal Suitable	Marginal Suitable	858	BSk	Arid, steppe, cold
806	Aegean	Aydın	Sultanhisar	0.403503	Suitable	Marginal Suitable	Marginal Suitable	77	Csa	Temperate, dry summer, hot summer
603	Aegean	Aydın	Kuyucak	0.400405	Suitable	Marginal Suitable	Marginal Suitable	124	Csa	Temperate, dry summer, hot summer
655	Aegean	Aydın	Nazilli	0.394713	Acceptable	Marginal Suitable	Marginal Suitable	81	Csa	Temperate, dry summer, hot summer
504	Aegean	Aydın	Karacasu	0.389042	Acceptable	Marginal Suitable	Marginal Suitable	518	Csa	Temperate, dry summer, hot summer
581	Aegean	Aydın	Köşk	0.385816	Acceptable	Marginal Suitable	Marginal Suitable	75	Csa	Temperate, dry summer, hot summer
163	Aegean	Aydın	Bozdoğan	0.385527	Acceptable	Marginal Suitable	Marginal Suitable	302	Csa	Temperate, dry summer, hot summer
900	Aegean	Aydın	Yenipazar/Aydın	0.381468	Acceptable	Marginal Suitable	Marginal Suitable	62	Csa	Temperate, dry summer, hot summer
173	Aegean	Aydın	Buharkent	0.377619	Acceptable	Marginal Suitable	Marginal Suitable	190	Csa	Temperate, dry summer, hot summer
235	Aegean	Aydın	Çine	0.368693	Acceptable	Marginal Suitable	Marginal Suitable	82	Csa	Temperate, dry summer, hot summer
524	Aegean	Aydın	Karpuzlu	0.346043	Acceptable	Marginal Suitable	Marginal Suitable	92	Csa	Temperate, dry summer, hot summer
89	Aegean	Aydın	Aydın/Merkez	0.337457	Acceptable	Marginal Suitable	Marginal Suitable	92	Csa	Temperate, dry summer, hot summer
469	Aegean	Aydın	İncirliova	0.292485	Acceptable	Marginal Suitable	Marginal Suitable	43	Csa	Temperate, dry summer, hot summer
568	Aegean	Aydın	Koçarlı	0.289787	Acceptable	Marginal Suitable	Marginal Suitable	34	Csa	Temperate, dry summer, hot summer
365	Aegean	Aydın	Germencik	0.251302	Acceptable	Marginal Suitable	Marginal Suitable	61	Csa	Temperate, dry summer, hot summer
797	Aegean	Aydın	Söke	0.208561	Acceptable	Marginal Suitable	Marginal Suitable	74	Csa	Temperate, dry summer, hot summer
273	Aegean	Aydın	Didim	0.187333	Marginal Suitable	Marginal Suitable	Marginal Suitable	35	Csa	Temperate, dry summer, hot summer
601	Aegean	Aydın	Kuşadası	0.164546	Marginal Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
187	Aegean	Denizli	Çameli	0.718941	Very Suitable	Acceptable	Acceptable	1309	Csa	Temperate, dry summer, hot summer
236	Aegean	Denizli	Çivril	0.695755	Very Suitable	Acceptable	Acceptable	831	BSk	Arid, steppe, cold
138	Aegean	Denizli	Beyağaç	0.693644	Very Suitable	Acceptable	Acceptable	699	Csa	Temperate, dry summer, hot summer
4	Aegean	Denizli	Acıpayam	0.673180	Very Suitable	Acceptable	Acceptable	937	Csa	Temperate, dry summer, hot summer
768	Aegean	Denizli	Serinhisar	0.664134	Very Suitable	Acceptable	Acceptable	972	Csa	Temperate, dry summer, hot summer
493	Aegean	Denizli	Kale/Denizli	0.644259	Very Suitable	Acceptable	Acceptable	1050	Csa	Temperate, dry summer, hot summer
825	Aegean	Denizli	Tavas	0.641599	Very Suitable	Acceptable	Acceptable	933	Csa	Temperate, dry summer, hot summer
108	Aegean	Denizli	Baklan	0.637877	Very Suitable	Acceptable	Acceptable	964	Csa	Temperate, dry summer, hot summer
131	Aegean	Denizli	Bekilli	0.629936	Very Suitable	Acceptable	Acceptable	830	Csa	Temperate, dry summer, hot summer
198	Aegean	Denizli	Çardak	0.628981	Very Suitable	Acceptable	Acceptable	857	Csa	Temperate, dry summer, hot summer
165	Aegean	Denizli	Bozkurt/Denizli	0.628206	Very Suitable	Acceptable	Acceptable	860	Csa	Temperate, dry summer, hot summer
183	Aegean	Denizli	Çal	0.596747	Suitable	Acceptable	Acceptable	838	Csa	Temperate, dry summer, hot summer

APPENDIX D: HAZELNUT CLIMATE SUITABILITY INDEX (GCSI) AND CLASSIFICATION CHANGE FOR 923 LOCATIONS FOR REFERENCE PERIOD OF 1991-2012 AND FUTURE PERIOD OF 2021-2050 BASED ON 3 APPROACHES I.E. EIC, PC, AND NBC WITH RE MODEL

HAZELNUT CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
449	Aegean	Denizli	Honaz	0.505223	Suitable	Marginal Suitable	Acceptable	502	Csa	Temperate, dry summer, hot summer
401	Aegean	Denizli	Güney	0.414959	Suitable	Marginal Suitable	Marginal Suitable	822	Csa	Temperate, dry summer, hot summer
260	Aegean	Denizli	Denizli/Merkez	0.386189	Acceptable	Marginal Suitable	Marginal Suitable	392	Csa	Temperate, dry summer, hot summer
176	Aegean	Denizli	Buldan	0.384960	Acceptable	Marginal Suitable	Marginal Suitable	619	Csa	Temperate, dry summer, hot summer
99	Aegean	Denizli	Babadağ	0.379312	Acceptable	Marginal Suitable	Marginal Suitable	758	Csa	Temperate, dry summer, hot summer
28	Aegean	Denizli	Akköy	0.375445	Acceptable	Marginal Suitable	Marginal Suitable	392	Csa	Temperate, dry summer, hot summer
737	Aegean	Denizli	Sarayköy	0.369982	Acceptable	Marginal Suitable	Marginal Suitable	165	Csa	Temperate, dry summer, hot summer
553	Aegean	İzmir	Kiraz	0.508115	Suitable	Marginal Suitable	Acceptable	305	Csa	Temperate, dry summer, hot summer
555	Aegean	İzmir	Kınık	0.491486	Suitable	Marginal Suitable	Marginal Suitable	85	Csa	Temperate, dry summer, hot summer
132	Aegean	İzmir	Bergama	0.487552	Suitable	Marginal Suitable	Marginal Suitable	61	Csa	Temperate, dry summer, hot summer
139	Aegean	İzmir	Beydağ	0.432128	Suitable	Marginal Suitable	Marginal Suitable	215	Csa	Temperate, dry summer, hot summer
665	Aegean	İzmir	Ödemiş	0.400694	Suitable	Marginal Suitable	Marginal Suitable	133	Csa	Temperate, dry summer, hot summer
126	Aegean	İzmir	Bayındır	0.378487	Acceptable	Marginal Suitable	Marginal Suitable	87	Csa	Temperate, dry summer, hot summer
543	Aegean	İzmir	Kemalpaşa/İzmir	0.366143	Acceptable	Marginal Suitable	Marginal Suitable	167	Csa	Temperate, dry summer, hot summer
834	Aegean	İzmir	Tire	0.350593	Acceptable	Marginal Suitable	Marginal Suitable	112	Csa	Temperate, dry summer, hot summer
171	Aegean	İzmir	Buca	0.333844	Acceptable	Marginal Suitable	Marginal Suitable	78	Csa	Temperate, dry summer, hot summer
840	Aegean	İzmir	Torbalı	0.318819	Acceptable	Marginal Suitable	Marginal Suitable	39	Csa	Temperate, dry summer, hot summer
160	Aegean	İzmir	Bornova	0.305131	Acceptable	Marginal Suitable	Marginal Suitable	78	Csa	Temperate, dry summer, hot summer
352	Aegean	İzmir	Gaziemir	0.273934	Acceptable	Marginal Suitable	Marginal Suitable	135	Csa	Temperate, dry summer, hot summer
631	Aegean	İzmir	Menemen	0.273827	Acceptable	Marginal Suitable	Marginal Suitable	12	Csa	Temperate, dry summer, hot summer
653	Aegean	İzmir	Narlıdere	0.195694	Marginal Suitable	Marginal Suitable	Marginal Suitable	25	Csa	Temperate, dry summer, hot summer
224	Aegean	İzmir	Çeşme	0.186787	Marginal Suitable	Marginal Suitable	Marginal Suitable	24	Csa	Temperate, dry summer, hot summer
502	Aegean	İzmir	Karaburun	0.179636	Marginal Suitable	Marginal Suitable	Marginal Suitable	45	Csa	Temperate, dry summer, hot summer
351	Aegean	İzmir	Foça	0.161179	Marginal Suitable	Marginal Suitable	Marginal Suitable	12	Csa	Temperate, dry summer, hot summer
411	Aegean	İzmir	Güzelbahçe	0.152763	Marginal Suitable	Marginal Suitable	Marginal Suitable	23	Csa	Temperate, dry summer, hot summer
571	Aegean	İzmir	Konak	0.151423	Marginal Suitable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
275	Aegean	İzmir	Dikili	0.142141	Marginal Suitable	Marginal Suitable	Marginal Suitable	4	Csa	Temperate, dry summer, hot summer
757	Aegean	İzmir	Seferihisar	0.135683	Marginal Suitable	Marginal Suitable	Marginal Suitable	36	Csa	Temperate, dry summer, hot summer
526	Aegean	İzmir	Karşıyaka	0.128904	Marginal Suitable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
869	Aegean	İzmir	Urla	0.127136	Marginal Suitable	Marginal Suitable	Marginal Suitable	70	Csa	Temperate, dry summer, hot summer
630	Aegean	İzmir	Menderes	0.123624	Marginal Suitable	Marginal Suitable	Marginal Suitable	130	Csa	Temperate, dry summer, hot summer
759	Aegean	İzmir	Selçuk	0.115561	Marginal Suitable	Marginal Suitable	Marginal Suitable	18	Csa	Temperate, dry summer, hot summer
46	Aegean	İzmir	Aliağa	0.113975	Marginal Suitable	Marginal Suitable	Marginal Suitable	7	Csa	Temperate, dry summer, hot summer
110	Aegean	İzmir	Balçova	0.110754	Marginal Suitable	Marginal Suitable	Marginal Suitable	34	Csa	Temperate, dry summer, hot summer
232	Aegean	İzmir	Çiğli	0.109076	Marginal Suitable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
826	Aegean	Kütahya	Tavşanlı	0.766926	Very Suitable	Acceptable	Acceptable	836	Csb	Temperate, dry summer, warm summer
732	Aegean	Kütahya	Şaphane	0.762911	Very Suitable	Acceptable	Acceptable	985	Csb	Temperate, dry summer, warm summer
695	Aegean	Kütahya	Pazarlar	0.754600	Very Suitable	Acceptable	Acceptable	925	Csb	Temperate, dry summer, warm summer
779	Aegean	Kütahya	Simav	0.753503	Very Suitable	Acceptable	Acceptable	808	Csb	Temperate, dry summer, warm summer
356	Aegean	Kütahya	Gediz	0.747673	Very Suitable	Acceptable	Acceptable	730	Csa	Temperate, dry summer, hot summer
313	Aegean	Kütahya	Emet	0.738462	Very Suitable	Acceptable	Acceptable	910	Csb	Temperate, dry summer, warm summer
445	Aegean	Kütahya	Hisarcık	0.724817	Very Suitable	Acceptable	Acceptable	752	Csb	Temperate, dry summer, warm summer
289	Aegean	Kütahya	Domaniç	0.718453	Very Suitable	Acceptable	Acceptable	873	Csb	Temperate, dry summer, warm summer
206	Aegean	Kütahya	Çavdarhisar	0.679321	Very Suitable	Acceptable	Acceptable	1007	BSk	Arid, steppe, cold

HAZELNUT CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
54	Aegean	Kütahya	Altıntaş	0.673865	Very Suitable	Acceptable	Acceptable	1039	BSk	Arid, steppe, cold
292	Aegean	Kütahya	Dumlupınar	0.673245	Very Suitable	Acceptable	Acceptable	1228	Dsb	Cold, dry summer, warm summer
602	Aegean	Kütahya	Kütahya/Merkez	0.666656	Very Suitable	Acceptable	Acceptable	958	BSk	Arid, steppe, cold
81	Aegean	Kütahya	Aslanapa	0.661759	Very Suitable	Acceptable	Acceptable	1031	Dsb	Cold, dry summer, warm summer
761	Aegean	Manisa	Selendi	0.691961	Very Suitable	Acceptable	Acceptable	437	Csa	Temperate, dry summer, hot summer
257	Aegean	Manisa	Demirci	0.681918	Very Suitable	Acceptable	Acceptable	881	Csa	Temperate, dry summer, hot summer
386	Aegean	Manisa	Gördes	0.622086	Very Suitable	Acceptable	Acceptable	668	Csa	Temperate, dry summer, hot summer
799	Aegean	Manisa	Soma	0.556085	Suitable	Marginal Suitable	Acceptable	172	Csa	Temperate, dry summer, hot summer
558	Aegean	Manisa	Kırkağaç	0.493189	Suitable	Marginal Suitable	Marginal Suitable	187	Csa	Temperate, dry summer, hot summer
589	Aegean	Manisa	Kula	0.465351	Suitable	Marginal Suitable	Marginal Suitable	665	Csa	Temperate, dry summer, hot summer
572	Aegean	Manisa	Köprübaşı/Manisa	0.439709	Suitable	Marginal Suitable	Marginal Suitable	247	Csa	Temperate, dry summer, hot summer
740	Aegean	Manisa	Sarıgöl	0.424196	Suitable	Marginal Suitable	Marginal Suitable	214	Csa	Temperate, dry summer, hot summer
45	Aegean	Manisa	Alaşehir	0.422619	Suitable	Marginal Suitable	Marginal Suitable	201	Csa	Temperate, dry summer, hot summer
724	Aegean	Manisa	Salihli	0.382132	Acceptable	Marginal Suitable	Marginal Suitable	119	Csa	Temperate, dry summer, hot summer
750	Aegean	Manisa	Saruhanlı	0.379011	Acceptable	Marginal Suitable	Marginal Suitable	40	Csa	Temperate, dry summer, hot summer
25	Aegean	Manisa	Akhisar	0.377333	Acceptable	Marginal Suitable	Marginal Suitable	106	Csa	Temperate, dry summer, hot summer
18	Aegean	Manisa	Ahmetli	0.375146	Acceptable	Marginal Suitable	Marginal Suitable	91	Csa	Temperate, dry summer, hot summer
379	Aegean	Manisa	Gölmarmara	0.362344	Acceptable	Marginal Suitable	Marginal Suitable	115	Csa	Temperate, dry summer, hot summer
847	Aegean	Manisa	Turgutlu	0.357851	Acceptable	Marginal Suitable	Marginal Suitable	95	Csa	Temperate, dry summer, hot summer
620	Aegean	Manisa	Manisa/Merkez	0.353691	Acceptable	Marginal Suitable	Marginal Suitable	79	Csa	Temperate, dry summer, hot summer
531	Aegean	Muğla	Kavaklıdere	0.592276	Suitable	Acceptable	Acceptable	877	Csa	Temperate, dry summer, hot summer
644	Aegean	Muğla	Muğla/Merkez	0.512512	Suitable	Marginal Suitable	Acceptable	659	Csa	Temperate, dry summer, hot summer
889	Aegean	Muğla	Yatağan	0.439243	Suitable	Marginal Suitable	Marginal Suitable	390	Csa	Temperate, dry summer, hot summer
857	Aegean	Muğla	Ula	0.378936	Acceptable	Marginal Suitable	Marginal Suitable	610	Csa	Temperate, dry summer, hot summer
640	Aegean	Muğla	Milas	0.232320	Acceptable	Marginal Suitable	Marginal Suitable	59	Csa	Temperate, dry summer, hot summer
583	Aegean	Muğla	Köyceğiz	0.227134	Acceptable	Marginal Suitable	Marginal Suitable	15	Csa	Temperate, dry summer, hot summer
153	Aegean	Muğla	Bodrum	0.146526	Marginal Suitable	Marginal Suitable	Marginal Suitable	4	Csa	Temperate, dry summer, hot summer
625	Aegean	Muğla	Marmaris	0.141763	Marginal Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
254	Aegean	Muğla	Datça	0.131028	Marginal Suitable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
348	Aegean	Muğla	Fethiye	0.092507	Marginal Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
676	Aegean	Muğla	Ortaca	0.091480	Marginal Suitable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
250	Aegean	Muğla	Dalaman	0.085751	Marginal Suitable	Marginal Suitable	Marginal Suitable	17	Csa	Temperate, dry summer, hot summer
788	Aegean	Uşak	Sivaslı	0.753390	Very Suitable	Acceptable	Acceptable	931	Csa	Temperate, dry summer, hot summer
114	Aegean	Uşak	Banaz	0.718925	Very Suitable	Acceptable	Acceptable	914	Csa	Temperate, dry summer, hot summer
870	Aegean	Uşak	Uşak/Merkez	0.715415	Very Suitable	Acceptable	Acceptable	915	Csa	Temperate, dry summer, hot summer
507	Aegean	Uşak	Karahallı	0.689407	Very Suitable	Acceptable	Acceptable	928	Csa	Temperate, dry summer, hot summer
860	Aegean	Uşak	Ulubey/Uşak	0.577323	Suitable	Acceptable	Acceptable	727	Csa	Temperate, dry summer, hot summer
335	Aegean	Uşak	Eşme	0.549326	Suitable	Marginal Suitable	Acceptable	828	Csa	Temperate, dry summer, hot summer
823	Black Sea	Amasya	Taşova	0.936346	Extremely Suitable	Suitable	Extremely Suitable	240	BSk	Arid, steppe, cold
388	Black Sea	Amasya	Göynücek	0.852031	Extremely Suitable	Suitable	Very Suitable	522	BSk	Arid, steppe, cold
59	Black Sea	Amasya	Amasya/Merkez	0.843446	Extremely Suitable	Acceptable	Suitable	400	BSk	Arid, steppe, cold
635	Black Sea	Amasya	Merzifon	0.833123	Extremely Suitable	Acceptable	Suitable	746	BSk	Arid, steppe, cold
807	Black Sea	Amasya	Suluova	0.820384	Extremely Suitable	Acceptable	Suitable	542	BSk	Arid, steppe, cold
397	Black Sea	Amasya	Gümüşhacıköy	0.763330	Very Suitable	Acceptable	Acceptable	822	BSk	Arid, steppe, cold

HAZELNUT CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
420	Black Sea	Amasya	Hamamözü	0.761288	Very Suitable	Acceptable	Acceptable	691	BSk	Arid, steppe, cold
450	Black Sea	Artvin	Hopa	0.832735	Extremely Suitable	Acceptable	Suitable	65	Cfa	Temperate, no dry season, hot summer
159	Black Sea	Artvin	Borçka	0.823336	Extremely Suitable	Acceptable	Suitable	123	Cfa	Temperate, no dry season, hot summer
647	Black Sea	Artvin	Murgul	0.822517	Extremely Suitable	Acceptable	Suitable	390	Dfb	Cold, no dry season, warm summer
72	Black Sea	Artvin	Arhavi	0.742265	Very Suitable	Acceptable	Acceptable	11	Cfb	Temperate, no dry season, warm summer
78	Black Sea	Artvin	Artvin/Merkez	0.529769	Suitable	Marginal Suitable	Acceptable	530	Cfa	Temperate, no dry season, hot summer
919	Black Sea	Artvin	Yusufeli	0.383150	Acceptable	Marginal Suitable	Marginal Suitable	603	Dfb	Cold, no dry season, warm summer
69	Black Sea	Artvin	Ardanuç	0.239937	Acceptable	Marginal Suitable	Marginal Suitable	499	Dfb	Cold, no dry season, warm summer
753	Black Sea	Artvin	Şavşat	0.128972	Marginal Suitable	Marginal Suitable	Marginal Suitable	1127	Dfb	Cold, no dry season, warm summer
600	Black Sea	Bartın	Kurucaşile	0.927291	Extremely Suitable	Suitable	Extremely Suitable	13	Cfb	Temperate, no dry season, warm summer
58	Black Sea	Bartın	Amasra	0.913183	Extremely Suitable	Suitable	Extremely Suitable	12	Cfa	Temperate, no dry season, hot summer
116	Black Sea	Bartın	Bartın/Merkez	0.879157	Extremely Suitable	Suitable	Very Suitable	12	Cfa	Temperate, no dry season, hot summer
864	Black Sea	Bartın	Ulus	0.875826	Extremely Suitable	Suitable	Very Suitable	179	Cfb	Temperate, no dry season, warm summer
259	Black Sea	Bayburt	Demirözü	0.208693	Acceptable	Marginal Suitable	Marginal Suitable	1685	Dsb	Cold, dry summer, warm summer
125	Black Sea	Bayburt	Bayburt/Merkez	0.191412	Marginal Suitable	Marginal Suitable	Marginal Suitable	1555	BSk	Arid, steppe, cold
93	Black Sea	Bayburt	Aydıntepe	0.184226	Marginal Suitable	Marginal Suitable	Marginal Suitable	1627	Dsc	Cold, dry summer, cold summer
632	Black Sea	Bolu	Mengen	0.801834	Extremely Suitable	Acceptable	Suitable	616	Csb	Temperate, dry summer, warm summer
389	Black Sea	Bolu	Göynük	0.793316	Very Suitable	Acceptable	Suitable	740	Dfb	Cold, no dry season, warm summer
156	Black Sea	Bolu	Bolu/Merkez	0.668704	Very Suitable	Acceptable	Acceptable	741	Cfb	Temperate, no dry season, warm summer
755	Black Sea	Bolu	Seben	0.649876	Very Suitable	Acceptable	Acceptable	759	BSk	Arid, steppe, cold
643	Black Sea	Bolu	Mudurnu	0.648665	Very Suitable	Acceptable	Acceptable	859	Dfb	Cold, no dry season, warm summer
895	Black Sea	Bolu	Yeniçağa	0.596406	Suitable	Acceptable	Acceptable	1002	Dsb	Cold, dry summer, warm summer
363	Black Sea	Bolu	Gerede	0.558058	Suitable	Marginal Suitable	Acceptable	1326	Dsb	Cold, dry summer, warm summer
290	Black Sea	Bolu	Dörtdivan	0.497432	Suitable	Marginal Suitable	Marginal Suitable	1168	Dsb	Cold, dry summer, warm summer
554	Black Sea	Bolu	Kıbrıscık	0.352290	Acceptable	Marginal Suitable	Marginal Suitable	1139	Dsb	Cold, dry summer, warm summer
628	Black Sea	Çorum	Mecitözü	0.819724	Extremely Suitable	Acceptable	Suitable	811	BSk	Arid, steppe, cold
678	Black Sea	Çorum	Ortaköy/Çorum	0.818394	Extremely Suitable	Acceptable	Suitable	809	BSk	Arid, steppe, cold
679	Black Sea	Çorum	Osmancık	0.793153	Very Suitable	Acceptable	Suitable	425	BSk	Arid, steppe, cold
281	Black Sea	Çorum	Dodurga	0.791396	Very Suitable	Acceptable	Suitable	624	BSk	Arid, steppe, cold
668	Black Sea	Çorum	Oğuzlar	0.770753	Very Suitable	Acceptable	Acceptable	680	Dfb	Cold, no dry season, warm summer
604	Black Sea	Çorum	Laçin	0.770113	Very Suitable	Acceptable	Acceptable	729	BSk	Arid, steppe, cold
243	Black Sea	Çorum	Çorum/Merkez	0.766466	Very Suitable	Acceptable	Acceptable	822	BSk	Arid, steppe, cold
856	Black Sea	Çorum	Uğurludağ	0.758808	Very Suitable	Acceptable	Acceptable	806	BSk	Arid, steppe, cold
810	Black Sea	Çorum	Sungurlu	0.758528	Very Suitable	Acceptable	Acceptable	762	BSk	Arid, steppe, cold
39	Black Sea	Çorum	Alaca	0.758526	Very Suitable	Acceptable	Acceptable	926	BSk	Arid, steppe, cold
154	Black Sea	Çorum	Boğazkale	0.747618	Very Suitable	Acceptable	Acceptable	995	Dsb	Cold, dry summer, warm summer
477	Black Sea	Çorum	İskilip	0.742750	Very Suitable	Acceptable	Acceptable	734	BSk	Arid, steppe, cold
521	Black Sea	Çorum	Kargı	0.716694	Very Suitable	Acceptable	Acceptable	387	BSk	Arid, steppe, cold
124	Black Sea	Çorum	Bayat/Çorum	0.701832	Very Suitable	Acceptable	Acceptable	698	BSk	Arid, steppe, cold
382	Black Sea	Düzce	Gölyaka	0.933979	Extremely Suitable	Suitable	Extremely Suitable	131	Cfa	Temperate, no dry season, hot summer
399	Black Sea	Düzce	Gümüşova	0.929259	Extremely Suitable	Suitable	Extremely Suitable	195	Cfa	Temperate, no dry season, hot summer
295	Black Sea	Düzce	Düzce/Merkez	0.927517	Extremely Suitable	Suitable	Extremely Suitable	149	Cfa	Temperate, no dry season, hot summer
246	Black Sea	Düzce	Cumayeri	0.921221	Extremely Suitable	Suitable	Extremely Suitable	133	Cfa	Temperate, no dry season, hot summer
234	Black Sea	Düzce	Çilimli	0.917321	Extremely Suitable	Suitable	Extremely Suitable	184	Cfb	Temperate, no dry season, warm summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
533	Black Sea	Düzce	Kaynaşlı	0.914566	Extremely Suitable	Suitable	Extremely Suitable	314	Cfa	Temperate, no dry season, hot summer
910	Black Sea	Düzce	Yığılca	0.910416	Extremely Suitable	Suitable	Extremely Suitable	326	Cfb	Temperate, no dry season, warm summer
23	Black Sea	Düzce	Akçakoca	0.882922	Extremely Suitable	Suitable	Very Suitable	7	Cfb	Temperate, no dry season, warm summer
263	Black Sea	Giresun	Dereli	0.900370	Extremely Suitable	Suitable	Very Suitable	282	Cfb	Temperate, no dry season, warm summer
881	Black Sea	Giresun	Yağlıdere	0.881003	Extremely Suitable	Suitable	Very Suitable	104	Cfb	Temperate, no dry season, warm summer
548	Black Sea	Giresun	Keşap	0.871556	Extremely Suitable	Suitable	Very Suitable	11	Cfa	Temperate, no dry season, hot summer
193	Black Sea	Giresun	Çanakçı	0.863854	Extremely Suitable	Suitable	Very Suitable	176	Cfb	Temperate, no dry season, warm summer
283	Black Sea	Giresun	Doğankent	0.855186	Extremely Suitable	Suitable	Very Suitable	195	Csb	Temperate, dry summer, warm summer
390	Black Sea	Giresun	Güce	0.801585	Extremely Suitable	Acceptable	Suitable	342	Cfb	Temperate, no dry season, warm summer
336	Black Sea	Giresun	Espiye	0.705533	Very Suitable	Acceptable	Acceptable	9	Cfa	Temperate, no dry season, hot summer
835	Black Sea	Giresun	Tirebolu	0.626659	Very Suitable	Acceptable	Acceptable	13	Cfa	Temperate, no dry season, hot summer
174	Black Sea	Giresun	Bulancak	0.604787	Very Suitable	Acceptable	Acceptable	15	Cfa	Temperate, no dry season, hot summer
369	Black Sea	Giresun	Giresun/Merkez	0.569437	Suitable	Marginal Suitable	Acceptable	14	Cfa	Temperate, no dry season, hot summer
703	Black Sea	Giresun	Piraziz	0.551916	Suitable	Marginal Suitable	Acceptable	3	Cfa	Temperate, no dry season, hot summer
340	Black Sea	Giresun	Eynesil	0.512794	Suitable	Marginal Suitable	Acceptable	9	Cfa	Temperate, no dry season, hot summer
387	Black Sea	Giresun	Görele	0.463829	Suitable	Marginal Suitable	Marginal Suitable	11	Cfa	Temperate, no dry season, hot summer
717	Black Sea	Giresun	Şebinkarahisar	0.327333	Acceptable	Marginal Suitable	Marginal Suitable	1372	Dsb	Cold, dry summer, warm summer
191	Black Sea	Giresun	Çamoluk	0.242829	Acceptable	Marginal Suitable	Marginal Suitable	1062	Dsb	Cold, dry summer, warm summer
57	Black Sea	Giresun	Alucra	0.200705	Acceptable	Marginal Suitable	Marginal Suitable	1477	Dsb	Cold, dry summer, warm summer
599	Black Sea	Gümüşhane	Kürtün	0.353660	Acceptable	Marginal Suitable	Marginal Suitable	629	Dsb	Cold, dry summer, warm summer
842	Black Sea	Gümüşhane	Torul	0.242781	Acceptable	Marginal Suitable	Marginal Suitable	940	Dsb	Cold, dry summer, warm summer
540	Black Sea	Gümüşhane	Kelkit	0.228261	Acceptable	Marginal Suitable	Marginal Suitable	1408	BSk	Arid, steppe, cold
784	Black Sea	Gümüşhane	Şiran	0.211638	Acceptable	Marginal Suitable	Marginal Suitable	1409	Dsb	Cold, dry summer, warm summer
580	Black Sea	Gümüşhane	Köse	0.202584	Acceptable	Marginal Suitable	Marginal Suitable	1577	Dsb	Cold, dry summer, warm summer
398	Black Sea	Gümüşhane	Gümüşhane/Merkez	0.189734	Marginal Suitable	Marginal Suitable	Marginal Suitable	1174	Dsb	Cold, dry summer, warm summer
897	Black Sea	Karabük	Yenice/Karabük	0.903419	Extremely Suitable	Suitable	Very Suitable	150	Cfa	Temperate, no dry season, hot summer
501	Black Sea	Karabük	Karabük/Merkez	0.842351	Extremely Suitable	Acceptable	Suitable	264	Cfa	Temperate, no dry season, hot summer
720	Black Sea	Karabük	Safranbolu	0.824107	Extremely Suitable	Acceptable	Suitable	544	Cfb	Temperate, no dry season, warm summer
685	Black Sea	Karabük	Ovacık/Karabük	0.762239	Very Suitable	Acceptable	Acceptable	1111	Dfb	Cold, no dry season, warm summer
302	Black Sea	Karabük	Eflani	0.657222	Very Suitable	Acceptable	Acceptable	907	Dfb	Cold, no dry season, warm summer
333	Black Sea	Karabük	Eskipazar	0.638127	Very Suitable	Acceptable	Acceptable	748	Dsb	Cold, dry summer, warm summer
205	Black Sea	Kastamonu	Çatalzeytin	0.953446	Extremely Suitable	Very Suitable	Extremely Suitable	11	Csa	Temperate, dry summer, hot summer
2	Black Sea	Kastamonu	Abana	0.946920	Extremely Suitable	Very Suitable	Extremely Suitable	11	Cfa	Temperate, no dry season, hot summer
228	Black Sea	Kastamonu	Cide	0.932126	Extremely Suitable	Suitable	Extremely Suitable	14	Cfa	Temperate, no dry season, hot summer
287	Black Sea	Kastamonu	Doğanyurt	0.931518	Extremely Suitable	Suitable	Extremely Suitable	13	Cfa	Temperate, no dry season, hot summer
166	Black Sea	Kastamonu	Bozkurt/Kastamonu	0.924002	Extremely Suitable	Suitable	Extremely Suitable	39	Cfb	Temperate, no dry season, warm summer
470	Black Sea	Kastamonu	İnebolu	0.907429	Extremely Suitable	Suitable	Extremely Suitable	17	Cfa	Temperate, no dry season, hot summer
766	Black Sea	Kastamonu	Şenpazar	0.864544	Extremely Suitable	Suitable	Very Suitable	373	Dfb	Cold, no dry season, warm summer
704	Black Sea	Kastamonu	Pınarbaşı/Kastamonu	0.787618	Very Suitable	Acceptable	Acceptable	672	Cfb	Temperate, no dry season, warm summer
425	Black Sea	Kastamonu	Hanönü	0.740854	Very Suitable	Acceptable	Acceptable	427	Cfb	Temperate, no dry season, warm summer
596	Black Sea	Kastamonu	Küre	0.735828	Very Suitable	Acceptable	Acceptable	976	Dfb	Cold, no dry season, warm summer
529	Black Sea	Kastamonu	Kastamonu/Merkez	0.708316	Very Suitable	Acceptable	Acceptable	814	BSk	Arid, steppe, cold
821	Black Sea	Kastamonu	Taşköprü	0.695923	Very Suitable	Acceptable	Acceptable	559	Cfa	Temperate, no dry season, hot summer
98	Black Sea	Kastamonu	Azdavay	0.637005	Very Suitable	Acceptable	Acceptable	834	Dfb	Cold, no dry season, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
64	Black Sea	Kastamonu	Araç	0.636455	Very Suitable	Acceptable	Acceptable	676	Dfb	Cold, no dry season, warm summer
14	Black Sea	Kastamonu	Ağlı	0.577092	Suitable	Acceptable	Acceptable	1174	Dfb	Cold, no dry season, warm summer
249	Black Sea	Kastamonu	Daday	0.572547	Suitable	Marginal Suitable	Acceptable	868	Dfb	Cold, no dry season, warm summer
271	Black Sea	Kastamonu	Devrekani	0.569777	Suitable	Marginal Suitable	Acceptable	1108	Dfb	Cold, no dry season, warm summer
769	Black Sea	Kastamonu	Seydiler	0.560279	Suitable	Marginal Suitable	Acceptable	1043	Dfb	Cold, no dry season, warm summer
843	Black Sea	Kastamonu	Tosya	0.490282	Suitable	Marginal Suitable	Marginal Suitable	833	BSk	Arid, steppe, cold
458	Black Sea	Kastamonu	İhsangazi	0.489690	Suitable	Marginal Suitable	Marginal Suitable	870	Dfb	Cold, no dry season, warm summer
209	Black Sea	Ordu	Çaybaşı	0.965476	Extremely Suitable	Very Suitable	Extremely Suitable	494	Cfb	Temperate, no dry season, warm summer
595	Black Sea	Ordu	Kumru	0.964293	Extremely Suitable	Very Suitable	Extremely Suitable	457	Cfb	Temperate, no dry season, warm summer
204	Black Sea	Ordu	Çatalpınar	0.963282	Extremely Suitable	Very Suitable	Extremely Suitable	139	Cfb	Temperate, no dry season, warm summer
186	Black Sea	Ordu	Çamaş	0.958351	Extremely Suitable	Very Suitable	Extremely Suitable	588	Cfb	Temperate, no dry season, warm summer
406	Black Sea	Ordu	Gürgentepe	0.949937	Extremely Suitable	Very Suitable	Extremely Suitable	1238	Cfb	Temperate, no dry season, warm summer
859	Black Sea	Ordu	Ulubey/Ordu	0.947297	Extremely Suitable	Very Suitable	Extremely Suitable	598	Cfb	Temperate, no dry season, warm summer
506	Black Sea	Ordu	Kabadüz	0.946445	Extremely Suitable	Very Suitable	Extremely Suitable	578	Cfb	Temperate, no dry season, warm summer
460	Black Sea	Ordu	İkizce	0.942932	Extremely Suitable	Very Suitable	Extremely Suitable	141	Cfb	Temperate, no dry season, warm summer
576	Black Sea	Ordu	Korgan	0.939653	Extremely Suitable	Very Suitable	Extremely Suitable	781	Cfb	Temperate, no dry season, warm summer
484	Black Sea	Ordu	Kabataş	0.932452	Extremely Suitable	Suitable	Extremely Suitable	436	Cfb	Temperate, no dry season, warm summer
29	Black Sea	Ordu	Akkuş	0.920463	Extremely Suitable	Suitable	Extremely Suitable	1236	Dsb	Cold, dry summer, warm summer
344	Black Sea	Ordu	Fatsa	0.791979	Very Suitable	Acceptable	Suitable	17	Cfa	Temperate, no dry season, hot summer
88	Black Sea	Ordu	Aybastı	0.771376	Very Suitable	Acceptable	Acceptable	741	Dfb	Cold, no dry season, warm summer
672	Black Sea	Ordu	Ordu/Merkez	0.725942	Very Suitable	Acceptable	Acceptable	25	Cfa	Temperate, no dry season, hot summer
378	Black Sea	Ordu	Gölköy	0.673044	Very Suitable	Acceptable	Acceptable	829	Dsb	Cold, dry summer, warm summer
700	Black Sea	Ordu	Perşembe	0.574427	Suitable	Marginal Suitable	Acceptable	7	Cfa	Temperate, no dry season, hot summer
396	Black Sea	Ordu	Gülyalı	0.548143	Suitable	Marginal Suitable	Acceptable	6	Cfb	Temperate, no dry season, warm summer
866	Black Sea	Ordu	Ünye	0.507053	Suitable	Marginal Suitable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
636	Black Sea	Ordu	Mesudiye	0.389435	Acceptable	Marginal Suitable	Marginal Suitable	1139	Dsb	Cold, dry summer, warm summer
442	Black Sea	Rize	Hemşin	0.821532	Extremely Suitable	Acceptable	Suitable	315	Cfb	Temperate, no dry season, warm summer
497	Black Sea	Rize	Kalkandere	0.802939	Extremely Suitable	Acceptable	Suitable	167	Cfa	Temperate, no dry season, hot summer
189	Black Sea	Rize	Çamlıhemşin	0.794230	Very Suitable	Acceptable	Suitable	311	Cfb	Temperate, no dry season, warm summer
403	Black Sea	Rize	Güneysu	0.778160	Very Suitable	Acceptable	Acceptable	169	Cfb	Temperate, no dry season, warm summer
350	Black Sea	Rize	Fındıklı	0.681812	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
692	Black Sea	Rize	Pazar/Rize	0.578040	Suitable	Acceptable	Acceptable	34	Cfa	Temperate, no dry season, hot summer
482	Black Sea	Rize	İyidere	0.576314	Suitable	Marginal Suitable	Acceptable	7	Cfa	Temperate, no dry season, hot summer
264	Black Sea	Rize	Derepazarı	0.530094	Suitable	Marginal Suitable	Acceptable	8	Cfa	Temperate, no dry season, hot summer
211	Black Sea	Rize	Çayeli	0.519169	Suitable	Marginal Suitable	Acceptable	10	Cfa	Temperate, no dry season, hot summer
716	Black Sea	Rize	Rize/Merkez	0.508164	Suitable	Marginal Suitable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
70	Black Sea	Rize	Ardeşen	0.470437	Suitable	Marginal Suitable	Marginal Suitable	5	Cfa	Temperate, no dry season, hot summer
461	Black Sea	Rize	İkizdere	0.380390	Acceptable	Marginal Suitable	Marginal Suitable	556	Dfb	Cold, no dry season, warm summer
530	Black Sea	Samsun	Kavak	0.968463	Extremely Suitable	Extremely Suitable	Extremely Suitable	603	Csb	Temperate, dry summer, warm summer
96	Black Sea	Samsun	Ayvacık/Samsun	0.967741	Extremely Suitable	Extremely Suitable	Extremely Suitable	69	Cfb	Temperate, no dry season, warm summer
79	Black Sea	Samsun	Asarcık	0.966955	Extremely Suitable	Extremely Suitable	Extremely Suitable	802	Csb	Temperate, dry summer, warm summer
41	Black Sea	Samsun	Alaçam	0.966183	Extremely Suitable	Very Suitable	Extremely Suitable	38	Cfb	Temperate, no dry season, warm summer
884	Black Sea	Samsun	Yakakent	0.949512	Extremely Suitable	Very Suitable	Extremely Suitable	12	Cfb	Temperate, no dry season, warm summer
829	Black Sea	Samsun	Tekkeköy	0.931172	Extremely Suitable	Suitable	Extremely Suitable	21	Cfa	Temperate, no dry season, hot summer

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878	Black Sea	Samsun	Vezirköprü	0.929004	Extremely Suitable	Suitable	Extremely Suitable	349	BSk	Arid, steppe, cold
725	Black Sea	Samsun	Salıpazarı	0.921313	Extremely Suitable	Suitable	Extremely Suitable	84	Cfa	Temperate, no dry season, hot summer
436	Black Sea	Samsun	Havza	0.861346	Extremely Suitable	Suitable	Very Suitable	625	BSk	Arid, steppe, cold
605	Black Sea	Samsun	Ladik	0.852514	Extremely Suitable	Suitable	Very Suitable	940	Dsb	Cold, dry summer, warm summer
729	Black Sea	Samsun	Samsun/Merkez	0.824887	Extremely Suitable	Acceptable	Suitable	10	Cfa	Temperate, no dry season, hot summer
1	Black Sea	Samsun	19 Mayıs	0.774450	Very Suitable	Acceptable	Acceptable	16	Csa	Temperate, dry summer, hot summer
833	Black Sea	Samsun	Terme	0.680419	Very Suitable	Acceptable	Acceptable	12	Cfa	Temperate, no dry season, hot summer
101	Black Sea	Samsun	Bafra	0.679461	Very Suitable	Acceptable	Acceptable	26	Csa	Temperate, dry summer, hot summer
199	Black Sea	Samsun	Çarşamba	0.649453	Very Suitable	Acceptable	Acceptable	22	Cfa	Temperate, no dry season, hot summer
324	Black Sea	Sinop	Erfelek	0.956399	Extremely Suitable	Very Suitable	Extremely Suitable	185	Cfb	Temperate, no dry season, warm summer
86	Black Sea	Sinop	Ayancık	0.953521	Extremely Suitable	Very Suitable	Extremely Suitable	9	Cfa	Temperate, no dry season, hot summer
849	Black Sea	Sinop	Türkeli	0.941194	Extremely Suitable	Very Suitable	Extremely Suitable	12	Cfb	Temperate, no dry season, warm summer
276	Black Sea	Sinop	Dikmen	0.922267	Extremely Suitable	Suitable	Extremely Suitable	193	Cfb	Temperate, no dry season, warm summer
161	Black Sea	Sinop	Boyabat	0.866529	Extremely Suitable	Suitable	Very Suitable	329	Cfa	Temperate, no dry season, hot summer
735	Black Sea	Sinop	Saraydüzü	0.864336	Extremely Suitable	Suitable	Very Suitable	415	BSk	Arid, steppe, cold
293	Black Sea	Sinop	Durağan	0.833562	Extremely Suitable	Acceptable	Suitable	213	Cfa	Temperate, no dry season, hot summer
366	Black Sea	Sinop	Gerze	0.831073	Extremely Suitable	Acceptable	Suitable	31	Cfa	Temperate, no dry season, hot summer
783	Black Sea	Sinop	Sinop/Merkez	0.280303	Acceptable	Marginal Suitable	Marginal Suitable	27	Cfa	Temperate, no dry season, hot summer
318	Black Sea	Tokat	Erbaa	0.959234	Extremely Suitable	Very Suitable	Extremely Suitable	237	BSk	Arid, steppe, cold
659	Black Sea	Tokat	Niksar	0.880224	Extremely Suitable	Suitable	Very Suitable	346	Csa	Temperate, dry summer, hot summer
848	Black Sea	Tokat	Turhal	0.866231	Extremely Suitable	Suitable	Very Suitable	588	BSk	Arid, steppe, cold
922	Black Sea	Tokat	Zile	0.865091	Extremely Suitable	Suitable	Very Suitable	743	BSk	Arid, steppe, cold
693	Black Sea	Tokat	Pazar/Tokat	0.861366	Extremely Suitable	Suitable	Very Suitable	576	BSk	Arid, steppe, cold
836	Black Sea	Tokat	Tokat/Merkez	0.814320	Extremely Suitable	Acceptable	Suitable	630	BSk	Arid, steppe, cold
117	Black Sea	Tokat	Başçiftlik	0.806040	Extremely Suitable	Acceptable	Suitable	1.395	Dsb	Cold, dry summer, warm summer
77	Black Sea	Tokat	Artova	0.767711	Very Suitable	Acceptable	Acceptable	1.184	BSk	Arid, steppe, cold
808	Black Sea	Tokat	Sulusaray	0.757365	Very Suitable	Acceptable	Acceptable	1.035	BSk	Arid, steppe, cold
47	Black Sea	Tokat	Almus	0.749983	Very Suitable	Acceptable	Acceptable	853	BSk	Arid, steppe, cold
909	Black Sea	Tokat	Yeşilyurt/Tokat	0.707650	Very Suitable	Acceptable	Acceptable	999	BSk	Arid, steppe, cold
714	Black Sea	Tokat	Reşadiye	0.650885	Very Suitable	Acceptable	Acceptable	538	BSk	Arid, steppe, cold
838	Black Sea	Trabzon	Tonya	0.950130	Extremely Suitable	Very Suitable	Extremely Suitable	742	Csb	Temperate, dry summer, warm summer
297	Black Sea	Trabzon	Düzköy	0.948502	Extremely Suitable	Very Suitable	Extremely Suitable	780	Dsb	Cold, dry summer, warm summer
726	Black Sea	Trabzon	Şalpazarı	0.932533	Extremely Suitable	Suitable	Extremely Suitable	325	Csb	Temperate, dry summer, warm summer
913	Black Sea	Trabzon	Yomra	0.900985	Extremely Suitable	Suitable	Very Suitable	10	Cfa	Temperate, no dry season, hot summer
875	Black Sea	Trabzon	Vakfıkebir	0.885687	Extremely Suitable	Suitable	Very Suitable	13	Csa	Temperate, dry summer, hot summer
611	Black Sea	Trabzon	Maçka	0.885244	Extremely Suitable	Suitable	Very Suitable	364	Dsb	Cold, dry summer, warm summer
811	Black Sea	Trabzon	Sürmene	0.880772	Extremely Suitable	Suitable	Very Suitable	11	Cfa	Temperate, no dry season, hot summer
666	Black Sea	Trabzon	Of	0.850330	Extremely Suitable	Suitable	Suitable	11	Cfa	Temperate, no dry season, hot summer
133	Black Sea	Trabzon	Beşikdüzü	0.820568	Extremely Suitable	Acceptable	Suitable	8	Cfa	Temperate, no dry season, hot summer
439	Black Sea	Trabzon	Hayrat	0.812333	Extremely Suitable	Acceptable	Suitable	202	Cfb	Temperate, no dry season, warm summer
268	Black Sea	Trabzon	Dernekpazarı	0.804262	Extremely Suitable	Acceptable	Suitable	199	Cfb	Temperate, no dry season, warm summer
65	Black Sea	Trabzon	Araklı	0.749549	Very Suitable	Acceptable	Acceptable	6	Cfa	Temperate, no dry season, hot summer
573	Black Sea	Trabzon	Köprübaşı/Trabzon	0.737241	Very Suitable	Acceptable	Acceptable	307	Dfb	Cold, no dry season, warm summer
76	Black Sea	Trabzon	Arsin	0.732297	Very Suitable	Acceptable	Acceptable	24	Cfa	Temperate, no dry season, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
19	Black Sea	Trabzon	Akçaabat	0.541591	Suitable	Marginal Suitable	Acceptable	16	Cfa	Temperate, no dry season, hot summer
214	Black Sea	Trabzon	Çaykara	0.513352	Suitable	Marginal Suitable	Acceptable	317	Dfb	Cold, no dry season, warm summer
844	Black Sea	Trabzon	Trabzon/Merkez	0.484666	Suitable	Marginal Suitable	Marginal Suitable	36	Cfa	Temperate, no dry season, hot summer
200	Black Sea	Trabzon	Çarşıbaşı	0.449825	Suitable	Marginal Suitable	Marginal Suitable	17	Csa	Temperate, dry summer, hot summer
923	Black Sea	Zonguldak	Zonguldak/Merkez	0.924321	Extremely Suitable	Suitable	Extremely Suitable	10	Cfa	Temperate, no dry season, hot summer
270	Black Sea	Zonguldak	Devrek	0.917469	Extremely Suitable	Suitable	Extremely Suitable	103	Cfa	Temperate, no dry season, hot summer
44	Black Sea	Zonguldak	Alaplı	0.897498	Extremely Suitable	Suitable	Very Suitable	18	Cfb	Temperate, no dry season, warm summer
371	Black Sea	Zonguldak	Gökçebey	0.885623	Extremely Suitable	Suitable	Very Suitable	62	Cfa	Temperate, no dry season, hot summer
210	Black Sea	Zonguldak	Çaycuma	0.866978	Extremely Suitable	Suitable	Very Suitable	36	Cfa	Temperate, no dry season, hot summer
323	Black Sea	Zonguldak	Ereğli/Zonguldak	0.421003	Suitable	Marginal Suitable	Marginal Suitable	12	Cfa	Temperate, no dry season, hot summer
11	Central Anatolia	Aksaray	Ağaçören	0.702727	Very Suitable	Acceptable	Acceptable	964	BSk	Arid, steppe, cold
745	Central Anatolia	Aksaray	Sarıyahşi	0.684175	Very Suitable	Acceptable	Acceptable	968	BSk	Arid, steppe, cold
677	Central Anatolia	Aksaray	Ortaköy/Aksaray	0.667766	Very Suitable	Acceptable	Acceptable	1227	BSk	Arid, steppe, cold
393	Central Anatolia	Aksaray	Gülağaç	0.655980	Very Suitable	Acceptable	Acceptable	1172	BSk	Arid, steppe, cold
32	Central Anatolia	Aksaray	Aksaray/Merkez	0.650517	Very Suitable	Acceptable	Acceptable	1228	BSk	Arid, steppe, cold
332	Central Anatolia	Aksaray	Eskil	0.631537	Very Suitable	Acceptable	Acceptable	940	BSk	Arid, steppe, cold
412	Central Anatolia	Aksaray	Güzelyurt	0.625468	Very Suitable	Acceptable	Acceptable	1502	BSk	Arid, steppe, cold
143	Central Anatolia	Ankara	Beypazarı	0.771390	Very Suitable	Acceptable	Acceptable	676	BSk	Arid, steppe, cold
899	Central Anatolia	Ankara	Yenimahalle	0.750115	Very Suitable	Acceptable	Acceptable	880	BSk	Arid, steppe, cold
87	Central Anatolia	Ankara	Ayaş	0.744444	Very Suitable	Acceptable	Acceptable	955	BSk	Arid, steppe, cold
337	Central Anatolia	Ankara	Etimesgut	0.736053	Very Suitable	Acceptable	Acceptable	819	BSk	Arid, steppe, cold
780	Central Anatolia	Ankara	Sincan	0.712529	Very Suitable	Acceptable	Acceptable	798	BSk	Arid, steppe, cold
708	Central Anatolia	Ankara	Polatlı	0.703050	Very Suitable	Acceptable	Acceptable	866	BSk	Arid, steppe, cold
339	Central Anatolia	Ankara	Evren	0.699865	Very Suitable	Acceptable	Acceptable	926	BSk	Arid, steppe, cold
437	Central Anatolia	Ankara	Haymana	0.698411	Very Suitable	Acceptable	Acceptable	1251	BSk	Arid, steppe, cold
196	Central Anatolia	Ankara	Çankaya	0.696782	Very Suitable	Acceptable	Acceptable	881	BSk	Arid, steppe, cold
496	Central Anatolia	Ankara	Kalecik	0.696649	Very Suitable	Acceptable	Acceptable	718	BSk	Arid, steppe, cold
538	Central Anatolia	Ankara	Keçiören	0.691218	Very Suitable	Acceptable	Acceptable	865	BSk	Arid, steppe, cold
652	Central Anatolia	Ankara	Nallıhan	0.678733	Very Suitable	Acceptable	Acceptable	633	BSk	Arid, steppe, cold
109	Central Anatolia	Ankara	Bala	0.670905	Very Suitable	Acceptable	Acceptable	1309	BSk	Arid, steppe, cold
373	Central Anatolia	Ankara	Gölbaşı/Ankara	0.670551	Very Suitable	Acceptable	Acceptable	1006	BSk	Arid, steppe, cold
311	Central Anatolia	Ankara	Elmadağ	0.667320	Very Suitable	Acceptable	Acceptable	1100	BSk	Arid, steppe, cold
618	Central Anatolia	Ankara	Mamak	0.664256	Very Suitable	Acceptable	Acceptable	909	BSk	Arid, steppe, cold
49	Central Anatolia	Ankara	Altındağ	0.649182	Very Suitable	Acceptable	Acceptable	892	BSk	Arid, steppe, cold
38	Central Anatolia	Ankara	Akyurt	0.648023	Very Suitable	Acceptable	Acceptable	1027	BSk	Arid, steppe, cold
392	Central Anatolia	Ankara	Güdül	0.644470	Very Suitable	Acceptable	Acceptable	738	BSk	Arid, steppe, cold
718	Central Anatolia	Ankara	Şereflikoçhisar	0.616080	Very Suitable	Acceptable	Acceptable	972	BSk	Arid, steppe, cold
534	Central Anatolia	Ankara	Kahramankazan	0.614298	Very Suitable	Acceptable	Acceptable	889	BSk	Arid, steppe, cold
244	Central Anatolia	Ankara	Çubuk	0.567607	Suitable	Marginal Suitable	Acceptable	1002	BSk	Arid, steppe, cold
188	Central Anatolia	Ankara	Çamlıdere	0.430187	Suitable	Marginal Suitable	Marginal Suitable	1243	Dsb	Cold, dry summer, warm summer
561	Central Anatolia	Ankara	Kızılcahamam	0.386178	Acceptable	Marginal Suitable	Marginal Suitable	985	Dsb	Cold, dry summer, warm summer
562	Central Anatolia	Çankırı	Kızılırmak	0.726975	Very Suitable	Acceptable	Acceptable	555	BSk	Arid, steppe, cold
197	Central Anatolia	Çankırı	Çankırı/Merkez	0.679970	Very Suitable	Acceptable	Acceptable	730	BSk	Arid, steppe, cold
309	Central Anatolia	Çankırı	Eldivan	0.678451	Very Suitable	Acceptable	Acceptable	945	BSk	Arid, steppe, cold

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577	Central Anatolia	Çankırı	Korgun	0.571738	Suitable	Marginal Suitable	Acceptable	925	BSk	Arid, steppe, cold
888	Central Anatolia	Çankırı	Yapraklı	0.558926	Suitable	Marginal Suitable	Acceptable	1200	Dsb	Cold, dry summer, warm summer
719	Central Anatolia	Çankırı	Şabanözü	0.550587	Suitable	Marginal Suitable	Acceptable	1030	BSk	Arid, steppe, cold
129	Central Anatolia	Çankırı	Bayramören	0.481689	Suitable	Marginal Suitable	Marginal Suitable	868	Dfb	Cold, no dry season, warm summer
597	Central Anatolia	Çankırı	Kurşunlu	0.471294	Suitable	Marginal Suitable	Marginal Suitable	1137	Dsb	Cold, dry summer, warm summer
221	Central Anatolia	Çankırı	Çerkeş	0.470919	Suitable	Marginal Suitable	Marginal Suitable	1132	Dsb	Cold, dry summer, warm summer
83	Central Anatolia	Çankırı	Atkaracalar	0.447615	Suitable	Marginal Suitable	Marginal Suitable	1247	Dsb	Cold, dry summer, warm summer
462	Central Anatolia	Çankırı	Ilgaz	0.433478	Suitable	Marginal Suitable	Marginal Suitable	929	BSk	Arid, steppe, cold
675	Central Anatolia	Çankırı	Orta	0.336104	Acceptable	Marginal Suitable	Marginal Suitable	1257	Dsb	Cold, dry summer, warm summer
638	Central Anatolia	Eskişehir	Mihalgazi	0.822323	Extremely Suitable	Acceptable	Suitable	215	BSk	Arid, steppe, cold
739	Central Anatolia	Eskişehir	Sarıcakaya	0.788635	Very Suitable	Acceptable	Acceptable	216	BSk	Arid, steppe, cold
473	Central Anatolia	Eskişehir	İnönü	0.779798	Very Suitable	Acceptable	Acceptable	837	Dsb	Cold, dry summer, warm summer
48	Central Anatolia	Eskişehir	Alpu	0.721433	Very Suitable	Acceptable	Acceptable	766	BSk	Arid, steppe, cold
334	Central Anatolia	Eskişehir	Eskişehir/Merkez	0.718772	Very Suitable	Acceptable	Acceptable	796	BSk	Arid, steppe, cold
141	Central Anatolia	Eskişehir	Beylikova	0.710325	Very Suitable	Acceptable	Acceptable	771	BSk	Arid, steppe, cold
613	Central Anatolia	Eskişehir	Mahmudiye	0.700738	Very Suitable	Acceptable	Acceptable	887	BSk	Arid, steppe, cold
791	Central Anatolia	Eskişehir	Sivrihisar	0.692243	Very Suitable	Acceptable	Acceptable	1109	BSk	Arid, steppe, cold
229	Central Anatolia	Eskişehir	Çifteler	0.684459	Very Suitable	Acceptable	Acceptable	877	BSk	Arid, steppe, cold
639	Central Anatolia	Eskişehir	Mihalıççık	0.679776	Very Suitable	Acceptable	Acceptable	1306	Dsb	Cold, dry summer, warm summer
772	Central Anatolia	Eskişehir	Seyitgazi	0.677066	Very Suitable	Acceptable	Acceptable	991	BSk	Arid, steppe, cold
405	Central Anatolia	Eskişehir	Günyüzü	0.673212	Very Suitable	Acceptable	Acceptable	894	BSk	Arid, steppe, cold
422	Central Anatolia	Eskişehir	Han	0.654533	Very Suitable	Acceptable	Acceptable	1224	BSk	Arid, steppe, cold
326	Central Anatolia	Karaman	Ermenek	0.648426	Very Suitable	Acceptable	Acceptable	1282	Csa	Temperate, dry summer, hot summer
137	Central Anatolia	Karaman	Başyayla	0.629223	Very Suitable	Acceptable	Acceptable	1346	Csa	Temperate, dry summer, hot summer
793	Central Anatolia	Karaman	Sarıveliler	0.624224	Very Suitable	Acceptable	Acceptable	1523	Dsb	Cold, dry summer, warm summer
94	Central Anatolia	Karaman	Ayrancı	0.617563	Very Suitable	Acceptable	Acceptable	1141	BSk	Arid, steppe, cold
535	Central Anatolia	Karaman	Kazımkarabekir	0.604121	Very Suitable	Acceptable	Acceptable	1052	Csa	Temperate, dry summer, hot summer
512	Central Anatolia	Karaman	Karaman/Merkez	0.593416	Suitable	Acceptable	Acceptable	1063	BSk	Arid, steppe, cold
569	Central Anatolia	Kayseri	Kocasinan	0.662976	Very Suitable	Acceptable	Acceptable	1056	BSk	Arid, steppe, cold
629	Central Anatolia	Kayseri	Melikgazi	0.650413	Very Suitable	Acceptable	Acceptable	1059	BSk	Arid, steppe, cold
468	Central Anatolia	Kayseri	İncesu	0.641080	Very Suitable	Acceptable	Acceptable	1098	BSk	Arid, steppe, cold
414	Central Anatolia	Kayseri	Hacılar	0.637819	Very Suitable	Acceptable	Acceptable	1385	BSk	Arid, steppe, cold
346	Central Anatolia	Kayseri	Felahiye	0.609025	Very Suitable	Acceptable	Acceptable	1308	BSk	Arid, steppe, cold
905	Central Anatolia	Kayseri	Yeşilhisar	0.593736	Suitable	Acceptable	Acceptable	1167	BSk	Arid, steppe, cold
177	Central Anatolia	Kayseri	Bünyan	0.591625	Suitable	Acceptable	Acceptable	1345	BSk	Arid, steppe, cold
269	Central Anatolia	Kayseri	Develi	0.583118	Suitable	Acceptable	Acceptable	1261	BSk	Arid, steppe, cold
883	Central Anatolia	Kayseri	Yahyalı	0.572702	Suitable	Marginal Suitable	Acceptable	1178	BSk	Arid, steppe, cold
744	Central Anatolia	Kayseri	Sarıoğlan	0.571601	Suitable	Marginal Suitable	Acceptable	1156	BSk	Arid, steppe, cold
817	Central Anatolia	Kayseri	Talas	0.560601	Suitable	Marginal Suitable	Acceptable	1150	BSk	Arid, steppe, cold
687	Central Anatolia	Kayseri	Özvatan	0.549014	Suitable	Marginal Suitable	Acceptable	1289	BSk	Arid, steppe, cold
837	Central Anatolia	Kayseri	Tomarza	0.519916	Suitable	Marginal Suitable	Acceptable	1396	BSk	Arid, steppe, cold
27	Central Anatolia	Kayseri	Akkışla	0.445804	Suitable	Marginal Suitable	Marginal Suitable	1357	Dsb	Cold, dry summer, warm summer
705	Central Anatolia	Kayseri	Pınarbaşı/Kayseri	0.368761	Acceptable	Marginal Suitable	Marginal Suitable	1526	Dsb	Cold, dry summer, warm summer
747	Central Anatolia	Kayseri	Sarız	0.336268	Acceptable	Marginal Suitable	Marginal Suitable	1569	Dsb	Cold, dry summer, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
256	Central Anatolia	Kırıkkale	Delice	0.720127	Very Suitable	Acceptable	Acceptable	696	BSk	Arid, steppe, cold
802	Central Anatolia	Kırıkkale	Sulakyurt	0.713671	Very Suitable	Acceptable	Acceptable	830	BSk	Arid, steppe, cold
112	Central Anatolia	Kırıkkale	Balışeyh	0.709304	Very Suitable	Acceptable	Acceptable	870	BSk	Arid, steppe, cold
882	Central Anatolia	Kırıkkale	Yahşihan	0.698457	Very Suitable	Acceptable	Acceptable	779	BSk	Arid, steppe, cold
557	Central Anatolia	Kırıkkale	Kırıkkale/Merkez	0.696121	Very Suitable	Acceptable	Acceptable	746	BSk	Arid, steppe, cold
106	Central Anatolia	Kırıkkale	Bahşili	0.694749	Very Suitable	Acceptable	Acceptable	703	BSk	Arid, steppe, cold
216	Central Anatolia	Kırıkkale	Çelebi	0.691324	Very Suitable	Acceptable	Acceptable	1241	BSk	Arid, steppe, cold
549	Central Anatolia	Kırıkkale	Keskin	0.682788	Very Suitable	Acceptable	Acceptable	1139	BSk	Arid, steppe, cold
509	Central Anatolia	Kırıkkale	Karakeçili	0.677063	Very Suitable	Acceptable	Acceptable	821	BSk	Arid, steppe, cold
22	Central Anatolia	Kırşehir	Akçakent	0.716878	Very Suitable	Acceptable	Acceptable	1410	BSk	Arid, steppe, cold
498	Central Anatolia	Kırşehir	Kaman	0.708910	Very Suitable	Acceptable	Acceptable	1128	BSk	Arid, steppe, cold
227	Central Anatolia	Kırşehir	Çiçekdağı	0.704754	Very Suitable	Acceptable	Acceptable	935	BSk	Arid, steppe, cold
31	Central Anatolia	Kırşehir	Akpınar	0.700357	Very Suitable	Acceptable	Acceptable	1163	BSk	Arid, steppe, cold
641	Central Anatolia	Kırşehir	Mucur	0.682113	Very Suitable	Acceptable	Acceptable	1071	BSk	Arid, steppe, cold
560	Central Anatolia	Kırşehir	Kışehir/Merkez	0.679761	Very Suitable	Acceptable	Acceptable	991	BSk	Arid, steppe, cold
168	Central Anatolia	Kırşehir	Boztepe	0.656604	Very Suitable	Acceptable	Acceptable	1167	BSk	Arid, steppe, cold
144	Central Anatolia	Konya	Beyşehir	0.747809	Very Suitable	Acceptable	Acceptable	1152	Dsa	Cold, dry summer, hot summer
262	Central Anatolia	Konya	Derebucak	0.721274	Very Suitable	Acceptable	Acceptable	1229	Csa	Temperate, dry summer, hot summer
453	Central Anatolia	Konya	Hüyük	0.709367	Very Suitable	Acceptable	Acceptable	1251	Dsb	Cold, dry summer, warm summer
463	Central Anatolia	Konya	Ilgın	0.699876	Very Suitable	Acceptable	Acceptable	1039	BSk	Arid, steppe, cold
917	Central Anatolia	Konya	Yunak	0.689311	Very Suitable	Acceptable	Acceptable	1101	BSk	Arid, steppe, cold
282	Central Anatolia	Konya	Doğanhisar	0.682298	Very Suitable	Acceptable	Acceptable	1188	BSk	Arid, steppe, cold
855	Central Anatolia	Konya	Tuzlukçu	0.675463	Very Suitable	Acceptable	Acceptable	994	BSk	Arid, steppe, cold
33	Central Anatolia	Konya	Akşehir	0.674988	Very Suitable	Acceptable	Acceptable	1027	Csa	Temperate, dry summer, hot summer
633	Central Anatolia	Konya	Meram	0.672455	Very Suitable	Acceptable	Acceptable	1027	BSk	Arid, steppe, cold
218	Central Anatolia	Konya	Çeltik	0.655912	Very Suitable	Acceptable	Acceptable	852	BSk	Arid, steppe, cold
591	Central Anatolia	Konya	Kulu	0.653695	Very Suitable	Acceptable	Acceptable	997	BSk	Arid, steppe, cold
770	Central Anatolia	Konya	Seydişehir	0.651970	Very Suitable	Acceptable	Acceptable	1133	Csa	Temperate, dry summer, hot summer
402	Central Anatolia	Konya	Güneysınır	0.648302	Very Suitable	Acceptable	Acceptable	1095	BSk	Arid, steppe, cold
487	Central Anatolia	Konya	Kadınhanı	0.645294	Very Suitable	Acceptable	Acceptable	1121	BSk	Arid, steppe, cold
760	Central Anatolia	Konya	Selçuklu	0.644834	Very Suitable	Acceptable	Acceptable	1024	BSk	Arid, steppe, cold
885	Central Anatolia	Konya	Yalıhüyük	0.635721	Very Suitable	Acceptable	Acceptable	1106	Csa	Temperate, dry summer, hot summer
738	Central Anatolia	Konya	Sarayönü	0.635354	Very Suitable	Acceptable	Acceptable	1064	BSk	Arid, steppe, cold
16	Central Anatolia	Konya	Ahırlı	0.631726	Very Suitable	Acceptable	Acceptable	1216	Csa	Temperate, dry summer, hot summer
233	Central Anatolia	Konya	Cihanbeyli	0.623592	Very Suitable	Acceptable	Acceptable	963	Dsa	Cold, dry summer, hot summer
261	Central Anatolia	Konya	Derbent	0.617188	Very Suitable	Acceptable	Acceptable	1479	Dsb	Cold, dry summer, warm summer
50	Central Anatolia	Konya	Altınekin	0.616149	Very Suitable	Acceptable	Acceptable	984	BSk	Arid, steppe, cold
30	Central Anatolia	Konya	Akören	0.615618	Very Suitable	Acceptable	Acceptable	1108	Dsa	Cold, dry summer, hot summer
322	Central Anatolia	Konya	Ereğli/Konya	0.614553	Very Suitable	Acceptable	Acceptable	1053	BSk	Arid, steppe, cold
519	Central Anatolia	Konya	Karatay	0.609769	Very Suitable	Acceptable	Acceptable	1023	BSk	Arid, steppe, cold
316	Central Anatolia	Konya	Emirgazi	0.604282	Very Suitable	Acceptable	Acceptable	1087	BSk	Arid, steppe, cold
247	Central Anatolia	Konya	Çumra	0.603558	Very Suitable	Acceptable	Acceptable	1018	BSk	Arid, steppe, cold
164	Central Anatolia	Konya	Bozkır	0.600560	Very Suitable	Acceptable	Acceptable	1137	Csa	Temperate, dry summer, hot summer
515	Central Anatolia	Konya	Karapınar	0.574167	Suitable	Marginal Suitable	Acceptable	997	BSk	Arid, steppe, cold

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LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
820	Central Anatolia	Konya	Taşkent	0.529945	Suitable	Marginal Suitable	Acceptable	1409	Dsb	Cold, dry summer, warm summer
415	Central Anatolia	Konya	Hadim	0.528955	Suitable	Marginal Suitable	Acceptable	1526	Dsb	Cold, dry summer, warm summer
419	Central Anatolia	Konya	Halkapınar	0.364070	Acceptable	Marginal Suitable	Marginal Suitable	1174	BSk	Arid, steppe, cold
585	Central Anatolia	Nevşehir	Kozaklı	0.665616	Very Suitable	Acceptable	Acceptable	1054	BSk	Arid, steppe, cold
413	Central Anatolia	Nevşehir	Hacıbektaş	0.657450	Very Suitable	Acceptable	Acceptable	1.288	BSk	Arid, steppe, cold
3	Central Anatolia	Nevşehir	Acıgöl	0.650577	Very Suitable	Acceptable	Acceptable	1247	BSk	Arid, steppe, cold
657	Central Anatolia	Nevşehir	Nevşehir/Merkez	0.649648	Very Suitable	Acceptable	Acceptable	1197	BSk	Arid, steppe, cold
84	Central Anatolia	Nevşehir	Avanos	0.644451	Very Suitable	Acceptable	Acceptable	934	BSk	Arid, steppe, cold
395	Central Anatolia	Nevşehir	Gülşehir	0.640814	Very Suitable	Acceptable	Acceptable	923	BSk	Arid, steppe, cold
868	Central Anatolia	Nevşehir	Ürgüp	0.640048	Very Suitable	Acceptable	Acceptable	1060	BSk	Arid, steppe, cold
267	Central Anatolia	Nevşehir	Derinkuyu	0.602130	Very Suitable	Acceptable	Acceptable	1359	BSk	Arid, steppe, cold
51	Central Anatolia	Niğde	Altunhisar	0.599416	Suitable	Acceptable	Acceptable	1200	BSk	Arid, steppe, cold
230	Central Anatolia	Niğde	Çiftlik	0.598983	Suitable	Acceptable	Acceptable	1546	BSk	Arid, steppe, cold
158	Central Anatolia	Niğde	Bor	0.595980	Suitable	Acceptable	Acceptable	1130	BSk	Arid, steppe, cold
863	Central Anatolia	Niğde	Ulukışla	0.579828	Suitable	Acceptable	Acceptable	1447	BSk	Arid, steppe, cold
658	Central Anatolia	Niğde	Niğde/Merkez	0.562029	Suitable	Marginal Suitable	Acceptable	1239	BSk	Arid, steppe, cold
185	Central Anatolia	Niğde	Çamardı	0.375688	Acceptable	Marginal Suitable	Marginal Suitable	1501	BSk	Arid, steppe, cold
359	Central Anatolia	Sivas	Gemerek	0.535669	Suitable	Marginal Suitable	Acceptable	1211	BSk	Arid, steppe, cold
743	Central Anatolia	Sivas	Şarkışla	0.496051	Suitable	Marginal Suitable	Marginal Suitable	1234	BSk	Arid, steppe, cold
912	Central Anatolia	Sivas	Yıldızeli	0.466680	Suitable	Marginal Suitable	Marginal Suitable	1370	BSk	Arid, steppe, cold
278	Central Anatolia	Sivas	Divriği	0.460479	Suitable	Marginal Suitable	Marginal Suitable	1014	BSk	Arid, steppe, cold
858	Central Anatolia	Sivas	Ulaş	0.453582	Suitable	Marginal Suitable	Marginal Suitable	1391	BSk	Arid, steppe, cold
787	Central Anatolia	Sivas	Sivas/Merkez	0.451948	Suitable	Marginal Suitable	Marginal Suitable	1313	BSk	Arid, steppe, cold
56	Central Anatolia	Sivas	Altınyayla/Sivas	0.436926	Suitable	Marginal Suitable	Marginal Suitable	1457	BSk	Arid, steppe, cold
416	Central Anatolia	Sivas	Hafik	0.425440	Suitable	Marginal Suitable	Marginal Suitable	1312	BSk	Arid, steppe, cold
284	Central Anatolia	Sivas	Doğanşar	0.415984	Suitable	Marginal Suitable	Marginal Suitable	1299	Dsb	Cold, dry summer, warm summer
410	Central Anatolia	Sivas	Gürün	0.411804	Suitable	Marginal Suitable	Marginal Suitable	1327	BSk	Arid, steppe, cold
26	Central Anatolia	Sivas	Akıncılar	0.408998	Suitable	Marginal Suitable	Marginal Suitable	1045	Dsa	Cold, dry summer, hot summer
813	Central Anatolia	Sivas	Suşehri	0.405688	Suitable	Marginal Suitable	Marginal Suitable	1073	Dsb	Cold, dry summer, warm summer
500	Central Anatolia	Sivas	Kangal	0.365161	Acceptable	Marginal Suitable	Marginal Suitable	1528	BSk	Arid, steppe, cold
380	Central Anatolia	Sivas	Gölova	0.355926	Acceptable	Marginal Suitable	Marginal Suitable	1336	Dsb	Cold, dry summer, warm summer
584	Central Anatolia	Sivas	Koyulhisar	0.330348	Acceptable	Marginal Suitable	Marginal Suitable	947	Dsb	Cold, dry summer, warm summer
920	Central Anatolia	Sivas	Zara	0.309327	Acceptable	Marginal Suitable	Marginal Suitable	1344	Dsb	Cold, dry summer, warm summer
467	Central Anatolia	Sivas	İmranlı	0.262675	Acceptable	Marginal Suitable	Marginal Suitable	1605	Dsb	Cold, dry summer, warm summer
91	Central Anatolia	Yozgat	Aydıncık/Yozgat	0.804795	Extremely Suitable	Acceptable	Suitable	831	BSk	Arid, steppe, cold
215	Central Anatolia	Yozgat	Çekerek	0.788407	Very Suitable	Acceptable	Acceptable	936	BSk	Arid, steppe, cold
488	Central Anatolia	Yozgat	Kadışehri	0.775695	Very Suitable	Acceptable	Acceptable	1036	BSk	Arid, steppe, cold
736	Central Anatolia	Yozgat	Saraykent	0.737591	Very Suitable	Acceptable	Acceptable	1142	BSk	Arid, steppe, cold
904	Central Anatolia	Yozgat	Yerköy	0.703604	Very Suitable	Acceptable	Acceptable	770	BSk	Arid, steppe, cold
800	Central Anatolia	Yozgat	Sorgun	0.698787	Very Suitable	Acceptable	Acceptable	1083	BSk	Arid, steppe, cold
742	Central Anatolia	Yozgat	Sarıkaya	0.695473	Very Suitable	Acceptable	Acceptable	1116	BSk	Arid, steppe, cold
756	Central Anatolia	Yozgat	Şefaatli	0.684158	Very Suitable	Acceptable	Acceptable	914	BSk	Arid, steppe, cold
914	Central Anatolia	Yozgat	Yozgat/Merkez	0.684119	Very Suitable	Acceptable	Acceptable	1317	Dsb	Cold, dry summer, warm summer
155	Central Anatolia	Yozgat	Boğazlıyan	0.670368	Very Suitable	Acceptable	Acceptable	1071	BSk	Arid, steppe, cold

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
898	Central Anatolia	Yozgat	Yenifakılı	0.663289	Very Suitable	Acceptable	Acceptable	1012	BSk	Arid, steppe, cold
24	Central Anatolia	Yozgat	Akdağmadeni	0.635062	Very Suitable	Acceptable	Acceptable	1322	BSk	Arid, steppe, cold
195	Central Anatolia	Yozgat	Çandır	0.623604	Very Suitable	Acceptable	Acceptable	1235	BSk	Arid, steppe, cold
212	Central Anatolia	Yozgat	Çayıralan	0.534941	Suitable	Marginal Suitable	Acceptable	1362	BSk	Arid, steppe, cold
691	East Anatolia	Ağrı	Patnos	0.383512	Acceptable	Marginal Suitable	Marginal Suitable	1639	Dsb	Cold, dry summer, warm summer
288	East Anatolia	Ağrı	Doğubayazıt	0.352574	Acceptable	Marginal Suitable	Marginal Suitable	1594	BSk	Arid, steppe, cold
852	East Anatolia	Ağrı	Tutak	0.315048	Acceptable	Marginal Suitable	Marginal Suitable	1567	Dsa	Cold, dry summer, hot summer
421	East Anatolia	Ağrı	Hamur	0.301002	Acceptable	Marginal Suitable	Marginal Suitable	1690	Dsb	Cold, dry summer, warm summer
15	East Anatolia	Ağrı	Ağrı/Merkez	0.256338	Acceptable	Marginal Suitable	Marginal Suitable	1630	Dsb	Cold, dry summer, warm summer
279	East Anatolia	Ağrı	Diyadin	0.240608	Acceptable	Marginal Suitable	Marginal Suitable	1933	Dsb	Cold, dry summer, warm summer
822	East Anatolia	Ağrı	Taşlıçay	0.203907	Acceptable	Marginal Suitable	Marginal Suitable	1762	Dsb	Cold, dry summer, warm summer
310	East Anatolia	Ağrı	Eleşkirt	0.201000	Acceptable	Marginal Suitable	Marginal Suitable	1810	Dsb	Cold, dry summer, warm summer
709	East Anatolia	Ardahan	Posof	0.226206	Acceptable	Marginal Suitable	Marginal Suitable	1546	Dfb	Cold, no dry season, warm summer
251	East Anatolia	Ardahan	Damal	0.216571	Acceptable	Marginal Suitable	Marginal Suitable	2056	Dfc	Cold, no dry season, cold summer
238	East Anatolia	Ardahan	Çıldır	0.216510	Acceptable	Marginal Suitable	Marginal Suitable	1911	Dfb	Cold, no dry season, warm summer
423	East Anatolia	Ardahan	Hanak	0.202157	Acceptable	Marginal Suitable	Marginal Suitable	1826	Dfb	Cold, no dry season, warm summer
376	East Anatolia	Ardahan	Göle	0.186908	Marginal Suitable	Marginal Suitable	Marginal Suitable	2020	Dfb	Cold, no dry season, warm summer
68	East Anatolia	Ardahan	Ardahan/Merkez	0.175330	Marginal Suitable	Marginal Suitable	Marginal Suitable	1799	Dfb	Cold, no dry season, warm summer
361	East Anatolia	Bingöl	Genç	0.589144	Suitable	Acceptable	Acceptable	1018	Dsa	Cold, dry summer, hot summer
149	East Anatolia	Bingöl	Bingöl/Merkez	0.559096	Suitable	Marginal Suitable	Acceptable	1159	Dsa	Cold, dry summer, hot summer
798	East Anatolia	Bingöl	Solhan	0.383848	Acceptable	Marginal Suitable	Marginal Suitable	1424	Dsa	Cold, dry summer, hot summer
892	East Anatolia	Bingöl	Yayladere	0.310208	Acceptable	Marginal Suitable	Marginal Suitable	1569	Dsa	Cold, dry summer, hot summer
551	East Anatolia	Bingöl	Kiğı	0.307583	Acceptable	Marginal Suitable	Marginal Suitable	1519	Dsa	Cold, dry summer, hot summer
5	East Anatolia	Bingöl	Adaklı	0.265016	Acceptable	Marginal Suitable	Marginal Suitable	1507	Dsb	Cold, dry summer, warm summer
894	East Anatolia	Bingöl	Yedisu	0.174091	Marginal Suitable	Marginal Suitable	Marginal Suitable	1534	Dsb	Cold, dry summer, warm summer
523	East Anatolia	Bingöl	Karlıova	0.129535	Marginal Suitable	Marginal Suitable	Marginal Suitable	1824	Dsb	Cold, dry summer, warm summer
7	East Anatolia	Bitlis	Adilcevaz	0.643563	Very Suitable	Acceptable	Acceptable	1683	Dsb	Cold, dry summer, warm summer
651	East Anatolia	Bitlis	Mutki	0.558023	Suitable	Marginal Suitable	Acceptable	1486	Dsa	Cold, dry summer, hot summer
17	East Anatolia	Bitlis	Ahlat	0.503143	Suitable	Marginal Suitable	Marginal Suitable	1703	Dsb	Cold, dry summer, warm summer
152	East Anatolia	Bitlis	Bitlis/Merkez	0.500961	Suitable	Marginal Suitable	Marginal Suitable	1637	Dsa	Cold, dry summer, hot summer
407	East Anatolia	Bitlis	Güroymak	0.482456	Suitable	Marginal Suitable	Marginal Suitable	1308	Dsa	Cold, dry summer, hot summer
824	East Anatolia	Bitlis	Tatvan	0.451690	Suitable	Marginal Suitable	Marginal Suitable	1656	Dsb	Cold, dry summer, warm summer
446	East Anatolia	Bitlis	Hizan	0.394637	Acceptable	Marginal Suitable	Marginal Suitable	1472	Dsb	Cold, dry summer, warm summer
12	East Anatolia	Elazığ	Ağın	0.697922	Very Suitable	Acceptable	Acceptable	889	Dsa	Cold, dry summer, hot summer
612	East Anatolia	Elazığ	Maden	0.660198	Very Suitable	Acceptable	Acceptable	1021	Dsa	Cold, dry summer, hot summer
790	East Anatolia	Elazığ	Sivrice	0.647860	Very Suitable	Acceptable	Acceptable	1273	Dsa	Cold, dry summer, hot summer
688	East Anatolia	Elazığ	Palu	0.636246	Very Suitable	Acceptable	Acceptable	871	Dsa	Cold, dry summer, hot summer
582	East Anatolia	Elazığ	Kovancılar	0.628869	Very Suitable	Acceptable	Acceptable	967	Dsa	Cold, dry summer, hot summer
536	East Anatolia	Elazığ	Keban	0.620653	Very Suitable	Acceptable	Acceptable	799	Dsa	Cold, dry summer, hot summer
306	East Anatolia	Elazığ	Elazığ/Merkez	0.618405	Very Suitable	Acceptable	Acceptable	1041	BSk	Arid, steppe, cold
510	East Anatolia	Elazığ	Karakoçan	0.615995	Very Suitable	Acceptable	Acceptable	1095	Dsa	Cold, dry summer, hot summer
119	East Anatolia	Elazığ	Baskil	0.600498	Very Suitable	Acceptable	Acceptable	1212	Dsa	Cold, dry summer, hot summer
40	East Anatolia	Elazığ	Alacakaya	0.536447	Suitable	Marginal Suitable	Acceptable	1147	Dsa	Cold, dry summer, hot summer
73	East Anatolia	Elazığ	Arıcak	0.419244	Suitable	Marginal Suitable	Marginal Suitable	1092	Csa	Temperate, dry summer, hot summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
542	East Anatolia	Erzincan	Kemaliye	0.563378	Suitable	Marginal Suitable	Acceptable	947	Dsa	Cold, dry summer, hot summer
464	East Anatolia	Erzincan	İliç	0.542834	Suitable	Marginal Suitable	Acceptable	1104	Dsa	Cold, dry summer, hot summer
541	East Anatolia	Erzincan	Kemah	0.274603	Acceptable	Marginal Suitable	Marginal Suitable	1068	Dsa	Cold, dry summer, hot summer
713	East Anatolia	Erzincan	Refahiye	0.270173	Acceptable	Marginal Suitable	Marginal Suitable	1602	Dsb	Cold, dry summer, warm summer
831	East Anatolia	Erzincan	Tercan	0.253732	Acceptable	Marginal Suitable	Marginal Suitable	1421	Dsa	Cold, dry summer, hot summer
329	East Anatolia	Erzincan	Erzincan/Merkez	0.244477	Acceptable	Marginal Suitable	Marginal Suitable	1216	BSk	Arid, steppe, cold
213	East Anatolia	Erzincan	Çayırlı	0.239900	Acceptable	Marginal Suitable	Marginal Suitable	1527	Dsb	Cold, dry summer, warm summer
872	East Anatolia	Erzincan	Üzümlü	0.189948	Marginal Suitable	Marginal Suitable	Marginal Suitable	1397	Dsb	Cold, dry summer, warm summer
683	East Anatolia	Erzincan	Otlukbeli	0.183656	Marginal Suitable	Marginal Suitable	Marginal Suitable	1741	Dsb	Cold, dry summer, warm summer
873	East Anatolia	Erzurum	Uzundere	0.346656	Acceptable	Marginal Suitable	Marginal Suitable	1098	Dfb	Cold, no dry season, warm summer
505	East Anatolia	Erzurum	Karaçoban	0.344263	Acceptable	Marginal Suitable	Marginal Suitable	1549	Dsb	Cold, dry summer, warm summer
669	East Anatolia	Erzurum	Oltu	0.299536	Acceptable	Marginal Suitable	Marginal Suitable	1274	BSk	Arid, steppe, cold
447	East Anatolia	Erzurum	Hınıs	0.266105	Acceptable	Marginal Suitable	Marginal Suitable	1713	Dsb	Cold, dry summer, warm summer
654	East Anatolia	Erzurum	Narman	0.236581	Acceptable	Marginal Suitable	Marginal Suitable	1644	Dfb	Cold, no dry season, warm summer
451	East Anatolia	Erzurum	Horasan	0.224625	Acceptable	Marginal Suitable	Marginal Suitable	1560	BSk	Arid, steppe, cold
480	East Anatolia	Erzurum	İspir	0.211854	Acceptable	Marginal Suitable	Marginal Suitable	1189	Dfb	Cold, no dry season, warm summer
574	East Anatolia	Erzurum	Köprüköy	0.211188	Acceptable	Marginal Suitable	Marginal Suitable	1602	Dfb	Cold, no dry season, warm summer
690	East Anatolia	Erzurum	Pasinler	0.210109	Acceptable	Marginal Suitable	Marginal Suitable	1661	Dsb	Cold, dry summer, warm summer
830	East Anatolia	Erzurum	Tekman	0.209783	Acceptable	Marginal Suitable	Marginal Suitable	1937	Dsb	Cold, dry summer, warm summer
465	East Anatolia	Erzurum	Ilıca	0.205318	Acceptable	Marginal Suitable	Marginal Suitable	1763	Dfb	Cold, no dry season, warm summer
841	East Anatolia	Erzurum	Tortum	0.204867	Acceptable	Marginal Suitable	Marginal Suitable	1618	Dfb	Cold, no dry season, warm summer
330	East Anatolia	Erzurum	Erzurum/Merkez	0.197925	Marginal Suitable	Marginal Suitable	Marginal Suitable	1923	Dfb	Cold, no dry season, warm summer
80	East Anatolia	Erzurum	Aşkale	0.196363	Marginal Suitable	Marginal Suitable	Marginal Suitable	1661	Dsb	Cold, dry summer, warm summer
765	East Anatolia	Erzurum	Şenkaya	0.189010	Marginal Suitable	Marginal Suitable	Marginal Suitable	1867	Dfb	Cold, no dry season, warm summer
697	East Anatolia	Erzurum	Pazaryolu	0.187658	Marginal Suitable	Marginal Suitable	Marginal Suitable	1482	Dfb	Cold, no dry season, warm summer
670	East Anatolia	Erzurum	Olur	0.186941	Marginal Suitable	Marginal Suitable	Marginal Suitable	1334	Dfb	Cold, no dry season, warm summer
520	East Anatolia	Erzurum	Karayazı	0.172491	Marginal Suitable	Marginal Suitable	Marginal Suitable	2281	Dsb	Cold, dry summer, warm summer
201	East Anatolia	Erzurum	Çat	0.153871	Marginal Suitable	Marginal Suitable	Marginal Suitable	1921	Dsb	Cold, dry summer, warm summer
245	East Anatolia	Hakkari	Çukurca	0.630680	Very Suitable	Acceptable	Acceptable	1312	Dsa	Cold, dry summer, hot summer
763	East Anatolia	Hakkari	Şemdinli	0.425599	Suitable	Marginal Suitable	Marginal Suitable	1391	Dsa	Cold, dry summer, hot summer
915	East Anatolia	Hakkari	Yüksekova	0.241724	Acceptable	Marginal Suitable	Marginal Suitable	1876	Dsa	Cold, dry summer, hot summer
417	East Anatolia	Hakkari	Hakkari/Merkez	0.182248	Marginal Suitable	Marginal Suitable	Marginal Suitable	1756	Dsa	Cold, dry summer, hot summer
66	East Anatolia	Iğdır	Aralık	0.680711	Very Suitable	Acceptable	Acceptable	819	BWk	Arid, desert, cold
511	East Anatolia	Iğdır	Karakoyunlu	0.659901	Very Suitable	Acceptable	Acceptable	847	BSk	Arid, steppe, cold
457	East Anatolia	Iğdır	Iğdır/Merkez	0.623087	Very Suitable	Acceptable	Acceptable	860	BWk	Arid, desert, cold
854	East Anatolia	Iğdır	Tuzluca	0.590879	Suitable	Acceptable	Acceptable	1104	BSk	Arid, steppe, cold
274	East Anatolia	Kars	Digor	0.404474	Suitable	Marginal Suitable	Marginal Suitable	1650	BSk	Arid, steppe, cold
36	East Anatolia	Kars	Akyaka	0.306700	Acceptable	Marginal Suitable	Marginal Suitable	1492	Dfb	Cold, no dry season, warm summer
75	East Anatolia	Kars	Arpaçay	0.272178	Acceptable	Marginal Suitable	Marginal Suitable	1695	Dfb	Cold, no dry season, warm summer
525	East Anatolia	Kars	Kars/Merkez	0.244178	Acceptable	Marginal Suitable	Marginal Suitable	1.756	Dfb	Cold, no dry season, warm summer
815	East Anatolia	Kars	Susuz	0.239210	Acceptable	Marginal Suitable	Marginal Suitable	1755	Dfb	Cold, no dry season, warm summer
490	East Anatolia	Kars	Kağızman	0.230625	Acceptable	Marginal Suitable	Marginal Suitable	1.414	BSk	Arid, steppe, cold
762	East Anatolia	Kars	Selim	0.209061	Acceptable	Marginal Suitable	Marginal Suitable	1858	Dfb	Cold, no dry season, warm summer
741	East Anatolia	Kars	Sarıkamış	0.200095	Acceptable	Marginal Suitable	Marginal Suitable	2103	Dfb	Cold, no dry season, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
286	East Anatolia	Malatya	Doğanyol	0.659732	Very Suitable	Acceptable	Acceptable	929	Dsa	Cold, dry summer, hot summer
710	East Anatolia	Malatya	Pütürge	0.659389	Very Suitable	Acceptable	Acceptable	1224	Dsa	Cold, dry summer, hot summer
71	East Anatolia	Malatya	Arguvan	0.643651	Very Suitable	Acceptable	Acceptable	1163	BSk	Arid, steppe, cold
67	East Anatolia	Malatya	Arapgir	0.611986	Very Suitable	Acceptable	Acceptable	1172	Dsa	Cold, dry summer, hot summer
893	East Anatolia	Malatya	Yazıhan	0.609032	Very Suitable	Acceptable	Acceptable	828	BSk	Arid, steppe, cold
495	East Anatolia	Malatya	Kale/Malatya	0.603022	Very Suitable	Acceptable	Acceptable	729	Dsa	Cold, dry summer, hot summer
908	East Anatolia	Malatya	Yeşilyurt/Malatya	0.594792	Suitable	Acceptable	Acceptable	1010	Dsa	Cold, dry summer, hot summer
20	East Anatolia	Malatya	Akçadağ	0.590331	Suitable	Acceptable	Acceptable	1056	BSk	Arid, steppe, cold
441	East Anatolia	Malatya	Hekimhan	0.589546	Suitable	Acceptable	Acceptable	1122	BSk	Arid, steppe, cold
614	East Anatolia	Malatya	Malatya/Merkez	0.582884	Suitable	Acceptable	Acceptable	970	BSk	Arid, steppe, cold
285	East Anatolia	Malatya	Doğanşehir	0.577201	Suitable	Acceptable	Acceptable	1225	Dsa	Cold, dry summer, hot summer
252	East Anatolia	Malatya	Darende	0.544681	Suitable	Marginal Suitable	Acceptable	1027	BSk	Arid, steppe, cold
122	East Anatolia	Malatya	Battalgazi	0.491984	Suitable	Marginal Suitable	Marginal Suitable	782	BSk	Arid, steppe, cold
592	East Anatolia	Malatya	Kuluncak	0.424372	Suitable	Marginal Suitable	Marginal Suitable	1276	BSk	Arid, steppe, cold
578	East Anatolia	Muş	Korkut	0.485481	Suitable	Marginal Suitable	Marginal Suitable	1315	Dsa	Cold, dry summer, hot summer
430	East Anatolia	Muş	Hasköy	0.479801	Suitable	Marginal Suitable	Marginal Suitable	1277	Dsa	Cold, dry summer, hot summer
648	East Anatolia	Muş	Muş/Merkez	0.450282	Suitable	Marginal Suitable	Marginal Suitable	1334	Dsa	Cold, dry summer, hot summer
615	East Anatolia	Muş	Malazgirt	0.427120	Suitable	Marginal Suitable	Marginal Suitable	1532	Dsa	Cold, dry summer, hot summer
175	East Anatolia	Muş	Bulanık	0.371107	Acceptable	Marginal Suitable	Marginal Suitable	1488	Dsa	Cold, dry summer, hot summer
877	East Anatolia	Muş	Varto	0.246368	Acceptable	Marginal Suitable	Marginal Suitable	1519	Dsa	Cold, dry summer, hot summer
701	East Anatolia	Tunceli	Pertek	0.661053	Very Suitable	Acceptable	Acceptable	1167	Dsa	Cold, dry summer, hot summer
626	East Anatolia	Tunceli	Mazgirt	0.606395	Very Suitable	Acceptable	Acceptable	1413	Dsa	Cold, dry summer, hot summer
846	East Anatolia	Tunceli	Tunceli/Merkez	0.588783	Suitable	Acceptable	Acceptable	922	Dsa	Cold, dry summer, hot summer
452	East Anatolia	Tunceli	Hozat	0.559443	Suitable	Marginal Suitable	Acceptable	1525	Dsa	Cold, dry summer, hot summer
656	East Anatolia	Tunceli	Nazımiye	0.493052	Suitable	Marginal Suitable	Marginal Suitable	1578	Dsa	Cold, dry summer, hot summer
220	East Anatolia	Tunceli	Çemişgezek	0.356275	Acceptable	Marginal Suitable	Marginal Suitable	1013	Dsa	Cold, dry summer, hot summer
684	East Anatolia	Tunceli	Ovacık/Tunceli	0.183384	Marginal Suitable	Marginal Suitable	Marginal Suitable	1257	Dsa	Cold, dry summer, hot summer
712	East Anatolia	Tunceli	Pülümür	0.172024	Marginal Suitable	Marginal Suitable	Marginal Suitable	1524	Dsb	Cold, dry summer, warm summer
733	East Anatolia	Van	Saray/Van	0.663202	Very Suitable	Acceptable	Acceptable	2095	BSk	Arid, steppe, cold
319	East Anatolia	Van	Erciş	0.622683	Very Suitable	Acceptable	Acceptable	1691	Dsb	Cold, dry summer, warm summer
876	East Anatolia	Van	Van/Merkez	0.607213	Very Suitable	Acceptable	Acceptable	1728	BSk	Arid, steppe, cold
301	East Anatolia	Van	Edremit/Van	0.580249	Suitable	Acceptable	Acceptable	1736	BSk	Arid, steppe, cold
367	East Anatolia	Van	Gevaş	0.440937	Suitable	Marginal Suitable	Marginal Suitable	1694	Dsb	Cold, dry summer, warm summer
408	East Anatolia	Van	Gürpınar	0.346356	Acceptable	Marginal Suitable	Marginal Suitable	1748	BSk	Arid, steppe, cold
105	East Anatolia	Van	Bahçesaray	0.254563	Acceptable	Marginal Suitable	Marginal Suitable	1767	Dsb	Cold, dry summer, warm summer
686	East Anatolia	Van	Özalp	0.239381	Acceptable	Marginal Suitable	Marginal Suitable	1999	BSk	Arid, steppe, cold
184	East Anatolia	Van	Çaldıran	0.223488	Acceptable	Marginal Suitable	Marginal Suitable	2046	Dsb	Cold, dry summer, warm summer
645	East Anatolia	Van	Muradiye	0.207058	Acceptable	Marginal Suitable	Marginal Suitable	1705	Dsb	Cold, dry summer, warm summer
118	East Anatolia	Van	Başkale	0.190518	Marginal Suitable	Marginal Suitable	Marginal Suitable	2320	Dsb	Cold, dry summer, warm summer
202	East Anatolia	Van	Çatak	0.157885	Marginal Suitable	Marginal Suitable	Marginal Suitable	1500	Dsb	Cold, dry summer, warm summer
294	Marmara	Balıkesir	Dursunbey	0.737564	Very Suitable	Acceptable	Acceptable	638	Csa	Temperate, dry summer, hot summer
814	Marmara	Balıkesir	Susurluk	0.657276	Very Suitable	Acceptable	Acceptable	46	Csa	Temperate, dry summer, hot summer
481	Marmara	Balıkesir	İvrindi	0.645448	Very Suitable	Acceptable	Acceptable	277	Csa	Temperate, dry summer, hot summer
113	Marmara	Balıkesir	Balya	0.645296	Very Suitable	Acceptable	Acceptable	242	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
792	Marmara	Balıkesir	Sındırgı	0.640112	Very Suitable	Acceptable	Acceptable	228	Csa	Temperate, dry summer, hot summer
434	Marmara	Balıkesir	Havran	0.632025	Very Suitable	Acceptable	Acceptable	43	Csa	Temperate, dry summer, hot summer
384	Marmara	Balıkesir	Gönen/Balıkesir	0.623872	Very Suitable	Acceptable	Acceptable	41	Csa	Temperate, dry summer, hot summer
546	Marmara	Balıkesir	Kepsut	0.621040	Very Suitable	Acceptable	Acceptable	88	Csa	Temperate, dry summer, hot summer
752	Marmara	Balıkesir	Savaştepe	0.614127	Very Suitable	Acceptable	Acceptable	284	Csa	Temperate, dry summer, hot summer
621	Marmara	Balıkesir	Manyas	0.604658	Very Suitable	Acceptable	Acceptable	56	Csa	Temperate, dry summer, hot summer
111	Marmara	Balıkesir	Balıkesir/Merkez	0.602092	Very Suitable	Acceptable	Acceptable	145	Csa	Temperate, dry summer, hot summer
147	Marmara	Balıkesir	Bigadiç	0.600149	Very Suitable	Acceptable	Acceptable	169	Csa	Temperate, dry summer, hot summer
300	Marmara	Balıkesir	Edremit/Balıkesir	0.592234	Suitable	Acceptable	Acceptable	31	Csa	Temperate, dry summer, hot summer
179	Marmara	Balıkesir	Burhaniye	0.408645	Suitable	Marginal Suitable	Marginal Suitable	22	Csa	Temperate, dry summer, hot summer
383	Marmara	Balıkesir	Gömeç	0.256795	Acceptable	Marginal Suitable	Marginal Suitable	16	Csa	Temperate, dry summer, hot summer
115	Marmara	Balıkesir	Bandırma	0.240686	Acceptable	Marginal Suitable	Marginal Suitable	17	Csa	Temperate, dry summer, hot summer
623	Marmara	Balıkesir	Marmara	0.214300	Acceptable	Marginal Suitable	Marginal Suitable	38	Csa	Temperate, dry summer, hot summer
320	Marmara	Balıkesir	Erdek	0.202737	Acceptable	Marginal Suitable	Marginal Suitable	7	Csa	Temperate, dry summer, hot summer
97	Marmara	Balıkesir	Ayvalık	0.179828	Marginal Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
696	Marmara	Bilecik	Pazaryeri	0.886791	Extremely Suitable	Suitable	Very Suitable	806	BSk	Arid, steppe, cold
169	Marmara	Bilecik	Bozüyük	0.860398	Extremely Suitable	Suitable	Very Suitable	757	BSk	Arid, steppe, cold
795	Marmara	Bilecik	Söğüt	0.852947	Extremely Suitable	Suitable	Very Suitable	682	BSk	Arid, steppe, cold
148	Marmara	Bilecik	Bilecik/Merkez	0.837237	Extremely Suitable	Acceptable	Suitable	513	BSk	Arid, steppe, cold
381	Marmara	Bilecik	Gölpazarı	0.826469	Extremely Suitable	Acceptable	Suitable	539	Csb	Temperate, dry summer, warm summer
472	Marmara	Bilecik	İnhisar	0.823933	Extremely Suitable	Acceptable	Suitable	208	BSk	Arid, steppe, cold
901	Marmara	Bilecik	Yenipazar/Bilecik	0.822648	Extremely Suitable	Acceptable	Suitable	622	BSk	Arid, steppe, cold
680	Marmara	Bilecik	Osmaneli	0.803862	Extremely Suitable	Acceptable	Suitable	107	BSk	Arid, steppe, cold
471	Marmara	Bursa	İnegöl	0.865994	Extremely Suitable	Suitable	Very Suitable	294	BSk	Arid, steppe, cold
550	Marmara	Bursa	Kestel	0.849365	Extremely Suitable	Suitable	Suitable	122	Csa	Temperate, dry summer, hot summer
409	Marmara	Bursa	Gürsu	0.836487	Extremely Suitable	Acceptable	Suitable	112	Csa	Temperate, dry summer, hot summer
483	Marmara	Bursa	İznik	0.821612	Extremely Suitable	Acceptable	Suitable	103	Csa	Temperate, dry summer, hot summer
539	Marmara	Bursa	Keles	0.786028	Very Suitable	Acceptable	Acceptable	1026	Csb	Temperate, dry summer, warm summer
673	Marmara	Bursa	Orhaneli	0.784822	Very Suitable	Acceptable	Acceptable	491	Csb	Temperate, dry summer, warm summer
903	Marmara	Bursa	Yenişehir/Bursa	0.784315	Very Suitable	Acceptable	Acceptable	229	BSk	Arid, steppe, cold
426	Marmara	Bursa	Harmancık	0.777616	Very Suitable	Acceptable	Acceptable	689	Csa	Temperate, dry summer, hot summer
181	Marmara	Bursa	Büyükorhan	0.766750	Very Suitable	Acceptable	Acceptable	799	Csb	Temperate, dry summer, warm summer
911	Marmara	Bursa	Yıldırım	0.763761	Very Suitable	Acceptable	Acceptable	160	Csa	Temperate, dry summer, hot summer
674	Marmara	Bursa	Orhangazi	0.756467	Very Suitable	Acceptable	Acceptable	115	Csa	Temperate, dry summer, hot summer
360	Marmara	Bursa	Gemlik	0.751252	Very Suitable	Acceptable	Acceptable	7	Csa	Temperate, dry summer, hot summer
681	Marmara	Bursa	Osmangazi	0.743255	Very Suitable	Acceptable	Acceptable	173	Csa	Temperate, dry summer, hot summer
660	Marmara	Bursa	Nilüfer	0.706398	Very Suitable	Acceptable	Acceptable	121	Csa	Temperate, dry summer, hot summer
610	Marmara	Bursa	Mustafakemalpaşa	0.644092	Very Suitable	Acceptable	Acceptable	27	Csa	Temperate, dry summer, hot summer
503	Marmara	Bursa	Karacabey	0.526140	Suitable	Marginal Suitable	Acceptable	35	Csa	Temperate, dry summer, hot summer
642	Marmara	Bursa	Mudanya	0.365437	Acceptable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
896	Marmara	Çanakkale	Yenice/Çanakkale	0.671740	Very Suitable	Acceptable	Acceptable	275	Csa	Temperate, dry summer, hot summer
192	Marmara	Çanakkale	Çan	0.648495	Very Suitable	Acceptable	Acceptable	83	Csa	Temperate, dry summer, hot summer
128	Marmara	Çanakkale	Bayramiç	0.615741	Very Suitable	Acceptable	Acceptable	106	Csa	Temperate, dry summer, hot summer
146	Marmara	Çanakkale	Biga	0.580160	Suitable	Acceptable	Acceptable	51	Csa	Temperate, dry summer, hot summer

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LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
342	Marmara	Çanakkale	Ezine	0.400004	Suitable	Marginal Suitable	Marginal Suitable	50	Csa	Temperate, dry summer, hot summer
607	Marmara	Çanakkale	Lapseki	0.399036	Acceptable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
162	Marmara	Çanakkale	Bozcaada	0.205220	Acceptable	Marginal Suitable	Marginal Suitable	41	Csa	Temperate, dry summer, hot summer
358	Marmara	Çanakkale	Gelibolu	0.198028	Marginal Suitable	Marginal Suitable	Marginal Suitable	20	Csa	Temperate, dry summer, hot summer
370	Marmara	Çanakkale	Gökçeada	0.192832	Marginal Suitable	Marginal Suitable	Marginal Suitable	50	Csa	Temperate, dry summer, hot summer
298	Marmara	Çanakkale	Eceabat	0.177178	Marginal Suitable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
95	Marmara	Çanakkale	Ayvacık/Çanakkale	0.160372	Marginal Suitable	Marginal Suitable	Marginal Suitable	288	Csa	Temperate, dry summer, hot summer
194	Marmara	Çanakkale	Çanakkale/Merkez	0.151378	Marginal Suitable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
634	Marmara	Edirne	Meriç	0.661276	Very Suitable	Acceptable	Acceptable	42	Csa	Temperate, dry summer, hot summer
874	Marmara	Edirne	Uzunköprü	0.656873	Very Suitable	Acceptable	Acceptable	32	Csa	Temperate, dry summer, hot summer
803	Marmara	Edirne	Süloğlu	0.645136	Very Suitable	Acceptable	Acceptable	151	Csa	Temperate, dry summer, hot summer
606	Marmara	Edirne	Lalapaşa	0.633805	Very Suitable	Acceptable	Acceptable	161	Cfa	Temperate, no dry season, hot summer
474	Marmara	Edirne	İpsala	0.629904	Very Suitable	Acceptable	Acceptable	18	Csa	Temperate, dry summer, hot summer
435	Marmara	Edirne	Havsa	0.629156	Very Suitable	Acceptable	Acceptable	78	Csa	Temperate, dry summer, hot summer
299	Marmara	Edirne	Edirne/Merkez	0.617741	Very Suitable	Acceptable	Acceptable	50	Csa	Temperate, dry summer, hot summer
547	Marmara	Edirne	Keşan	0.616666	Very Suitable	Acceptable	Acceptable	122	Csa	Temperate, dry summer, hot summer
317	Marmara	Edirne	Enez	0.192348	Marginal Suitable	Marginal Suitable	Marginal Suitable	18	Csa	Temperate, dry summer, hot summer
865	Marmara	İstanbul	Ümraniye	0.687829	Very Suitable	Acceptable	Acceptable	144	Csa	Temperate, dry summer, hot summer
353	Marmara	İstanbul	Gaziosmanpaşa	0.570950	Suitable	Marginal Suitable	Acceptable	113	Csa	Temperate, dry summer, hot summer
746	Marmara	İstanbul	Sarıyer	0.562998	Suitable	Marginal Suitable	Acceptable	81	Csa	Temperate, dry summer, hot summer
140	Marmara	İstanbul	Beykoz	0.558112	Suitable	Marginal Suitable	Acceptable	9	Csa	Temperate, dry summer, hot summer
804	Marmara	İstanbul	Sultanbeyli	0.552272	Suitable	Marginal Suitable	Acceptable	127	Csa	Temperate, dry summer, hot summer
203	Marmara	İstanbul	Çatalca	0.499124	Suitable	Marginal Suitable	Marginal Suitable	84	Csa	Temperate, dry summer, hot summer
786	Marmara	İstanbul	Şişli	0.490012	Suitable	Marginal Suitable	Marginal Suitable	111	Csa	Temperate, dry summer, hot summer
774	Marmara	İstanbul	Şile	0.489071	Suitable	Marginal Suitable	Marginal Suitable	49	Csa	Temperate, dry summer, hot summer
489	Marmara	İstanbul	Kağıthane	0.329751	Acceptable	Marginal Suitable	Marginal Suitable	16	Csa	Temperate, dry summer, hot summer
331	Marmara	İstanbul	Esenler	0.277485	Acceptable	Marginal Suitable	Marginal Suitable	44	Csa	Temperate, dry summer, hot summer
699	Marmara	İstanbul	Pendik	0.265108	Acceptable	Marginal Suitable	Marginal Suitable	35	Csa	Temperate, dry summer, hot summer
130	Marmara	İstanbul	Bayrampaşa	0.260831	Acceptable	Marginal Suitable	Marginal Suitable	102	Csa	Temperate, dry summer, hot summer
527	Marmara	İstanbul	Kartal	0.251700	Acceptable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
134	Marmara	İstanbul	Beşiktaş	0.251103	Acceptable	Marginal Suitable	Marginal Suitable	16	Csa	Temperate, dry summer, hot summer
341	Marmara	İstanbul	Eyüp	0.241348	Acceptable	Marginal Suitable	Marginal Suitable	8	Csa	Temperate, dry summer, hot summer
853	Marmara	İstanbul	Tuzla	0.231296	Acceptable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
6	Marmara	İstanbul	Adalar	0.228781	Acceptable	Marginal Suitable	Marginal Suitable	48	Csa	Temperate, dry summer, hot summer
776	Marmara	İstanbul	Silivri	0.227785	Acceptable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
617	Marmara	İstanbul	Maltepe	0.221151	Acceptable	Marginal Suitable	Marginal Suitable	8	Csa	Temperate, dry summer, hot summer
102	Marmara	İstanbul	Bağcılar	0.198797	Marginal Suitable	Marginal Suitable	Marginal Suitable	34	Csa	Temperate, dry summer, hot summer
404	Marmara	İstanbul	Güngören	0.197745	Marginal Suitable	Marginal Suitable	Marginal Suitable	69	Csa	Temperate, dry summer, hot summer
142	Marmara	İstanbul	Beyoğlu	0.195056	Marginal Suitable	Marginal Suitable	Marginal Suitable	82	Csa	Temperate, dry summer, hot summer
343	Marmara	İstanbul	Fatih	0.190684	Marginal Suitable	Marginal Suitable	Marginal Suitable	33	Csa	Temperate, dry summer, hot summer
107	Marmara	İstanbul	Bakırköy	0.184090	Marginal Suitable	Marginal Suitable	Marginal Suitable	26	Csa	Temperate, dry summer, hot summer
921	Marmara	İstanbul	Zeytinburnu	0.182507	Marginal Suitable	Marginal Suitable	Marginal Suitable	40	Csa	Temperate, dry summer, hot summer
588	Marmara	İstanbul	Küçükçekmece	0.179640	Marginal Suitable	Marginal Suitable	Marginal Suitable	72	Csa	Temperate, dry summer, hot summer
486	Marmara	İstanbul	Kadıköy	0.178830	Marginal Suitable	Marginal Suitable	Marginal Suitable	32	Csa	Temperate, dry summer, hot summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
104	Marmara	İstanbul	Bahçelievler	0.178424	Marginal Suitable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
871	Marmara	İstanbul	Üsküdar	0.177326	Marginal Suitable	Marginal Suitable	Marginal Suitable	14	Csa	Temperate, dry summer, hot summer
85	Marmara	İstanbul	Avcılar	0.175945	Marginal Suitable	Marginal Suitable	Marginal Suitable	85	Csa	Temperate, dry summer, hot summer
314	Marmara	İstanbul	Eminönü	0.174737	Marginal Suitable	Marginal Suitable	Marginal Suitable	33	Csa	Temperate, dry summer, hot summer
180	Marmara	İstanbul	Büyükçekmece	0.167881	Marginal Suitable	Marginal Suitable	Marginal Suitable	2	Csa	Temperate, dry summer, hot summer
258	Marmara	Kırklareli	Demirköy	0.785827	Very Suitable	Acceptable	Acceptable	302	Cfa	Temperate, no dry season, hot summer
570	Marmara	Kırklareli	Kofçaz	0.674963	Very Suitable	Acceptable	Acceptable	434	Cfb	Temperate, no dry season, warm summer
880	Marmara	Kırklareli	Vize	0.674385	Very Suitable	Acceptable	Acceptable	174	Csa	Temperate, dry summer, hot summer
559	Marmara	Kırklareli	Kırklareli/Merkez	0.669057	Very Suitable	Acceptable	Acceptable	231	Csa	Temperate, dry summer, hot summer
706	Marmara	Kırklareli	Pınarhisar	0.663204	Very Suitable	Acceptable	Acceptable	190	Csa	Temperate, dry summer, hot summer
609	Marmara	Kırklareli	Lüleburgaz	0.629150	Very Suitable	Acceptable	Acceptable	60	Csa	Temperate, dry summer, hot summer
100	Marmara	Kırklareli	Babaeski	0.626745	Very Suitable	Acceptable	Acceptable	59	Csa	Temperate, dry summer, hot summer
698	Marmara	Kırklareli	Pehlivanköy	0.625440	Very Suitable	Acceptable	Acceptable	28	Csa	Temperate, dry summer, hot summer
375	Marmara	Kocaeli	Gölcük	0.866001	Extremely Suitable	Suitable	Very Suitable	14	Csa	Temperate, dry summer, hot summer
266	Marmara	Kocaeli	Derince	0.829326	Extremely Suitable	Acceptable	Suitable	39	Csa	Temperate, dry summer, hot summer
514	Marmara	Kocaeli	Karamürsel	0.823453	Extremely Suitable	Acceptable	Suitable	15	Csa	Temperate, dry summer, hot summer
499	Marmara	Kocaeli	Kandıra	0.771619	Very Suitable	Acceptable	Acceptable	40	Cfa	Temperate, no dry season, hot summer
566	Marmara	Kocaeli	Kocaeli/İzmit	0.661332	Very Suitable	Acceptable	Acceptable	7	Csa	Temperate, dry summer, hot summer
575	Marmara	Kocaeli	Körfez	0.301191	Acceptable	Marginal Suitable	Marginal Suitable	60	Csa	Temperate, dry summer, hot summer
355	Marmara	Kocaeli	Gebze	0.253157	Acceptable	Marginal Suitable	Marginal Suitable	184	Csa	Temperate, dry summer, hot summer
37	Marmara	Sakarya	Akyazı	0.914446	Extremely Suitable	Suitable	Extremely Suitable	45	Cfa	Temperate, no dry season, hot summer
443	Marmara	Sakarya	Hendek	0.910595	Extremely Suitable	Suitable	Extremely Suitable	167	Cfa	Temperate, no dry season, hot summer
516	Marmara	Sakarya	Karapürçek	0.891347	Extremely Suitable	Suitable	Very Suitable	138	Cfa	Temperate, no dry season, hot summer
368	Marmara	Sakarya	Geyve	0.868309	Extremely Suitable	Suitable	Very Suitable	84	Csa	Temperate, dry summer, hot summer
818	Marmara	Sakarya	Taraklı	0.864339	Extremely Suitable	Suitable	Very Suitable	449	Cfb	Temperate, no dry season, warm summer
731	Marmara	Sakarya	Sapanca	0.846335	Extremely Suitable	Acceptable	Suitable	43	Cfa	Temperate, no dry season, hot summer
689	Marmara	Sakarya	Pamukova	0.842922	Extremely Suitable	Acceptable	Suitable	91	Csa	Temperate, dry summer, hot summer
723	Marmara	Sakarya	Sakarya/Adapazarı	0.826781	Extremely Suitable	Acceptable	Suitable	30	Cfa	Temperate, no dry season, hot summer
347	Marmara	Sakarya	Ferizli	0.812570	Extremely Suitable	Acceptable	Suitable	28	Cfa	Temperate, no dry season, hot summer
796	Marmara	Sakarya	Söğütlü	0.790651	Very Suitable	Acceptable	Suitable	20	Cfa	Temperate, no dry season, hot summer
517	Marmara	Sakarya	Karasu	0.790068	Very Suitable	Acceptable	Suitable	5	Cfa	Temperate, no dry season, hot summer
532	Marmara	Sakarya	Kaynarca	0.765853	Very Suitable	Acceptable	Acceptable	53	Cfa	Temperate, no dry season, hot summer
565	Marmara	Sakarya	Kocaali	0.689911	Very Suitable	Acceptable	Acceptable	35	Cfa	Temperate, no dry season, hot summer
222	Marmara	Tekirdağ	Çerkezköy	0.656396	Very Suitable	Acceptable	Acceptable	146	Csa	Temperate, dry summer, hot summer
616	Marmara	Tekirdağ	Malkara	0.632468	Very Suitable	Acceptable	Acceptable	222	Csa	Temperate, dry summer, hot summer
646	Marmara	Tekirdağ	Muratlı	0.630185	Very Suitable	Acceptable	Acceptable	76	Csa	Temperate, dry summer, hot summer
242	Marmara	Tekirdağ	Çorlu	0.629182	Very Suitable	Acceptable	Acceptable	168	Csa	Temperate, dry summer, hot summer
438	Marmara	Tekirdağ	Hayrabolu	0.619430	Very Suitable	Acceptable	Acceptable	62	Csa	Temperate, dry summer, hot summer
828	Marmara	Tekirdağ	Tekirdağ/Merkez	0.256969	Acceptable	Marginal Suitable	Marginal Suitable	28	BSk	Arid, steppe, cold
749	Marmara	Tekirdağ	Şarköy	0.253157	Acceptable	Marginal Suitable	Marginal Suitable	15	Csa	Temperate, dry summer, hot summer
734	Marmara	Tekirdağ	Saray/Tekirdağ	0.217953	Acceptable	Marginal Suitable	Marginal Suitable	148	Csa	Temperate, dry summer, hot summer
624	Marmara	Tekirdağ	Marmaraereğlisi	0.182272	Marginal Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
52	Marmara	Yalova	Altınova	0.744991	Very Suitable	Acceptable	Acceptable	15	Csa	Temperate, dry summer, hot summer
231	Marmara	Yalova	Çiftlikköy	0.727553	Very Suitable	Acceptable	Acceptable	13	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
832	Marmara	Yalova	Termal	0.685343	Very Suitable	Acceptable	Acceptable	146	Csa	Temperate, dry summer, hot summer
240	Marmara	Yalova	Çınarcık	0.645830	Very Suitable	Acceptable	Acceptable	29	Csa	Temperate, dry summer, hot summer
886	Marmara	Yalova	Yalova/Merkez	0.636331	Very Suitable	Acceptable	Acceptable	6	Csa	Temperate, dry summer, hot summer
74	Marmara	Yalova	Armutlu	0.261415	Acceptable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
345	Mediterrenean	Adana	Feke	0.725354	Very Suitable	Acceptable	Acceptable	558	Dsa	Cold, dry summer, hot summer
42	Mediterrenean	Adana	Aladağ	0.711672	Very Suitable	Acceptable	Acceptable	858	Csa	Temperate, dry summer, hot summer
711	Mediterrenean	Adana	Pozantı	0.689366	Very Suitable	Acceptable	Acceptable	786	Csa	Temperate, dry summer, hot summer
722	Mediterrenean	Adana	Saimbeyli	0.647134	Very Suitable	Acceptable	Acceptable	971	BSk	Arid, steppe, cold
845	Mediterrenean	Adana	Tufanbeyli	0.441432	Suitable	Marginal Suitable	Marginal Suitable	1415	Dsb	Cold, dry summer, warm summer
508	Mediterrenean	Adana	Karaisalı	0.203257	Acceptable	Marginal Suitable	Marginal Suitable	257	Csa	Temperate, dry summer, hot summer
586	Mediterrenean	Adana	Kozan	0.182452	Marginal Suitable	Marginal Suitable	Marginal Suitable	137	Csa	Temperate, dry summer, hot summer
466	Mediterrenean	Adana	İmamoğlu	0.170858	Marginal Suitable	Marginal Suitable	Marginal Suitable	78	Csa	Temperate, dry summer, hot summer
771	Mediterrenean	Adana	Seyhan	0.155449	Marginal Suitable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
518	Mediterrenean	Adana	Karataş	0.153248	Marginal Suitable	Marginal Suitable	Marginal Suitable	11	Csa	Temperate, dry summer, hot summer
916	Mediterrenean	Adana	Yumurtalık	0.137299	Marginal Suitable	Marginal Suitable	Marginal Suitable	10	Csa	Temperate, dry summer, hot summer
225	Mediterrenean	Adana	Ceyhan	0.136840	Marginal Suitable	Marginal Suitable	Marginal Suitable	31	Csa	Temperate, dry summer, hot summer
918	Mediterrenean	Adana	Yüreğir	0.135760	Marginal Suitable	Marginal Suitable	Marginal Suitable	26	Csa	Temperate, dry summer, hot summer
400	Mediterrenean	Antalya	Gündoğmuş	0.739916	Very Suitable	Acceptable	Acceptable	890	Dsb	Cold, dry summer, warm summer
34	Mediterrenean	Antalya	Akseki	0.724853	Very Suitable	Acceptable	Acceptable	1057	Csa	Temperate, dry summer, hot summer
454	Mediterrenean	Antalya	İbradı	0.657262	Very Suitable	Acceptable	Acceptable	1038	Csa	Temperate, dry summer, hot summer
312	Mediterrenean	Antalya	Elmalı	0.657119	Very Suitable	Acceptable	Acceptable	1085	Csa	Temperate, dry summer, hot summer
579	Mediterrenean	Antalya	Korkuteli	0.642090	Very Suitable	Acceptable	Acceptable	996	Csa	Temperate, dry summer, hot summer
619	Mediterrenean	Antalya	Manavgat	0.109715	Marginal Suitable	Marginal Suitable	Marginal Suitable	21	Csa	Temperate, dry summer, hot summer
62	Mediterrenean	Antalya	Antalya/Merkez	0.097458	Marginal Suitable	Marginal Suitable	Marginal Suitable	62	Csa	Temperate, dry summer, hot summer
545	Mediterrenean	Antalya	Kemer/Antalya	0.092713	Marginal Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
43	Mediterrenean	Antalya	Alanya	0.092136	Marginal Suitable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
349	Mediterrenean	Antalya	Finike	0.091452	Marginal Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
354	Mediterrenean	Antalya	Gazipaşa	0.089078	Marginal Suitable	Marginal Suitable	Marginal Suitable	20	Csa	Temperate, dry summer, hot summer
528	Mediterrenean	Antalya	Kaş	0.078404	Marginal Suitable	Marginal Suitable	Marginal Suitable	19	Csa	Temperate, dry summer, hot summer
494	Mediterrenean	Antalya	Demre	0.076850	Marginal Suitable	Marginal Suitable	Marginal Suitable	12	Csa	Temperate, dry summer, hot summer
767	Mediterrenean	Antalya	Serik	0.070840	Marginal Suitable	Marginal Suitable	Marginal Suitable	30	Csa	Temperate, dry summer, hot summer
594	Mediterrenean	Antalya	Kumluca	0.070328	Marginal Suitable	Marginal Suitable	Marginal Suitable	35	Csa	Temperate, dry summer, hot summer
13	Mediterrenean	Burdur	Ağlasun	0.715778	Very Suitable	Acceptable	Acceptable	1144	Csa	Temperate, dry summer, hot summer
178	Mediterrenean	Burdur	Burdur/Merkez	0.695385	Very Suitable	Acceptable	Acceptable	963	BSk	Arid, steppe, cold
55	Mediterrenean	Burdur	Altınyayla/Burdur	0.694868	Very Suitable	Acceptable	Acceptable	1245	Csa	Temperate, dry summer, hot summer
219	Mediterrenean	Burdur	Çeltikçi	0.694809	Very Suitable	Acceptable	Acceptable	859	Csa	Temperate, dry summer, hot summer
377	Mediterrenean	Burdur	Gölhisar	0.674724	Very Suitable	Acceptable	Acceptable	1009	Csa	Temperate, dry summer, hot summer
172	Mediterrenean	Burdur	Bucak	0.674644	Very Suitable	Acceptable	Acceptable	811	Csa	Temperate, dry summer, hot summer
207	Mediterrenean	Burdur	Çavdır	0.654651	Very Suitable	Acceptable	Acceptable	1081	Csa	Temperate, dry summer, hot summer
907	Mediterrenean	Burdur	Yeşilova	0.645558	Very Suitable	Acceptable	Acceptable	1205	Csa	Temperate, dry summer, hot summer
827	Mediterrenean	Burdur	Tefenni	0.642027	Very Suitable	Acceptable	Acceptable	1161	Csa	Temperate, dry summer, hot summer
544	Mediterrenean	Burdur	Kemer/Burdur	0.641637	Very Suitable	Acceptable	Acceptable	1145	Csa	Temperate, dry summer, hot summer
513	Mediterrenean	Burdur	Karamanlı	0.638125	Very Suitable	Acceptable	Acceptable	1159	Csa	Temperate, dry summer, hot summer
431	Mediterrenean	Hatay	Hassa	0.302687	Acceptable	Marginal Suitable	Marginal Suitable	416	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
432	Mediterrenean	Hatay	Hatay/Merkez	0.280936	Acceptable	Marginal Suitable	Marginal Suitable	89	Csa	Temperate, dry summer, hot summer
556	Mediterrenean	Hatay	Kırıkhan	0.263717	Acceptable	Marginal Suitable	Marginal Suitable	155	Csa	Temperate, dry summer, hot summer
53	Mediterrenean	Hatay	Altınözü	0.245370	Acceptable	Marginal Suitable	Marginal Suitable	258	Csa	Temperate, dry summer, hot summer
715	Mediterrenean	Hatay	Reyhanlı	0.242509	Acceptable	Marginal Suitable	Marginal Suitable	170	Csa	Temperate, dry summer, hot summer
433	Mediterrenean	Hatay	Hatay/Belen	0.236147	Acceptable	Marginal Suitable	Marginal Suitable	496	Csa	Temperate, dry summer, hot summer
593	Mediterrenean	Hatay	Kumlu	0.231941	Acceptable	Marginal Suitable	Marginal Suitable	91	Csa	Temperate, dry summer, hot summer
891	Mediterrenean	Hatay	Yayladağı	0.214638	Acceptable	Marginal Suitable	Marginal Suitable	419	Csa	Temperate, dry summer, hot summer
727	Mediterrenean	Hatay	Samandağ	0.173219	Marginal Suitable	Marginal Suitable	Marginal Suitable	39	Csa	Temperate, dry summer, hot summer
476	Mediterrenean	Hatay	İskenderun	0.141601	Marginal Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
291	Mediterrenean	Hatay	Dörtyol	0.139043	Marginal Suitable	Marginal Suitable	Marginal Suitable	48	Csa	Temperate, dry summer, hot summer
328	Mediterrenean	Hatay	Erzin	0.138126	Marginal Suitable	Marginal Suitable	Marginal Suitable	172	Csa	Temperate, dry summer, hot summer
748	Mediterrenean	Isparta	Şarkıkaraağaç	0.758242	Very Suitable	Acceptable	Acceptable	1169	Dsb	Cold, dry summer, warm summer
537	Mediterrenean	Isparta	Keçiborlu	0.747246	Very Suitable	Acceptable	Acceptable	1004	Csa	Temperate, dry summer, hot summer
479	Mediterrenean	Isparta	Isparta/Merkez	0.744585	Very Suitable	Acceptable	Acceptable	1058	Csa	Temperate, dry summer, hot summer
304	Mediterrenean	Isparta	Eğirdir	0.744388	Very Suitable	Acceptable	Acceptable	926	Csa	Temperate, dry summer, hot summer
357	Mediterrenean	Isparta	Gelendost	0.741805	Very Suitable	Acceptable	Acceptable	952	Csa	Temperate, dry summer, hot summer
82	Mediterrenean	Isparta	Atabey	0.734352	Very Suitable	Acceptable	Acceptable	1042	Csb	Temperate, dry summer, warm summer
385	Mediterrenean	Isparta	Gönen/Isparta	0.708037	Very Suitable	Acceptable	Acceptable	1040	Csa	Temperate, dry summer, hot summer
902	Mediterrenean	Isparta	Yenişarbademli	0.704779	Very Suitable	Acceptable	Acceptable	1181	Dsb	Cold, dry summer, warm summer
35	Mediterrenean	Isparta	Aksu/Isparta	0.698585	Very Suitable	Acceptable	Acceptable	1223	Csa	Temperate, dry summer, hot summer
861	Mediterrenean	Isparta	Uluborlu	0.696427	Very Suitable	Acceptable	Acceptable	1054	Csa	Temperate, dry summer, hot summer
764	Mediterrenean	Isparta	Senirkent	0.694213	Very Suitable	Acceptable	Acceptable	961	Csa	Temperate, dry summer, hot summer
816	Mediterrenean	Isparta	Sütçüler	0.683755	Very Suitable	Acceptable	Acceptable	992	Csa	Temperate, dry summer, hot summer
887	Mediterrenean	Isparta	Yalvaç	0.683733	Very Suitable	Acceptable	Acceptable	1103	Csb	Temperate, dry summer, warm summer
182	Mediterrenean	Kahramanmaraş	Çağlayancerit	0.692003	Very Suitable	Acceptable	Acceptable	1103	Dsa	Cold, dry summer, hot summer
663	Mediterrenean	Kahramanmaraş	Nurhak	0.611648	Very Suitable	Acceptable	Acceptable	1401	Dsb	Cold, dry summer, warm summer
372	Mediterrenean	Kahramanmaraş	Göksun	0.549717	Suitable	Marginal Suitable	Acceptable	1347	Dsb	Cold, dry summer, warm summer
308	Mediterrenean	Kahramanmaraş	Elbistan	0.549439	Suitable	Marginal Suitable	Acceptable	1139	BSk	Arid, steppe, cold
305	Mediterrenean	Kahramanmaraş	Ekinözü	0.545343	Suitable	Marginal Suitable	Acceptable	1282	BSk	Arid, steppe, cold
9	Mediterrenean	Kahramanmaraş	Afşin	0.540306	Suitable	Marginal Suitable	Acceptable	1237	BSk	Arid, steppe, cold
61	Mediterrenean	Kahramanmaraş	Andırın	0.526156	Suitable	Marginal Suitable	Acceptable	1047	Csa	Temperate, dry summer, hot summer
491	Mediterrenean	Kahramanmaraş	Kahramanmaraş/Merkez	0.432409	Suitable	Marginal Suitable	Marginal Suitable	562	Csa	Temperate, dry summer, hot summer
850	Mediterrenean	Kahramanmaraş	Türkoğlu	0.426335	Suitable	Marginal Suitable	Marginal Suitable	488	Csa	Temperate, dry summer, hot summer
694	Mediterrenean	Kahramanmaraş	Pazarcık	0.406321	Suitable	Marginal Suitable	Marginal Suitable	750	Csa	Temperate, dry summer, hot summer
190	Mediterrenean	Mersin	Çamlıyayla	0.684512	Very Suitable	Acceptable	Acceptable	1168	Csa	Temperate, dry summer, hot summer
650	Mediterrenean	Mersin	Mut	0.342547	Acceptable	Marginal Suitable	Marginal Suitable	314	Csa	Temperate, dry summer, hot summer
394	Mediterrenean	Mersin	Gülnar	0.261853	Acceptable	Marginal Suitable	Marginal Suitable	965	Csa	Temperate, dry summer, hot summer
819	Mediterrenean	Mersin	Tarsus	0.157849	Marginal Suitable	Marginal Suitable	Marginal Suitable	25	Csa	Temperate, dry summer, hot summer
455	Mediterrenean	Mersin	İçel/Mersin	0.101186	Marginal Suitable	Marginal Suitable	Marginal Suitable	18	Csa	Temperate, dry summer, hot summer
90	Mediterrenean	Mersin	Aydıncık/Mersin	0.063356	Marginal Suitable	Marginal Suitable	Marginal Suitable	21	Csa	Temperate, dry summer, hot summer
60	Mediterrenean	Mersin	Anamur	0.048533	Marginal Suitable	Marginal Suitable	Marginal Suitable	33	Csa	Temperate, dry summer, hot summer
170	Mediterrenean	Mersin	Bozyazı	0.048049	Marginal Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
321	Mediterrenean	Mersin	Erdemli	0.043709	Marginal Suitable	Marginal Suitable	Marginal Suitable	13	Csa	Temperate, dry summer, hot summer
775	Mediterrenean	Mersin	Silifke	0.040817	Marginal Suitable	Marginal Suitable	Marginal Suitable	19	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
296	Mediterrenean	Osmaniye	Düziçi	0.415009	Suitable	Marginal Suitable	Marginal Suitable	401	Dsa	Cold, dry summer, hot summer
103	Mediterrenean	Osmaniye	Bahçe	0.408968	Suitable	Marginal Suitable	Marginal Suitable	594	Csa	Temperate, dry summer, hot summer
428	Mediterrenean	Osmaniye	Hasanbeyli	0.392485	Acceptable	Marginal Suitable	Marginal Suitable	753	Csa	Temperate, dry summer, hot summer
809	Mediterrenean	Osmaniye	Sumbas	0.209741	Acceptable	Marginal Suitable	Marginal Suitable	130	Csa	Temperate, dry summer, hot summer
485	Mediterrenean	Osmaniye	Kadirli	0.197201	Marginal Suitable	Marginal Suitable	Marginal Suitable	93	Csa	Temperate, dry summer, hot summer
682	Mediterrenean	Osmaniye	Osmaniye/Merkez	0.191597	Marginal Suitable	Marginal Suitable	Marginal Suitable	121	Csa	Temperate, dry summer, hot summer
839	Mediterrenean	Osmaniye	Toprakkale	0.135911	Marginal Suitable	Marginal Suitable	Marginal Suitable	57	Csa	Temperate, dry summer, hot summer
782	South-East	Adıyaman	Sincik	0.660000	Very Suitable	Acceptable	Acceptable	1373	Dsa	Cold, dry summer, hot summer
217	South-East	Adıyaman	Çelikhan	0.640176	Very Suitable	Acceptable	Acceptable	1388	Dsa	Cold, dry summer, hot summer
374	South-East	Adıyaman	Gölbaşı/Adıyaman	0.524563	Suitable	Marginal Suitable	Acceptable	902	Csa	Temperate, dry summer, hot summer
851	South-East	Adıyaman	Tut	0.438976	Suitable	Marginal Suitable	Marginal Suitable	929	Csa	Temperate, dry summer, hot summer
364	South-East	Adıyaman	Gerger	0.400138	Suitable	Marginal Suitable	Marginal Suitable	750	Csa	Temperate, dry summer, hot summer
136	South-East	Adıyaman	Besni	0.316478	Acceptable	Marginal Suitable	Marginal Suitable	902	Csa	Temperate, dry summer, hot summer
8	South-East	Adıyaman	Adıyaman/Merkez	0.304435	Acceptable	Marginal Suitable	Marginal Suitable	701	Csa	Temperate, dry summer, hot summer
492	South-East	Adıyaman	Kahta	0.280687	Acceptable	Marginal Suitable	Marginal Suitable	724	Csa	Temperate, dry summer, hot summer
728	South-East	Adıyaman	Samsat	0.117725	Marginal Suitable	Marginal Suitable	Marginal Suitable	593	Csa	Temperate, dry summer, hot summer
751	South-East	Batman	Sason	0.433911	Suitable	Marginal Suitable	Marginal Suitable	908	Dsa	Cold, dry summer, hot summer
362	South-East	Batman	Gercüş	0.298816	Acceptable	Marginal Suitable	Marginal Suitable	955	Csa	Temperate, dry summer, hot summer
429	South-East	Batman	Hasankeyf	0.292852	Acceptable	Marginal Suitable	Marginal Suitable	513	Csa	Temperate, dry summer, hot summer
121	South-East	Batman	Batman/Merkez	0.266259	Acceptable	Marginal Suitable	Marginal Suitable	570	Csa	Temperate, dry summer, hot summer
135	South-East	Batman	Beşiri	0.265191	Acceptable	Marginal Suitable	Marginal Suitable	751	Csa	Temperate, dry summer, hot summer
587	South-East	Batman	Kozluk	0.247745	Acceptable	Marginal Suitable	Marginal Suitable	874	Csa	Temperate, dry summer, hot summer
590	South-East	Diyarbakır	Kulp	0.554646	Suitable	Marginal Suitable	Acceptable	1015	Dsa	Cold, dry summer, hot summer
248	South-East	Diyarbakır	Çüngüş	0.455456	Suitable	Marginal Suitable	Marginal Suitable	978	Dsa	Cold, dry summer, hot summer
223	South-East	Diyarbakır	Çermik	0.426173	Suitable	Marginal Suitable	Marginal Suitable	686	Csa	Temperate, dry summer, hot summer
325	South-East	Diyarbakır	Ergani	0.416912	Suitable	Marginal Suitable	Marginal Suitable	951	Csa	Temperate, dry summer, hot summer
608	South-East	Diyarbakır	Lice	0.415795	Suitable	Marginal Suitable	Marginal Suitable	997	Dsa	Cold, dry summer, hot summer
272	South-East	Diyarbakır	Dicle	0.399110	Acceptable	Marginal Suitable	Marginal Suitable	939	Csa	Temperate, dry summer, hot summer
424	South-East	Diyarbakır	Hani	0.388599	Acceptable	Marginal Suitable	Marginal Suitable	900	Dsa	Cold, dry summer, hot summer
303	South-East	Diyarbakır	Eğil	0.360254	Acceptable	Marginal Suitable	Marginal Suitable	855	Csa	Temperate, dry summer, hot summer
280	South-East	Diyarbakır	Diyarbakır/Merkez	0.338016	Acceptable	Marginal Suitable	Marginal Suitable	674	Csa	Temperate, dry summer, hot summer
239	South-East	Diyarbakır	Çınar	0.333481	Acceptable	Marginal Suitable	Marginal Suitable	673	Csa	Temperate, dry summer, hot summer
440	South-East	Diyarbakır	Hazro	0.330554	Acceptable	Marginal Suitable	Marginal Suitable	1012	Dsa	Cold, dry summer, hot summer
567	South-East	Diyarbakır	Kocaköy	0.327495	Acceptable	Marginal Suitable	Marginal Suitable	969	Csa	Temperate, dry summer, hot summer
151	South-East	Diyarbakır	Bismil	0.299849	Acceptable	Marginal Suitable	Marginal Suitable	548	Csa	Temperate, dry summer, hot summer
778	South-East	Diyarbakır	Silvan	0.276110	Acceptable	Marginal Suitable	Marginal Suitable	840	Csa	Temperate, dry summer, hot summer
758	South-East	Gaziantep	Şehitkamil	0.427408	Suitable	Marginal Suitable	Marginal Suitable	838	Csa	Temperate, dry summer, hot summer
662	South-East	Gaziantep	Nurdağı	0.408771	Suitable	Marginal Suitable	Marginal Suitable	529	Csa	Temperate, dry summer, hot summer
478	South-East	Gaziantep	Islahiye	0.391280	Acceptable	Marginal Suitable	Marginal Suitable	503	Csa	Temperate, dry summer, hot summer
721	South-East	Gaziantep	Şahinbey	0.363856	Acceptable	Marginal Suitable	Marginal Suitable	875	Csa	Temperate, dry summer, hot summer
890	South-East	Gaziantep	Yavuzeli	0.331102	Acceptable	Marginal Suitable	Marginal Suitable	568	Csa	Temperate, dry summer, hot summer
63	South-East	Gaziantep	Araban	0.312136	Acceptable	Marginal Suitable	Marginal Suitable	530	Csa	Temperate, dry summer, hot summer
661	South-East	Gaziantep	Nizip	0.293229	Acceptable	Marginal Suitable	Marginal Suitable	535	Csa	Temperate, dry summer, hot summer

HAZELNUT CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
667	South-East	Gaziantep	Oğuzeli	0.287751	Acceptable	Marginal Suitable	Marginal Suitable	687	Csa	Temperate, dry summer, hot summer
522	South-East	Gaziantep	Karkamış	0.266326	Acceptable	Marginal Suitable	Marginal Suitable	358	Csa	Temperate, dry summer, hot summer
707	South-East	Kilis	Polateli	0.291269	Acceptable	Marginal Suitable	Marginal Suitable	840	Csa	Temperate, dry summer, hot summer
552	South-East	Kilis	Kilis/Merkez	0.287384	Acceptable	Marginal Suitable	Marginal Suitable	660	Csa	Temperate, dry summer, hot summer
649	South-East	Kilis	Musabeyli	0.286991	Acceptable	Marginal Suitable	Marginal Suitable	745	Csa	Temperate, dry summer, hot summer
307	South-East	Kilis	Elbeyli	0.262661	Acceptable	Marginal Suitable	Marginal Suitable	519	Csa	Temperate, dry summer, hot summer
627	South-East	Mardin	Mazıdağı	0.320424	Acceptable	Marginal Suitable	Marginal Suitable	1048	Csa	Temperate, dry summer, hot summer
754	South-East	Mardin	Savur	0.313898	Acceptable	Marginal Suitable	Marginal Suitable	877	Csa	Temperate, dry summer, hot summer
671	South-East	Mardin	Ömerli	0.275300	Acceptable	Marginal Suitable	Marginal Suitable	1089	Csa	Temperate, dry summer, hot summer
637	South-East	Mardin	Midyat	0.268361	Acceptable	Marginal Suitable	Marginal Suitable	944	Csa	Temperate, dry summer, hot summer
906	South-East	Mardin	Yeşilli	0.262282	Acceptable	Marginal Suitable	Marginal Suitable	822	Csa	Temperate, dry summer, hot summer
253	South-East	Mardin	Dargeçit	0.259602	Acceptable	Marginal Suitable	Marginal Suitable	902	Csa	Temperate, dry summer, hot summer
265	South-East	Mardin	Derik	0.248199	Acceptable	Marginal Suitable	Marginal Suitable	799	Csa	Temperate, dry summer, hot summer
622	South-East	Mardin	Mardin/Merkez	0.238039	Acceptable	Marginal Suitable	Marginal Suitable	938	Csa	Temperate, dry summer, hot summer
564	South-East	Mardin	Kızıltepe	0.207311	Acceptable	Marginal Suitable	Marginal Suitable	485	Csa	Temperate, dry summer, hot summer
664	South-East	Mardin	Nusaybin	0.200546	Acceptable	Marginal Suitable	Marginal Suitable	475	Csa	Temperate, dry summer, hot summer
702	South-East	Siirt	Pervari	0.592509	Suitable	Acceptable	Acceptable	1376	Dsa	Cold, dry summer, hot summer
785	South-East	Siirt	Şirvan	0.407167	Suitable	Marginal Suitable	Marginal Suitable	905	Csa	Temperate, dry summer, hot summer
127	South-East	Siirt	Baykan	0.398257	Acceptable	Marginal Suitable	Marginal Suitable	720	Dsa	Cold, dry summer, hot summer
327	South-East	Siirt	Eruh	0.389303	Acceptable	Marginal Suitable	Marginal Suitable	1164	Csa	Temperate, dry summer, hot summer
92	South-East	Siirt	Aydınlar	0.257361	Acceptable	Marginal Suitable	Marginal Suitable	118	Csa	Temperate, dry summer, hot summer
773	South-East	Siirt	Siirt/Merkez	0.256344	Acceptable	Marginal Suitable	Marginal Suitable	887	Csa	Temperate, dry summer, hot summer
598	South-East	Siirt	Kurtalan	0.238754	Acceptable	Marginal Suitable	Marginal Suitable	715	Csa	Temperate, dry summer, hot summer
789	South-East	Şanlıurfa	Siverek	0.335423	Acceptable	Marginal Suitable	Marginal Suitable	788	Csa	Temperate, dry summer, hot summer
418	South-East	Şanlıurfa	Halfeti	0.333159	Acceptable	Marginal Suitable	Marginal Suitable	664	Csa	Temperate, dry summer, hot summer
444	South-East	Şanlıurfa	Hilvan	0.280805	Acceptable	Marginal Suitable	Marginal Suitable	592	Csa	Temperate, dry summer, hot summer
167	South-East	Şanlıurfa	Bozova	0.279482	Acceptable	Marginal Suitable	Marginal Suitable	582	Csa	Temperate, dry summer, hot summer
150	South-East	Şanlıurfa	Birecik	0.276536	Acceptable	Marginal Suitable	Marginal Suitable	343	Csa	Temperate, dry summer, hot summer
867	South-East	Şanlıurfa	Şanlıurfa/Merkez	0.274333	Acceptable	Marginal Suitable	Marginal Suitable	527	Csa	Temperate, dry summer, hot summer
812	South-East	Şanlıurfa	Suruç	0.241323	Acceptable	Marginal Suitable	Marginal Suitable	500	Csa	Temperate, dry summer, hot summer
21	South-East	Şanlıurfa	Akçakale	0.230948	Acceptable	Marginal Suitable	Marginal Suitable	359	BSh	Arid, steppe, hot
879	South-East	Şanlıurfa	Viranşehir	0.230830	Acceptable	Marginal Suitable	Marginal Suitable	566	Csa	Temperate, dry summer, hot summer
427	South-East	Şanlıurfa	Harran	0.230309	Acceptable	Marginal Suitable	Marginal Suitable	374	Csa	Temperate, dry summer, hot summer
226	South-East	Şanlıurfa	Ceylanpınar	0.210482	Acceptable	Marginal Suitable	Marginal Suitable	364	Csa	Temperate, dry summer, hot summer
862	South-East	Şırnak	Uludere	0.632121	Very Suitable	Acceptable	Acceptable	1227	Dsa	Cold, dry summer, hot summer
794	South-East	Şırnak	Şırnak/Merkez	0.338862	Acceptable	Marginal Suitable	Marginal Suitable	1343	Dsa	Cold, dry summer, hot summer
145	South-East	Şırnak	Beytüşşebap	0.257670	Acceptable	Marginal Suitable	Marginal Suitable	1546	Dsa	Cold, dry summer, hot summer
391	South-East	Şırnak	Güçlükonak	0.233042	Acceptable	Marginal Suitable	Marginal Suitable	791	Csa	Temperate, dry summer, hot summer
456	South-East	Şırnak	İdil	0.227569	Acceptable	Marginal Suitable	Marginal Suitable	765	Csa	Temperate, dry summer, hot summer
237	South-East	Şırnak	Cizre	0.202443	Acceptable	Marginal Suitable	Marginal Suitable	374	Csa	Temperate, dry summer, hot summer
777	South-East	Şırnak	Silopi	0.175566	Marginal Suitable	Marginal Suitable	Marginal Suitable	510	Csa	Temperate, dry summer, hot summer

APPENDIX E: GRAPE CLIMATE SUITABILITY INDEX (GCSI) AND CLASSIFICATION CHANGE FOR 923 LOCATIONS FOR REFERENCE PERIOD OF 1991-2012 AND FUTURE PERIOD OF 2021-2050 BASED ON 3 APPROACHES I.E. EIC, PC, AND NBC WITH FE MODEL

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS

LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
241	Aegean	Afyonkarahisar	Çobanlar	0.870450	Extremely Suitable	Suitable	Very Suitable	992	BSk	Arid, steppe, cold
805	Aegean	Afyonkarahisar	Sultandağı	0.867493	Extremely Suitable	Suitable	Very Suitable	77	Csa	Temperate, dry summer, hot summer
255	Aegean	Afyonkarahisar	Dazkırı	0.866787	Extremely Suitable	Suitable	Very Suitable	894	BSk	Arid, steppe, cold
338	Aegean	Afyonkarahisar	Evciler	0.864620	Extremely Suitable	Suitable	Very Suitable	909	BSk	Arid, steppe, cold
563	Aegean	Afyonkarahisar	Kızılören	0.845532	Extremely Suitable	Suitable	Suitable	1112	BSk	Arid, steppe, cold
277	Aegean	Afyonkarahisar	Dinar	0.843347	Extremely Suitable	Suitable	Suitable	865	BSk	Arid, steppe, cold
730	Aegean	Afyonkarahisar	Sandıklı	0.838771	Extremely Suitable	Suitable	Suitable	1094	BSk	Arid, steppe, cold
459	Aegean	Afyonkarahisar	İhsaniye	0.836022	Extremely Suitable	Suitable	Suitable	141	Cfb	Temperate, no dry season, warm summer
448	Aegean	Afyonkarahisar	Hocalar	0.825160	Extremely Suitable	Suitable	Suitable	1077	BSk	Arid, steppe, cold
475	Aegean	Afyonkarahisar	İşcehisar	0.813363	Extremely Suitable	Suitable	Suitable	277	Csa	Temperate, dry summer, hot summer
781	Aegean	Afyonkarahisar	Sincanlı	0.798635	Very Suitable	Suitable	Suitable	1373	Dsa	Cold, dry summer, hot summer
123	Aegean	Afyonkarahisar	Bayat/Afyon	0.791570	Very Suitable	Suitable	Suitable	698	BSk	Arid, steppe, cold
10	Aegean	Afyonkarahisar	Afyon/Merkez	0.767430	Very Suitable	Suitable	Suitable	1012	BSk	Arid, steppe, cold
157	Aegean	Afyonkarahisar	Bolvadin	0.736120	Very Suitable	Acceptable	Suitable	990	BSk	Arid, steppe, cold
315	Aegean	Afyonkarahisar	Emirdağ	0.730248	Very Suitable	Acceptable	Suitable	965	BSk	Arid, steppe, cold
208	Aegean	Afyonkarahisar	Çay	0.714858	Very Suitable	Acceptable	Acceptable	1038	BSk	Arid, steppe, cold
801	Aegean	Afyonkarahisar	Şuhut	0.714606	Very Suitable	Acceptable	Acceptable	1145	BSk	Arid, steppe, cold
120	Aegean	Afyonkarahisar	Basmakçı	0.689503	Very Suitable	Acceptable	Acceptable	1.395	Dsb	Cold, dry summer, warm summer
504	Aegean	Aydın	Karacasu	0.849262	Extremely Suitable	Suitable	Suitable	35	Csa	Temperate, dry summer, hot summer
163	Aegean	Aydın	Bozdoğan	0.780997	Very Suitable	Suitable	Suitable	302	Csa	Temperate, dry summer, hot summer
603	Aegean	Aydın	Kuyucak	0.721989	Very Suitable	Acceptable	Suitable	124	Csa	Temperate, dry summer, hot summer
173	Aegean	Aydın	Buharkent	0.721205	Very Suitable	Acceptable	Suitable	190	Csa	Temperate, dry summer, hot summer
524	Aegean	Aydın	Karpuzlu	0.675098	Very Suitable	Acceptable	Acceptable	1824	Dsb	Cold, dry summer, warm summer
601	Aegean	Aydın	Kuşadası	0.673911	Very Suitable	Acceptable	Acceptable	6	Csa	Temperate, dry summer, hot summer
655	Aegean	Aydın	Nazilli	0.661805	Very Suitable	Acceptable	Acceptable	81	Csa	Temperate, dry summer, hot summer
235	Aegean	Aydın	Çine	0.647098	Very Suitable	Acceptable	Acceptable	82	Csa	Temperate, dry summer, hot summer
806	Aegean	Aydın	Sultanhisar	0.635959	Very Suitable	Acceptable	Acceptable	542	BSk	Arid, steppe, cold
273	Aegean	Aydın	Didim	0.606828	Very Suitable	Acceptable	Acceptable	35	Csa	Temperate, dry summer, hot summer
581	Aegean	Aydın	Köşk	0.591607	Suitable	Acceptable	Acceptable	75	Csa	Temperate, dry summer, hot summer
89	Aegean	Aydın	Aydın/Merkez	0.527367	Suitable	Acceptable	Acceptable	92	Csa	Temperate, dry summer, hot summer
469	Aegean	Aydın	İncirliova	0.515989	Suitable	Acceptable	Acceptable	17	Cfa	Temperate, no dry season, hot summer
797	Aegean	Aydın	Söke	0.506621	Suitable	Acceptable	Acceptable	830	BSk	Arid, steppe, cold
568	Aegean	Aydın	Koçarlı	0.496077	Suitable	Marginal Suitable	Acceptable	34	Csa	Temperate, dry summer, hot summer
900	Aegean	Aydın	Yenipazar/Aydın	0.463702	Suitable	Marginal Suitable	Marginal Suitable	62	Csa	Temperate, dry summer, hot summer
365	Aegean	Aydın	Germencik	0.457010	Suitable	Marginal Suitable	Marginal Suitable	61	Csa	Temperate, dry summer, hot summer
131	Aegean	Denizli	Bekilli	0.885230	Extremely Suitable	Suitable	Very Suitable	830	Csa	Temperate, dry summer, hot summer
825	Aegean	Denizli	Tavas	0.883555	Extremely Suitable	Suitable	Very Suitable	933	Csa	Temperate, dry summer, hot summer
187	Aegean	Denizli	Çameli	0.881856	Extremely Suitable	Suitable	Very Suitable	1309	Csa	Temperate, dry summer, hot summer
165	Aegean	Denizli	Bozkurt/Denizli	0.877932	Extremely Suitable	Suitable	Very Suitable	860	Csa	Temperate, dry summer, hot summer
4	Aegean	Denizli	Acıpayam	0.875986	Extremely Suitable	Suitable	Very Suitable	937	Csa	Temperate, dry summer, hot summer
493	Aegean	Denizli	Kale/Denizli	0.873355	Extremely Suitable	Suitable	Very Suitable	724	Csa	Temperate, dry summer, hot summer
236	Aegean	Denizli	Çivril	0.868936	Extremely Suitable	Suitable	Very Suitable	831	BSk	Arid, steppe, cold
198	Aegean	Denizli	Çardak	0.867548	Extremely Suitable	Suitable	Very Suitable	857	Csa	Temperate, dry summer, hot summer
108	Aegean	Denizli	Baklan	0.865849	Extremely Suitable	Suitable	Very Suitable	964	Csa	Temperate, dry summer, hot summer
401	Aegean	Denizli	Güney	0.862135	Extremely Suitable	Suitable	Very Suitable	822	Csa	Temperate, dry summer, hot summer
449	Aegean	Denizli	Honaz	0.859983	Extremely Suitable	Suitable	Very Suitable	502	Csa	Temperate, dry summer, hot summer
183	Aegean	Denizli	Çal	0.811417	Extremely Suitable	Suitable	Suitable	838	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
138	Aegean	Denizli	Beyağaç	0.808350	Extremely Suitable	Suitable	Suitable	699	Csa	Temperate, dry summer, hot summer
99	Aegean	Denizli	Babadağ	0.790616	Very Suitable	Suitable	Suitable	758	Csa	Temperate, dry summer, hot summer
768	Aegean	Denizli	Serinhisar	0.736467	Very Suitable	Acceptable	Suitable	972	Csa	Temperate, dry summer, hot summer
260	Aegean	Denizli	Denizli/Merkez	0.707123	Very Suitable	Acceptable	Acceptable	392	Csa	Temperate, dry summer, hot summer
28	Aegean	Denizli	Akköy	0.591728	Suitable	Acceptable	Acceptable	392	Csa	Temperate, dry summer, hot summer
176	Aegean	Denizli	Buldan	0.585140	Suitable	Acceptable	Acceptable	619	Csa	Temperate, dry summer, hot summer
737	Aegean	Denizli	Sarayköy	0.473874	Suitable	Marginal Suitable	Acceptable	165	Csa	Temperate, dry summer, hot summer
553	Aegean	İzmir	Kiraz	0.886626	Extremely Suitable	Suitable	Very Suitable	305	Csa	Temperate, dry summer, hot summer
665	Aegean	İzmir	Ödemiş	0.869175	Extremely Suitable	Suitable	Very Suitable	133	Csa	Temperate, dry summer, hot summer
132	Aegean	İzmir	Bergama	0.841945	Extremely Suitable	Suitable	Suitable	61	Csa	Temperate, dry summer, hot summer
139	Aegean	İzmir	Beydağ	0.838034	Extremely Suitable	Suitable	Suitable	215	Csa	Temperate, dry summer, hot summer
126	Aegean	İzmir	Bayındır	0.823105	Extremely Suitable	Suitable	Suitable	87	Csa	Temperate, dry summer, hot summer
571	Aegean	İzmir	Konak	0.815723	Extremely Suitable	Suitable	Suitable	11	Csa	Temperate, dry summer, hot summer
543	Aegean	İzmir	Kemalpaşa/İzmir	0.813494	Extremely Suitable	Suitable	Suitable	167	Csa	Temperate, dry summer, hot summer
555	Aegean	İzmir	Kınık	0.783050	Very Suitable	Suitable	Suitable	85	Csa	Temperate, dry summer, hot summer
46	Aegean	İzmir	Aliağa	0.780617	Very Suitable	Suitable	Suitable	7	Csa	Temperate, dry summer, hot summer
275	Aegean	İzmir	Dikili	0.779817	Very Suitable	Suitable	Suitable	4	Csa	Temperate, dry summer, hot summer
110	Aegean	İzmir	Balçova	0.765846	Very Suitable	Suitable	Suitable	34	Csa	Temperate, dry summer, hot summer
757	Aegean	İzmir	Seferihisar	0.739531	Very Suitable	Suitable	Suitable	36	Csa	Temperate, dry summer, hot summer
160	Aegean	İzmir	Bornova	0.737650	Very Suitable	Acceptable	Suitable	78	Csa	Temperate, dry summer, hot summer
171	Aegean	İzmir	Buca	0.716370	Very Suitable	Acceptable	Suitable	78	Csa	Temperate, dry summer, hot summer
630	Aegean	İzmir	Menderes	0.702610	Very Suitable	Acceptable	Acceptable	130	Csa	Temperate, dry summer, hot summer
232	Aegean	İzmir	Çiğli	0.687381	Very Suitable	Acceptable	Acceptable	11	Csa	Temperate, dry summer, hot summer
351	Aegean	İzmir	Foça	0.684982	Very Suitable	Acceptable	Acceptable	12	Csa	Temperate, dry summer, hot summer
653	Aegean	İzmir	Narlıdere	0.675818	Very Suitable	Acceptable	Acceptable	25	Csa	Temperate, dry summer, hot summer
834	Aegean	İzmir	Tire	0.666616	Very Suitable	Acceptable	Acceptable	112	Csa	Temperate, dry summer, hot summer
352	Aegean	İzmir	Gaziemir	0.610060	Very Suitable	Acceptable	Acceptable	135	Csa	Temperate, dry summer, hot summer
526	Aegean	İzmir	Karşıyaka	0.604885	Very Suitable	Acceptable	Acceptable	1.756	Dfb	Cold, no dry season, warm summer
502	Aegean	İzmir	Karaburun	0.600377	Very Suitable	Acceptable	Acceptable	1528	BSk	Arid, steppe, cold
631	Aegean	İzmir	Menemen	0.592516	Suitable	Acceptable	Acceptable	12	Csa	Temperate, dry summer, hot summer
224	Aegean	İzmir	Çeşme	0.573126	Suitable	Acceptable	Acceptable	24	Csa	Temperate, dry summer, hot summer
759	Aegean	İzmir	Selçuklu	0.552234	Suitable	Acceptable	Acceptable	1024	BSk	Arid, steppe, cold
869	Aegean	İzmir	Urla	0.517568	Suitable	Acceptable	Acceptable	70	Csa	Temperate, dry summer, hot summer
411	Aegean	İzmir	Güzelbahçe	0.512427	Suitable	Acceptable	Acceptable	23	Csa	Temperate, dry summer, hot summer
840	Aegean	İzmir	Torbalı	0.473159	Suitable	Marginal Suitable	Acceptable	39	Csa	Temperate, dry summer, hot summer
779	Aegean	Kütahya	Simav	0.826165	Extremely Suitable	Suitable	Suitable	798	BSk	Arid, steppe, cold
695	Aegean	Kütahya	Pazarlar	0.814653	Extremely Suitable	Suitable	Suitable	925	Csb	Temperate, dry summer, warm summer
313	Aegean	Kütahya	Emet	0.814431	Extremely Suitable	Suitable	Suitable	910	Csb	Temperate, dry summer, warm summer
356	Aegean	Kütahya	Gediz	0.814031	Extremely Suitable	Suitable	Suitable	730	Csa	Temperate, dry summer, hot summer
445	Aegean	Kütahya	Hisarcık	0.807118	Extremely Suitable	Suitable	Suitable	752	Csb	Temperate, dry summer, warm summer
826	Aegean	Kütahya	Tavşanlı	0.802761	Extremely Suitable	Suitable	Suitable	836	Csb	Temperate, dry summer, warm summer
54	Aegean	Kütahya	Altıntaş	0.800425	Extremely Suitable	Suitable	Suitable	1039	BSk	Arid, steppe, cold
292	Aegean	Kütahya	Dumlupınar	0.758685	Very Suitable	Suitable	Suitable	1228	Dsb	Cold, dry summer, warm summer
602	Aegean	Kütahya	Kütahya/Merkez	0.743080	Very Suitable	Suitable	Suitable	958	BSk	Arid, steppe, cold
206	Aegean	Kütahya	Çavdarhisar	0.735957	Very Suitable	Acceptable	Suitable	1007	BSk	Arid, steppe, cold
81	Aegean	Kütahya	Aslanapa	0.713290	Very Suitable	Acceptable	Acceptable	1031	Dsb	Cold, dry summer, warm summer
289	Aegean	Kütahya	Domaniç	0.696670	Very Suitable	Acceptable	Acceptable	873	Csb	Temperate, dry summer, warm summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
732	Aegean	Kütahya	Şaphane	0.682428	Very Suitable	Acceptable	Acceptable	1169	Dsb	Cold, dry summer, warm summer
761	Aegean	Manisa	Selendi	0.882525	Extremely Suitable	Suitable	Very Suitable	437	Csa	Temperate, dry summer, hot summer
386	Aegean	Manisa	Gördes	0.880034	Extremely Suitable	Suitable	Very Suitable	668	Csa	Temperate, dry summer, hot summer
799	Aegean	Manisa	Soma	0.834558	Extremely Suitable	Suitable	Suitable	1083	BSk	Arid, steppe, cold
589	Aegean	Manisa	Kula	0.829087	Extremely Suitable	Suitable	Suitable	665	Csa	Temperate, dry summer, hot summer
572	Aegean	Manisa	Köprübaşı/Manisa	0.828728	Extremely Suitable	Suitable	Suitable	247	Csa	Temperate, dry summer, hot summer
740	Aegean	Manisa	Sarıgöl	0.814858	Extremely Suitable	Suitable	Suitable	214	Csa	Temperate, dry summer, hot summer
257	Aegean	Manisa	Demirci	0.803774	Extremely Suitable	Suitable	Suitable	881	Csa	Temperate, dry summer, hot summer
724	Aegean	Manisa	Salihli	0.787449	Very Suitable	Suitable	Suitable	119	Csa	Temperate, dry summer, hot summer
45	Aegean	Manisa	Alaşehir	0.785384	Very Suitable	Suitable	Suitable	201	Csa	Temperate, dry summer, hot summer
620	Aegean	Manisa	Manisa/Merkez	0.724684	Very Suitable	Acceptable	Suitable	79	Csa	Temperate, dry summer, hot summer
25	Aegean	Manisa	Akhisar	0.718867	Very Suitable	Acceptable	Suitable	106	Csa	Temperate, dry summer, hot summer
18	Aegean	Manisa	Ahmetli	0.717566	Very Suitable	Acceptable	Suitable	91	Csa	Temperate, dry summer, hot summer
847	Aegean	Manisa	Turgutlu	0.712954	Very Suitable	Acceptable	Acceptable	95	Csa	Temperate, dry summer, hot summer
558	Aegean	Manisa	Kırkağaç	0.658261	Very Suitable	Acceptable	Acceptable	187	Csa	Temperate, dry summer, hot summer
750	Aegean	Manisa	Saruhanlı	0.653023	Very Suitable	Acceptable	Acceptable	40	Csa	Temperate, dry summer, hot summer
379	Aegean	Manisa	Gölmarmara	0.435375	Suitable	Marginal Suitable	Marginal Suitable	115	Csa	Temperate, dry summer, hot summer
889	Aegean	Muğla	Yatağan	0.882608	Extremely Suitable	Suitable	Very Suitable	390	Csa	Temperate, dry summer, hot summer
531	Aegean	Muğla	Kavaklıdere	0.865906	Extremely Suitable	Suitable	Very Suitable	603	Csb	Temperate, dry summer, warm summer
857	Aegean	Muğla	Ula	0.748529	Very Suitable	Suitable	Suitable	610	Csa	Temperate, dry summer, hot summer
644	Aegean	Muğla	Muğla/Merkez	0.734717	Very Suitable	Acceptable	Suitable	659	Csa	Temperate, dry summer, hot summer
153	Aegean	Muğla	Bodrum	0.700064	Very Suitable	Acceptable	Acceptable	4	Csa	Temperate, dry summer, hot summer
348	Aegean	Muğla	Fethiye	0.676602	Very Suitable	Acceptable	Acceptable	6	Csa	Temperate, dry summer, hot summer
640	Aegean	Muğla	Milas	0.620181	Very Suitable	Acceptable	Acceptable	59	Csa	Temperate, dry summer, hot summer
583	Aegean	Muğla	Köyceğiz	0.524348	Suitable	Acceptable	Acceptable	15	Csa	Temperate, dry summer, hot summer
250	Aegean	Muğla	Dalaman	0.503012	Suitable	Acceptable	Acceptable	17	Csa	Temperate, dry summer, hot summer
625	Aegean	Muğla	Marmaris	0.490692	Suitable	Marginal Suitable	Acceptable	5	Csa	Temperate, dry summer, hot summer
254	Aegean	Muğla	Datça	0.487309	Suitable	Marginal Suitable	Acceptable	9	Csa	Temperate, dry summer, hot summer
676	Aegean	Muğla	Ortaca	0.389164	Acceptable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
507	Aegean	Uşak	Karahallı	0.887725	Extremely Suitable	Very Suitable	Very Suitable	1549	Dsb	Cold, dry summer, warm summer
335	Aegean	Uşak	Eşme	0.865043	Extremely Suitable	Suitable	Very Suitable	828	Csa	Temperate, dry summer, hot summer
860	Aegean	Uşak	Ulubey/Uşak	0.851424	Extremely Suitable	Suitable	Suitable	727	Csa	Temperate, dry summer, hot summer
114	Aegean	Uşak	Banaz	0.790444	Very Suitable	Suitable	Suitable	914	Csa	Temperate, dry summer, hot summer
788	Aegean	Uşak	Sivaslı	0.723720	Very Suitable	Acceptable	Suitable	788	Csa	Temperate, dry summer, hot summer
870	Aegean	Uşak	Uşak/Merkez	0.694176	Very Suitable	Acceptable	Acceptable	915	Csa	Temperate, dry summer, hot summer
823	Black Sea	Amasya	Taşova	0.725532	Very Suitable	Acceptable	Suitable	240	BSk	Arid, steppe, cold
388	Black Sea	Amasya	Göynücek	0.680070	Very Suitable	Acceptable	Acceptable	522	BSk	Arid, steppe, cold
807	Black Sea	Amasya	Suluova	0.674567	Very Suitable	Acceptable	Acceptable	1.035	BSk	Arid, steppe, cold
420	Black Sea	Amasya	Hamamözü	0.639029	Very Suitable	Acceptable	Acceptable	691	BSk	Arid, steppe, cold
635	Black Sea	Amasya	Merzifon	0.620574	Very Suitable	Acceptable	Acceptable	746	BSk	Arid, steppe, cold
59	Black Sea	Amasya	Amasya/Merkez	0.613158	Very Suitable	Acceptable	Acceptable	400	BSk	Arid, steppe, cold
397	Black Sea	Amasya	Gümüşhacıköy	0.610510	Very Suitable	Acceptable	Acceptable	822	BSk	Arid, steppe, cold
72	Black Sea	Artvin	Arhavi	0.583428	Suitable	Acceptable	Acceptable	11	Cfb	Temperate, no dry season, warm summer
450	Black Sea	Artvin	Hopa	0.566971	Suitable	Acceptable	Acceptable	65	Cfa	Temperate, no dry season, hot summer
159	Black Sea	Artvin	Borçka	0.395336	Acceptable	Marginal Suitable	Marginal Suitable	123	Cfa	Temperate, no dry season, hot summer
647	Black Sea	Artvin	Murgul	0.392443	Acceptable	Marginal Suitable	Marginal Suitable	390	Dfb	Cold, no dry season, warm summer
919	Black Sea	Artvin	Yusufeli	0.306058	Acceptable	Marginal Suitable	Marginal Suitable	603	Dfb	Cold, no dry season, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
753	Black Sea	Artvin	Şavşat	0.178830	Marginal Suitable	Marginal Suitable	Marginal Suitable	1372	Dsb	Cold, dry summer, warm summer
69	Black Sea	Artvin	Ardanuç	0.176808	Marginal Suitable	Marginal Suitable	Marginal Suitable	499	Dfb	Cold, no dry season, warm summer
78	Black Sea	Artvin	Artvin/Merkez	0.170265	Marginal Suitable	Marginal Suitable	Marginal Suitable	530	Cfa	Temperate, no dry season, hot summer
116	Black Sea	Bartın	Bartın/Merkez	0.791277	Very Suitable	Suitable	Suitable	12	Cfa	Temperate, no dry season, hot summer
600	Black Sea	Bartın	Kurucaşile	0.724726	Very Suitable	Acceptable	Suitable	13	Cfb	Temperate, no dry season, warm summer
58	Black Sea	Bartın	Amasra	0.607149	Very Suitable	Acceptable	Acceptable	12	Cfa	Temperate, no dry season, hot summer
864	Black Sea	Bartın	Ulus	0.581860	Suitable	Acceptable	Acceptable	179	Cfb	Temperate, no dry season, warm summer
125	Black Sea	Bayburt	Bayburt/Merkez	0.246913	Acceptable	Marginal Suitable	Marginal Suitable	1555	BSk	Arid, steppe, cold
259	Black Sea	Bayburt	Demirözü	0.200809	Acceptable	Marginal Suitable	Marginal Suitable	1685	Dsb	Cold, dry summer, warm summer
93	Black Sea	Bayburt	Aydıntepe	0.103002	Marginal Suitable	Marginal Suitable	Marginal Suitable	1627	Dsc	Cold, dry summer, cold summer
755	Black Sea	Bolu	Seben	0.575065	Suitable	Acceptable	Acceptable	759	BSk	Arid, steppe, cold
389	Black Sea	Bolu	Göynük	0.547531	Suitable	Acceptable	Acceptable	740	Dfb	Cold, no dry season, warm summer
643	Black Sea	Bolu	Mudurnu	0.515428	Suitable	Acceptable	Acceptable	859	Dfb	Cold, no dry season, warm summer
632	Black Sea	Bolu	Mengen	0.510059	Suitable	Acceptable	Acceptable	616	Csb	Temperate, dry summer, warm summer
156	Black Sea	Bolu	Bolu/Merkez	0.443523	Suitable	Marginal Suitable	Marginal Suitable	741	Cfb	Temperate, no dry season, warm summer
554	Black Sea	Bolu	Kıbrıscık	0.360068	Acceptable	Marginal Suitable	Marginal Suitable	1139	Dsb	Cold, dry summer, warm summer
290	Black Sea	Bolu	Dörtdivan	0.330751	Acceptable	Marginal Suitable	Marginal Suitable	1168	Dsb	Cold, dry summer, warm summer
895	Black Sea	Bolu	Yeniçağa	0.330397	Acceptable	Marginal Suitable	Marginal Suitable	1002	Dsb	Cold, dry summer, warm summer
363	Black Sea	Bolu	Gerede	0.246166	Acceptable	Marginal Suitable	Marginal Suitable	1326	Dsb	Cold, dry summer, warm summer
628	Black Sea	Çorum	Mecitözü	0.811533	Extremely Suitable	Suitable	Suitable	811	BSk	Arid, steppe, cold
856	Black Sea	Çorum	Uğurludağ	0.802687	Extremely Suitable	Suitable	Suitable	806	BSk	Arid, steppe, cold
243	Black Sea	Çorum	Çorum/Merkez	0.751624	Very Suitable	Suitable	Suitable	822	BSk	Arid, steppe, cold
281	Black Sea	Çorum	Dodurga	0.747312	Very Suitable	Suitable	Suitable	624	BSk	Arid, steppe, cold
154	Black Sea	Çorum	Boğazkale	0.741936	Very Suitable	Suitable	Suitable	995	Dsb	Cold, dry summer, warm summer
678	Black Sea	Çorum	Ortaköy/Çorum	0.715043	Very Suitable	Acceptable	Acceptable	809	BSk	Arid, steppe, cold
39	Black Sea	Çorum	Alaca	0.714116	Very Suitable	Acceptable	Acceptable	926	BSk	Arid, steppe, cold
668	Black Sea	Çorum	Oğuzlar	0.710519	Very Suitable	Acceptable	Acceptable	680	Dfb	Cold, no dry season, warm summer
124	Black Sea	Çorum	Bayat/Çorum	0.706589	Very Suitable	Acceptable	Acceptable	698	BSk	Arid, steppe, cold
810	Black Sea	Çorum	Sungurlu	0.696834	Very Suitable	Acceptable	Acceptable	500	Csa	Temperate, dry summer, hot summer
679	Black Sea	Çorum	Osmancık	0.680080	Very Suitable	Acceptable	Acceptable	425	BSk	Arid, steppe, cold
521	Black Sea	Çorum	Kargı	0.618935	Very Suitable	Acceptable	Acceptable	2281	Dsb	Cold, dry summer, warm summer
477	Black Sea	Çorum	İskilip	0.582260	Suitable	Acceptable	Acceptable	734	BSk	Arid, steppe, cold
604	Black Sea	Çorum	Laçin	0.561186	Suitable	Acceptable	Acceptable	729	BSk	Arid, steppe, cold
234	Black Sea	Düzce	Çilimli	0.811163	Extremely Suitable	Suitable	Suitable	184	Cfb	Temperate, no dry season, warm summer
399	Black Sea	Düzce	Gümüşova	0.780557	Very Suitable	Suitable	Suitable	195	Cfa	Temperate, no dry season, hot summer
23	Black Sea	Düzce	Akçakoca	0.752763	Very Suitable	Suitable	Suitable	7	Cfb	Temperate, no dry season, warm summer
533	Black Sea	Düzce	Kaynaşlı	0.683019	Very Suitable	Acceptable	Acceptable	53	Cfa	Temperate, no dry season, hot summer
910	Black Sea	Düzce	Yığılca	0.680658	Very Suitable	Acceptable	Acceptable	326	Cfb	Temperate, no dry season, warm summer
295	Black Sea	Düzce	Düzce/Merkez	0.652453	Very Suitable	Acceptable	Acceptable	149	Cfa	Temperate, no dry season, hot summer
382	Black Sea	Düzce	Gölyaka	0.638352	Very Suitable	Acceptable	Acceptable	131	Cfa	Temperate, no dry season, hot summer
246	Black Sea	Düzce	Cumayeri	0.622048	Very Suitable	Acceptable	Acceptable	133	Cfa	Temperate, no dry season, hot summer
336	Black Sea	Giresun	Espiye	0.695532	Very Suitable	Acceptable	Acceptable	9	Cfa	Temperate, no dry season, hot summer
835	Black Sea	Giresun	Tirebolu	0.692634	Very Suitable	Acceptable	Acceptable	13	Cfa	Temperate, no dry season, hot summer
387	Black Sea	Giresun	Görele	0.666351	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
703	Black Sea	Giresun	Piraziz	0.660060	Very Suitable	Acceptable	Acceptable	3	Cfa	Temperate, no dry season, hot summer
369	Black Sea	Giresun	Giresun/Merkez	0.651549	Very Suitable	Acceptable	Acceptable	14	Cfa	Temperate, no dry season, hot summer
548	Black Sea	Giresun	Keşap	0.644588	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer

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LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
174	Black Sea	Giresun	Bulancak	0.642958	Very Suitable	Acceptable	Acceptable	15	Cfa	Temperate, no dry season, hot summer
340	Black Sea	Giresun	Eynesil	0.516897	Suitable	Acceptable	Acceptable	9	Cfa	Temperate, no dry season, hot summer
193	Black Sea	Giresun	Çanakçı	0.491410	Suitable	Marginal Suitable	Acceptable	176	Cfb	Temperate, no dry season, warm summer
263	Black Sea	Giresun	Dereli	0.426616	Suitable	Marginal Suitable	Marginal Suitable	282	Cfb	Temperate, no dry season, warm summer
881	Black Sea	Giresun	Yağlıdere	0.365211	Acceptable	Marginal Suitable	Marginal Suitable	104	Cfb	Temperate, no dry season, warm summer
717	Black Sea	Giresun	Şebinkarahisar	0.309990	Acceptable	Marginal Suitable	Marginal Suitable	914	BSk	Arid, steppe, cold
283	Black Sea	Giresun	Doğankent	0.287726	Acceptable	Marginal Suitable	Marginal Suitable	195	Csb	Temperate, dry summer, warm summer
390	Black Sea	Giresun	Güce	0.279747	Acceptable	Marginal Suitable	Marginal Suitable	342	Cfb	Temperate, no dry season, warm summer
57	Black Sea	Giresun	Alucra	0.173682	Marginal Suitable	Marginal Suitable	Marginal Suitable	1477	Dsb	Cold, dry summer, warm summer
191	Black Sea	Giresun	Çamoluk	0.122470	Marginal Suitable	Marginal Suitable	Marginal Suitable	1062	Dsb	Cold, dry summer, warm summer
540	Black Sea	Gümüşhane	Kelkit	0.275718	Acceptable	Marginal Suitable	Marginal Suitable	1408	BSk	Arid, steppe, cold
398	Black Sea	Gümüşhane	Gümüşhane/Merkez	0.236436	Acceptable	Marginal Suitable	Marginal Suitable	1174	Dsb	Cold, dry summer, warm summer
784	Black Sea	Gümüşhane	Şiran	0.234196	Acceptable	Marginal Suitable	Marginal Suitable	1409	Dsb	Cold, dry summer, warm summer
580	Black Sea	Gümüşhane	Köse	0.187606	Marginal Suitable	Marginal Suitable	Marginal Suitable	1577	Dsb	Cold, dry summer, warm summer
599	Black Sea	Gümüşhane	Kürtün	0.082848	Marginal Suitable	Marginal Suitable	Marginal Suitable	629	Dsb	Cold, dry summer, warm summer
842	Black Sea	Gümüşhane	Torul	0.041195	Marginal Suitable	Marginal Suitable	Marginal Suitable	940	Dsb	Cold, dry summer, warm summer
897	Black Sea	Karabük	Yenice/Karabük	0.647584	Very Suitable	Acceptable	Acceptable	150	Cfa	Temperate, no dry season, hot summer
501	Black Sea	Karabük	Karabük/Merkez	0.645241	Very Suitable	Acceptable	Acceptable	45	Csa	Temperate, dry summer, hot summer
720	Black Sea	Karabük	Safranbolu	0.505809	Suitable	Acceptable	Acceptable	544	Cfb	Temperate, no dry season, warm summer
685	Black Sea	Karabük	Ovacık/Karabuk	0.451017	Suitable	Marginal Suitable	Marginal Suitable	1111	Dfb	Cold, no dry season, warm summer
333	Black Sea	Karabük	Eskipazar	0.403947	Suitable	Marginal Suitable	Marginal Suitable	748	Dsb	Cold, dry summer, warm summer
302	Black Sea	Karabük	Eflani	0.365980	Acceptable	Marginal Suitable	Marginal Suitable	907	Dfb	Cold, no dry season, warm summer
205	Black Sea	Kastamonu	Çatalzeytin	0.661429	Very Suitable	Acceptable	Acceptable	11	Csa	Temperate, dry summer, hot summer
166	Black Sea	Kastamonu	Bozkurt/Kastamonu	0.616199	Very Suitable	Acceptable	Acceptable	39	Cfb	Temperate, no dry season, warm summer
2	Black Sea	Kastamonu	Abana	0.602878	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
228	Black Sea	Kastamonu	Cide	0.597920	Suitable	Acceptable	Acceptable	14	Cfa	Temperate, no dry season, hot summer
470	Black Sea	Kastamonu	İnebolu	0.585001	Suitable	Acceptable	Acceptable	294	BSk	Arid, steppe, cold
287	Black Sea	Kastamonu	Doğanyurt	0.580997	Suitable	Acceptable	Acceptable	13	Cfa	Temperate, no dry season, hot summer
425	Black Sea	Kastamonu	Hanönü	0.510071	Suitable	Acceptable	Acceptable	427	Cfb	Temperate, no dry season, warm summer
821	Black Sea	Kastamonu	Taşköprü	0.504800	Suitable	Acceptable	Acceptable	1762	Dsb	Cold, dry summer, warm summer
704	Black Sea	Kastamonu	Pınarbaşı/Kastamonu	0.457708	Suitable	Marginal Suitable	Marginal Suitable	672	Cfb	Temperate, no dry season, warm summer
529	Black Sea	Kastamonu	Kastamonu/Merkez	0.443194	Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
64	Black Sea	Kastamonu	Araç	0.371133	Acceptable	Marginal Suitable	Marginal Suitable	676	Dfb	Cold, no dry season, warm summer
843	Black Sea	Kastamonu	Tosya	0.363731	Acceptable	Marginal Suitable	Marginal Suitable	833	BSk	Arid, steppe, cold
766	Black Sea	Kastamonu	Şenpazar	0.348770	Acceptable	Marginal Suitable	Marginal Suitable	972	BSk	Arid, steppe, cold
98	Black Sea	Kastamonu	Azdavay	0.331145	Acceptable	Marginal Suitable	Marginal Suitable	834	Dfb	Cold, no dry season, warm summer
458	Black Sea	Kastamonu	İhsangazi	0.313653	Acceptable	Marginal Suitable	Marginal Suitable	1099	BSk	Arid, steppe, cold
271	Black Sea	Kastamonu	Devrekani	0.234658	Acceptable	Marginal Suitable	Marginal Suitable	1108	Dfb	Cold, no dry season, warm summer
249	Black Sea	Kastamonu	Daday	0.221382	Acceptable	Marginal Suitable	Marginal Suitable	868	Dfb	Cold, no dry season, warm summer
14	Black Sea	Kastamonu	Ağlı	0.211714	Acceptable	Marginal Suitable	Marginal Suitable	1174	Dfb	Cold, no dry season, warm summer
596	Black Sea	Kastamonu	Küre	0.206184	Acceptable	Marginal Suitable	Marginal Suitable	976	Dfb	Cold, no dry season, warm summer
769	Black Sea	Kastamonu	Seydiler	0.196090	Marginal Suitable	Marginal Suitable	Marginal Suitable	1043	Dfb	Cold, no dry season, warm summer
672	Black Sea	Ordu	Ordu/Merkez	0.724732	Very Suitable	Acceptable	Suitable	25	Cfa	Temperate, no dry season, hot summer
700	Black Sea	Ordu	Perşembe	0.720050	Very Suitable	Acceptable	Suitable	7	Cfa	Temperate, no dry season, hot summer
866	Black Sea	Ordu	Ünye	0.681300	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
460	Black Sea	Ordu	İkizce	0.661108	Very Suitable	Acceptable	Acceptable	556	Dfb	Cold, no dry season, warm summer
396	Black Sea	Ordu	Gülyalı	0.651221	Very Suitable	Acceptable	Acceptable	6	Cfb	Temperate, no dry season, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
204	Black Sea	Ordu	Çatalpınar	0.621551	Very Suitable	Acceptable	Acceptable	139	Cfb	Temperate, no dry season, warm summer
406	Black Sea	Ordu	Gürgentepe	0.617838	Very Suitable	Acceptable	Acceptable	1238	Cfb	Temperate, no dry season, warm summer
344	Black Sea	Ordu	Fatsa	0.615087	Very Suitable	Acceptable	Acceptable	17	Cfa	Temperate, no dry season, hot summer
209	Black Sea	Ordu	Çaybaşı	0.577694	Suitable	Acceptable	Acceptable	494	Cfb	Temperate, no dry season, warm summer
186	Black Sea	Ordu	Çamaş	0.543465	Suitable	Acceptable	Acceptable	588	Cfb	Temperate, no dry season, warm summer
29	Black Sea	Ordu	Akkuş	0.530524	Suitable	Acceptable	Acceptable	1236	Dsb	Cold, dry summer, warm summer
859	Black Sea	Ordu	Ulubey/Ordu	0.482640	Suitable	Marginal Suitable	Acceptable	598	Cfb	Temperate, no dry season, warm summer
595	Black Sea	Ordu	Kumru	0.479046	Suitable	Marginal Suitable	Acceptable	457	Cfb	Temperate, no dry season, warm summer
484	Black Sea	Ordu	Kabataş	0.470520	Suitable	Marginal Suitable	Marginal Suitable	436	Cfb	Temperate, no dry season, warm summer
576	Black Sea	Ordu	Korgan	0.459595	Suitable	Marginal Suitable	Marginal Suitable	781	Cfb	Temperate, no dry season, warm summer
506	Black Sea	Ordu	Kabadüz	0.450202	Suitable	Marginal Suitable	Marginal Suitable	578	Cfb	Temperate, no dry season, warm summer
636	Black Sea	Ordu	Mesudiye	0.226131	Acceptable	Marginal Suitable	Marginal Suitable	1139	Dsb	Cold, dry summer, warm summer
378	Black Sea	Ordu	Gölköy	0.221718	Acceptable	Marginal Suitable	Marginal Suitable	829	Dsb	Cold, dry summer, warm summer
88	Black Sea	Ordu	Aybastı	0.178933	Marginal Suitable	Marginal Suitable	Marginal Suitable	741	Dfb	Cold, no dry season, warm summer
264	Black Sea	Rize	Derepazarı	0.684748	Very Suitable	Acceptable	Acceptable	8	Cfa	Temperate, no dry season, hot summer
482	Black Sea	Rize	İyidere	0.668107	Very Suitable	Acceptable	Acceptable	103	Csa	Temperate, dry summer, hot summer
716	Black Sea	Rize	Rize/Merkez	0.624926	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
350	Black Sea	Rize	Fındıklı	0.622300	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
211	Black Sea	Rize	Çayeli	0.595057	Suitable	Acceptable	Acceptable	10	Cfa	Temperate, no dry season, hot summer
403	Black Sea	Rize	Güneysu	0.483144	Suitable	Marginal Suitable	Acceptable	169	Cfb	Temperate, no dry season, warm summer
692	Black Sea	Rize	Pazar/Rize	0.473253	Suitable	Marginal Suitable	Acceptable	34	Cfa	Temperate, no dry season, hot summer
497	Black Sea	Rize	Kalkandere	0.456243	Suitable	Marginal Suitable	Marginal Suitable	718	BSk	Arid, steppe, cold
70	Black Sea	Rize	Ardeşen	0.442336	Suitable	Marginal Suitable	Marginal Suitable	5	Cfa	Temperate, no dry season, hot summer
442	Black Sea	Rize	Hemşin	0.426995	Suitable	Marginal Suitable	Marginal Suitable	315	Cfb	Temperate, no dry season, warm summer
189	Black Sea	Rize	Çamlıhemşin	0.374732	Acceptable	Marginal Suitable	Marginal Suitable	311	Cfb	Temperate, no dry season, warm summer
461	Black Sea	Rize	İkizdere	0.120871	Marginal Suitable	Marginal Suitable	Marginal Suitable	1104	Dsa	Cold, dry summer, hot summer
833	Black Sea	Samsun	Terme	0.791036	Very Suitable	Suitable	Suitable	12	Cfa	Temperate, no dry season, hot summer
41	Black Sea	Samsun	Alaçam	0.785422	Very Suitable	Suitable	Suitable	38	Cfb	Temperate, no dry season, warm summer
829	Black Sea	Samsun	Tekkeköy	0.782666	Very Suitable	Suitable	Suitable	21	Cfa	Temperate, no dry season, hot summer
1	Black Sea	Samsun	19 Mayıs	0.780876	Very Suitable	Suitable	Suitable	16	Csa	Temperate, dry summer, hot summer
729	Black Sea	Samsun	Samsun/Merkez	0.779625	Very Suitable	Suitable	Suitable	10	Cfa	Temperate, no dry season, hot summer
884	Black Sea	Samsun	Yakakent	0.778011	Very Suitable	Suitable	Suitable	12	Cfb	Temperate, no dry season, warm summer
878	Black Sea	Samsun	Vezirköprü	0.777606	Very Suitable	Suitable	Suitable	349	BSk	Arid, steppe, cold
101	Black Sea	Samsun	Bafra	0.764035	Very Suitable	Suitable	Suitable	26	Csa	Temperate, dry summer, hot summer
199	Black Sea	Samsun	Çarşamba	0.758576	Very Suitable	Suitable	Suitable	22	Cfa	Temperate, no dry season, hot summer
725	Black Sea	Samsun	Salıpazarı	0.745206	Very Suitable	Suitable	Suitable	84	Cfa	Temperate, no dry season, hot summer
79	Black Sea	Samsun	Asarcık	0.692365	Very Suitable	Acceptable	Acceptable	802	Csb	Temperate, dry summer, warm summer
530	Black Sea	Samsun	Kavak	0.648028	Very Suitable	Acceptable	Acceptable	19	Csa	Temperate, dry summer, hot summer
605	Black Sea	Samsun	Ladik	0.645114	Very Suitable	Acceptable	Acceptable	940	Dsb	Cold, dry summer, warm summer
436	Black Sea	Samsun	Havza	0.594204	Suitable	Acceptable	Acceptable	625	BSk	Arid, steppe, cold
96	Black Sea	Samsun	Ayvacık/Samsun	0.565549	Suitable	Acceptable	Acceptable	69	Cfb	Temperate, no dry season, warm summer
324	Black Sea	Sinop	Erfelek	0.763271	Very Suitable	Suitable	Suitable	185	Cfb	Temperate, no dry season, warm summer
366	Black Sea	Sinop	Gerze	0.668220	Very Suitable	Acceptable	Acceptable	31	Cfa	Temperate, no dry season, hot summer
783	Black Sea	Sinop	Sinop/Merkez	0.663701	Very Suitable	Acceptable	Acceptable	1313	BSk	Arid, steppe, cold
161	Black Sea	Sinop	Boyabat	0.641186	Very Suitable	Acceptable	Acceptable	329	Cfa	Temperate, no dry season, hot summer
735	Black Sea	Sinop	Saraydüzü	0.635917	Very Suitable	Acceptable	Acceptable	415	BSk	Arid, steppe, cold
276	Black Sea	Sinop	Dikmen	0.607288	Very Suitable	Acceptable	Acceptable	193	Cfb	Temperate, no dry season, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
293	Black Sea	Sinop	Durağan	0.546241	Suitable	Acceptable	Acceptable	213	Cfa	Temperate, no dry season, hot summer
86	Black Sea	Sinop	Ayancık	0.539153	Suitable	Acceptable	Acceptable	9	Cfa	Temperate, no dry season, hot summer
849	Black Sea	Sinop	Türkeli	0.486746	Suitable	Marginal Suitable	Acceptable	12	Cfb	Temperate, no dry season, warm summer
693	Black Sea	Tokat	Pazar/Tokat	0.720600	Very Suitable	Acceptable	Suitable	576	BSk	Arid, steppe, cold
318	Black Sea	Tokat	Erbaa	0.698018	Very Suitable	Acceptable	Acceptable	237	BSk	Arid, steppe, cold
848	Black Sea	Tokat	Turhal	0.675662	Very Suitable	Acceptable	Acceptable	588	BSk	Arid, steppe, cold
922	Black Sea	Tokat	Zile	0.640655	Very Suitable	Acceptable	Acceptable	743	BSk	Arid, steppe, cold
808	Black Sea	Tokat	Sulusaray	0.633554	Very Suitable	Acceptable	Acceptable	130	Csa	Temperate, dry summer, hot summer
659	Black Sea	Tokat	Niksar	0.586500	Suitable	Acceptable	Acceptable	346	Csa	Temperate, dry summer, hot summer
909	Black Sea	Tokat	Yeşilyurt/Tokat	0.520344	Suitable	Acceptable	Acceptable	999	BSk	Arid, steppe, cold
77	Black Sea	Tokat	Artova	0.505757	Suitable	Acceptable	Acceptable	1.184	BSk	Arid, steppe, cold
836	Black Sea	Tokat	Tokat/Merkez	0.502314	Suitable	Acceptable	Acceptable	630	BSk	Arid, steppe, cold
117	Black Sea	Tokat	Başçiftlik	0.424294	Suitable	Marginal Suitable	Marginal Suitable	2320	Dsb	Cold, dry summer, warm summer
47	Black Sea	Tokat	Almus	0.397421	Acceptable	Marginal Suitable	Marginal Suitable	853	BSk	Arid, steppe, cold
714	Black Sea	Tokat	Reşadiye	0.181033	Marginal Suitable	Marginal Suitable	Marginal Suitable	538	BSk	Arid, steppe, cold
19	Black Sea	Trabzon	Akçaabat	0.732269	Very Suitable	Acceptable	Suitable	16	Cfa	Temperate, no dry season, hot summer
875	Black Sea	Trabzon	Vakfıkebir	0.725135	Very Suitable	Acceptable	Suitable	13	Csa	Temperate, dry summer, hot summer
65	Black Sea	Trabzon	Araklı	0.696223	Very Suitable	Acceptable	Acceptable	6	Cfa	Temperate, no dry season, hot summer
200	Black Sea	Trabzon	Çarşıbaşı	0.678653	Very Suitable	Acceptable	Acceptable	17	Csa	Temperate, dry summer, hot summer
76	Black Sea	Trabzon	Arsin	0.668777	Very Suitable	Acceptable	Acceptable	24	Cfa	Temperate, no dry season, hot summer
133	Black Sea	Trabzon	Beşikdüzü	0.662382	Very Suitable	Acceptable	Acceptable	8	Cfa	Temperate, no dry season, hot summer
913	Black Sea	Trabzon	Yomra	0.633839	Very Suitable	Acceptable	Acceptable	10	Cfa	Temperate, no dry season, hot summer
844	Black Sea	Trabzon	Trabzon/Merkez	0.617160	Very Suitable	Acceptable	Acceptable	36	Cfa	Temperate, no dry season, hot summer
811	Black Sea	Trabzon	Sürmene	0.613458	Very Suitable	Acceptable	Acceptable	992	Csa	Temperate, dry summer, hot summer
726	Black Sea	Trabzon	Şalpazarı	0.607288	Very Suitable	Acceptable	Acceptable	527	Csa	Temperate, dry summer, hot summer
297	Black Sea	Trabzon	Düzköy	0.524391	Suitable	Acceptable	Acceptable	780	Dsb	Cold, dry summer, warm summer
838	Black Sea	Trabzon	Tonya	0.498154	Suitable	Marginal Suitable	Acceptable	742	Csb	Temperate, dry summer, warm summer
666	Black Sea	Trabzon	Of	0.461693	Suitable	Marginal Suitable	Marginal Suitable	11	Cfa	Temperate, no dry season, hot summer
439	Black Sea	Trabzon	Hayrat	0.389870	Acceptable	Marginal Suitable	Marginal Suitable	202	Cfb	Temperate, no dry season, warm summer
611	Black Sea	Trabzon	Maçka	0.348097	Acceptable	Marginal Suitable	Marginal Suitable	364	Dsb	Cold, dry summer, warm summer
573	Black Sea	Trabzon	Köprübaşı/Trabzon	0.307874	Acceptable	Marginal Suitable	Marginal Suitable	307	Dfb	Cold, no dry season, warm summer
268	Black Sea	Trabzon	Dernekpazarı	0.236530	Acceptable	Marginal Suitable	Marginal Suitable	199	Cfb	Temperate, no dry season, warm summer
214	Black Sea	Trabzon	Çaykara	0.223523	Acceptable	Marginal Suitable	Marginal Suitable	317	Dfb	Cold, no dry season, warm summer
210	Black Sea	Zonguldak	Çaycuma	0.775970	Very Suitable	Suitable	Suitable	36	Cfa	Temperate, no dry season, hot summer
44	Black Sea	Zonguldak	Alaplı	0.754538	Very Suitable	Suitable	Suitable	18	Cfb	Temperate, no dry season, warm summer
371	Black Sea	Zonguldak	Gökçebey	0.669012	Very Suitable	Acceptable	Acceptable	62	Cfa	Temperate, no dry season, hot summer
923	Black Sea	Zonguldak	Zonguldak/Merkez	0.665644	Very Suitable	Acceptable	Acceptable	10	Cfa	Temperate, no dry season, hot summer
270	Black Sea	Zonguldak	Devrek	0.651993	Very Suitable	Acceptable	Acceptable	103	Cfa	Temperate, no dry season, hot summer
323	Black Sea	Zonguldak	Ereğli/Zonguldak	0.560265	Suitable	Acceptable	Acceptable	12	Cfa	Temperate, no dry season, hot summer
745	Central Anatolia	Aksaray	Sarıyahşi	0.886724	Extremely Suitable	Suitable	Very Suitable	968	BSk	Arid, steppe, cold
677	Central Anatolia	Aksaray	Ortaköy/Aksaray	0.885912	Extremely Suitable	Suitable	Very Suitable	1227	BSk	Arid, steppe, cold
11	Central Anatolia	Aksaray	Ağaçören	0.884298	Extremely Suitable	Suitable	Very Suitable	964	BSk	Arid, steppe, cold
32	Central Anatolia	Aksaray	Aksaray/Merkez	0.881327	Extremely Suitable	Suitable	Very Suitable	1228	BSk	Arid, steppe, cold
393	Central Anatolia	Aksaray	Gülağaç	0.824437	Extremely Suitable	Suitable	Suitable	1172	BSk	Arid, steppe, cold
412	Central Anatolia	Aksaray	Güzelyurt	0.794549	Very Suitable	Suitable	Suitable	1502	BSk	Arid, steppe, cold
332	Central Anatolia	Aksaray	Eskil	0.794539	Very Suitable	Suitable	Suitable	940	BSk	Arid, steppe, cold
87	Central Anatolia	Ankara	Ayaş	0.858143	Extremely Suitable	Suitable	Suitable	955	BSk	Arid, steppe, cold

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
337	Central Anatolia	Ankara	Etimesgut	0.850323	Extremely Suitable	Suitable	Suitable	819	BSk	Arid, steppe, cold
143	Central Anatolia	Ankara	Beypazarı	0.847937	Extremely Suitable	Suitable	Suitable	676	BSk	Arid, steppe, cold
899	Central Anatolia	Ankara	Yenimahalle	0.842704	Extremely Suitable	Suitable	Suitable	880	BSk	Arid, steppe, cold
373	Central Anatolia	Ankara	Gölbaşı/Ankara	0.840277	Extremely Suitable	Suitable	Suitable	1006	BSk	Arid, steppe, cold
339	Central Anatolia	Ankara	Evren	0.832023	Extremely Suitable	Suitable	Suitable	926	BSk	Arid, steppe, cold
196	Central Anatolia	Ankara	Çankaya	0.825487	Extremely Suitable	Suitable	Suitable	881	BSk	Arid, steppe, cold
718	Central Anatolia	Ankara	Şereflikoçhisar	0.805946	Extremely Suitable	Suitable	Suitable	1343	Dsa	Cold, dry summer, hot summer
780	Central Anatolia	Ankara	Sincan	0.804766	Extremely Suitable	Suitable	Suitable	1125	Dsb	Cold, dry summer, warm summer
618	Central Anatolia	Ankara	Mamak	0.802457	Extremely Suitable	Suitable	Suitable	909	BSk	Arid, steppe, cold
652	Central Anatolia	Ankara	Nallıhan	0.795127	Very Suitable	Suitable	Suitable	633	BSk	Arid, steppe, cold
392	Central Anatolia	Ankara	Güdül	0.788957	Very Suitable	Suitable	Suitable	738	BSk	Arid, steppe, cold
708	Central Anatolia	Ankara	Polatlı	0.766112	Very Suitable	Suitable	Suitable	866	BSk	Arid, steppe, cold
49	Central Anatolia	Ankara	Altındağ	0.734101	Very Suitable	Acceptable	Suitable	892	BSk	Arid, steppe, cold
38	Central Anatolia	Ankara	Akyurt	0.719617	Very Suitable	Acceptable	Suitable	1027	BSk	Arid, steppe, cold
109	Central Anatolia	Ankara	Bala	0.718753	Very Suitable	Acceptable	Suitable	1309	BSk	Arid, steppe, cold
534	Central Anatolia	Ankara	Kazan	0.697796	Very Suitable	Acceptable	Acceptable	314	Cfa	Temperate, no dry season, hot summer
437	Central Anatolia	Ankara	Haymana	0.691726	Very Suitable	Acceptable	Acceptable	1251	BSk	Arid, steppe, cold
311	Central Anatolia	Ankara	Elmadağ	0.667810	Very Suitable	Acceptable	Acceptable	1100	BSk	Arid, steppe, cold
496	Central Anatolia	Ankara	Kalecik	0.663831	Very Suitable	Acceptable	Acceptable	729	Dsa	Cold, dry summer, hot summer
244	Central Anatolia	Ankara	Çubuk	0.655695	Very Suitable	Acceptable	Acceptable	1002	BSk	Arid, steppe, cold
538	Central Anatolia	Ankara	Keçiören	0.640049	Very Suitable	Acceptable	Acceptable	865	BSk	Arid, steppe, cold
561	Central Anatolia	Ankara	Kızılcahamam	0.412428	Suitable	Marginal Suitable	Marginal Suitable	985	Dsb	Cold, dry summer, warm summer
188	Central Anatolia	Ankara	Çamlıdere	0.407693	Suitable	Marginal Suitable	Marginal Suitable	1243	Dsb	Cold, dry summer, warm summer
562	Central Anatolia	Çankırı	Kızılırmak	0.849569	Extremely Suitable	Suitable	Suitable	555	BSk	Arid, steppe, cold
309	Central Anatolia	Çankırı	Eldivan	0.757632	Very Suitable	Suitable	Suitable	945	BSk	Arid, steppe, cold
197	Central Anatolia	Çankırı	Çankırı/Merkez	0.621397	Very Suitable	Acceptable	Acceptable	730	BSk	Arid, steppe, cold
719	Central Anatolia	Çankırı	Şabanözü	0.547871	Suitable	Acceptable	Acceptable	875	Csa	Temperate, dry summer, hot summer
577	Central Anatolia	Çankırı	Korgun	0.496861	Suitable	Marginal Suitable	Acceptable	925	BSk	Arid, steppe, cold
888	Central Anatolia	Çankırı	Yapraklı	0.477584	Suitable	Marginal Suitable	Acceptable	1200	Dsb	Cold, dry summer, warm summer
675	Central Anatolia	Çankırı	Orta	0.320057	Acceptable	Marginal Suitable	Marginal Suitable	1257	Dsb	Cold, dry summer, warm summer
597	Central Anatolia	Çankırı	Kurşunlu	0.218555	Acceptable	Marginal Suitable	Marginal Suitable	1137	Dsb	Cold, dry summer, warm summer
462	Central Anatolia	Çankırı	Ilgaz	0.208444	Acceptable	Marginal Suitable	Marginal Suitable	929	BSk	Arid, steppe, cold
129	Central Anatolia	Çankırı	Bayramören	0.189535	Marginal Suitable	Marginal Suitable	Marginal Suitable	868	Dfb	Cold, no dry season, warm summer
83	Central Anatolia	Çankırı	Atkaracalar	0.167823	Marginal Suitable	Marginal Suitable	Marginal Suitable	1247	Dsb	Cold, dry summer, warm summer
221	Central Anatolia	Çankırı	Çerkeş	0.145199	Marginal Suitable	Marginal Suitable	Marginal Suitable	1132	Dsb	Cold, dry summer, warm summer
141	Central Anatolia	Eskişehir	Beylikova	0.861011	Extremely Suitable	Suitable	Very Suitable	771	BSk	Arid, steppe, cold
639	Central Anatolia	Eskişehir	Mihaliççık	0.837845	Extremely Suitable	Suitable	Suitable	1306	Dsb	Cold, dry summer, warm summer
229	Central Anatolia	Eskişehir	Çifteler	0.834073	Extremely Suitable	Suitable	Suitable	877	BSk	Arid, steppe, cold
405	Central Anatolia	Eskişehir	Günyüzü	0.833668	Extremely Suitable	Suitable	Suitable	894	BSk	Arid, steppe, cold
48	Central Anatolia	Eskişehir	Alpu	0.828691	Extremely Suitable	Suitable	Suitable	766	BSk	Arid, steppe, cold
613	Central Anatolia	Eskişehir	Mahmudiye	0.798596	Very Suitable	Suitable	Suitable	887	BSk	Arid, steppe, cold
739	Central Anatolia	Eskişehir	Sarıcakaya	0.792255	Very Suitable	Suitable	Suitable	216	BSk	Arid, steppe, cold
638	Central Anatolia	Eskişehir	Mihalgazi	0.784396	Very Suitable	Suitable	Suitable	215	BSk	Arid, steppe, cold
334	Central Anatolia	Eskişehir	Eskişehir/Merkez	0.753767	Very Suitable	Suitable	Suitable	796	BSk	Arid, steppe, cold
422	Central Anatolia	Eskişehir	Han	0.706147	Very Suitable	Acceptable	Acceptable	1224	BSk	Arid, steppe, cold
791	Central Anatolia	Eskişehir	Sivrihisar	0.693994	Very Suitable	Acceptable	Acceptable	1424	Dsa	Cold, dry summer, hot summer
772	Central Anatolia	Eskişehir	Seyitgazi	0.693211	Very Suitable	Acceptable	Acceptable	991	BSk	Arid, steppe, cold

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
473	Central Anatolia	Eskişehir	İnönü	0.599530	Suitable	Acceptable	Acceptable	18	Csa	Temperate, dry summer, hot summer
326	Central Anatolia	Karaman	Ermenek	0.869780	Extremely Suitable	Suitable	Very Suitable	1282	Csa	Temperate, dry summer, hot summer
512	Central Anatolia	Karaman	Karaman/Merkez	0.829765	Extremely Suitable	Suitable	Suitable	847	BSk	Arid, steppe, cold
94	Central Anatolia	Karaman	Ayrancı	0.825931	Extremely Suitable	Suitable	Suitable	1141	BSk	Arid, steppe, cold
137	Central Anatolia	Karaman	Başyayla	0.725131	Very Suitable	Acceptable	Suitable	1346	Csa	Temperate, dry summer, hot summer
793	Central Anatolia	Karaman	Sarıveliler	0.715244	Very Suitable	Acceptable	Acceptable	1523	Dsb	Cold, dry summer, warm summer
535	Central Anatolia	Karaman	Kazımkarabekir	0.709235	Very Suitable	Acceptable	Acceptable	1052	Csa	Temperate, dry summer, hot summer
569	Central Anatolia	Kayseri	Kocasinan	0.793048	Very Suitable	Suitable	Suitable	1056	BSk	Arid, steppe, cold
629	Central Anatolia	Kayseri	Melikgazi	0.790797	Very Suitable	Suitable	Suitable	1059	BSk	Arid, steppe, cold
468	Central Anatolia	Kayseri	İncesu	0.756857	Very Suitable	Suitable	Suitable	43	Csa	Temperate, dry summer, hot summer
414	Central Anatolia	Kayseri	Hacılar	0.748630	Very Suitable	Suitable	Suitable	1385	BSk	Arid, steppe, cold
346	Central Anatolia	Kayseri	Felahiye	0.702103	Very Suitable	Acceptable	Acceptable	1308	BSk	Arid, steppe, cold
905	Central Anatolia	Kayseri	Yeşilhisar	0.697390	Very Suitable	Acceptable	Acceptable	1167	BSk	Arid, steppe, cold
269	Central Anatolia	Kayseri	Develi	0.696264	Very Suitable	Acceptable	Acceptable	1261	BSk	Arid, steppe, cold
177	Central Anatolia	Kayseri	Bünyan	0.647713	Very Suitable	Acceptable	Acceptable	1345	BSk	Arid, steppe, cold
744	Central Anatolia	Kayseri	Sarıoğlan	0.635132	Very Suitable	Acceptable	Acceptable	1156	BSk	Arid, steppe, cold
883	Central Anatolia	Kayseri	Yahyalı	0.600938	Very Suitable	Acceptable	Acceptable	1178	BSk	Arid, steppe, cold
817	Central Anatolia	Kayseri	Talas	0.588146	Suitable	Acceptable	Acceptable	1150	BSk	Arid, steppe, cold
687	Central Anatolia	Kayseri	Özvatan	0.578200	Suitable	Acceptable	Acceptable	1289	BSk	Arid, steppe, cold
837	Central Anatolia	Kayseri	Tomarza	0.570056	Suitable	Acceptable	Acceptable	1396	BSk	Arid, steppe, cold
705	Central Anatolia	Kayseri	Pınarbaşı/Kayseri	0.388875	Acceptable	Marginal Suitable	Marginal Suitable	1526	Dsb	Cold, dry summer, warm summer
747	Central Anatolia	Kayseri	Sarız	0.352941	Acceptable	Marginal Suitable	Marginal Suitable	1569	Dsb	Cold, dry summer, warm summer
27	Central Anatolia	Kayseri	Akkışla	0.289603	Acceptable	Marginal Suitable	Marginal Suitable	1357	Dsb	Cold, dry summer, warm summer
256	Central Anatolia	Kırıkkale	Delice	0.869069	Extremely Suitable	Suitable	Very Suitable	696	BSk	Arid, steppe, cold
509	Central Anatolia	Kırıkkale	Karakeçili	0.867115	Extremely Suitable	Suitable	Very Suitable	257	Csa	Temperate, dry summer, hot summer
112	Central Anatolia	Kırıkkale	Balışeyh	0.863823	Extremely Suitable	Suitable	Very Suitable	870	BSk	Arid, steppe, cold
549	Central Anatolia	Kırıkkale	Keskin	0.862658	Extremely Suitable	Suitable	Very Suitable	1139	BSk	Arid, steppe, cold
216	Central Anatolia	Kırıkkale	Çelebi	0.839072	Extremely Suitable	Suitable	Suitable	1241	BSk	Arid, steppe, cold
106	Central Anatolia	Kırıkkale	Bahşılı	0.837796	Extremely Suitable	Suitable	Suitable	703	BSk	Arid, steppe, cold
882	Central Anatolia	Kırıkkale	Yahşihan	0.832811	Extremely Suitable	Suitable	Suitable	779	BSk	Arid, steppe, cold
557	Central Anatolia	Kırıkkale	Kırıkkale/Merkez	0.825951	Extremely Suitable	Suitable	Suitable	746	BSk	Arid, steppe, cold
802	Central Anatolia	Kırıkkale	Sulakyurt	0.770624	Very Suitable	Suitable	Suitable	127	Csa	Temperate, dry summer, hot summer
641	Central Anatolia	Kırşehir	Mucur	0.860263	Extremely Suitable	Suitable	Very Suitable	1071	BSk	Arid, steppe, cold
227	Central Anatolia	Kırşehir	Çiçekdağı	0.854355	Extremely Suitable	Suitable	Suitable	935	BSk	Arid, steppe, cold
22	Central Anatolia	Kırşehir	Akçakent	0.850678	Extremely Suitable	Suitable	Suitable	1410	BSk	Arid, steppe, cold
498	Central Anatolia	Kırşehir	Kaman	0.830137	Extremely Suitable	Suitable	Suitable	167	Cfa	Temperate, no dry season, hot summer
31	Central Anatolia	Kırşehir	Akpınar	0.825104	Extremely Suitable	Suitable	Suitable	1163	BSk	Arid, steppe, cold
168	Central Anatolia	Kırşehir	Boztepe	0.816988	Extremely Suitable	Suitable	Suitable	1167	BSk	Arid, steppe, cold
560	Central Anatolia	Kırşehir	Kırşehir/Merkez	0.729526	Very Suitable	Acceptable	Suitable	991	BSk	Arid, steppe, cold
487	Central Anatolia	Konya	Kadınhanı	0.875572	Extremely Suitable	Suitable	Very Suitable	1121	BSk	Arid, steppe, cold
591	Central Anatolia	Konya	Kulu	0.875095	Extremely Suitable	Suitable	Very Suitable	997	BSk	Arid, steppe, cold
50	Central Anatolia	Konya	Altınekin	0.875036	Extremely Suitable	Suitable	Very Suitable	984	BSk	Arid, steppe, cold
738	Central Anatolia	Konya	Sarayönü	0.873654	Extremely Suitable	Suitable	Very Suitable	1064	BSk	Arid, steppe, cold
33	Central Anatolia	Konya	Akşehir	0.871707	Extremely Suitable	Suitable	Very Suitable	1027	Csa	Temperate, dry summer, hot summer
855	Central Anatolia	Konya	Tuzlukçu	0.869587	Extremely Suitable	Suitable	Very Suitable	994	BSk	Arid, steppe, cold
463	Central Anatolia	Konya	Ilgın	0.869125	Extremely Suitable	Suitable	Very Suitable	1039	BSk	Arid, steppe, cold
760	Central Anatolia	Konya	Selçuk	0.861357	Extremely Suitable	Suitable	Very Suitable	18	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
633	Central Anatolia	Konya	Meram	0.860936	Extremely Suitable	Suitable	Very Suitable	1027	BSk	Arid, steppe, cold
770	Central Anatolia	Konya	Seydişehir	0.854195	Extremely Suitable	Suitable	Suitable	1133	Csa	Temperate, dry summer, hot summer
316	Central Anatolia	Konya	Emirgazi	0.844226	Extremely Suitable	Suitable	Suitable	1087	BSk	Arid, steppe, cold
30	Central Anatolia	Konya	Akören	0.843318	Extremely Suitable	Suitable	Suitable	1108	Dsa	Cold, dry summer, hot summer
885	Central Anatolia	Konya	Yalıhüyük	0.840548	Extremely Suitable	Suitable	Suitable	1106	Csa	Temperate, dry summer, hot summer
453	Central Anatolia	Konya	Hüyük	0.839755	Extremely Suitable	Suitable	Suitable	1251	Dsb	Cold, dry summer, warm summer
402	Central Anatolia	Konya	Güneysınır	0.835610	Extremely Suitable	Suitable	Suitable	1095	BSk	Arid, steppe, cold
218	Central Anatolia	Konya	Çeltik	0.831571	Extremely Suitable	Suitable	Suitable	852	BSk	Arid, steppe, cold
515	Central Anatolia	Konya	Karapınar	0.824812	Extremely Suitable	Suitable	Suitable	15	Csa	Temperate, dry summer, hot summer
144	Central Anatolia	Konya	Beyşehir	0.818871	Extremely Suitable	Suitable	Suitable	1152	Dsa	Cold, dry summer, hot summer
322	Central Anatolia	Konya	Ereğli/Konya	0.801026	Extremely Suitable	Suitable	Suitable	1053	BSk	Arid, steppe, cold
233	Central Anatolia	Konya	Cihanbeyli	0.786171	Very Suitable	Suitable	Suitable	963	Dsa	Cold, dry summer, hot summer
917	Central Anatolia	Konya	Yunak	0.773285	Very Suitable	Suitable	Suitable	1101	BSk	Arid, steppe, cold
262	Central Anatolia	Konya	Derebucak	0.772736	Very Suitable	Suitable	Suitable	1229	Csa	Temperate, dry summer, hot summer
247	Central Anatolia	Konya	Çumra	0.763769	Very Suitable	Suitable	Suitable	1018	BSk	Arid, steppe, cold
261	Central Anatolia	Konya	Derbent	0.760068	Very Suitable	Suitable	Suitable	1479	Dsb	Cold, dry summer, warm summer
164	Central Anatolia	Konya	Bozkır	0.738572	Very Suitable	Acceptable	Suitable	1137	Csa	Temperate, dry summer, hot summer
519	Central Anatolia	Konya	Karatay	0.734761	Very Suitable	Acceptable	Suitable	11	Csa	Temperate, dry summer, hot summer
282	Central Anatolia	Konya	Doğanhisar	0.702702	Very Suitable	Acceptable	Acceptable	1188	BSk	Arid, steppe, cold
415	Central Anatolia	Konya	Hadim	0.644734	Very Suitable	Acceptable	Acceptable	1526	Dsb	Cold, dry summer, warm summer
16	Central Anatolia	Konya	Ahırlı	0.641176	Very Suitable	Acceptable	Acceptable	1216	Csa	Temperate, dry summer, hot summer
820	Central Anatolia	Konya	Taşkent	0.631217	Very Suitable	Acceptable	Acceptable	559	Cfa	Temperate, no dry season, hot summer
419	Central Anatolia	Konya	Halkapınar	0.409989	Suitable	Marginal Suitable	Marginal Suitable	1174	BSk	Arid, steppe, cold
3	Central Anatolia	Nevşehir	Acıgöl	0.882888	Extremely Suitable	Suitable	Very Suitable	1247	BSk	Arid, steppe, cold
413	Central Anatolia	Nevşehir	Hacıbektaş	0.873230	Extremely Suitable	Suitable	Very Suitable	1.288	BSk	Arid, steppe, cold
395	Central Anatolia	Nevşehir	Gülşehir	0.865720	Extremely Suitable	Suitable	Very Suitable	923	BSk	Arid, steppe, cold
84	Central Anatolia	Nevşehir	Avanos	0.859976	Extremely Suitable	Suitable	Very Suitable	934	BSk	Arid, steppe, cold
868	Central Anatolia	Nevşehir	Ürgup	0.840308	Extremely Suitable	Suitable	Suitable	1060	BSk	Arid, steppe, cold
585	Central Anatolia	Nevşehir	Kozaklı	0.819044	Extremely Suitable	Suitable	Suitable	1054	BSk	Arid, steppe, cold
267	Central Anatolia	Nevşehir	Derinkuyu	0.770080	Very Suitable	Suitable	Suitable	1359	BSk	Arid, steppe, cold
657	Central Anatolia	Nevşehir	Nevşehir/Merkez	0.712245	Very Suitable	Acceptable	Acceptable	1197	BSk	Arid, steppe, cold
51	Central Anatolia	Niğde	Altunhisar	0.799200	Very Suitable	Suitable	Suitable	1200	BSk	Arid, steppe, cold
158	Central Anatolia	Niğde	Bor	0.719562	Very Suitable	Acceptable	Suitable	1130	BSk	Arid, steppe, cold
863	Central Anatolia	Niğde	Ulukışla	0.702195	Very Suitable	Acceptable	Acceptable	1447	BSk	Arid, steppe, cold
230	Central Anatolia	Niğde	Çiftlik	0.674212	Very Suitable	Acceptable	Acceptable	1546	BSk	Arid, steppe, cold
658	Central Anatolia	Niğde	Niğde/Merkez	0.607521	Very Suitable	Acceptable	Acceptable	1239	BSk	Arid, steppe, cold
185	Central Anatolia	Niğde	Çamardı	0.439670	Suitable	Marginal Suitable	Marginal Suitable	1501	BSk	Arid, steppe, cold
359	Central Anatolia	Sivas	Gemerek	0.551102	Suitable	Acceptable	Acceptable	1211	BSk	Arid, steppe, cold
410	Central Anatolia	Sivas	Gürün	0.439140	Suitable	Marginal Suitable	Marginal Suitable	1327	BSk	Arid, steppe, cold
278	Central Anatolia	Sivas	Divriği	0.417925	Suitable	Marginal Suitable	Marginal Suitable	1014	BSk	Arid, steppe, cold
56	Central Anatolia	Sivas	Altınyayla/Sivas	0.382993	Acceptable	Marginal Suitable	Marginal Suitable	1457	BSk	Arid, steppe, cold
500	Central Anatolia	Sivas	Kangal	0.382309	Acceptable	Marginal Suitable	Marginal Suitable	40	Cfa	Temperate, no dry season, hot summer
743	Central Anatolia	Sivas	Şarkışla	0.367635	Acceptable	Marginal Suitable	Marginal Suitable	15	Csa	Temperate, dry summer, hot summer
416	Central Anatolia	Sivas	Hafik	0.351463	Acceptable	Marginal Suitable	Marginal Suitable	1312	BSk	Arid, steppe, cold
26	Central Anatolia	Sivas	Akıncılar	0.327148	Acceptable	Marginal Suitable	Marginal Suitable	1045	Dsa	Cold, dry summer, hot summer
920	Central Anatolia	Sivas	Zara	0.300940	Acceptable	Marginal Suitable	Marginal Suitable	1344	Dsb	Cold, dry summer, warm summer
380	Central Anatolia	Sivas	Gölova	0.288595	Acceptable	Marginal Suitable	Marginal Suitable	1336	Dsb	Cold, dry summer, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
858	Central Anatolia	Sivas	Ulaş	0.272186	Acceptable	Marginal Suitable	Marginal Suitable	1391	BSk	Arid, steppe, cold
787	Central Anatolia	Sivas	Sivas/Merkez	0.256430	Acceptable	Marginal Suitable	Marginal Suitable	931	Csa	Temperate, dry summer, hot summer
467	Central Anatolia	Sivas	İmranlı	0.236746	Acceptable	Marginal Suitable	Marginal Suitable	1098	BSk	Arid, steppe, cold
912	Central Anatolia	Sivas	Yıldızeli	0.233669	Acceptable	Marginal Suitable	Marginal Suitable	1370	BSk	Arid, steppe, cold
284	Central Anatolia	Sivas	Doğansar	0.233647	Acceptable	Marginal Suitable	Marginal Suitable	1299	Dsb	Cold, dry summer, warm summer
813	Central Anatolia	Sivas	Suşehri	0.221682	Acceptable	Marginal Suitable	Marginal Suitable	151	Csa	Temperate, dry summer, hot summer
584	Central Anatolia	Sivas	Koyulhisar	0.199061	Marginal Suitable	Marginal Suitable	Marginal Suitable	947	Dsb	Cold, dry summer, warm summer
756	Central Anatolia	Yozgat	Şefaatli	0.848808	Extremely Suitable	Suitable	Suitable	838	Csa	Temperate, dry summer, hot summer
904	Central Anatolia	Yozgat	Yerköy	0.832601	Extremely Suitable	Suitable	Suitable	770	BSk	Arid, steppe, cold
155	Central Anatolia	Yozgat	Boğazlıyan	0.812270	Extremely Suitable	Suitable	Suitable	1071	BSk	Arid, steppe, cold
898	Central Anatolia	Yozgat	Yenifakılı	0.804547	Extremely Suitable	Suitable	Suitable	1012	BSk	Arid, steppe, cold
742	Central Anatolia	Yozgat	Sarıkaya	0.797790	Very Suitable	Suitable	Suitable	1116	BSk	Arid, steppe, cold
215	Central Anatolia	Yozgat	Çekerek	0.713702	Very Suitable	Acceptable	Acceptable	936	BSk	Arid, steppe, cold
488	Central Anatolia	Yozgat	Kadışehri	0.710836	Very Suitable	Acceptable	Acceptable	1036	BSk	Arid, steppe, cold
914	Central Anatolia	Yozgat	Yozgat/Merkez	0.695205	Very Suitable	Acceptable	Acceptable	1317	Dsb	Cold, dry summer, warm summer
91	Central Anatolia	Yozgat	Aydıncık/Yozgat	0.693336	Very Suitable	Acceptable	Acceptable	831	BSk	Arid, steppe, cold
800	Central Anatolia	Yozgat	Sorgun	0.600854	Very Suitable	Acceptable	Acceptable	682	BSk	Arid, steppe, cold
195	Central Anatolia	Yozgat	Çandır	0.597559	Suitable	Acceptable	Acceptable	1235	BSk	Arid, steppe, cold
736	Central Anatolia	Yozgat	Saraykent	0.538428	Suitable	Acceptable	Acceptable	1142	BSk	Arid, steppe, cold
212	Central Anatolia	Yozgat	Çayıralan	0.472142	Suitable	Marginal Suitable	Marginal Suitable	1362	BSk	Arid, steppe, cold
24	Central Anatolia	Yozgat	Akdağmadeni	0.420320	Suitable	Marginal Suitable	Marginal Suitable	1322	BSk	Arid, steppe, cold
852	East Anatolia	Ağrı	Tutak	0.468869	Suitable	Marginal Suitable	Marginal Suitable	1567	Dsa	Cold, dry summer, hot summer
691	East Anatolia	Ağrı	Patnos	0.369188	Acceptable	Marginal Suitable	Marginal Suitable	1639	Dsb	Cold, dry summer, warm summer
279	East Anatolia	Ağrı	Diyadin	0.315414	Acceptable	Marginal Suitable	Marginal Suitable	1933	Dsb	Cold, dry summer, warm summer
288	East Anatolia	Ağrı	Doğubayazıt	0.298924	Acceptable	Marginal Suitable	Marginal Suitable	1594	BSk	Arid, steppe, cold
822	East Anatolia	Ağrı	Taslıçay	0.289313	Acceptable	Marginal Suitable	Marginal Suitable	1409	Dsb	Cold, dry summer, warm summer
421	East Anatolia	Ağrı	Hamur	0.264698	Acceptable	Marginal Suitable	Marginal Suitable	1690	Dsb	Cold, dry summer, warm summer
310	East Anatolia	Ağrı	Eleşkirt	0.251379	Acceptable	Marginal Suitable	Marginal Suitable	1810	Dsb	Cold, dry summer, warm summer
15	East Anatolia	Ağrı	Ağrı/Merkez	0.191710	Marginal Suitable	Marginal Suitable	Marginal Suitable	1630	Dsb	Cold, dry summer, warm summer
376	East Anatolia	Ardahan	Göle	0.239491	Acceptable	Marginal Suitable	Marginal Suitable	2020	Dfb	Cold, no dry season, warm summer
68	East Anatolia	Ardahan	Ardahan/Merkez	0.227845	Acceptable	Marginal Suitable	Marginal Suitable	1799	Dfb	Cold, no dry season, warm summer
238	East Anatolia	Ardahan	Çıldır	0.224725	Acceptable	Marginal Suitable	Marginal Suitable	1911	Dfb	Cold, no dry season, warm summer
423	East Anatolia	Ardahan	Hanak	0.212096	Acceptable	Marginal Suitable	Marginal Suitable	1826	Dfb	Cold, no dry season, warm summer
251	East Anatolia	Ardahan	Damal	0.200824	Acceptable	Marginal Suitable	Marginal Suitable	2056	Dfc	Cold, no dry season, cold summer
709	East Anatolia	Ardahan	Posof	0.072254	Marginal Suitable	Marginal Suitable	Marginal Suitable	1546	Dfb	Cold, no dry season, warm summer
149	East Anatolia	Bingöl	Bingöl/Merkez	0.679664	Very Suitable	Acceptable	Acceptable	1159	Dsa	Cold, dry summer, hot summer
361	East Anatolia	Bingöl	Genç	0.660438	Very Suitable	Acceptable	Acceptable	1018	Dsa	Cold, dry summer, hot summer
798	East Anatolia	Bingöl	Solhan	0.575052	Suitable	Acceptable	Acceptable	172	Csa	Temperate, dry summer, hot summer
892	East Anatolia	Bingöl	Yayladere	0.459083	Suitable	Marginal Suitable	Marginal Suitable	1569	Dsa	Cold, dry summer, hot summer
551	East Anatolia	Bingöl	Kiğı	0.457667	Suitable	Marginal Suitable	Marginal Suitable	1519	Dsa	Cold, dry summer, hot summer
523	East Anatolia	Bingöl	Karlıova	0.314581	Acceptable	Marginal Suitable	Marginal Suitable	358	Csa	Temperate, dry summer, hot summer
894	East Anatolia	Bingöl	Yedisu	0.300858	Acceptable	Marginal Suitable	Marginal Suitable	1534	Dsb	Cold, dry summer, warm summer
5	East Anatolia	Bingöl	Adaklı	0.298138	Acceptable	Marginal Suitable	Marginal Suitable	1507	Dsb	Cold, dry summer, warm summer
152	East Anatolia	Bitlis	Bitlis/Merkez	0.671838	Very Suitable	Acceptable	Acceptable	1637	Dsa	Cold, dry summer, hot summer
651	East Anatolia	Bitlis	Mutki	0.666858	Very Suitable	Acceptable	Acceptable	1486	Dsa	Cold, dry summer, hot summer
407	East Anatolia	Bitlis	Güroymak	0.640315	Very Suitable	Acceptable	Acceptable	1308	Dsa	Cold, dry summer, hot summer
824	East Anatolia	Bitlis	Tatvan	0.599509	Suitable	Acceptable	Acceptable	1656	Dsb	Cold, dry summer, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
17	East Anatolia	Bitlis	Ahlat	0.529595	Suitable	Acceptable	Acceptable	1703	Dsb	Cold, dry summer, warm summer
7	East Anatolia	Bitlis	Adilcevaz	0.528712	Suitable	Acceptable	Acceptable	1683	Dsb	Cold, dry summer, warm summer
446	East Anatolia	Bitlis	Hizan	0.502325	Suitable	Acceptable	Acceptable	1472	Dsb	Cold, dry summer, warm summer
12	East Anatolia	Elazığ	Ağın	0.886083	Extremely Suitable	Suitable	Very Suitable	889	Dsa	Cold, dry summer, hot summer
582	East Anatolia	Elazığ	Kovancılar	0.876104	Extremely Suitable	Suitable	Very Suitable	967	Dsa	Cold, dry summer, hot summer
612	East Anatolia	Elazığ	Maden	0.866168	Extremely Suitable	Suitable	Very Suitable	1021	Dsa	Cold, dry summer, hot summer
306	East Anatolia	Elazığ	Elazığ/Merkez	0.865755	Extremely Suitable	Suitable	Very Suitable	1041	BSk	Arid, steppe, cold
536	East Anatolia	Elazığ	Keban	0.865009	Extremely Suitable	Suitable	Very Suitable	799	Dsa	Cold, dry summer, hot summer
73	East Anatolia	Elazığ	Arıcak	0.853370	Extremely Suitable	Suitable	Suitable	1092	Csa	Temperate, dry summer, hot summer
40	East Anatolia	Elazığ	Alacakaya	0.846288	Extremely Suitable	Suitable	Suitable	1147	Dsa	Cold, dry summer, hot summer
688	East Anatolia	Elazığ	Palu	0.838861	Extremely Suitable	Suitable	Suitable	871	Dsa	Cold, dry summer, hot summer
119	East Anatolia	Elazığ	Baskil	0.770932	Very Suitable	Suitable	Suitable	1212	Dsa	Cold, dry summer, hot summer
510	East Anatolia	Elazığ	Karakoçan	0.732491	Very Suitable	Acceptable	Suitable	821	BSk	Arid, steppe, cold
790	East Anatolia	Elazığ	Sivrice	0.693548	Very Suitable	Acceptable	Acceptable	1109	BSk	Arid, steppe, cold
464	East Anatolia	Erzincan	İliç	0.606688	Very Suitable	Acceptable	Acceptable	78	Csa	Temperate, dry summer, hot summer
542	East Anatolia	Erzincan	Kemaliye	0.556105	Suitable	Acceptable	Acceptable	947	Dsa	Cold, dry summer, hot summer
831	East Anatolia	Erzincan	Tercan	0.359205	Acceptable	Marginal Suitable	Marginal Suitable	1421	Dsa	Cold, dry summer, hot summer
541	East Anatolia	Erzincan	Kemah	0.328074	Acceptable	Marginal Suitable	Marginal Suitable	1068	Dsa	Cold, dry summer, hot summer
213	East Anatolia	Erzincan	Çayırlı	0.302031	Acceptable	Marginal Suitable	Marginal Suitable	1527	Dsb	Cold, dry summer, warm summer
329	East Anatolia	Erzincan	Erzincan/Merkez	0.259159	Acceptable	Marginal Suitable	Marginal Suitable	1216	BSk	Arid, steppe, cold
872	East Anatolia	Erzincan	Üzümlü	0.257652	Acceptable	Marginal Suitable	Marginal Suitable	1397	Dsb	Cold, dry summer, warm summer
683	East Anatolia	Erzincan	Otlukbeli	0.254852	Acceptable	Marginal Suitable	Marginal Suitable	1741	Dsb	Cold, dry summer, warm summer
713	East Anatolia	Erzincan	Refahiye	0.122225	Marginal Suitable	Marginal Suitable	Marginal Suitable	1602	Dsb	Cold, dry summer, warm summer
505	East Anatolia	Erzurum	Karaçoban	0.439367	Suitable	Marginal Suitable	Marginal Suitable	518	Csa	Temperate, dry summer, hot summer
447	East Anatolia	Erzurum	Hınıs	0.324280	Acceptable	Marginal Suitable	Marginal Suitable	1713	Dsb	Cold, dry summer, warm summer
451	East Anatolia	Erzurum	Horasan	0.295292	Acceptable	Marginal Suitable	Marginal Suitable	1560	BSk	Arid, steppe, cold
690	East Anatolia	Erzurum	Pasinler	0.281614	Acceptable	Marginal Suitable	Marginal Suitable	1661	Dsb	Cold, dry summer, warm summer
201	East Anatolia	Erzurum	Çat	0.279868	Acceptable	Marginal Suitable	Marginal Suitable	1921	Dsb	Cold, dry summer, warm summer
830	East Anatolia	Erzurum	Tekman	0.278380	Acceptable	Marginal Suitable	Marginal Suitable	1937	Dsb	Cold, dry summer, warm summer
520	East Anatolia	Erzurum	Karayazı	0.271835	Acceptable	Marginal Suitable	Marginal Suitable	1023	BSk	Arid, steppe, cold
574	East Anatolia	Erzurum	Köprüköy	0.271318	Acceptable	Marginal Suitable	Marginal Suitable	1602	Dfb	Cold, no dry season, warm summer
465	East Anatolia	Erzurum	Ilıca	0.253766	Acceptable	Marginal Suitable	Marginal Suitable	1763	Dfb	Cold, no dry season, warm summer
841	East Anatolia	Erzurum	Tortum	0.251101	Acceptable	Marginal Suitable	Marginal Suitable	1618	Dfb	Cold, no dry season, warm summer
330	East Anatolia	Erzurum	Erzurum/Merkez	0.249963	Acceptable	Marginal Suitable	Marginal Suitable	1923	Dfb	Cold, no dry season, warm summer
670	East Anatolia	Erzurum	Olur	0.245215	Acceptable	Marginal Suitable	Marginal Suitable	1334	Dfb	Cold, no dry season, warm summer
765	East Anatolia	Erzurum	Şenkaya	0.238270	Acceptable	Marginal Suitable	Marginal Suitable	373	Dfb	Cold, no dry season, warm summer
654	East Anatolia	Erzurum	Narman	0.234420	Acceptable	Marginal Suitable	Marginal Suitable	1644	Dfb	Cold, no dry season, warm summer
697	East Anatolia	Erzurum	Pazaryolu	0.222901	Acceptable	Marginal Suitable	Marginal Suitable	1482	Dfb	Cold, no dry season, warm summer
80	East Anatolia	Erzurum	Aşkale	0.222524	Acceptable	Marginal Suitable	Marginal Suitable	1661	Dsb	Cold, dry summer, warm summer
873	East Anatolia	Erzurum	Uzundere	0.220371	Acceptable	Marginal Suitable	Marginal Suitable	1098	Dfb	Cold, no dry season, warm summer
669	East Anatolia	Erzurum	Oltu	0.218866	Acceptable	Marginal Suitable	Marginal Suitable	1274	BSk	Arid, steppe, cold
480	East Anatolia	Erzurum	İspir	0.103950	Marginal Suitable	Marginal Suitable	Marginal Suitable	1189	Dfb	Cold, no dry season, warm summer
245	East Anatolia	Hakkari	Çukurca	0.728041	Very Suitable	Acceptable	Suitable	1312	Dsa	Cold, dry summer, hot summer
763	East Anatolia	Hakkari	Şemdinli	0.501635	Suitable	Marginal Suitable	Acceptable	1867	Dfb	Cold, no dry season, warm summer
915	East Anatolia	Hakkari	Yüksekova	0.334375	Acceptable	Marginal Suitable	Marginal Suitable	1876	Dsa	Cold, dry summer, hot summer
417	East Anatolia	Hakkari	Hakkari/Merkez	0.253060	Acceptable	Marginal Suitable	Marginal Suitable	1756	Dsa	Cold, dry summer, hot summer
511	East Anatolia	Iğdır	Karakoyunlu	0.837867	Extremely Suitable	Suitable	Suitable	1095	Dsa	Cold, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
66	East Anatolia	Iğdır	Aralık	0.809137	Extremely Suitable	Suitable	Suitable	819	BWk	Arid, desert, cold
457	East Anatolia	Iğdır	Iğdır/Merkez	0.762477	Very Suitable	Suitable	Suitable	860	BWk	Arid, desert, cold
854	East Anatolia	Iğdır	Tuzluca	0.672176	Very Suitable	Acceptable	Acceptable	1104	BSk	Arid, steppe, cold
274	East Anatolia	Kars	Digor	0.379075	Acceptable	Marginal Suitable	Marginal Suitable	1650	BSk	Arid, steppe, cold
36	East Anatolia	Kars	Akyaka	0.321762	Acceptable	Marginal Suitable	Marginal Suitable	1492	Dfb	Cold, no dry season, warm summer
490	East Anatolia	Kars	Kağızman	0.279036	Acceptable	Marginal Suitable	Marginal Suitable	1.414	BSk	Arid, steppe, cold
762	East Anatolia	Kars	Selim	0.256338	Acceptable	Marginal Suitable	Marginal Suitable	1858	Dfb	Cold, no dry season, warm summer
75	East Anatolia	Kars	Arpaçay	0.251671	Acceptable	Marginal Suitable	Marginal Suitable	1695	Dfb	Cold, no dry season, warm summer
815	East Anatolia	Kars	Susuz	0.238821	Acceptable	Marginal Suitable	Marginal Suitable	1073	Dsb	Cold, dry summer, warm summer
525	East Anatolia	Kars	Kars/Merkez	0.226151	Acceptable	Marginal Suitable	Marginal Suitable	92	Csa	Temperate, dry summer, hot summer
741	East Anatolia	Kars	Sarıkamış	0.094687	Marginal Suitable	Marginal Suitable	Marginal Suitable	2103	Dfb	Cold, no dry season, warm summer
286	East Anatolia	Malatya	Doğanyol	0.865740	Extremely Suitable	Suitable	Very Suitable	929	Dsa	Cold, dry summer, hot summer
495	East Anatolia	Malatya	Kale/Malatya	0.841162	Extremely Suitable	Suitable	Suitable	1050	Csa	Temperate, dry summer, hot summer
893	East Anatolia	Malatya	Yazıhan	0.836583	Extremely Suitable	Suitable	Suitable	828	BSk	Arid, steppe, cold
20	East Anatolia	Malatya	Akçadağ	0.819299	Extremely Suitable	Suitable	Suitable	1056	BSk	Arid, steppe, cold
908	East Anatolia	Malatya	Yeşilyurt/Malatya	0.812036	Extremely Suitable	Suitable	Suitable	1010	Dsa	Cold, dry summer, hot summer
710	East Anatolia	Malatya	Pütürge	0.783646	Very Suitable	Suitable	Suitable	1224	Dsa	Cold, dry summer, hot summer
614	East Anatolia	Malatya	Malatya/Merkez	0.743348	Very Suitable	Suitable	Suitable	970	BSk	Arid, steppe, cold
67	East Anatolia	Malatya	Arapgir	0.725076	Very Suitable	Acceptable	Suitable	1172	Dsa	Cold, dry summer, hot summer
285	East Anatolia	Malatya	Doğanşehir	0.710969	Very Suitable	Acceptable	Acceptable	1225	Dsa	Cold, dry summer, hot summer
122	East Anatolia	Malatya	Battalgazi	0.703589	Very Suitable	Acceptable	Acceptable	782	BSk	Arid, steppe, cold
441	East Anatolia	Malatya	Hekimhan	0.688032	Very Suitable	Acceptable	Acceptable	1122	BSk	Arid, steppe, cold
71	East Anatolia	Malatya	Arguvan	0.670229	Very Suitable	Acceptable	Acceptable	1163	BSk	Arid, steppe, cold
252	East Anatolia	Malatya	Darende	0.630370	Very Suitable	Acceptable	Acceptable	1027	BSk	Arid, steppe, cold
592	East Anatolia	Malatya	Kuluncak	0.464827	Suitable	Marginal Suitable	Marginal Suitable	1276	BSk	Arid, steppe, cold
648	East Anatolia	Muş	Muş/Merkez	0.673304	Very Suitable	Acceptable	Acceptable	1334	Dsa	Cold, dry summer, hot summer
578	East Anatolia	Muş	Korkut	0.653676	Very Suitable	Acceptable	Acceptable	1315	Dsa	Cold, dry summer, hot summer
615	East Anatolia	Muş	Malazgirt	0.604348	Very Suitable	Acceptable	Acceptable	1532	Dsa	Cold, dry summer, hot summer
175	East Anatolia	Muş	Bulanık	0.559091	Suitable	Acceptable	Acceptable	1488	Dsa	Cold, dry summer, hot summer
430	East Anatolia	Muş	Hasköy	0.515954	Suitable	Acceptable	Acceptable	1277	Dsa	Cold, dry summer, hot summer
877	East Anatolia	Muş	Varto	0.375663	Acceptable	Marginal Suitable	Marginal Suitable	1519	Dsa	Cold, dry summer, hot summer
701	East Anatolia	Tunceli	Pertek	0.837394	Extremely Suitable	Suitable	Suitable	1167	Dsa	Cold, dry summer, hot summer
626	East Anatolia	Tunceli	Mazgirt	0.781697	Very Suitable	Suitable	Suitable	1413	Dsa	Cold, dry summer, hot summer
452	East Anatolia	Tunceli	Hozat	0.748795	Very Suitable	Suitable	Suitable	1525	Dsa	Cold, dry summer, hot summer
846	East Anatolia	Tunceli	Tunceli/Merkez	0.697406	Very Suitable	Acceptable	Acceptable	922	Dsa	Cold, dry summer, hot summer
220	East Anatolia	Tunceli	Çemişgezek	0.654773	Very Suitable	Acceptable	Acceptable	1013	Dsa	Cold, dry summer, hot summer
656	East Anatolia	Tunceli	Nazımiye	0.638123	Very Suitable	Acceptable	Acceptable	1578	Dsa	Cold, dry summer, hot summer
684	East Anatolia	Tunceli	Ovacık/Tunceli	0.351949	Acceptable	Marginal Suitable	Marginal Suitable	1257	Dsa	Cold, dry summer, hot summer
712	East Anatolia	Tunceli	Pulumur	0.299981	Acceptable	Marginal Suitable	Marginal Suitable	1524	Dsb	Cold, dry summer, warm summer
301	East Anatolia	Van	Edremit/Van	0.565807	Suitable	Acceptable	Acceptable	1736	BSk	Arid, steppe, cold
876	East Anatolia	Van	Van/Merkez	0.563169	Suitable	Acceptable	Acceptable	1728	BSk	Arid, steppe, cold
408	East Anatolia	Van	Gürpınar	0.519939	Suitable	Acceptable	Acceptable	1748	BSk	Arid, steppe, cold
319	East Anatolia	Van	Erciş	0.484848	Suitable	Marginal Suitable	Acceptable	1691	Dsb	Cold, dry summer, warm summer
367	East Anatolia	Van	Gevaş	0.429651	Suitable	Marginal Suitable	Marginal Suitable	1694	Dsb	Cold, dry summer, warm summer
734	East Anatolia	Van	Saray/Van	0.330095	Acceptable	Marginal Suitable	Marginal Suitable	2095	BSk	Arid, steppe, cold
118	East Anatolia	Van	Başkale	0.316812	Acceptable	Marginal Suitable	Marginal Suitable	858	BSk	Arid, steppe, cold
202	East Anatolia	Van	Çatak	0.309471	Acceptable	Marginal Suitable	Marginal Suitable	1500	Dsb	Cold, dry summer, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
105	East Anatolia	Van	Bahçesaray	0.307393	Acceptable	Marginal Suitable	Marginal Suitable	1767	Dsb	Cold, dry summer, warm summer
184	East Anatolia	Van	Çaldıran	0.287098	Acceptable	Marginal Suitable	Marginal Suitable	2046	Dsb	Cold, dry summer, warm summer
686	East Anatolia	Van	Özalp	0.275902	Acceptable	Marginal Suitable	Marginal Suitable	1999	BSk	Arid, steppe, cold
645	East Anatolia	Van	Muradiye	0.178434	Marginal Suitable	Marginal Suitable	Marginal Suitable	1705	Dsb	Cold, dry summer, warm summer
792	Marmara	Balıkesir	Sındırgı	0.839907	Extremely Suitable	Suitable	Suitable	228	Csa	Temperate, dry summer, hot summer
179	Marmara	Balıkesir	Burhaniye	0.833060	Extremely Suitable	Suitable	Suitable	22	Csa	Temperate, dry summer, hot summer
752	Marmara	Balıkesir	Savaştepe	0.828584	Extremely Suitable	Suitable	Suitable	284	Csa	Temperate, dry summer, hot summer
481	Marmara	Balıkesir	İvrindi	0.825759	Extremely Suitable	Suitable	Suitable	7	Cfa	Temperate, no dry season, hot summer
546	Marmara	Balıkesir	Kepsut	0.821036	Extremely Suitable	Suitable	Suitable	88	Csa	Temperate, dry summer, hot summer
113	Marmara	Balıkesir	Balya	0.816760	Extremely Suitable	Suitable	Suitable	242	Csa	Temperate, dry summer, hot summer
383	Marmara	Balıkesir	Gömeç	0.812917	Extremely Suitable	Suitable	Suitable	16	Csa	Temperate, dry summer, hot summer
115	Marmara	Balıkesir	Bandırma	0.810940	Extremely Suitable	Suitable	Suitable	17	Csa	Temperate, dry summer, hot summer
147	Marmara	Balıkesir	Bigadiç	0.807289	Extremely Suitable	Suitable	Suitable	169	Csa	Temperate, dry summer, hot summer
300	Marmara	Balıkesir	Edremit/Balıkesir	0.788553	Very Suitable	Suitable	Suitable	31	Csa	Temperate, dry summer, hot summer
111	Marmara	Balıkesir	Balıkesir/Merkez	0.785040	Very Suitable	Suitable	Suitable	145	Csa	Temperate, dry summer, hot summer
434	Marmara	Balıkesir	Havran	0.762737	Very Suitable	Suitable	Suitable	43	Csa	Temperate, dry summer, hot summer
814	Marmara	Balıkesir	Susurluk	0.752050	Very Suitable	Suitable	Suitable	1755	Dfb	Cold, no dry season, warm summer
384	Marmara	Balıkesir	Gönen/Balıkesir	0.744013	Very Suitable	Suitable	Suitable	41	Csa	Temperate, dry summer, hot summer
623	Marmara	Balıkesir	Marmara	0.694993	Very Suitable	Acceptable	Acceptable	38	Csa	Temperate, dry summer, hot summer
294	Marmara	Balıkesir	Dursunbey	0.692624	Very Suitable	Acceptable	Acceptable	638	Csa	Temperate, dry summer, hot summer
621	Marmara	Balıkesir	Manyas	0.672225	Very Suitable	Acceptable	Acceptable	56	Csa	Temperate, dry summer, hot summer
97	Marmara	Balıkesir	Ayvalık	0.565271	Suitable	Acceptable	Acceptable	6	Csa	Temperate, dry summer, hot summer
320	Marmara	Balıkesir	Erdek	0.476826	Suitable	Marginal Suitable	Acceptable	7	Csa	Temperate, dry summer, hot summer
472	Marmara	Bilecik	İnhisar	0.835592	Extremely Suitable	Suitable	Suitable	837	Dsb	Cold, dry summer, warm summer
696	Marmara	Bilecik	Pazaryeri	0.802387	Extremely Suitable	Suitable	Suitable	806	BSk	Arid, steppe, cold
148	Marmara	Bilecik	Bilecik/Merkez	0.790503	Very Suitable	Suitable	Suitable	513	BSk	Arid, steppe, cold
381	Marmara	Bilecik	Gölpazarı	0.781980	Very Suitable	Suitable	Suitable	539	Csb	Temperate, dry summer, warm summer
169	Marmara	Bilecik	Bozüyük	0.765019	Very Suitable	Suitable	Suitable	757	BSk	Arid, steppe, cold
680	Marmara	Bilecik	Osmaneli	0.684426	Very Suitable	Acceptable	Acceptable	107	BSk	Arid, steppe, cold
795	Marmara	Bilecik	Söğüt	0.683617	Very Suitable	Acceptable	Acceptable	20	Cfa	Temperate, no dry season, hot summer
901	Marmara	Bilecik	Yenipazar/Bilecik	0.648936	Very Suitable	Acceptable	Acceptable	622	BSk	Arid, steppe, cold
610	Marmara	Bursa	Mustafa Kemalpaşa	0.857571	Extremely Suitable	Suitable	Suitable	27	Csa	Temperate, dry summer, hot summer
674	Marmara	Bursa	Orhangazi	0.836495	Extremely Suitable	Suitable	Suitable	115	Csa	Temperate, dry summer, hot summer
642	Marmara	Bursa	Mudanya	0.833468	Extremely Suitable	Suitable	Suitable	5	Csa	Temperate, dry summer, hot summer
903	Marmara	Bursa	Yenişehir/Bursa	0.833439	Extremely Suitable	Suitable	Suitable	229	BSk	Arid, steppe, cold
503	Marmara	Bursa	Karacabey	0.826204	Extremely Suitable	Suitable	Suitable	264	Cfa	Temperate, no dry season, hot summer
409	Marmara	Bursa	Gürsu	0.804741	Extremely Suitable	Suitable	Suitable	112	Csa	Temperate, dry summer, hot summer
681	Marmara	Bursa	Osmangazi	0.791638	Very Suitable	Suitable	Suitable	173	Csa	Temperate, dry summer, hot summer
471	Marmara	Bursa	İnegöl	0.786506	Very Suitable	Suitable	Suitable	208	BSk	Arid, steppe, cold
550	Marmara	Bursa	Kestel	0.778457	Very Suitable	Suitable	Suitable	122	Csa	Temperate, dry summer, hot summer
660	Marmara	Bursa	Nilüfer	0.775928	Very Suitable	Suitable	Suitable	121	Csa	Temperate, dry summer, hot summer
673	Marmara	Bursa	Orhaneli	0.770425	Very Suitable	Suitable	Suitable	491	Csb	Temperate, dry summer, warm summer
539	Marmara	Bursa	Keles	0.767623	Very Suitable	Suitable	Suitable	1026	Csb	Temperate, dry summer, warm summer
426	Marmara	Bursa	Harmancık	0.763180	Very Suitable	Suitable	Suitable	689	Csa	Temperate, dry summer, hot summer
911	Marmara	Bursa	Yıldırım	0.745911	Very Suitable	Suitable	Suitable	160	Csa	Temperate, dry summer, hot summer
360	Marmara	Bursa	Gemlik	0.734772	Very Suitable	Acceptable	Suitable	7	Csa	Temperate, dry summer, hot summer
181	Marmara	Bursa	Büyükorhan	0.706917	Very Suitable	Acceptable	Acceptable	799	Csb	Temperate, dry summer, warm summer

LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
483	Marmara	Bursa	Iznik	0.679677	Very Suitable	Acceptable	Acceptable	1038	Csa	Temperate, dry summer, hot summer
607	Marmara	Çanakkale	Lapseki	0.816047	Extremely Suitable	Suitable	Suitable	9	Csa	Temperate, dry summer, hot summer
146	Marmara	Çanakkale	Biga	0.810672	Extremely Suitable	Suitable	Suitable	51	Csa	Temperate, dry summer, hot summer
896	Marmara	Çanakkale	Yenice/Çanakkale	0.810449	Extremely Suitable	Suitable	Suitable	275	Csa	Temperate, dry summer, hot summer
358	Marmara	Çanakkale	Gelibolu	0.801652	Extremely Suitable	Suitable	Suitable	20	Csa	Temperate, dry summer, hot summer
95	Marmara	Çanakkale	Ayvacık/Çanakkale	0.795708	Very Suitable	Suitable	Suitable	288	Csa	Temperate, dry summer, hot summer
342	Marmara	Çanakkale	Ezine	0.779368	Very Suitable	Suitable	Suitable	50	Csa	Temperate, dry summer, hot summer
192	Marmara	Çanakkale	Çan	0.775433	Very Suitable	Suitable	Suitable	83	Csa	Temperate, dry summer, hot summer
128	Marmara	Çanakkale	Bayramiç	0.704351	Very Suitable	Acceptable	Acceptable	106	Csa	Temperate, dry summer, hot summer
370	Marmara	Çanakkale	Gökçeada	0.680343	Very Suitable	Acceptable	Acceptable	50	Csa	Temperate, dry summer, hot summer
298	Marmara	Çanakkale	Eceabat	0.600852	Very Suitable	Acceptable	Acceptable	9	Csa	Temperate, dry summer, hot summer
194	Marmara	Çanakkale	Çanakkale/Merkez	0.582417	Suitable	Acceptable	Acceptable	11	Csa	Temperate, dry summer, hot summer
162	Marmara	Çanakkale	Bozcaada	0.488931	Suitable	Marginal Suitable	Acceptable	41	Csa	Temperate, dry summer, hot summer
606	Marmara	Edirne	Lalapaşa	0.829094	Extremely Suitable	Suitable	Suitable	161	Cfa	Temperate, no dry season, hot summer
317	Marmara	Edirne	Enez	0.778780	Very Suitable	Suitable	Suitable	18	Csa	Temperate, dry summer, hot summer
547	Marmara	Edirne	Keşan	0.759234	Very Suitable	Suitable	Suitable	122	Csa	Temperate, dry summer, hot summer
803	Marmara	Edirne	Süloğlu	0.757712	Very Suitable	Suitable	Suitable	11	Cfa	Temperate, no dry season, hot summer
634	Marmara	Edirne	Meriç	0.733331	Very Suitable	Acceptable	Suitable	42	Csa	Temperate, dry summer, hot summer
299	Marmara	Edirne	Edirne/Merkez	0.677599	Very Suitable	Acceptable	Acceptable	50	Csa	Temperate, dry summer, hot summer
874	Marmara	Edirne	Uzunköprü	0.671451	Very Suitable	Acceptable	Acceptable	32	Csa	Temperate, dry summer, hot summer
435	Marmara	Edirne	Havsa	0.669107	Very Suitable	Acceptable	Acceptable	78	Csa	Temperate, dry summer, hot summer
474	Marmara	Edirne	İpsala	0.662319	Very Suitable	Acceptable	Acceptable	1081	BSk	Arid, steppe, cold
804	Marmara	İstanbul	Sultanbeyli	0.837359	Extremely Suitable	Suitable	Suitable	1012	BSk	Arid, steppe, cold
140	Marmara	İstanbul	Beykoz	0.823589	Extremely Suitable	Suitable	Suitable	9	Csa	Temperate, dry summer, hot summer
786	Marmara	İstanbul	Şişli	0.818402	Extremely Suitable	Suitable	Suitable	111	Csa	Temperate, dry summer, hot summer
699	Marmara	İstanbul	Pendik	0.781005	Very Suitable	Suitable	Suitable	35	Csa	Temperate, dry summer, hot summer
353	Marmara	İstanbul	Gaziosmanpaşa	0.777087	Very Suitable	Suitable	Suitable	113	Csa	Temperate, dry summer, hot summer
130	Marmara	İstanbul	Bayrampaşa	0.760556	Very Suitable	Suitable	Suitable	102	Csa	Temperate, dry summer, hot summer
489	Marmara	İstanbul	Kağıthane	0.755717	Very Suitable	Suitable	Suitable	16	Csa	Temperate, dry summer, hot summer
776	Marmara	İstanbul	Silivri	0.710933	Very Suitable	Acceptable	Acceptable	510	Csa	Temperate, dry summer, hot summer
134	Marmara	İstanbul	Beşiktaş	0.709899	Very Suitable	Acceptable	Acceptable	16	Csa	Temperate, dry summer, hot summer
746	Marmara	İstanbul	Sarıyer	0.695053	Very Suitable	Acceptable	Acceptable	81	Csa	Temperate, dry summer, hot summer
102	Marmara	İstanbul	Bağcılar	0.686382	Very Suitable	Acceptable	Acceptable	34	Csa	Temperate, dry summer, hot summer
527	Marmara	İstanbul	Kartal	0.682707	Very Suitable	Acceptable	Acceptable	9	Csa	Temperate, dry summer, hot summer
865	Marmara	İstanbul	Ümraniye	0.678862	Very Suitable	Acceptable	Acceptable	144	Csa	Temperate, dry summer, hot summer
331	Marmara	İstanbul	Esenler	0.666463	Very Suitable	Acceptable	Acceptable	44	Csa	Temperate, dry summer, hot summer
774	Marmara	İstanbul	Sile	0.659558	Very Suitable	Acceptable	Acceptable	19	Csa	Temperate, dry summer, hot summer
853	Marmara	İstanbul	Tuzla	0.656771	Very Suitable	Acceptable	Acceptable	9	Csa	Temperate, dry summer, hot summer
203	Marmara	İstanbul	Çatalca	0.656473	Very Suitable	Acceptable	Acceptable	84	Csa	Temperate, dry summer, hot summer
404	Marmara	İstanbul	Güngören	0.645416	Very Suitable	Acceptable	Acceptable	69	Csa	Temperate, dry summer, hot summer
921	Marmara	İstanbul	Zeytinburnu	0.630266	Very Suitable	Acceptable	Acceptable	40	Csa	Temperate, dry summer, hot summer
343	Marmara	İstanbul	Fatih	0.619571	Very Suitable	Acceptable	Acceptable	33	Csa	Temperate, dry summer, hot summer
104	Marmara	İstanbul	Bahçelievler	0.597412	Suitable	Acceptable	Acceptable	28	Csa	Temperate, dry summer, hot summer
486	Marmara	İstanbul	Kadıköy	0.592025	Suitable	Acceptable	Acceptable	32	Csa	Temperate, dry summer, hot summer
6	Marmara	İstanbul	Adalar	0.588650	Suitable	Acceptable	Acceptable	48	Csa	Temperate, dry summer, hot summer
341	Marmara	İstanbul	Eyüp	0.587468	Suitable	Acceptable	Acceptable	8	Csa	Temperate, dry summer, hot summer
107	Marmara	İstanbul	Bakırkoy	0.586267	Suitable	Acceptable	Acceptable	26	Csa	Temperate, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
180	Marmara	İstanbul	Büyükçekmece	0.561290	Suitable	Acceptable	Acceptable	2	Csa	Temperate, dry summer, hot summer
142	Marmara	İstanbul	Beyoğlu	0.542112	Suitable	Acceptable	Acceptable	82	Csa	Temperate, dry summer, hot summer
617	Marmara	İstanbul	Maltepe	0.536244	Suitable	Acceptable	Acceptable	8	Csa	Temperate, dry summer, hot summer
314	Marmara	İstanbul	Eminönü	0.506558	Suitable	Acceptable	Acceptable	33	Csa	Temperate, dry summer, hot summer
588	Marmara	İstanbul	Küçükçekmece	0.504799	Suitable	Acceptable	Acceptable	72	Csa	Temperate, dry summer, hot summer
85	Marmara	İstanbul	Avcılar	0.472800	Suitable	Marginal Suitable	Acceptable	85	Csa	Temperate, dry summer, hot summer
871	Marmara	İstanbul	Üsküdar	0.453563	Suitable	Marginal Suitable	Marginal Suitable	14	Csa	Temperate, dry summer, hot summer
609	Marmara	Kırklareli	Lüleburgaz	0.831935	Extremely Suitable	Suitable	Suitable	60	Csa	Temperate, dry summer, hot summer
570	Marmara	Kırklareli	Kofçaz	0.803010	Extremely Suitable	Suitable	Suitable	434	Cfb	Temperate, no dry season, warm summer
698	Marmara	Kırklareli	Pehlivanköy	0.797160	Very Suitable	Suitable	Suitable	28	Csa	Temperate, dry summer, hot summer
258	Marmara	Kırklareli	Demirköy	0.731443	Very Suitable	Acceptable	Suitable	302	Cfa	Temperate, no dry season, hot summer
100	Marmara	Kırklareli	Babaeski	0.712535	Very Suitable	Acceptable	Acceptable	59	Csa	Temperate, dry summer, hot summer
559	Marmara	Kırklareli	Kırklareli/Merkez	0.678904	Very Suitable	Acceptable	Acceptable	231	Csa	Temperate, dry summer, hot summer
706	Marmara	Kırklareli	Pınarhisar	0.663407	Very Suitable	Acceptable	Acceptable	190	Csa	Temperate, dry summer, hot summer
880	Marmara	Kırklareli	Vize	0.663062	Very Suitable	Acceptable	Acceptable	174	Csa	Temperate, dry summer, hot summer
499	Marmara	Kocaeli	Kandıra	0.792203	Very Suitable	Suitable	Suitable	1128	BSk	Arid, steppe, cold
266	Marmara	Kocaeli	Derince	0.786847	Very Suitable	Suitable	Suitable	39	Csa	Temperate, dry summer, hot summer
514	Marmara	Kocaeli	Karamürsel	0.782685	Very Suitable	Suitable	Suitable	1159	Csa	Temperate, dry summer, hot summer
575	Marmara	Kocaeli	Körfez	0.681287	Very Suitable	Acceptable	Acceptable	60	Csa	Temperate, dry summer, hot summer
566	Marmara	Kocaeli	Kocaeli/Izmit	0.666434	Very Suitable	Acceptable	Acceptable	7	Csa	Temperate, dry summer, hot summer
355	Marmara	Kocaeli	Gebze	0.657589	Very Suitable	Acceptable	Acceptable	184	Csa	Temperate, dry summer, hot summer
375	Marmara	Kocaeli	Gölcük	0.606617	Very Suitable	Acceptable	Acceptable	14	Csa	Temperate, dry summer, hot summer
796	Marmara	Sakarya	Söğütlü	0.836301	Extremely Suitable	Suitable	Suitable	74	Csa	Temperate, dry summer, hot summer
532	Marmara	Sakarya	Kaynarca	0.824084	Extremely Suitable	Suitable	Suitable	877	Csa	Temperate, dry summer, hot summer
689	Marmara	Sakarya	Pamukova	0.810236	Extremely Suitable	Suitable	Suitable	91	Csa	Temperate, dry summer, hot summer
443	Marmara	Sakarya	Hendek	0.806084	Extremely Suitable	Suitable	Suitable	167	Cfa	Temperate, no dry season, hot summer
731	Marmara	Sakarya	Sapanca	0.794696	Very Suitable	Suitable	Suitable	43	Cfa	Temperate, no dry season, hot summer
347	Marmara	Sakarya	Ferizli	0.785030	Very Suitable	Suitable	Suitable	28	Cfa	Temperate, no dry season, hot summer
818	Marmara	Sakarya	Taraklı	0.784317	Very Suitable	Suitable	Suitable	449	Cfb	Temperate, no dry season, warm summer
516	Marmara	Sakarya	Karapürçek	0.772420	Very Suitable	Suitable	Suitable	997	BSk	Arid, steppe, cold
723	Marmara	Sakarya	Sakarya/Adapazarı	0.767333	Very Suitable	Suitable	Suitable	30	Cfa	Temperate, no dry season, hot summer
368	Marmara	Sakarya	Geyve	0.763398	Very Suitable	Suitable	Suitable	84	Csa	Temperate, dry summer, hot summer
565	Marmara	Sakarya	Kocaali	0.721288	Very Suitable	Acceptable	Suitable	35	Cfa	Temperate, no dry season, hot summer
37	Marmara	Sakarya	Akyazı	0.637690	Very Suitable	Acceptable	Acceptable	45	Cfa	Temperate, no dry season, hot summer
517	Marmara	Sakarya	Karasu	0.626999	Very Suitable	Acceptable	Acceptable	138	Cfa	Temperate, no dry season, hot summer
438	Marmara	Tekirdağ	Hayrabolu	0.812998	Extremely Suitable	Suitable	Suitable	62	Csa	Temperate, dry summer, hot summer
646	Marmara	Tekirdağ	Muratlı	0.803287	Extremely Suitable	Suitable	Suitable	76	Csa	Temperate, dry summer, hot summer
242	Marmara	Tekirdağ	Çorlu	0.802400	Extremely Suitable	Suitable	Suitable	168	Csa	Temperate, dry summer, hot summer
616	Marmara	Tekirdağ	Malkara	0.747121	Very Suitable	Suitable	Suitable	222	Csa	Temperate, dry summer, hot summer
749	Marmara	Tekirdağ	Şarköy	0.699746	Very Suitable	Acceptable	Acceptable	1127	Dfb	Cold, no dry season, warm summer
222	Marmara	Tekirdağ	Çerkezköy	0.680940	Very Suitable	Acceptable	Acceptable	146	Csa	Temperate, dry summer, hot summer
733	Marmara	Tekirdağ	Saray/Tekirdağ	0.642239	Very Suitable	Acceptable	Acceptable	148	Csa	Temperate, dry summer, hot summer
828	Marmara	Tekirdağ	Tekirdağ/Merkez	0.607960	Very Suitable	Acceptable	Acceptable	28	BSk	Arid, steppe, cold
624	Marmara	Tekirdağ	Marmaraereğlisi	0.554279	Suitable	Acceptable	Acceptable	5	Csa	Temperate, dry summer, hot summer
886	Marmara	Yalova	Yalova/Merkez	0.831402	Extremely Suitable	Suitable	Suitable	6	Csa	Temperate, dry summer, hot summer
240	Marmara	Yalova	Çınarcık	0.830662	Extremely Suitable	Suitable	Suitable	29	Csa	Temperate, dry summer, hot summer
231	Marmara	Yalova	Çiftlikköy	0.805800	Extremely Suitable	Suitable	Suitable	13	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
832	Marmara	Yalova	Termal	0.786414	Very Suitable	Suitable	Suitable	146	Csa	Temperate, dry summer, hot summer
52	Marmara	Yalova	Altınova	0.781651	Very Suitable	Suitable	Suitable	15	Csa	Temperate, dry summer, hot summer
74	Marmara	Yalova	Armutlu	0.721015	Very Suitable	Acceptable	Suitable	11	Csa	Temperate, dry summer, hot summer
711	Mediterranean	Adana	Pozantı	0.881793	Extremely Suitable	Suitable	Very Suitable	786	Csa	Temperate, dry summer, hot summer
42	Mediterranean	Adana	Aladağ	0.862078	Extremely Suitable	Suitable	Very Suitable	858	Csa	Temperate, dry summer, hot summer
345	Mediterranean	Adana	Feke	0.846820	Extremely Suitable	Suitable	Suitable	558	Dsa	Cold, dry summer, hot summer
508	Mediterranean	Adana	Karaisalı	0.655044	Very Suitable	Acceptable	Acceptable	928	Csa	Temperate, dry summer, hot summer
916	Mediterranean	Adana	Yumurtalık	0.580636	Suitable	Acceptable	Acceptable	10	Csa	Temperate, dry summer, hot summer
722	Mediterranean	Adana	Saimbeyli	0.568925	Suitable	Acceptable	Acceptable	971	BSk	Arid, steppe, cold
518	Mediterranean	Adana	Karataş	0.562482	Suitable	Acceptable	Acceptable	5	Cfa	Temperate, no dry season, hot summer
586	Mediterranean	Adana	Kozan	0.442549	Suitable	Marginal Suitable	Marginal Suitable	137	Csa	Temperate, dry summer, hot summer
845	Mediterranean	Adana	Tufanbeyli	0.432566	Suitable	Marginal Suitable	Marginal Suitable	1415	Dsb	Cold, dry summer, warm summer
225	Mediterranean	Adana	Ceyhan	0.362707	Acceptable	Marginal Suitable	Marginal Suitable	31	Csa	Temperate, dry summer, hot summer
918	Mediterranean	Adana	Yüreğir	0.336198	Acceptable	Marginal Suitable	Marginal Suitable	26	Csa	Temperate, dry summer, hot summer
771	Mediterranean	Adana	Seyhan	0.299476	Acceptable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
466	Mediterranean	Adana	İmamoğlu	0.210503	Acceptable	Marginal Suitable	Marginal Suitable	1605	Dsb	Cold, dry summer, warm summer
454	Mediterranean	Antalya	İbradı	0.874318	Extremely Suitable	Suitable	Very Suitable	18	Csa	Temperate, dry summer, hot summer
579	Mediterranean	Antalya	Korkuteli	0.868808	Extremely Suitable	Suitable	Very Suitable	996	Csa	Temperate, dry summer, hot summer
34	Mediterranean	Antalya	Akseki	0.853379	Extremely Suitable	Suitable	Suitable	1057	Csa	Temperate, dry summer, hot summer
400	Mediterranean	Antalya	Gündoğmuş	0.800443	Extremely Suitable	Suitable	Suitable	890	Dsb	Cold, dry summer, warm summer
312	Mediterranean	Antalya	Elmalı	0.799428	Very Suitable	Suitable	Suitable	1085	Csa	Temperate, dry summer, hot summer
349	Mediterranean	Antalya	Finike	0.670453	Very Suitable	Acceptable	Acceptable	5	Csa	Temperate, dry summer, hot summer
528	Mediterranean	Antalya	Kaş	0.658625	Very Suitable	Acceptable	Acceptable	814	BSk	Arid, steppe, cold
43	Mediterranean	Antalya	Alanya	0.634533	Very Suitable	Acceptable	Acceptable	9	Csa	Temperate, dry summer, hot summer
767	Mediterranean	Antalya	Serik	0.609823	Very Suitable	Acceptable	Acceptable	30	Csa	Temperate, dry summer, hot summer
494	Mediterranean	Antalya	Demre	0.596298	Suitable	Acceptable	Acceptable	12	Csa	Temperate, dry summer, hot summer
594	Mediterranean	Antalya	Kumluca	0.551292	Suitable	Acceptable	Acceptable	35	Csa	Temperate, dry summer, hot summer
62	Mediterranean	Antalya	Antalya/Merkez	0.460663	Suitable	Marginal Suitable	Marginal Suitable	62	Csa	Temperate, dry summer, hot summer
619	Mediterranean	Antalya	Manavgat	0.453426	Suitable	Marginal Suitable	Marginal Suitable	21	Csa	Temperate, dry summer, hot summer
354	Mediterranean	Antalya	Gazipaşa	0.444239	Suitable	Marginal Suitable	Marginal Suitable	20	Csa	Temperate, dry summer, hot summer
545	Mediterranean	Antalya	Kemer/Antalya	0.223592	Acceptable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
13	Mediterranean	Burdur	Ağlasun	0.887336	Extremely Suitable	Suitable	Very Suitable	1144	Csa	Temperate, dry summer, hot summer
172	Mediterranean	Burdur	Bucak	0.879665	Extremely Suitable	Suitable	Very Suitable	811	Csa	Temperate, dry summer, hot summer
55	Mediterranean	Burdur	Altınyayla/Burdur	0.865792	Extremely Suitable	Suitable	Very Suitable	1245	Csa	Temperate, dry summer, hot summer
827	Mediterranean	Burdur	Tefenni	0.860884	Extremely Suitable	Suitable	Very Suitable	1161	Csa	Temperate, dry summer, hot summer
377	Mediterranean	Burdur	Gölhisar	0.857303	Extremely Suitable	Suitable	Suitable	1009	Csa	Temperate, dry summer, hot summer
907	Mediterranean	Burdur	Yeşilova	0.855045	Extremely Suitable	Suitable	Suitable	1205	Csa	Temperate, dry summer, hot summer
513	Mediterranean	Burdur	Karamanlı	0.847761	Extremely Suitable	Suitable	Suitable	1063	BSk	Arid, steppe, cold
207	Mediterranean	Burdur	Çavdır	0.846923	Extremely Suitable	Suitable	Suitable	1081	Csa	Temperate, dry summer, hot summer
178	Mediterranean	Burdur	Burdur/Merkez	0.821815	Extremely Suitable	Suitable	Suitable	963	BSk	Arid, steppe, cold
219	Mediterranean	Burdur	Çeltikçi	0.797830	Very Suitable	Suitable	Suitable	859	Csa	Temperate, dry summer, hot summer
544	Mediterranean	Burdur	Kemer/Burdur	0.740361	Very Suitable	Suitable	Suitable	1145	Csa	Temperate, dry summer, hot summer
432	Mediterranean	Hatay	Hatay/Merkez	0.734740	Very Suitable	Acceptable	Suitable	89	Csa	Temperate, dry summer, hot summer
891	Mediterranean	Hatay	Yayladağı	0.714553	Very Suitable	Acceptable	Acceptable	419	Csa	Temperate, dry summer, hot summer
431	Mediterranean	Hatay	Hassa	0.685651	Very Suitable	Acceptable	Acceptable	416	Csa	Temperate, dry summer, hot summer
53	Mediterranean	Hatay	Altınözü	0.664407	Very Suitable	Acceptable	Acceptable	258	Csa	Temperate, dry summer, hot summer
291	Mediterranean	Hatay	Dörtyol	0.627070	Very Suitable	Acceptable	Acceptable	48	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
556	Mediterranean	Hatay	Kırıkhan	0.622231	Very Suitable	Acceptable	Acceptable	155	Csa	Temperate, dry summer, hot summer
328	Mediterranean	Hatay	Erzin	0.612624	Very Suitable	Acceptable	Acceptable	172	Csa	Temperate, dry summer, hot summer
727	Mediterranean	Hatay	Samandağ	0.600969	Very Suitable	Acceptable	Acceptable	39	Csa	Temperate, dry summer, hot summer
476	Mediterranean	Hatay	İskenderun	0.565984	Suitable	Acceptable	Acceptable	5	Csa	Temperate, dry summer, hot summer
715	Mediterranean	Hatay	Reyhanlı	0.557563	Suitable	Acceptable	Acceptable	170	Csa	Temperate, dry summer, hot summer
433	Mediterranean	Hatay	Hatay/Belen	0.521931	Suitable	Acceptable	Acceptable	496	Csa	Temperate, dry summer, hot summer
593	Mediterranean	Hatay	Kumlu	0.438084	Suitable	Marginal Suitable	Marginal Suitable	91	Csa	Temperate, dry summer, hot summer
816	Mediterranean	Isparta	Sütçüler	0.885469	Extremely Suitable	Suitable	Very Suitable	1030	BSk	Arid, steppe, cold
764	Mediterranean	Isparta	Senirkent	0.869876	Extremely Suitable	Suitable	Very Suitable	961	Csa	Temperate, dry summer, hot summer
304	Mediterranean	Isparta	Eğirdir	0.865249	Extremely Suitable	Suitable	Very Suitable	926	Csa	Temperate, dry summer, hot summer
385	Mediterranean	Isparta	Gönen/Isparta	0.858688	Extremely Suitable	Suitable	Suitable	1040	Csa	Temperate, dry summer, hot summer
82	Mediterranean	Isparta	Atabey	0.843330	Extremely Suitable	Suitable	Suitable	1042	Csb	Temperate, dry summer, warm summer
861	Mediterranean	Isparta	Uluborlu	0.837336	Extremely Suitable	Suitable	Suitable	1054	Csa	Temperate, dry summer, hot summer
887	Mediterranean	Isparta	Yalvaç	0.820930	Extremely Suitable	Suitable	Suitable	1103	Csb	Temperate, dry summer, warm summer
748	Mediterranean	Isparta	Şarkıkaraağaç	0.811920	Extremely Suitable	Suitable	Suitable	1234	BSk	Arid, steppe, cold
35	Mediterranean	Isparta	Aksu/Isparta	0.811794	Extremely Suitable	Suitable	Suitable	1223	Csa	Temperate, dry summer, hot summer
357	Mediterranean	Isparta	Gelendost	0.783999	Very Suitable	Suitable	Suitable	952	Csa	Temperate, dry summer, hot summer
479	Mediterranean	Isparta	Isparta/Merkez	0.772482	Very Suitable	Suitable	Suitable	1058	Csa	Temperate, dry summer, hot summer
537	Mediterranean	Isparta	Keçiborlu	0.722635	Very Suitable	Acceptable	Suitable	1004	Csa	Temperate, dry summer, hot summer
902	Mediterranean	Isparta	Yenişarbademli	0.686208	Very Suitable	Acceptable	Acceptable	1181	Dsb	Cold, dry summer, warm summer
182	Mediterranean	Kahramanmaraş	Çağlayancerit	0.856005	Extremely Suitable	Suitable	Suitable	1103	Dsa	Cold, dry summer, hot summer
491	Mediterranean	Kahramanmaraş	Kahramanmaraş/Merkez	0.852294	Extremely Suitable	Suitable	Suitable	889	BSk	Arid, steppe, cold
694	Mediterranean	Kahramanmaraş	Pazarcık	0.850711	Extremely Suitable	Suitable	Suitable	750	Csa	Temperate, dry summer, hot summer
61	Mediterranean	Kahramanmaraş	Andırın	0.799080	Very Suitable	Suitable	Suitable	1047	Csa	Temperate, dry summer, hot summer
9	Mediterranean	Kahramanmaraş	Afsin	0.765662	Very Suitable	Suitable	Suitable	1237	BSk	Arid, steppe, cold
663	Mediterranean	Kahramanmaraş	Nurhak	0.747599	Very Suitable	Suitable	Suitable	1401	Dsb	Cold, dry summer, warm summer
850	Mediterranean	Kahramanmaraş	Türkoğlu	0.724899	Very Suitable	Acceptable	Suitable	488	Csa	Temperate, dry summer, hot summer
305	Mediterranean	Kahramanmaraş	Ekinözü	0.676808	Very Suitable	Acceptable	Acceptable	1282	BSk	Arid, steppe, cold
308	Mediterranean	Kahramanmaraş	Elbistan	0.661054	Very Suitable	Acceptable	Acceptable	1139	BSk	Arid, steppe, cold
372	Mediterranean	Kahramanmaraş	Göksun	0.559702	Suitable	Acceptable	Acceptable	1347	Dsb	Cold, dry summer, warm summer
394	Mediterranean	Mersin	Gülnar	0.769470	Very Suitable	Suitable	Suitable	965	Csa	Temperate, dry summer, hot summer
190	Mediterranean	Mersin	Çamlıyayla	0.711189	Very Suitable	Acceptable	Acceptable	1168	Csa	Temperate, dry summer, hot summer
650	Mediterranean	Mersin	Mut	0.616427	Very Suitable	Acceptable	Acceptable	314	Csa	Temperate, dry summer, hot summer
775	Mediterranean	Mersin	Silifke	0.610671	Very Suitable	Acceptable	Acceptable	11	Csa	Temperate, dry summer, hot summer
455	Mediterranean	Mersin	İçel/Mersin	0.596948	Suitable	Acceptable	Acceptable	765	Csa	Temperate, dry summer, hot summer
90	Mediterranean	Mersin	Aydıncık/Mersin	0.579512	Suitable	Acceptable	Acceptable	21	Csa	Temperate, dry summer, hot summer
170	Mediterranean	Mersin	Bozyazı	0.567236	Suitable	Acceptable	Acceptable	6	Csa	Temperate, dry summer, hot summer
321	Mediterranean	Mersin	Erdemli	0.527362	Suitable	Acceptable	Acceptable	13	Csa	Temperate, dry summer, hot summer
60	Mediterranean	Mersin	Anamur	0.510223	Suitable	Acceptable	Acceptable	33	Csa	Temperate, dry summer, hot summer
819	Mediterranean	Mersin	Tarsus	0.458047	Suitable	Marginal Suitable	Marginal Suitable	25	Csa	Temperate, dry summer, hot summer
103	Mediterranean	Osmaniye	Bahçe	0.859138	Extremely Suitable	Suitable	Suitable	594	Csa	Temperate, dry summer, hot summer
296	Mediterranean	Osmaniye	Düziçi	0.845271	Extremely Suitable	Suitable	Suitable	401	Dsa	Cold, dry summer, hot summer
428	Mediterranean	Osmaniye	Hasanbeyli	0.812483	Extremely Suitable	Suitable	Suitable	753	Csa	Temperate, dry summer, hot summer
682	Mediterranean	Osmaniye	Osmaniye/Merkez	0.641681	Very Suitable	Acceptable	Acceptable	121	Csa	Temperate, dry summer, hot summer
839	Mediterranean	Osmaniye	Toprakkale	0.596793	Suitable	Acceptable	Acceptable	57	Csa	Temperate, dry summer, hot summer
809	Mediterranean	Osmaniye	Sumbas	0.527935	Suitable	Acceptable	Acceptable	762	BSk	Arid, steppe, cold
485	Mediterranean	Osmaniye	Kadirli	0.494799	Suitable	Marginal Suitable	Acceptable	93	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
374	Sout-East Anatolia	Adıyaman	Gölbaşı/Adıyaman	0.864479	Extremely Suitable	Suitable	Very Suitable	902	Csa	Temperate, dry summer, hot summer
851	Sout-East Anatolia	Adıyaman	Tut	0.846071	Extremely Suitable	Suitable	Suitable	929	Csa	Temperate, dry summer, hot summer
217	Sout-East Anatolia	Adıyaman	Çelikhan	0.796027	Very Suitable	Suitable	Suitable	1388	Dsa	Cold, dry summer, hot summer
782	Sout-East Anatolia	Adıyaman	Sincik	0.793413	Very Suitable	Suitable	Suitable	27	Cfa	Temperate, no dry season, hot summer
364	Sout-East Anatolia	Adıyaman	Gerger	0.779852	Very Suitable	Suitable	Suitable	750	Csa	Temperate, dry summer, hot summer
136	Sout-East Anatolia	Adıyaman	Besni	0.654952	Very Suitable	Acceptable	Acceptable	902	Csa	Temperate, dry summer, hot summer
8	Sout-East Anatolia	Adıyaman	Adıyaman/Merkez	0.648771	Very Suitable	Acceptable	Acceptable	701	Csa	Temperate, dry summer, hot summer
728	Sout-East Anatolia	Adıyaman	Samsat	0.617070	Very Suitable	Acceptable	Acceptable	593	Csa	Temperate, dry summer, hot summer
492	Sout-East Anatolia	Adıyaman	Kahta	0.444161	Suitable	Marginal Suitable	Marginal Suitable	562	Csa	Temperate, dry summer, hot summer
751	Sout-East Anatolia	Batman	Sason	0.743701	Very Suitable	Suitable	Suitable	908	Dsa	Cold, dry summer, hot summer
587	Sout-East Anatolia	Batman	Kozluk	0.491544	Suitable	Marginal Suitable	Acceptable	874	Csa	Temperate, dry summer, hot summer
135	Sout-East Anatolia	Batman	Beşiri	0.448047	Suitable	Marginal Suitable	Marginal Suitable	751	Csa	Temperate, dry summer, hot summer
121	Sout-East Anatolia	Batman	Batman/Merkez	0.406786	Suitable	Marginal Suitable	Marginal Suitable	570	Csa	Temperate, dry summer, hot summer
429	Sout-East Anatolia	Batman	Hasankeyf	0.397551	Acceptable	Marginal Suitable	Marginal Suitable	513	Csa	Temperate, dry summer, hot summer
362	Sout-East Anatolia	Batman	Gercüş	0.383316	Acceptable	Marginal Suitable	Marginal Suitable	955	Csa	Temperate, dry summer, hot summer
248	Sout-East Anatolia	Diyarbakır	Çüngüş	0.829915	Extremely Suitable	Suitable	Suitable	978	Dsa	Cold, dry summer, hot summer
223	Sout-East Anatolia	Diyarbakır	Çermik	0.823362	Extremely Suitable	Suitable	Suitable	686	Csa	Temperate, dry summer, hot summer
590	Sout-East Anatolia	Diyarbakır	Kulp	0.792044	Very Suitable	Suitable	Suitable	1015	Dsa	Cold, dry summer, hot summer
325	Sout-East Anatolia	Diyarbakır	Ergani	0.791701	Very Suitable	Suitable	Suitable	951	Csa	Temperate, dry summer, hot summer
608	Sout-East Anatolia	Diyarbakır	Lice	0.785912	Very Suitable	Suitable	Suitable	997	Dsa	Cold, dry summer, hot summer
424	Sout-East Anatolia	Diyarbakır	Hani	0.674769	Very Suitable	Acceptable	Acceptable	900	Dsa	Cold, dry summer, hot summer
272	Sout-East Anatolia	Diyarbakır	Dicle	0.668638	Very Suitable	Acceptable	Acceptable	939	Csa	Temperate, dry summer, hot summer
440	Sout-East Anatolia	Diyarbakır	Hazro	0.547308	Suitable	Acceptable	Acceptable	1012	Dsa	Cold, dry summer, hot summer
303	Sout-East Anatolia	Diyarbakır	Eğil	0.540129	Suitable	Acceptable	Acceptable	855	Csa	Temperate, dry summer, hot summer
567	Sout-East Anatolia	Diyarbakır	Kocaköy	0.517874	Suitable	Acceptable	Acceptable	969	Csa	Temperate, dry summer, hot summer
280	Sout-East Anatolia	Diyarbakır	Diyarbakır/Merkez	0.447179	Suitable	Marginal Suitable	Marginal Suitable	674	Csa	Temperate, dry summer, hot summer
151	Sout-East Anatolia	Diyarbakır	Bismil	0.396014	Acceptable	Marginal Suitable	Marginal Suitable	548	Csa	Temperate, dry summer, hot summer
239	Sout-East Anatolia	Diyarbakır	Çınar	0.389504	Acceptable	Marginal Suitable	Marginal Suitable	673	Csa	Temperate, dry summer, hot summer
778	Sout-East Anatolia	Diyarbakır	Silvan	0.322639	Acceptable	Marginal Suitable	Marginal Suitable	808	Csb	Temperate, dry summer, warm summer
662	Sout-East Anatolia	Gaziantep	Nurdağı	0.871236	Extremely Suitable	Suitable	Very Suitable	529	Csa	Temperate, dry summer, hot summer
721	Sout-East Anatolia	Gaziantep	Şahinbey	0.821398	Extremely Suitable	Suitable	Suitable	325	Csb	Temperate, dry summer, warm summer
478	Sout-East Anatolia	Gaziantep	Islahiye	0.809621	Extremely Suitable	Suitable	Suitable	503	Csa	Temperate, dry summer, hot summer
758	Sout-East Anatolia	Gaziantep	Şehitkamil	0.755304	Very Suitable	Suitable	Suitable	1391	Dsa	Cold, dry summer, hot summer
667	Sout-East Anatolia	Gaziantep	Oğuzeli	0.609587	Very Suitable	Acceptable	Acceptable	687	Csa	Temperate, dry summer, hot summer
63	Sout-East Anatolia	Gaziantep	Araban	0.572921	Suitable	Acceptable	Acceptable	530	Csa	Temperate, dry summer, hot summer
890	Sout-East Anatolia	Gaziantep	Yavuzeli	0.556426	Suitable	Acceptable	Acceptable	568	Csa	Temperate, dry summer, hot summer
661	Sout-East Anatolia	Gaziantep	Nizip	0.445526	Suitable	Marginal Suitable	Marginal Suitable	535	Csa	Temperate, dry summer, hot summer
522	Sout-East Anatolia	Gaziantep	Karkamış	0.253240	Acceptable	Marginal Suitable	Marginal Suitable	387	BSk	Arid, steppe, cold
649	Sout-East Anatolia	Kilis	Musabeyli	0.758564	Very Suitable	Suitable	Suitable	745	Csa	Temperate, dry summer, hot summer
552	Sout-East Anatolia	Kilis	Kilis/Merkez	0.652450	Very Suitable	Acceptable	Acceptable	660	Csa	Temperate, dry summer, hot summer
707	Sout-East Anatolia	Kilis	Polateli	0.596188	Suitable	Acceptable	Acceptable	840	Csa	Temperate, dry summer, hot summer
307	Sout-East Anatolia	Kilis	Elbeyli	0.445675	Suitable	Marginal Suitable	Marginal Suitable	519	Csa	Temperate, dry summer, hot summer
754	Sout-East Anatolia	Mardin	Savur	0.500688	Suitable	Marginal Suitable	Acceptable	877	Csa	Temperate, dry summer, hot summer
671	Sout-East Anatolia	Mardin	Ömerli	0.477681	Suitable	Marginal Suitable	Acceptable	1089	Csa	Temperate, dry summer, hot summer
627	Sout-East Anatolia	Mardin	Mazıdağı	0.466740	Suitable	Marginal Suitable	Marginal Suitable	1048	Csa	Temperate, dry summer, hot summer
253	Sout-East Anatolia	Mardin	Dargeçit	0.457290	Suitable	Marginal Suitable	Marginal Suitable	902	Csa	Temperate, dry summer, hot summer
265	Sout-East Anatolia	Mardin	Derik	0.443953	Suitable	Marginal Suitable	Marginal Suitable	799	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
622	Sout-East Anatolia	Mardin	Mardin/Merkez	0.423577	Suitable	Marginal Suitable	Marginal Suitable	938	Csa	Temperate, dry summer, hot summer
637	Sout-East Anatolia	Mardin	Midyat	0.421694	Suitable	Marginal Suitable	Marginal Suitable	944	Csa	Temperate, dry summer, hot summer
906	Sout-East Anatolia	Mardin	Yeşilli	0.365213	Acceptable	Marginal Suitable	Marginal Suitable	822	Csa	Temperate, dry summer, hot summer
564	Sout-East Anatolia	Mardin	Kızıltepe	0.336091	Acceptable	Marginal Suitable	Marginal Suitable	485	Csa	Temperate, dry summer, hot summer
664	Sout-East Anatolia	Mardin	Nusaybin	0.316416	Acceptable	Marginal Suitable	Marginal Suitable	475	Csa	Temperate, dry summer, hot summer
127	Sout-East Anatolia	Siirt	Baykan	0.837236	Extremely Suitable	Suitable	Suitable	720	Dsa	Cold, dry summer, hot summer
327	Sout-East Anatolia	Siirt	Eruh	0.816589	Extremely Suitable	Suitable	Suitable	1164	Csa	Temperate, dry summer, hot summer
785	Sout-East Anatolia	Siirt	Şirvan	0.814136	Extremely Suitable	Suitable	Suitable	905	Csa	Temperate, dry summer, hot summer
702	Sout-East Anatolia	Siirt	Pervari	0.751358	Very Suitable	Suitable	Suitable	1376	Dsa	Cold, dry summer, hot summer
598	Sout-East Anatolia	Siirt	Kurtalan	0.555614	Suitable	Acceptable	Acceptable	715	Csa	Temperate, dry summer, hot summer
92	Sout-East Anatolia	Siirt	Aydınlar	0.553721	Suitable	Acceptable	Acceptable	118	Csa	Temperate, dry summer, hot summer
773	Sout-East Anatolia	Siirt	Siirt/Merkez	0.525460	Suitable	Acceptable	Acceptable	887	Csa	Temperate, dry summer, hot summer
789	Sout-East Anatolia	Şanlıurfa	Siverek	0.600072	Very Suitable	Acceptable	Acceptable	1273	Dsa	Cold, dry summer, hot summer
444	Sout-East Anatolia	Şanlıurfa	Hilvan	0.497374	Suitable	Marginal Suitable	Acceptable	592	Csa	Temperate, dry summer, hot summer
418	Sout-East Anatolia	Şanlıurfa	Halfeti	0.452094	Suitable	Marginal Suitable	Marginal Suitable	664	Csa	Temperate, dry summer, hot summer
879	Sout-East Anatolia	Şanlıurfa	Viranşehir	0.392844	Acceptable	Marginal Suitable	Marginal Suitable	566	Csa	Temperate, dry summer, hot summer
812	Sout-East Anatolia	Şanlıurfa	Suruç	0.356934	Acceptable	Marginal Suitable	Marginal Suitable	46	Csa	Temperate, dry summer, hot summer
427	Sout-East Anatolia	Şanlıurfa	Harran	0.346098	Acceptable	Marginal Suitable	Marginal Suitable	374	Csa	Temperate, dry summer, hot summer
150	Sout-East Anatolia	Şanlıurfa	Birecik	0.340704	Acceptable	Marginal Suitable	Marginal Suitable	343	Csa	Temperate, dry summer, hot summer
21	Sout-East Anatolia	Şanlıurfa	Akçakale	0.339236	Acceptable	Marginal Suitable	Marginal Suitable	359	BSh	Arid, steppe, hot
167	Sout-East Anatolia	Şanlıurfa	Bozova	0.337976	Acceptable	Marginal Suitable	Marginal Suitable	582	Csa	Temperate, dry summer, hot summer
867	Sout-East Anatolia	Şanlıurfa	Şanlıurfa/Merkez	0.325962	Acceptable	Marginal Suitable	Marginal Suitable	985	Csb	Temperate, dry summer, warm summer
226	Sout-East Anatolia	Şanlıurfa	Ceylanpınar	0.303649	Acceptable	Marginal Suitable	Marginal Suitable	364	Csa	Temperate, dry summer, hot summer
862	Sout-East Anatolia	Şırnak	Uludere	0.795962	Very Suitable	Suitable	Suitable	1227	Dsa	Cold, dry summer, hot summer
794	Sout-East Anatolia	Şırnak	Şırnak/Merkez	0.730461	Very Suitable	Acceptable	Suitable	49	Csa	Temperate, dry summer, hot summer
391	Sout-East Anatolia	Şırnak	Güçlükonak	0.427554	Suitable	Marginal Suitable	Marginal Suitable	791	Csa	Temperate, dry summer, hot summer
145	Sout-East Anatolia	Şırnak	Beytüşşebap	0.412672	Suitable	Marginal Suitable	Marginal Suitable	1546	Dsa	Cold, dry summer, hot summer
456	Sout-East Anatolia	Şırnak	İdil	0.387996	Acceptable	Marginal Suitable	Marginal Suitable	870	Dfb	Cold, no dry season, warm summer
237	Sout-East Anatolia	Şırnak	Cizre	0.351806	Acceptable	Marginal Suitable	Marginal Suitable	374	Csa	Temperate, dry summer, hot summer
777	Sout-East Anatolia	Şırnak	Silopi	0.318591	Acceptable	Marginal Suitable	Marginal Suitable	840	Csa	Temperate, dry summer, hot summer

APPENDIX F: GRAPE CLIMATE SUITABILITY INDEX (GCSI) AND CLASSIFICATION CHANGE FOR 923 LOCATIONS FOR REFERENCE PERIOD OF 1991-2012 AND FUTURE PERIOD OF 2021-2050 BASED ON 3 APPROACHES I.E. EIC, PC, AND NBC WITH RE MODEL

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
255	Aegean	Afyonkarahisar	Dazkırı	0.870368	Extremely Suitable	Suitable	Very Suitable	894	BSk	Arid, steppe, cold
563	Aegean	Afyonkarahisar	Kızılören	0.867617	Extremely Suitable	Suitable	Very Suitable	1112	BSk	Arid, steppe, cold
338	Aegean	Afyonkarahisar	Evciler	0.866408	Extremely Suitable	Suitable	Very Suitable	909	BSk	Arid, steppe, cold
241	Aegean	Afyonkarahisar	Çobanlar	0.865492	Extremely Suitable	Suitable	Very Suitable	992	BSk	Arid, steppe, cold
805	Aegean	Afyonkarahisar	Sultandağı	0.859400	Extremely Suitable	Suitable	Very Suitable	77	Csa	Temperate, dry summer, hot summer
277	Aegean	Afyonkarahisar	Dinar	0.851430	Extremely Suitable	Suitable	Suitable	865	BSk	Arid, steppe, cold
10	Aegean	Afyonkarahisar	Afyon/Merkez	0.840145	Extremely Suitable	Suitable	Suitable	1012	BSk	Arid, steppe, cold
448	Aegean	Afyonkarahisar	Hocalar	0.837419	Extremely Suitable	Suitable	Suitable	1077	BSk	Arid, steppe, cold
315	Aegean	Afyonkarahisar	Emirdağ	0.836811	Extremely Suitable	Suitable	Suitable	965	BSk	Arid, steppe, cold
730	Aegean	Afyonkarahisar	Sandıklı	0.830578	Extremely Suitable	Suitable	Suitable	1094	BSk	Arid, steppe, cold
157	Aegean	Afyonkarahisar	Bolvadin	0.830100	Extremely Suitable	Suitable	Suitable	990	BSk	Arid, steppe, cold
459	Aegean	Afyonkarahisar	İhsaniye	0.827835	Extremely Suitable	Suitable	Suitable	141	Cfb	Temperate, no dry season, warm summer
781	Aegean	Afyonkarahisar	Sincanlı	0.822751	Extremely Suitable	Suitable	Suitable	1373	Dsa	Cold, dry summer, hot summer
475	Aegean	Afyonkarahisar	İşcehisar	0.821509	Extremely Suitable	Suitable	Suitable	277	Csa	Temperate, dry summer, hot summer
208	Aegean	Afyonkarahisar	Çay	0.815079	Extremely Suitable	Suitable	Suitable	1038	BSk	Arid, steppe, cold
123	Aegean	Afyonkarahisar	Bayat/Afyon	0.811792	Extremely Suitable	Suitable	Suitable	698	BSk	Arid, steppe, cold
801	Aegean	Afyonkarahisar	Şuhut	0.782566	Very Suitable	Acceptable	Suitable	1145	BSk	Arid, steppe, cold
120	Aegean	Afyonkarahisar	Basmakçı	0.750236	Very Suitable	Acceptable	Suitable	1.395	Dsb	Cold, dry summer, warm summer
504	Aegean	Aydın	Karacasu	0.855211	Extremely Suitable	Suitable	Suitable	35	Csa	Temperate, dry summer, hot summer
163	Aegean	Aydın	Bozdoğan	0.830662	Extremely Suitable	Suitable	Suitable	302	Csa	Temperate, dry summer, hot summer
173	Aegean	Aydın	Buharkent	0.747625	Very Suitable	Acceptable	Suitable	190	Csa	Temperate, dry summer, hot summer
603	Aegean	Aydın	Kuyucak	0.739490	Very Suitable	Acceptable	Suitable	124	Csa	Temperate, dry summer, hot summer
655	Aegean	Aydın	Nazilli	0.675980	Very Suitable	Acceptable	Acceptable	81	Csa	Temperate, dry summer, hot summer
524	Aegean	Aydın	Karpuzlu	0.672635	Very Suitable	Acceptable	Acceptable	1824	Dsb	Cold, dry summer, warm summer
235	Aegean	Aydın	Çine	0.649524	Very Suitable	Acceptable	Acceptable	82	Csa	Temperate, dry summer, hot summer
806	Aegean	Aydın	Sultanhisar	0.632909	Very Suitable	Acceptable	Acceptable	542	BSk	Arid, steppe, cold
601	Aegean	Aydın	Kuşadası	0.630567	Very Suitable	Acceptable	Acceptable	6	Csa	Temperate, dry summer, hot summer
581	Aegean	Aydın	Köşk	0.570153	Suitable	Acceptable	Acceptable	75	Csa	Temperate, dry summer, hot summer
273	Aegean	Aydın	Didim	0.558835	Suitable	Acceptable	Acceptable	35	Csa	Temperate, dry summer, hot summer
900	Aegean	Aydın	Yenipazar/Aydın	0.540838	Suitable	Marginal Suitable	Acceptable	62	Csa	Temperate, dry summer, hot summer
89	Aegean	Aydın	Aydın/Merkez	0.501145	Suitable	Marginal Suitable	Acceptable	92	Csa	Temperate, dry summer, hot summer
469	Aegean	Aydın	İncirliova	0.473155	Suitable	Marginal Suitable	Acceptable	17	Cfa	Temperate, no dry season, hot summer
797	Aegean	Aydın	Söke	0.458670	Suitable	Marginal Suitable	Acceptable	830	BSk	Arid, steppe, cold
365	Aegean	Aydın	Germencik	0.453627	Suitable	Marginal Suitable	Acceptable	61	Csa	Temperate, dry summer, hot summer
568	Aegean	Aydın	Koçarlı	0.445485	Suitable	Marginal Suitable	Acceptable	34	Csa	Temperate, dry summer, hot summer
131	Aegean	Denizli	Bekilli	0.881693	Extremely Suitable	Suitable	Very Suitable	830	Csa	Temperate, dry summer, hot summer
187	Aegean	Denizli	Çameli	0.880299	Extremely Suitable	Suitable	Very Suitable	1309	Csa	Temperate, dry summer, hot summer
825	Aegean	Denizli	Tavas	0.879182	Extremely Suitable	Suitable	Very Suitable	933	Csa	Temperate, dry summer, hot summer
165	Aegean	Denizli	Bozkurt/Denizli	0.874528	Extremely Suitable	Suitable	Very Suitable	860	Csa	Temperate, dry summer, hot summer
493	Aegean	Denizli	Kale/Denizli	0.873719	Extremely Suitable	Suitable	Very Suitable	724	Csa	Temperate, dry summer, hot summer
4	Aegean	Denizli	Acıpayam	0.870524	Extremely Suitable	Suitable	Very Suitable	937	Csa	Temperate, dry summer, hot summer
236	Aegean	Denizli	Çivril	0.869166	Extremely Suitable	Suitable	Very Suitable	831	BSk	Arid, steppe, cold
198	Aegean	Denizli	Çardak	0.867139	Extremely Suitable	Suitable	Very Suitable	857	Csa	Temperate, dry summer, hot summer
108	Aegean	Denizli	Baklan	0.866468	Extremely Suitable	Suitable	Very Suitable	964	Csa	Temperate, dry summer, hot summer
183	Aegean	Denizli	Çal	0.866353	Extremely Suitable	Suitable	Very Suitable	838	Csa	Temperate, dry summer, hot summer
401	Aegean	Denizli	Güney	0.865902	Extremely Suitable	Suitable	Very Suitable	822	Csa	Temperate, dry summer, hot summer
449	Aegean	Denizli	Honaz	0.861647	Extremely Suitable	Suitable	Very Suitable	502	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
138	Aegean	Denizli	Beyağaç	0.849554	Extremely Suitable	Suitable	Suitable	699	Csa	Temperate, dry summer, hot summer
768	Aegean	Denizli	Serinhisar	0.834587	Extremely Suitable	Suitable	Suitable	972	Csa	Temperate, dry summer, hot summer
260	Aegean	Denizli	Denizli/Merkez	0.820049	Extremely Suitable	Suitable	Suitable	392	Csa	Temperate, dry summer, hot summer
99	Aegean	Denizli	Babadağ	0.816799	Extremely Suitable	Suitable	Suitable	758	Csa	Temperate, dry summer, hot summer
176	Aegean	Denizli	Buldan	0.715017	Very Suitable	Acceptable	Suitable	619	Csa	Temperate, dry summer, hot summer
28	Aegean	Denizli	Akköy	0.713970	Very Suitable	Acceptable	Suitable	392	Csa	Temperate, dry summer, hot summer
737	Aegean	Denizli	Sarayköy	0.618784	Very Suitable	Acceptable	Acceptable	165	Csa	Temperate, dry summer, hot summer
553	Aegean	İzmir	Kiraz	0.883839	Extremely Suitable	Suitable	Very Suitable	305	Csa	Temperate, dry summer, hot summer
665	Aegean	İzmir	Ödemiş	0.870503	Extremely Suitable	Suitable	Very Suitable	133	Csa	Temperate, dry summer, hot summer
139	Aegean	İzmir	Beydağ	0.861226	Extremely Suitable	Suitable	Very Suitable	215	Csa	Temperate, dry summer, hot summer
132	Aegean	İzmir	Bergama	0.846013	Extremely Suitable	Suitable	Suitable	61	Csa	Temperate, dry summer, hot summer
126	Aegean	İzmir	Bayındır	0.838267	Extremely Suitable	Suitable	Suitable	87	Csa	Temperate, dry summer, hot summer
555	Aegean	İzmir	Kınık	0.835614	Extremely Suitable	Suitable	Suitable	85	Csa	Temperate, dry summer, hot summer
543	Aegean	İzmir	Kemalpaşa/İzmir	0.818225	Extremely Suitable	Suitable	Suitable	167	Csa	Temperate, dry summer, hot summer
160	Aegean	İzmir	Bornova	0.767827	Very Suitable	Acceptable	Suitable	78	Csa	Temperate, dry summer, hot summer
571	Aegean	İzmir	Konak	0.759395	Very Suitable	Acceptable	Suitable	11	Csa	Temperate, dry summer, hot summer
275	Aegean	İzmir	Dikili	0.723098	Very Suitable	Acceptable	Suitable	4	Csa	Temperate, dry summer, hot summer
110	Aegean	İzmir	Balçova	0.712064	Very Suitable	Acceptable	Suitable	34	Csa	Temperate, dry summer, hot summer
171	Aegean	İzmir	Buca	0.700927	Very Suitable	Acceptable	Acceptable	78	Csa	Temperate, dry summer, hot summer
757	Aegean	İzmir	Seferihisar	0.697721	Very Suitable	Acceptable	Acceptable	36	Csa	Temperate, dry summer, hot summer
46	Aegean	İzmir	Aliağa	0.692466	Very Suitable	Acceptable	Acceptable	7	Csa	Temperate, dry summer, hot summer
630	Aegean	İzmir	Menderes	0.677557	Very Suitable	Acceptable	Acceptable	130	Csa	Temperate, dry summer, hot summer
834	Aegean	İzmir	Tire	0.666660	Very Suitable	Acceptable	Acceptable	112	Csa	Temperate, dry summer, hot summer
526	Aegean	İzmir	Karşıyaka	0.661501	Very Suitable	Acceptable	Acceptable	1.756	Dfb	Cold, no dry season, warm summer
759	Aegean	İzmir	Selçuklu	0.660504	Very Suitable	Acceptable	Acceptable	1024	BSk	Arid, steppe, cold
232	Aegean	İzmir	Çiğli	0.656849	Very Suitable	Acceptable	Acceptable	11	Csa	Temperate, dry summer, hot summer
351	Aegean	İzmir	Foça	0.654173	Very Suitable	Acceptable	Acceptable	12	Csa	Temperate, dry summer, hot summer
352	Aegean	İzmir	Gaziemir	0.633072	Very Suitable	Acceptable	Acceptable	135	Csa	Temperate, dry summer, hot summer
653	Aegean	İzmir	Narlıdere	0.629471	Very Suitable	Acceptable	Acceptable	25	Csa	Temperate, dry summer, hot summer
502	Aegean	İzmir	Karaburun	0.617680	Very Suitable	Acceptable	Acceptable	1528	BSk	Arid, steppe, cold
224	Aegean	İzmir	Çeşme	0.590144	Suitable	Acceptable	Acceptable	24	Csa	Temperate, dry summer, hot summer
411	Aegean	İzmir	Güzelbahçe	0.565931	Suitable	Acceptable	Acceptable	23	Csa	Temperate, dry summer, hot summer
869	Aegean	İzmir	Urla	0.562042	Suitable	Acceptable	Acceptable	70	Csa	Temperate, dry summer, hot summer
840	Aegean	İzmir	Torbalı	0.555292	Suitable	Acceptable	Acceptable	39	Csa	Temperate, dry summer, hot summer
631	Aegean	İzmir	Menemen	0.521613	Suitable	Marginal Suitable	Acceptable	12	Csa	Temperate, dry summer, hot summer
779	Aegean	Kütahya	Simav	0.838421	Extremely Suitable	Suitable	Suitable	798	BSk	Arid, steppe, cold
695	Aegean	Kütahya	Pazarlar	0.829692	Extremely Suitable	Suitable	Suitable	925	Csb	Temperate, dry summer, warm summer
356	Aegean	Kütahya	Gediz	0.826554	Extremely Suitable	Suitable	Suitable	730	Csa	Temperate, dry summer, hot summer
313	Aegean	Kütahya	Emet	0.822091	Extremely Suitable	Suitable	Suitable	910	Csb	Temperate, dry summer, warm summer
445	Aegean	Kütahya	Hisarcık	0.814948	Extremely Suitable	Suitable	Suitable	752	Csb	Temperate, dry summer, warm summer
826	Aegean	Kütahya	Tavşanlı	0.807708	Extremely Suitable	Suitable	Suitable	836	Csb	Temperate, dry summer, warm summer
732	Aegean	Kütahya	Şaphane	0.802621	Extremely Suitable	Suitable	Suitable	1169	Dsb	Cold, dry summer, warm summer
54	Aegean	Kütahya	Altıntaş	0.792390	Very Suitable	Acceptable	Suitable	1039	BSk	Arid, steppe, cold
292	Aegean	Kütahya	Dumlupınar	0.745703	Very Suitable	Acceptable	Suitable	1228	Dsb	Cold, dry summer, warm summer
206	Aegean	Kütahya	Çavdarhisar	0.736102	Very Suitable	Acceptable	Suitable	1007	BSk	Arid, steppe, cold
81	Aegean	Kütahya	Aslanapa	0.715585	Very Suitable	Acceptable	Suitable	1031	Dsb	Cold, dry summer, warm summer
602	Aegean	Kütahya	Kütahya/Merkez	0.713402	Very Suitable	Acceptable	Suitable	958	BSk	Arid, steppe, cold

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
289	Aegean	Kütahya	Domaniç	0.686430	Very Suitable	Acceptable	Acceptable	873	Csb	Temperate, dry summer, warm summer
761	Aegean	Manisa	Selendi	0.879742	Extremely Suitable	Suitable	Very Suitable	437	Csa	Temperate, dry summer, hot summer
386	Aegean	Manisa	Gördes	0.878564	Extremely Suitable	Suitable	Very Suitable	668	Csa	Temperate, dry summer, hot summer
799	Aegean	Manisa	Soma	0.847697	Extremely Suitable	Suitable	Suitable	1083	BSk	Arid, steppe, cold
572	Aegean	Manisa	Köprübaşı/Manisa	0.842349	Extremely Suitable	Suitable	Suitable	247	Csa	Temperate, dry summer, hot summer
45	Aegean	Manisa	Alaşehir	0.840411	Extremely Suitable	Suitable	Suitable	201	Csa	Temperate, dry summer, hot summer
589	Aegean	Manisa	Kula	0.839529	Extremely Suitable	Suitable	Suitable	665	Csa	Temperate, dry summer, hot summer
740	Aegean	Manisa	Sarıgöl	0.832753	Extremely Suitable	Suitable	Suitable	214	Csa	Temperate, dry summer, hot summer
257	Aegean	Manisa	Demirci	0.824058	Extremely Suitable	Suitable	Suitable	881	Csa	Temperate, dry summer, hot summer
558	Aegean	Manisa	Kırkağaç	0.787903	Very Suitable	Acceptable	Suitable	187	Csa	Temperate, dry summer, hot summer
724	Aegean	Manisa	Salihli	0.782304	Very Suitable	Acceptable	Suitable	119	Csa	Temperate, dry summer, hot summer
18	Aegean	Manisa	Ahmetli	0.703275	Very Suitable	Acceptable	Acceptable	91	Csa	Temperate, dry summer, hot summer
620	Aegean	Manisa	Manisa/Merkez	0.691857	Very Suitable	Acceptable	Acceptable	79	Csa	Temperate, dry summer, hot summer
25	Aegean	Manisa	Akhisar	0.666758	Very Suitable	Acceptable	Acceptable	106	Csa	Temperate, dry summer, hot summer
847	Aegean	Manisa	Turgutlu	0.660277	Very Suitable	Acceptable	Acceptable	95	Csa	Temperate, dry summer, hot summer
750	Aegean	Manisa	Saruhanlı	0.568416	Suitable	Acceptable	Acceptable	40	Csa	Temperate, dry summer, hot summer
379	Aegean	Manisa	Gölmarmara	0.449495	Suitable	Marginal Suitable	Acceptable	115	Csa	Temperate, dry summer, hot summer
889	Aegean	Muğla	Yatağan	0.879542	Extremely Suitable	Suitable	Very Suitable	390	Csa	Temperate, dry summer, hot summer
531	Aegean	Muğla	Kavaklıdere	0.868064	Extremely Suitable	Suitable	Very Suitable	603	Csb	Temperate, dry summer, warm summer
644	Aegean	Muğla	Muğla/Merkez	0.823465	Extremely Suitable	Suitable	Suitable	659	Csa	Temperate, dry summer, hot summer
857	Aegean	Muğla	Ula	0.793235	Very Suitable	Acceptable	Suitable	610	Csa	Temperate, dry summer, hot summer
640	Aegean	Muğla	Milas	0.660799	Very Suitable	Acceptable	Acceptable	59	Csa	Temperate, dry summer, hot summer
348	Aegean	Muğla	Fethiye	0.657364	Very Suitable	Acceptable	Acceptable	6	Csa	Temperate, dry summer, hot summer
153	Aegean	Muğla	Bodrum	0.636934	Very Suitable	Acceptable	Acceptable	4	Csa	Temperate, dry summer, hot summer
583	Aegean	Muğla	Köyceğiz	0.541796	Suitable	Marginal Suitable	Acceptable	15	Csa	Temperate, dry summer, hot summer
625	Aegean	Muğla	Marmaris	0.427662	Suitable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
676	Aegean	Muğla	Ortaca	0.417859	Suitable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
250	Aegean	Muğla	Dalaman	0.407944	Suitable	Marginal Suitable	Marginal Suitable	17	Csa	Temperate, dry summer, hot summer
254	Aegean	Muğla	Datça	0.368810	Acceptable	Marginal Suitable	Marginal Suitable	9	Csa	Temperate, dry summer, hot summer
507	Aegean	Uşak	Karahallı	0.884506	Extremely Suitable	Suitable	Very Suitable	1549	Dsb	Cold, dry summer, warm summer
335	Aegean	Uşak	Eşme	0.866927	Extremely Suitable	Suitable	Very Suitable	828	Csa	Temperate, dry summer, hot summer
860	Aegean	Uşak	Ulubey/Uşak	0.861128	Extremely Suitable	Suitable	Very Suitable	727	Csa	Temperate, dry summer, hot summer
788	Aegean	Uşak	Sivaslı	0.832366	Extremely Suitable	Suitable	Suitable	788	Csa	Temperate, dry summer, hot summer
114	Aegean	Uşak	Banaz	0.823976	Extremely Suitable	Suitable	Suitable	914	Csa	Temperate, dry summer, hot summer
870	Aegean	Uşak	Uşak/Merkez	0.810566	Extremely Suitable	Suitable	Suitable	915	Csa	Temperate, dry summer, hot summer
388	Black Sea	Amasya	Göynücek	0.766842	Very Suitable	Acceptable	Suitable	522	BSk	Arid, steppe, cold
807	Black Sea	Amasya	Suluova	0.763967	Very Suitable	Acceptable	Suitable	1.035	BSk	Arid, steppe, cold
823	Black Sea	Amasya	Taşova	0.740087	Very Suitable	Acceptable	Suitable	240	BSk	Arid, steppe, cold
59	Black Sea	Amasya	Amasya/Merkez	0.734585	Very Suitable	Acceptable	Suitable	400	BSk	Arid, steppe, cold
635	Black Sea	Amasya	Merzifon	0.732292	Very Suitable	Acceptable	Suitable	746	BSk	Arid, steppe, cold
420	Black Sea	Amasya	Hamamözü	0.639461	Very Suitable	Acceptable	Acceptable	691	BSk	Arid, steppe, cold
397	Black Sea	Amasya	Gümüşhacıköy	0.588289	Suitable	Acceptable	Acceptable	822	BSk	Arid, steppe, cold
72	Black Sea	Artvin	Arhavi	0.594052	Suitable	Acceptable	Acceptable	11	Cfb	Temperate, no dry season, warm summer
450	Black Sea	Artvin	Hopa	0.586127	Suitable	Acceptable	Acceptable	65	Cfa	Temperate, no dry season, hot summer
159	Black Sea	Artvin	Borçka	0.383718	Acceptable	Marginal Suitable	Marginal Suitable	123	Cfa	Temperate, no dry season, hot summer
647	Black Sea	Artvin	Murgul	0.349663	Acceptable	Marginal Suitable	Marginal Suitable	390	Dfb	Cold, no dry season, warm summer
919	Black Sea	Artvin	Yusufeli	0.165483	Marginal Suitable	Marginal Suitable	Marginal Suitable	603	Dfb	Cold, no dry season, warm summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
69	Black Sea	Artvin	Ardanuç	0.087070	Marginal Suitable	Marginal Suitable	Marginal Suitable	499	Dfb	Cold, no dry season, warm summer
753	Black Sea	Artvin	Şavşat	0.076546	Marginal Suitable	Marginal Suitable	Marginal Suitable	1372	Dsb	Cold, dry summer, warm summer
78	Black Sea	Artvin	Artvin/Merkez	0.060382	Marginal Suitable	Marginal Suitable	Marginal Suitable	530	Cfa	Temperate, no dry season, hot summer
116	Black Sea	Bartın	Bartın/Merkez	0.794009	Very Suitable	Acceptable	Suitable	12	Cfa	Temperate, no dry season, hot summer
600	Black Sea	Bartın	Kurucaşile	0.703295	Very Suitable	Acceptable	Acceptable	13	Cfb	Temperate, no dry season, warm summer
58	Black Sea	Bartın	Amasra	0.696795	Very Suitable	Acceptable	Acceptable	12	Cfa	Temperate, no dry season, hot summer
864	Black Sea	Bartın	Ulus	0.663620	Very Suitable	Acceptable	Acceptable	179	Cfb	Temperate, no dry season, warm summer
125	Black Sea	Bayburt	Bayburt/Merkez	0.126324	Marginal Suitable	Marginal Suitable	Marginal Suitable	1555	BSk	Arid, steppe, cold
259	Black Sea	Bayburt	Demirözü	0.103383	Marginal Suitable	Marginal Suitable	Marginal Suitable	1685	Dsb	Cold, dry summer, warm summer
93	Black Sea	Bayburt	Aydıntepe	0.089353	Marginal Suitable	Marginal Suitable	Marginal Suitable	1627	Dsc	Cold, dry summer, cold summer
389	Black Sea	Bolu	Göynük	0.675197	Very Suitable	Acceptable	Acceptable	740	Dfb	Cold, no dry season, warm summer
755	Black Sea	Bolu	Seben	0.513013	Suitable	Marginal Suitable	Acceptable	759	BSk	Arid, steppe, cold
632	Black Sea	Bolu	Mengen	0.473468	Suitable	Marginal Suitable	Acceptable	616	Csb	Temperate, dry summer, warm summer
643	Black Sea	Bolu	Mudurnu	0.459039	Suitable	Marginal Suitable	Acceptable	859	Dfb	Cold, no dry season, warm summer
156	Black Sea	Bolu	Bolu/Merkez	0.358486	Acceptable	Marginal Suitable	Marginal Suitable	741	Cfb	Temperate, no dry season, warm summer
895	Black Sea	Bolu	Yeniçağa	0.204151	Acceptable	Marginal Suitable	Marginal Suitable	1002	Dsb	Cold, dry summer, warm summer
554	Black Sea	Bolu	Kıbrıscık	0.201347	Acceptable	Marginal Suitable	Marginal Suitable	1139	Dsb	Cold, dry summer, warm summer
290	Black Sea	Bolu	Dörtdivan	0.174396	Marginal Suitable	Marginal Suitable	Marginal Suitable	1168	Dsb	Cold, dry summer, warm summer
363	Black Sea	Bolu	Gerede	0.160750	Marginal Suitable	Marginal Suitable	Marginal Suitable	1326	Dsb	Cold, dry summer, warm summer
856	Black Sea	Çorum	Uğurludağ	0.830356	Extremely Suitable	Suitable	Suitable	806	BSk	Arid, steppe, cold
810	Black Sea	Çorum	Sungurlu	0.809759	Extremely Suitable	Suitable	Suitable	500	Csa	Temperate, dry summer, hot summer
628	Black Sea	Çorum	Mecitözü	0.808968	Extremely Suitable	Suitable	Suitable	811	BSk	Arid, steppe, cold
154	Black Sea	Çorum	Boğazkale	0.800749	Extremely Suitable	Suitable	Suitable	995	Dsb	Cold, dry summer, warm summer
678	Black Sea	Çorum	Ortaköy/Çorum	0.796397	Very Suitable	Acceptable	Suitable	809	BSk	Arid, steppe, cold
281	Black Sea	Çorum	Dodurga	0.754034	Very Suitable	Acceptable	Suitable	624	BSk	Arid, steppe, cold
243	Black Sea	Çorum	Çorum/Merkez	0.753559	Very Suitable	Acceptable	Suitable	822	BSk	Arid, steppe, cold
679	Black Sea	Çorum	Osmancık	0.743232	Very Suitable	Acceptable	Suitable	425	BSk	Arid, steppe, cold
668	Black Sea	Çorum	Oğuzlar	0.722620	Very Suitable	Acceptable	Suitable	680	Dfb	Cold, no dry season, warm summer
39	Black Sea	Çorum	Alaca	0.708852	Very Suitable	Acceptable	Suitable	926	BSk	Arid, steppe, cold
124	Black Sea	Çorum	Bayat/Çorum	0.702061	Very Suitable	Acceptable	Acceptable	698	BSk	Arid, steppe, cold
477	Black Sea	Çorum	İskilip	0.692555	Very Suitable	Acceptable	Acceptable	734	BSk	Arid, steppe, cold
604	Black Sea	Çorum	Laçin	0.672057	Very Suitable	Acceptable	Acceptable	729	BSk	Arid, steppe, cold
521	Black Sea	Çorum	Kargı	0.546989	Suitable	Marginal Suitable	Acceptable	2281	Dsb	Cold, dry summer, warm summer
234	Black Sea	Düzce	Çilimli	0.796565	Very Suitable	Acceptable	Suitable	184	Cfb	Temperate, no dry season, warm summer
399	Black Sea	Düzce	Gümüşova	0.770325	Very Suitable	Acceptable	Suitable	195	Cfa	Temperate, no dry season, hot summer
295	Black Sea	Düzce	Düzce/Merkez	0.732845	Very Suitable	Acceptable	Suitable	149	Cfa	Temperate, no dry season, hot summer
23	Black Sea	Düzce	Akçakoca	0.732008	Very Suitable	Acceptable	Suitable	7	Cfb	Temperate, no dry season, warm summer
246	Black Sea	Düzce	Cumayeri	0.726412	Very Suitable	Acceptable	Suitable	133	Cfa	Temperate, no dry season, hot summer
382	Black Sea	Düzce	Gölyaka	0.699614	Very Suitable	Acceptable	Acceptable	131	Cfa	Temperate, no dry season, hot summer
533	Black Sea	Düzce	Kaynaşlı	0.689746	Very Suitable	Acceptable	Acceptable	53	Cfa	Temperate, no dry season, hot summer
910	Black Sea	Düzce	Yığılca	0.686270	Very Suitable	Acceptable	Acceptable	326	Cfb	Temperate, no dry season, warm summer
336	Black Sea	Giresun	Espiye	0.670700	Very Suitable	Acceptable	Acceptable	9	Cfa	Temperate, no dry season, hot summer
835	Black Sea	Giresun	Tirebolu	0.668183	Very Suitable	Acceptable	Acceptable	13	Cfa	Temperate, no dry season, hot summer
387	Black Sea	Giresun	Görele	0.641870	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
703	Black Sea	Giresun	Piraziz	0.638134	Very Suitable	Acceptable	Acceptable	3	Cfa	Temperate, no dry season, hot summer
174	Black Sea	Giresun	Bulancak	0.636446	Very Suitable	Acceptable	Acceptable	15	Cfa	Temperate, no dry season, hot summer
548	Black Sea	Giresun	Keşap	0.636047	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
369	Black Sea	Giresun	Giresun/Merkez	0.633808	Very Suitable	Acceptable	Acceptable	14	Cfa	Temperate, no dry season, hot summer
340	Black Sea	Giresun	Eynesil	0.605067	Very Suitable	Acceptable	Acceptable	9	Cfa	Temperate, no dry season, hot summer
193	Black Sea	Giresun	Çanakçı	0.489980	Suitable	Marginal Suitable	Acceptable	176	Cfb	Temperate, no dry season, warm summer
263	Black Sea	Giresun	Dereli	0.385388	Acceptable	Marginal Suitable	Marginal Suitable	282	Cfb	Temperate, no dry season, warm summer
283	Black Sea	Giresun	Doğankent	0.379309	Acceptable	Marginal Suitable	Marginal Suitable	195	Csb	Temperate, dry summer, warm summer
881	Black Sea	Giresun	Yağlıdere	0.342755	Acceptable	Marginal Suitable	Marginal Suitable	104	Cfb	Temperate, no dry season, warm summer
390	Black Sea	Giresun	Güce	0.253433	Acceptable	Marginal Suitable	Marginal Suitable	342	Cfb	Temperate, no dry season, warm summer
717	Black Sea	Giresun	Şebinkarahisar	0.183079	Marginal Suitable	Marginal Suitable	Marginal Suitable	914	BSk	Arid, steppe, cold
57	Black Sea	Giresun	Alucra	0.101476	Marginal Suitable	Marginal Suitable	Marginal Suitable	1477	Dsb	Cold, dry summer, warm summer
191	Black Sea	Giresun	Çamoluk	0.099723	Marginal Suitable	Marginal Suitable	Marginal Suitable	1062	Dsb	Cold, dry summer, warm summer
540	Black Sea	Gümüşhane	Kelkit	0.144360	Marginal Suitable	Marginal Suitable	Marginal Suitable	1408	BSk	Arid, steppe, cold
784	Black Sea	Gümüşhane	Şiran	0.134183	Marginal Suitable	Marginal Suitable	Marginal Suitable	1409	Dsb	Cold, dry summer, warm summer
580	Black Sea	Gümüşhane	Köse	0.119063	Marginal Suitable	Marginal Suitable	Marginal Suitable	1577	Dsb	Cold, dry summer, warm summer
398	Black Sea	Gümüşhane	Gümüşhane/Merkez	0.113984	Marginal Suitable	Marginal Suitable	Marginal Suitable	1174	Dsb	Cold, dry summer, warm summer
599	Black Sea	Gümüşhane	Kürtün	0.070646	Marginal Suitable	Marginal Suitable	Marginal Suitable	629	Dsb	Cold, dry summer, warm summer
842	Black Sea	Gümüşhane	Torul	0.036846	Marginal Suitable	Marginal Suitable	Marginal Suitable	940	Dsb	Cold, dry summer, warm summer
897	Black Sea	Karabük	Yenice/Karabük	0.685143	Very Suitable	Acceptable	Acceptable	150	Cfa	Temperate, no dry season, hot summer
501	Black Sea	Karabük	Karabük/Merkez	0.682661	Very Suitable	Acceptable	Acceptable	45	Csa	Temperate, dry summer, hot summer
720	Black Sea	Karabük	Safranbolu	0.645775	Very Suitable	Acceptable	Acceptable	544	Cfb	Temperate, no dry season, warm summer
685	Black Sea	Karabük	Ovacık/Karabuk	0.480227	Suitable	Marginal Suitable	Acceptable	1111	Dfb	Cold, no dry season, warm summer
302	Black Sea	Karabük	Eflani	0.427837	Suitable	Marginal Suitable	Marginal Suitable	907	Dfb	Cold, no dry season, warm summer
333	Black Sea	Karabük	Eskipazar	0.278808	Acceptable	Marginal Suitable	Marginal Suitable	748	Dsb	Cold, dry summer, warm summer
287	Black Sea	Kastamonu	Doğanyurt	0.670981	Very Suitable	Acceptable	Acceptable	13	Cfa	Temperate, no dry season, hot summer
228	Black Sea	Kastamonu	Cide	0.662039	Very Suitable	Acceptable	Acceptable	14	Cfa	Temperate, no dry season, hot summer
205	Black Sea	Kastamonu	Çatalzeytin	0.648664	Very Suitable	Acceptable	Acceptable	11	Csa	Temperate, dry summer, hot summer
470	Black Sea	Kastamonu	İnebolu	0.626740	Very Suitable	Acceptable	Acceptable	294	BSk	Arid, steppe, cold
166	Black Sea	Kastamonu	Bozkurt/Kastamonu	0.618766	Very Suitable	Acceptable	Acceptable	39	Cfb	Temperate, no dry season, warm summer
2	Black Sea	Kastamonu	Abana	0.605801	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
766	Black Sea	Kastamonu	Şenpazar	0.481794	Suitable	Marginal Suitable	Acceptable	972	BSk	Arid, steppe, cold
425	Black Sea	Kastamonu	Hanönü	0.473904	Suitable	Marginal Suitable	Acceptable	427	Cfb	Temperate, no dry season, warm summer
704	Black Sea	Kastamonu	Pınarbaşı/Kastamonu	0.453684	Suitable	Marginal Suitable	Acceptable	672	Cfb	Temperate, no dry season, warm summer
821	Black Sea	Kastamonu	Taşköprü	0.443951	Suitable	Marginal Suitable	Acceptable	1762	Dsb	Cold, dry summer, warm summer
529	Black Sea	Kastamonu	Kastamonu/Merkez	0.430774	Suitable	Marginal Suitable	Marginal Suitable	6	Csa	Temperate, dry summer, hot summer
64	Black Sea	Kastamonu	Araç	0.340200	Acceptable	Marginal Suitable	Marginal Suitable	676	Dfb	Cold, no dry season, warm summer
98	Black Sea	Kastamonu	Azdavay	0.286415	Acceptable	Marginal Suitable	Marginal Suitable	834	Dfb	Cold, no dry season, warm summer
596	Black Sea	Kastamonu	Küre	0.278266	Acceptable	Marginal Suitable	Marginal Suitable	976	Dfb	Cold, no dry season, warm summer
249	Black Sea	Kastamonu	Daday	0.203633	Acceptable	Marginal Suitable	Marginal Suitable	868	Dfb	Cold, no dry season, warm summer
271	Black Sea	Kastamonu	Devrekani	0.202546	Acceptable	Marginal Suitable	Marginal Suitable	1108	Dfb	Cold, no dry season, warm summer
843	Black Sea	Kastamonu	Tosya	0.196623	Marginal Suitable	Marginal Suitable	Marginal Suitable	833	BSk	Arid, steppe, cold
14	Black Sea	Kastamonu	Ağlı	0.182657	Marginal Suitable	Marginal Suitable	Marginal Suitable	1174	Dfb	Cold, no dry season, warm summer
769	Black Sea	Kastamonu	Seydiler	0.174745	Marginal Suitable	Marginal Suitable	Marginal Suitable	1043	Dfb	Cold, no dry season, warm summer
458	Black Sea	Kastamonu	İhsangazi	0.161715	Marginal Suitable	Marginal Suitable	Marginal Suitable	1099	BSk	Arid, steppe, cold
460	Black Sea	Ordu	İkizce	0.710815	Very Suitable	Acceptable	Suitable	556	Dfb	Cold, no dry season, warm summer
700	Black Sea	Ordu	Perşembe	0.705066	Very Suitable	Acceptable	Acceptable	7	Cfa	Temperate, no dry season, hot summer
672	Black Sea	Ordu	Ordu/Merkez	0.689399	Very Suitable	Acceptable	Acceptable	25	Cfa	Temperate, no dry season, hot summer
209	Black Sea	Ordu	Çaybaşı	0.675633	Very Suitable	Acceptable	Acceptable	494	Cfb	Temperate, no dry season, warm summer
344	Black Sea	Ordu	Fatsa	0.658453	Very Suitable	Acceptable	Acceptable	17	Cfa	Temperate, no dry season, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
866	Black Sea	Ordu	Ünye	0.655495	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
396	Black Sea	Ordu	Gülyalı	0.637814	Very Suitable	Acceptable	Acceptable	6	Cfb	Temperate, no dry season, warm summer
204	Black Sea	Ordu	Çatalpınar	0.636326	Very Suitable	Acceptable	Acceptable	139	Cfb	Temperate, no dry season, warm summer
406	Black Sea	Ordu	Gürgentepe	0.627142	Very Suitable	Acceptable	Acceptable	1238	Cfb	Temperate, no dry season, warm summer
186	Black Sea	Ordu	Çamaş	0.626032	Very Suitable	Acceptable	Acceptable	588	Cfb	Temperate, no dry season, warm summer
859	Black Sea	Ordu	Ulubey/Ordu	0.592764	Suitable	Acceptable	Acceptable	598	Cfb	Temperate, no dry season, warm summer
506	Black Sea	Ordu	Kabadüz	0.569588	Suitable	Acceptable	Acceptable	578	Cfb	Temperate, no dry season, warm summer
29	Black Sea	Ordu	Akkuş	0.506126	Suitable	Marginal Suitable	Acceptable	1236	Dsb	Cold, dry summer, warm summer
595	Black Sea	Ordu	Kumru	0.455294	Suitable	Marginal Suitable	Acceptable	457	Cfb	Temperate, no dry season, warm summer
484	Black Sea	Ordu	Kabataş	0.415371	Suitable	Marginal Suitable	Marginal Suitable	436	Cfb	Temperate, no dry season, warm summer
576	Black Sea	Ordu	Korgan	0.409404	Suitable	Marginal Suitable	Marginal Suitable	781	Cfb	Temperate, no dry season, warm summer
88	Black Sea	Ordu	Aybastı	0.150928	Marginal Suitable	Marginal Suitable	Marginal Suitable	741	Dfb	Cold, no dry season, warm summer
378	Black Sea	Ordu	Gölköy	0.120918	Marginal Suitable	Marginal Suitable	Marginal Suitable	829	Dsb	Cold, dry summer, warm summer
636	Black Sea	Ordu	Mesudiye	0.098968	Marginal Suitable	Marginal Suitable	Marginal Suitable	1139	Dsb	Cold, dry summer, warm summer
264	Black Sea	Rize	Derepazarı	0.657623	Very Suitable	Acceptable	Acceptable	8	Cfa	Temperate, no dry season, hot summer
482	Black Sea	Rize	İyidere	0.648880	Very Suitable	Acceptable	Acceptable	103	Csa	Temperate, dry summer, hot summer
350	Black Sea	Rize	Fındıklı	0.623693	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
716	Black Sea	Rize	Rize/Merkez	0.616138	Very Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
211	Black Sea	Rize	Çayeli	0.598868	Suitable	Acceptable	Acceptable	10	Cfa	Temperate, no dry season, hot summer
692	Black Sea	Rize	Pazar/Rize	0.575346	Suitable	Acceptable	Acceptable	34	Cfa	Temperate, no dry season, hot summer
70	Black Sea	Rize	Ardeşen	0.557158	Suitable	Acceptable	Acceptable	5	Cfa	Temperate, no dry season, hot summer
403	Black Sea	Rize	Güneysu	0.532782	Suitable	Marginal Suitable	Acceptable	169	Cfb	Temperate, no dry season, warm summer
497	Black Sea	Rize	Kalkandere	0.471392	Suitable	Marginal Suitable	Acceptable	718	BSk	Arid, steppe, cold
442	Black Sea	Rize	Hemşin	0.428667	Suitable	Marginal Suitable	Marginal Suitable	315	Cfb	Temperate, no dry season, warm summer
189	Black Sea	Rize	Çamlıhemşin	0.339837	Acceptable	Marginal Suitable	Marginal Suitable	311	Cfb	Temperate, no dry season, warm summer
461	Black Sea	Rize	İkizdere	0.092684	Marginal Suitable	Marginal Suitable	Marginal Suitable	1104	Dsa	Cold, dry summer, hot summer
1	Black Sea	Samsun	19 Mayıs	0.790502	Very Suitable	Acceptable	Suitable	16	Csa	Temperate, dry summer, hot summer
101	Black Sea	Samsun	Bafra	0.782186	Very Suitable	Acceptable	Suitable	26	Csa	Temperate, dry summer, hot summer
729	Black Sea	Samsun	Samsun/Merkez	0.780912	Very Suitable	Acceptable	Suitable	10	Cfa	Temperate, no dry season, hot summer
833	Black Sea	Samsun	Terme	0.778385	Very Suitable	Acceptable	Suitable	12	Cfa	Temperate, no dry season, hot summer
884	Black Sea	Samsun	Yakakent	0.778013	Very Suitable	Acceptable	Suitable	12	Cfb	Temperate, no dry season, warm summer
199	Black Sea	Samsun	Çarşamba	0.776993	Very Suitable	Acceptable	Suitable	22	Cfa	Temperate, no dry season, hot summer
878	Black Sea	Samsun	Vezirköprü	0.776475	Very Suitable	Acceptable	Suitable	349	BSk	Arid, steppe, cold
41	Black Sea	Samsun	Alaçam	0.769894	Very Suitable	Acceptable	Suitable	38	Cfb	Temperate, no dry season, warm summer
829	Black Sea	Samsun	Tekkeköy	0.768037	Very Suitable	Acceptable	Suitable	21	Cfa	Temperate, no dry season, hot summer
725	Black Sea	Samsun	Salıpazarı	0.761837	Very Suitable	Acceptable	Suitable	84	Cfa	Temperate, no dry season, hot summer
530	Black Sea	Samsun	Kavak	0.733174	Very Suitable	Acceptable	Suitable	19	Csa	Temperate, dry summer, hot summer
79	Black Sea	Samsun	Asarcık	0.704418	Very Suitable	Acceptable	Acceptable	802	Csb	Temperate, dry summer, warm summer
436	Black Sea	Samsun	Havza	0.700034	Very Suitable	Acceptable	Acceptable	625	BSk	Arid, steppe, cold
96	Black Sea	Samsun	Ayvacık/Samsun	0.681944	Very Suitable	Acceptable	Acceptable	69	Cfb	Temperate, no dry season, warm summer
605	Black Sea	Samsun	Ladik	0.635617	Very Suitable	Acceptable	Acceptable	940	Dsb	Cold, dry summer, warm summer
324	Black Sea	Sinop	Erfelek	0.751330	Very Suitable	Acceptable	Suitable	185	Cfb	Temperate, no dry season, warm summer
366	Black Sea	Sinop	Gerze	0.737958	Very Suitable	Acceptable	Suitable	31	Cfa	Temperate, no dry season, hot summer
735	Black Sea	Sinop	Saraydüzü	0.736939	Very Suitable	Acceptable	Suitable	415	BSk	Arid, steppe, cold
161	Black Sea	Sinop	Boyabat	0.717038	Very Suitable	Acceptable	Suitable	329	Cfa	Temperate, no dry season, hot summer
276	Black Sea	Sinop	Dikmen	0.706618	Very Suitable	Acceptable	Acceptable	193	Cfb	Temperate, no dry season, warm summer
293	Black Sea	Sinop	Durağan	0.670872	Very Suitable	Acceptable	Acceptable	213	Cfa	Temperate, no dry season, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
86	Black Sea	Sinop	Ayancık	0.635061	Very Suitable	Acceptable	Acceptable	9	Cfa	Temperate, no dry season, hot summer
783	Black Sea	Sinop	Sinop/Merkez	0.627505	Very Suitable	Acceptable	Acceptable	1313	BSk	Arid, steppe, cold
849	Black Sea	Sinop	Türkeli	0.595159	Suitable	Acceptable	Acceptable	12	Cfb	Temperate, no dry season, warm summer
922	Black Sea	Tokat	Zile	0.746184	Very Suitable	Acceptable	Suitable	743	BSk	Arid, steppe, cold
848	Black Sea	Tokat	Turhal	0.737656	Very Suitable	Acceptable	Suitable	588	BSk	Arid, steppe, cold
318	Black Sea	Tokat	Erbaa	0.724523	Very Suitable	Acceptable	Suitable	237	BSk	Arid, steppe, cold
693	Black Sea	Tokat	Pazar/Tokat	0.718572	Very Suitable	Acceptable	Suitable	576	BSk	Arid, steppe, cold
808	Black Sea	Tokat	Sulusaray	0.582053	Suitable	Acceptable	Acceptable	130	Csa	Temperate, dry summer, hot summer
659	Black Sea	Tokat	Niksar	0.567179	Suitable	Acceptable	Acceptable	346	Csa	Temperate, dry summer, hot summer
836	Black Sea	Tokat	Tokat/Merkez	0.473751	Suitable	Marginal Suitable	Acceptable	630	BSk	Arid, steppe, cold
77	Black Sea	Tokat	Artova	0.456274	Suitable	Marginal Suitable	Acceptable	1.184	BSk	Arid, steppe, cold
909	Black Sea	Tokat	Yeşilyurt/Tokat	0.433174	Suitable	Marginal Suitable	Acceptable	999	BSk	Arid, steppe, cold
117	Black Sea	Tokat	Başçiftlik	0.362017	Acceptable	Marginal Suitable	Marginal Suitable	2320	Dsb	Cold, dry summer, warm summer
47	Black Sea	Tokat	Almus	0.299133	Acceptable	Marginal Suitable	Marginal Suitable	853	BSk	Arid, steppe, cold
714	Black Sea	Tokat	Reşadiye	0.150152	Marginal Suitable	Marginal Suitable	Marginal Suitable	538	BSk	Arid, steppe, cold
19	Black Sea	Trabzon	Akçaabat	0.707289	Very Suitable	Acceptable	Acceptable	16	Cfa	Temperate, no dry season, hot summer
875	Black Sea	Trabzon	Vakfıkebir	0.692279	Very Suitable	Acceptable	Acceptable	13	Csa	Temperate, dry summer, hot summer
65	Black Sea	Trabzon	Araklı	0.666391	Very Suitable	Acceptable	Acceptable	6	Cfa	Temperate, no dry season, hot summer
200	Black Sea	Trabzon	Çarşıbaşı	0.664962	Very Suitable	Acceptable	Acceptable	17	Csa	Temperate, dry summer, hot summer
76	Black Sea	Trabzon	Arsin	0.661408	Very Suitable	Acceptable	Acceptable	24	Cfa	Temperate, no dry season, hot summer
844	Black Sea	Trabzon	Trabzon/Merkez	0.660881	Very Suitable	Acceptable	Acceptable	36	Cfa	Temperate, no dry season, hot summer
133	Black Sea	Trabzon	Beşikdüzü	0.646988	Very Suitable	Acceptable	Acceptable	8	Cfa	Temperate, no dry season, hot summer
913	Black Sea	Trabzon	Yomra	0.627495	Very Suitable	Acceptable	Acceptable	10	Cfa	Temperate, no dry season, hot summer
811	Black Sea	Trabzon	Sürmene	0.617934	Very Suitable	Acceptable	Acceptable	992	Csa	Temperate, dry summer, hot summer
726	Black Sea	Trabzon	Şalpazarı	0.613513	Very Suitable	Acceptable	Acceptable	527	Csa	Temperate, dry summer, hot summer
666	Black Sea	Trabzon	Of	0.574959	Suitable	Acceptable	Acceptable	11	Cfa	Temperate, no dry season, hot summer
297	Black Sea	Trabzon	Düzköy	0.544420	Suitable	Marginal Suitable	Acceptable	780	Dsb	Cold, dry summer, warm summer
838	Black Sea	Trabzon	Tonya	0.524424	Suitable	Marginal Suitable	Acceptable	742	Csb	Temperate, dry summer, warm summer
439	Black Sea	Trabzon	Hayrat	0.400036	Suitable	Marginal Suitable	Marginal Suitable	202	Cfb	Temperate, no dry season, warm summer
611	Black Sea	Trabzon	Maçka	0.344422	Acceptable	Marginal Suitable	Marginal Suitable	364	Dsb	Cold, dry summer, warm summer
268	Black Sea	Trabzon	Dernekpazarı	0.296154	Acceptable	Marginal Suitable	Marginal Suitable	199	Cfb	Temperate, no dry season, warm summer
573	Black Sea	Trabzon	Köprübaşı/Trabzon	0.215354	Acceptable	Marginal Suitable	Marginal Suitable	307	Dfb	Cold, no dry season, warm summer
214	Black Sea	Trabzon	Çaykara	0.120798	Marginal Suitable	Marginal Suitable	Marginal Suitable	317	Dfb	Cold, no dry season, warm summer
210	Black Sea	Zonguldak	Çaycuma	0.786716	Very Suitable	Acceptable	Suitable	36	Cfa	Temperate, no dry season, hot summer
371	Black Sea	Zonguldak	Gökçebey	0.776262	Very Suitable	Acceptable	Suitable	62	Cfa	Temperate, no dry season, hot summer
44	Black Sea	Zonguldak	Alaplı	0.766628	Very Suitable	Acceptable	Suitable	18	Cfb	Temperate, no dry season, warm summer
270	Black Sea	Zonguldak	Devrek	0.748093	Very Suitable	Acceptable	Suitable	103	Cfa	Temperate, no dry season, hot summer
923	Black Sea	Zonguldak	Zonguldak/Merkez	0.740449	Very Suitable	Acceptable	Suitable	10	Cfa	Temperate, no dry season, hot summer
323	Black Sea	Zonguldak	Ereğli/Zonguldak	0.628792	Very Suitable	Acceptable	Acceptable	12	Cfa	Temperate, no dry season, hot summer
745	Central Anatolia	Aksaray	Sarıyahşi	0.883722	Extremely Suitable	Suitable	Very Suitable	968	BSk	Arid, steppe, cold
11	Central Anatolia	Aksaray	Ağaçören	0.882129	Extremely Suitable	Suitable	Very Suitable	964	BSk	Arid, steppe, cold
677	Central Anatolia	Aksaray	Ortaköy/Aksaray	0.881837	Extremely Suitable	Suitable	Very Suitable	1227	BSk	Arid, steppe, cold
32	Central Anatolia	Aksaray	Aksaray/Merkez	0.880086	Extremely Suitable	Suitable	Very Suitable	1228	BSk	Arid, steppe, cold
393	Central Anatolia	Aksaray	Gülağaç	0.854981	Extremely Suitable	Suitable	Suitable	1172	BSk	Arid, steppe, cold
332	Central Anatolia	Aksaray	Eskil	0.840574	Extremely Suitable	Suitable	Suitable	940	BSk	Arid, steppe, cold
412	Central Anatolia	Aksaray	Güzelyurt	0.761260	Very Suitable	Acceptable	Suitable	1502	BSk	Arid, steppe, cold
339	Central Anatolia	Ankara	Evren	0.869262	Extremely Suitable	Suitable	Very Suitable	926	BSk	Arid, steppe, cold

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
87	Central Anatolia	Ankara	Ayaş	0.859156	Extremely Suitable	Suitable	Very Suitable	955	BSk	Arid, steppe, cold
337	Central Anatolia	Ankara	Etimesgut	0.852696	Extremely Suitable	Suitable	Suitable	819	BSk	Arid, steppe, cold
143	Central Anatolia	Ankara	Beypazarı	0.851680	Extremely Suitable	Suitable	Suitable	676	BSk	Arid, steppe, cold
899	Central Anatolia	Ankara	Yenimahalle	0.845086	Extremely Suitable	Suitable	Suitable	880	BSk	Arid, steppe, cold
780	Central Anatolia	Ankara	Sincan	0.833113	Extremely Suitable	Suitable	Suitable	1125	Dsb	Cold, dry summer, warm summer
373	Central Anatolia	Ankara	Gölbaşı/Ankara	0.832925	Extremely Suitable	Suitable	Suitable	1006	BSk	Arid, steppe, cold
708	Central Anatolia	Ankara	Polatlı	0.831830	Extremely Suitable	Suitable	Suitable	866	BSk	Arid, steppe, cold
109	Central Anatolia	Ankara	Bala	0.823512	Extremely Suitable	Suitable	Suitable	1309	BSk	Arid, steppe, cold
196	Central Anatolia	Ankara	Çankaya	0.822827	Extremely Suitable	Suitable	Suitable	881	BSk	Arid, steppe, cold
652	Central Anatolia	Ankara	Nallıhan	0.817263	Extremely Suitable	Suitable	Suitable	633	BSk	Arid, steppe, cold
437	Central Anatolia	Ankara	Haymana	0.807503	Extremely Suitable	Suitable	Suitable	1251	BSk	Arid, steppe, cold
718	Central Anatolia	Ankara	Şereflikoçhisar	0.799161	Very Suitable	Acceptable	Suitable	1343	Dsa	Cold, dry summer, hot summer
618	Central Anatolia	Ankara	Mamak	0.789813	Very Suitable	Acceptable	Suitable	909	BSk	Arid, steppe, cold
392	Central Anatolia	Ankara	Güdül	0.776873	Very Suitable	Acceptable	Suitable	738	BSk	Arid, steppe, cold
496	Central Anatolia	Ankara	Kalecik	0.771676	Very Suitable	Acceptable	Suitable	729	Dsa	Cold, dry summer, hot summer
311	Central Anatolia	Ankara	Elmadağ	0.763567	Very Suitable	Acceptable	Suitable	1100	BSk	Arid, steppe, cold
538	Central Anatolia	Ankara	Keçiören	0.748594	Very Suitable	Acceptable	Suitable	865	BSk	Arid, steppe, cold
49	Central Anatolia	Ankara	Altındağ	0.720745	Very Suitable	Acceptable	Suitable	892	BSk	Arid, steppe, cold
534	Central Anatolia	Ankara	Kazan	0.690433	Very Suitable	Acceptable	Acceptable	314	Cfa	Temperate, no dry season, hot summer
38	Central Anatolia	Ankara	Akyurt	0.688788	Very Suitable	Acceptable	Acceptable	1027	BSk	Arid, steppe, cold
244	Central Anatolia	Ankara	Çubuk	0.578052	Suitable	Acceptable	Acceptable	1002	BSk	Arid, steppe, cold
188	Central Anatolia	Ankara	Çamlıdere	0.226859	Acceptable	Marginal Suitable	Marginal Suitable	1243	Dsb	Cold, dry summer, warm summer
561	Central Anatolia	Ankara	Kızılcahamam	0.225360	Acceptable	Marginal Suitable	Marginal Suitable	985	Dsb	Cold, dry summer, warm summer
562	Central Anatolia	Çankırı	Kızılırmak	0.859749	Extremely Suitable	Suitable	Very Suitable	555	BSk	Arid, steppe, cold
309	Central Anatolia	Çankırı	Eldivan	0.725496	Very Suitable	Acceptable	Suitable	945	BSk	Arid, steppe, cold
197	Central Anatolia	Çankırı	Çankırı/Merkez	0.699030	Very Suitable	Acceptable	Acceptable	730	BSk	Arid, steppe, cold
719	Central Anatolia	Çankırı	Şabanözü	0.423641	Suitable	Marginal Suitable	Marginal Suitable	875	Csa	Temperate, dry summer, hot summer
888	Central Anatolia	Çankırı	Yapraklı	0.396721	Acceptable	Marginal Suitable	Marginal Suitable	1200	Dsb	Cold, dry summer, warm summer
577	Central Anatolia	Çankırı	Korgun	0.364784	Acceptable	Marginal Suitable	Marginal Suitable	925	BSk	Arid, steppe, cold
675	Central Anatolia	Çankırı	Orta	0.168245	Marginal Suitable	Marginal Suitable	Marginal Suitable	1257	Dsb	Cold, dry summer, warm summer
597	Central Anatolia	Çankırı	Kurşunlu	0.157128	Marginal Suitable	Marginal Suitable	Marginal Suitable	1137	Dsb	Cold, dry summer, warm summer
462	Central Anatolia	Çankırı	Ilgaz	0.149343	Marginal Suitable	Marginal Suitable	Marginal Suitable	929	BSk	Arid, steppe, cold
129	Central Anatolia	Çankırı	Bayramören	0.132160	Marginal Suitable	Marginal Suitable	Marginal Suitable	868	Dfb	Cold, no dry season, warm summer
83	Central Anatolia	Çankırı	Atkaracalar	0.119240	Marginal Suitable	Marginal Suitable	Marginal Suitable	1247	Dsb	Cold, dry summer, warm summer
221	Central Anatolia	Çankırı	Çerkeş	0.101154	Marginal Suitable	Marginal Suitable	Marginal Suitable	1132	Dsb	Cold, dry summer, warm summer
141	Central Anatolia	Eskişehir	Beylikova	0.863042	Extremely Suitable	Suitable	Very Suitable	771	BSk	Arid, steppe, cold
405	Central Anatolia	Eskişehir	Günyüzü	0.861325	Extremely Suitable	Suitable	Very Suitable	894	BSk	Arid, steppe, cold
613	Central Anatolia	Eskişehir	Mahmudiye	0.848316	Extremely Suitable	Suitable	Suitable	887	BSk	Arid, steppe, cold
639	Central Anatolia	Eskişehir	Mihaliççık	0.847055	Extremely Suitable	Suitable	Suitable	1306	Dsb	Cold, dry summer, warm summer
229	Central Anatolia	Eskişehir	Çifteler	0.841125	Extremely Suitable	Suitable	Suitable	877	BSk	Arid, steppe, cold
48	Central Anatolia	Eskişehir	Alpu	0.838427	Extremely Suitable	Suitable	Suitable	766	BSk	Arid, steppe, cold
739	Central Anatolia	Eskişehir	Sarıcakaya	0.819939	Extremely Suitable	Suitable	Suitable	216	BSk	Arid, steppe, cold
791	Central Anatolia	Eskişehir	Sivrihisar	0.809306	Extremely Suitable	Suitable	Suitable	1424	Dsa	Cold, dry summer, hot summer
772	Central Anatolia	Eskişehir	Seyitgazi	0.804435	Extremely Suitable	Suitable	Suitable	991	BSk	Arid, steppe, cold
638	Central Anatolia	Eskişehir	Mihalgazi	0.799783	Very Suitable	Suitable	Suitable	215	BSk	Arid, steppe, cold
334	Central Anatolia	Eskişehir	Eskişehir/Merkez	0.794751	Very Suitable	Acceptable	Suitable	796	BSk	Arid, steppe, cold
422	Central Anatolia	Eskişehir	Han	0.791884	Very Suitable	Acceptable	Suitable	1224	BSk	Arid, steppe, cold

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
473	Central Anatolia	Eskişehir	İnönü	0.727397	Very Suitable	Acceptable	Suitable	18	Csa	Temperate, dry summer, hot summer
326	Central Anatolia	Karaman	Ermenek	0.869181	Extremely Suitable	Suitable	Very Suitable	1282	Csa	Temperate, dry summer, hot summer
94	Central Anatolia	Karaman	Ayrancı	0.839732	Extremely Suitable	Suitable	Suitable	1141	BSk	Arid, steppe, cold
512	Central Anatolia	Karaman	Karaman/Merkez	0.838579	Extremely Suitable	Suitable	Suitable	847	BSk	Arid, steppe, cold
535	Central Anatolia	Karaman	Kazımkarabekir	0.819984	Extremely Suitable	Suitable	Suitable	1052	Csa	Temperate, dry summer, hot summer
137	Central Anatolia	Karaman	Başyayla	0.628167	Very Suitable	Acceptable	Acceptable	1346	Csa	Temperate, dry summer, hot summer
793	Central Anatolia	Karaman	Sarıveliler	0.588346	Suitable	Acceptable	Acceptable	1523	Dsb	Cold, dry summer, warm summer
569	Central Anatolia	Kayseri	Kocasinan	0.827361	Extremely Suitable	Suitable	Suitable	1056	BSk	Arid, steppe, cold
468	Central Anatolia	Kayseri	İncesu	0.794907	Very Suitable	Acceptable	Suitable	43	Csa	Temperate, dry summer, hot summer
905	Central Anatolia	Kayseri	Yeşilhisar	0.767299	Very Suitable	Acceptable	Suitable	1167	BSk	Arid, steppe, cold
629	Central Anatolia	Kayseri	Melikgazi	0.731177	Very Suitable	Acceptable	Suitable	1059	BSk	Arid, steppe, cold
414	Central Anatolia	Kayseri	Hacılar	0.669072	Very Suitable	Acceptable	Acceptable	1385	BSk	Arid, steppe, cold
346	Central Anatolia	Kayseri	Felahiye	0.610376	Very Suitable	Acceptable	Acceptable	1308	BSk	Arid, steppe, cold
269	Central Anatolia	Kayseri	Develi	0.560927	Suitable	Acceptable	Acceptable	1261	BSk	Arid, steppe, cold
744	Central Anatolia	Kayseri	Sarıoğlan	0.530051	Suitable	Marginal Suitable	Acceptable	1156	BSk	Arid, steppe, cold
177	Central Anatolia	Kayseri	Bünyan	0.527056	Suitable	Marginal Suitable	Acceptable	1345	BSk	Arid, steppe, cold
883	Central Anatolia	Kayseri	Yahyalı	0.478064	Suitable	Marginal Suitable	Acceptable	1178	BSk	Arid, steppe, cold
817	Central Anatolia	Kayseri	Talas	0.445614	Suitable	Marginal Suitable	Acceptable	1150	BSk	Arid, steppe, cold
687	Central Anatolia	Kayseri	Özvatan	0.440816	Suitable	Marginal Suitable	Acceptable	1289	BSk	Arid, steppe, cold
837	Central Anatolia	Kayseri	Tomarza	0.407006	Suitable	Marginal Suitable	Marginal Suitable	1396	BSk	Arid, steppe, cold
27	Central Anatolia	Kayseri	Akkışla	0.231802	Acceptable	Marginal Suitable	Marginal Suitable	1357	Dsb	Cold, dry summer, warm summer
705	Central Anatolia	Kayseri	Pınarbaşı/Kayseri	0.230936	Acceptable	Marginal Suitable	Marginal Suitable	1526	Dsb	Cold, dry summer, warm summer
747	Central Anatolia	Kayseri	Sarız	0.201929	Acceptable	Marginal Suitable	Marginal Suitable	1569	Dsb	Cold, dry summer, warm summer
256	Central Anatolia	Kırıkkale	Delice	0.866788	Extremely Suitable	Suitable	Very Suitable	696	BSk	Arid, steppe, cold
509	Central Anatolia	Kırıkkale	Karakeçili	0.865250	Extremely Suitable	Suitable	Very Suitable	257	Csa	Temperate, dry summer, hot summer
112	Central Anatolia	Kırıkkale	Balışeyh	0.861521	Extremely Suitable	Suitable	Very Suitable	870	BSk	Arid, steppe, cold
549	Central Anatolia	Kırıkkale	Keskin	0.861368	Extremely Suitable	Suitable	Very Suitable	1139	BSk	Arid, steppe, cold
106	Central Anatolia	Kırıkkale	Bahşılı	0.849352	Extremely Suitable	Suitable	Suitable	703	BSk	Arid, steppe, cold
216	Central Anatolia	Kırıkkale	Çelebi	0.845956	Extremely Suitable	Suitable	Suitable	1241	BSk	Arid, steppe, cold
882	Central Anatolia	Kırıkkale	Yahşihan	0.835229	Extremely Suitable	Suitable	Suitable	779	BSk	Arid, steppe, cold
557	Central Anatolia	Kırıkkale	Kırıkkale/Merkez	0.834483	Extremely Suitable	Suitable	Suitable	746	BSk	Arid, steppe, cold
802	Central Anatolia	Kırıkkale	Sulakyurt	0.824248	Extremely Suitable	Suitable	Suitable	127	Csa	Temperate, dry summer, hot summer
641	Central Anatolia	Kırşehir	Mucur	0.855041	Extremely Suitable	Suitable	Suitable	1071	BSk	Arid, steppe, cold
227	Central Anatolia	Kırşehir	Çiçekdağı	0.852586	Extremely Suitable	Suitable	Suitable	935	BSk	Arid, steppe, cold
22	Central Anatolia	Kırşehir	Akçakent	0.850713	Extremely Suitable	Suitable	Suitable	1410	BSk	Arid, steppe, cold
31	Central Anatolia	Kırşehir	Akpınar	0.850610	Extremely Suitable	Suitable	Suitable	1163	BSk	Arid, steppe, cold
498	Central Anatolia	Kırşehir	Kaman	0.846175	Extremely Suitable	Suitable	Suitable	167	Cfa	Temperate, no dry season, hot summer
168	Central Anatolia	Kırşehir	Boztepe	0.828124	Extremely Suitable	Suitable	Suitable	1167	BSk	Arid, steppe, cold
560	Central Anatolia	Kırşehir	Kırşehir/Merkez	0.821300	Extremely Suitable	Suitable	Suitable	991	BSk	Arid, steppe, cold
487	Central Anatolia	Konya	Kadınhanı	0.875560	Extremely Suitable	Suitable	Very Suitable	1121	BSk	Arid, steppe, cold
738	Central Anatolia	Konya	Sarayönü	0.874452	Extremely Suitable	Suitable	Very Suitable	1064	BSk	Arid, steppe, cold
50	Central Anatolia	Konya	Altınekin	0.873466	Extremely Suitable	Suitable	Very Suitable	984	BSk	Arid, steppe, cold
591	Central Anatolia	Konya	Kulu	0.872521	Extremely Suitable	Suitable	Very Suitable	997	BSk	Arid, steppe, cold
855	Central Anatolia	Konya	Tuzlukçu	0.868382	Extremely Suitable	Suitable	Very Suitable	994	BSk	Arid, steppe, cold
463	Central Anatolia	Konya	Ilgın	0.867243	Extremely Suitable	Suitable	Very Suitable	1039	BSk	Arid, steppe, cold
760	Central Anatolia	Konya	Selçuk	0.864645	Extremely Suitable	Suitable	Very Suitable	18	Csa	Temperate, dry summer, hot summer
316	Central Anatolia	Konya	Emirgazi	0.851338	Extremely Suitable	Suitable	Suitable	1087	BSk	Arid, steppe, cold

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
917	Central Anatolia	Konya	Yunak	0.849970	Extremely Suitable	Suitable	Suitable	1101	BSk	Arid, steppe, cold
633	Central Anatolia	Konya	Meram	0.849954	Extremely Suitable	Suitable	Suitable	1027	BSk	Arid, steppe, cold
33	Central Anatolia	Konya	Akşehir	0.849397	Extremely Suitable	Suitable	Suitable	1027	Csa	Temperate, dry summer, hot summer
322	Central Anatolia	Konya	Ereğli/Konya	0.848646	Extremely Suitable	Suitable	Suitable	1053	BSk	Arid, steppe, cold
218	Central Anatolia	Konya	Çeltik	0.847951	Extremely Suitable	Suitable	Suitable	852	BSk	Arid, steppe, cold
30	Central Anatolia	Konya	Akören	0.847762	Extremely Suitable	Suitable	Suitable	1108	Dsa	Cold, dry summer, hot summer
402	Central Anatolia	Konya	Güneysınır	0.839473	Extremely Suitable	Suitable	Suitable	1095	BSk	Arid, steppe, cold
233	Central Anatolia	Konya	Cihanbeyli	0.835883	Extremely Suitable	Suitable	Suitable	963	Dsa	Cold, dry summer, hot summer
515	Central Anatolia	Konya	Karapınar	0.830923	Extremely Suitable	Suitable	Suitable	15	Csa	Temperate, dry summer, hot summer
144	Central Anatolia	Konya	Beyşehir	0.828946	Extremely Suitable	Suitable	Suitable	1152	Dsa	Cold, dry summer, hot summer
519	Central Anatolia	Konya	Karatay	0.822567	Extremely Suitable	Suitable	Suitable	11	Csa	Temperate, dry summer, hot summer
453	Central Anatolia	Konya	Hüyük	0.822029	Extremely Suitable	Suitable	Suitable	1251	Dsb	Cold, dry summer, warm summer
262	Central Anatolia	Konya	Derebucak	0.818285	Extremely Suitable	Suitable	Suitable	1229	Csa	Temperate, dry summer, hot summer
770	Central Anatolia	Konya	Seydişehir	0.806585	Extremely Suitable	Suitable	Suitable	1133	Csa	Temperate, dry summer, hot summer
247	Central Anatolia	Konya	Çumra	0.789872	Very Suitable	Acceptable	Suitable	1018	BSk	Arid, steppe, cold
282	Central Anatolia	Konya	Doğanhisar	0.783913	Very Suitable	Acceptable	Suitable	1188	BSk	Arid, steppe, cold
885	Central Anatolia	Konya	Yalıhüyük	0.770467	Very Suitable	Acceptable	Suitable	1106	Csa	Temperate, dry summer, hot summer
16	Central Anatolia	Konya	Ahırlı	0.641211	Very Suitable	Acceptable	Acceptable	1216	Csa	Temperate, dry summer, hot summer
261	Central Anatolia	Konya	Derbent	0.636090	Very Suitable	Acceptable	Acceptable	1479	Dsb	Cold, dry summer, warm summer
164	Central Anatolia	Konya	Bozkır	0.627401	Very Suitable	Acceptable	Acceptable	1137	Csa	Temperate, dry summer, hot summer
415	Central Anatolia	Konya	Hadim	0.457807	Suitable	Marginal Suitable	Acceptable	1526	Dsb	Cold, dry summer, warm summer
820	Central Anatolia	Konya	Taşkent	0.436886	Suitable	Marginal Suitable	Acceptable	559	Cfa	Temperate, no dry season, hot summer
419	Central Anatolia	Konya	Halkapınar	0.240935	Acceptable	Marginal Suitable	Marginal Suitable	1174	BSk	Arid, steppe, cold
3	Central Anatolia	Nevşehir	Acıgöl	0.874150	Extremely Suitable	Suitable	Very Suitable	1247	BSk	Arid, steppe, cold
395	Central Anatolia	Nevşehir	Gülşehir	0.865150	Extremely Suitable	Suitable	Very Suitable	923	BSk	Arid, steppe, cold
413	Central Anatolia	Nevşehir	Hacıbektaş	0.863596	Extremely Suitable	Suitable	Very Suitable	1.288	BSk	Arid, steppe, cold
84	Central Anatolia	Nevşehir	Avanos	0.853943	Extremely Suitable	Suitable	Suitable	934	BSk	Arid, steppe, cold
868	Central Anatolia	Nevşehir	Ürgup	0.842557	Extremely Suitable	Suitable	Suitable	1060	BSk	Arid, steppe, cold
585	Central Anatolia	Nevşehir	Kozaklı	0.839262	Extremely Suitable	Suitable	Suitable	1054	BSk	Arid, steppe, cold
657	Central Anatolia	Nevşehir	Nevşehir/Merkez	0.805813	Extremely Suitable	Suitable	Suitable	1197	BSk	Arid, steppe, cold
267	Central Anatolia	Nevşehir	Derinkuyu	0.730333	Very Suitable	Acceptable	Suitable	1359	BSk	Arid, steppe, cold
158	Central Anatolia	Niğde	Bor	0.785873	Very Suitable	Acceptable	Suitable	1130	BSk	Arid, steppe, cold
51	Central Anatolia	Niğde	Altunhisar	0.734486	Very Suitable	Acceptable	Suitable	1200	BSk	Arid, steppe, cold
863	Central Anatolia	Niğde	Ulukışla	0.611756	Very Suitable	Acceptable	Acceptable	1447	BSk	Arid, steppe, cold
230	Central Anatolia	Niğde	Çiftlik	0.556900	Suitable	Acceptable	Acceptable	1546	BSk	Arid, steppe, cold
658	Central Anatolia	Niğde	Niğde/Merkez	0.480447	Suitable	Marginal Suitable	Acceptable	1239	BSk	Arid, steppe, cold
185	Central Anatolia	Niğde	Çamardı	0.270360	Acceptable	Marginal Suitable	Marginal Suitable	1501	BSk	Arid, steppe, cold
359	Central Anatolia	Sivas	Gemerek	0.464090	Suitable	Marginal Suitable	Acceptable	1211	BSk	Arid, steppe, cold
278	Central Anatolia	Sivas	Divriği	0.346452	Acceptable	Marginal Suitable	Marginal Suitable	1014	BSk	Arid, steppe, cold
743	Central Anatolia	Sivas	Şarkışla	0.319721	Acceptable	Marginal Suitable	Marginal Suitable	15	Csa	Temperate, dry summer, hot summer
410	Central Anatolia	Sivas	Gürün	0.280277	Acceptable	Marginal Suitable	Marginal Suitable	1327	BSk	Arid, steppe, cold
56	Central Anatolia	Sivas	Altınyayla/Sivas	0.247756	Acceptable	Marginal Suitable	Marginal Suitable	1457	BSk	Arid, steppe, cold
500	Central Anatolia	Sivas	Kangal	0.240362	Acceptable	Marginal Suitable	Marginal Suitable	40	Cfa	Temperate, no dry season, hot summer
858	Central Anatolia	Sivas	Ulaş	0.224722	Acceptable	Marginal Suitable	Marginal Suitable	1391	BSk	Arid, steppe, cold
787	Central Anatolia	Sivas	Sivas/Merkez	0.212033	Acceptable	Marginal Suitable	Marginal Suitable	931	Csa	Temperate, dry summer, hot summer
416	Central Anatolia	Sivas	Hafik	0.211613	Acceptable	Marginal Suitable	Marginal Suitable	1312	BSk	Arid, steppe, cold
26	Central Anatolia	Sivas	Akıncılar	0.204872	Acceptable	Marginal Suitable	Marginal Suitable	1045	Dsa	Cold, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
912	Central Anatolia	Sivas	Yıldızeli	0.187761	Marginal Suitable	Marginal Suitable	Marginal Suitable	1370	BSk	Arid, steppe, cold
380	Central Anatolia	Sivas	Gölova	0.173349	Marginal Suitable	Marginal Suitable	Marginal Suitable	1336	Dsb	Cold, dry summer, warm summer
920	Central Anatolia	Sivas	Zara	0.171344	Marginal Suitable	Marginal Suitable	Marginal Suitable	1344	Dsb	Cold, dry summer, warm summer
813	Central Anatolia	Sivas	Suşehri	0.142275	Marginal Suitable	Marginal Suitable	Marginal Suitable	151	Csa	Temperate, dry summer, hot summer
467	Central Anatolia	Sivas	İmranlı	0.139598	Marginal Suitable	Marginal Suitable	Marginal Suitable	1098	BSk	Arid, steppe, cold
284	Central Anatolia	Sivas	Doğansar	0.113699	Marginal Suitable	Marginal Suitable	Marginal Suitable	1299	Dsb	Cold, dry summer, warm summer
584	Central Anatolia	Sivas	Koyulhisar	0.095492	Marginal Suitable	Marginal Suitable	Marginal Suitable	947	Dsb	Cold, dry summer, warm summer
898	Central Anatolia	Yozgat	Yenifakılı	0.843955	Extremely Suitable	Suitable	Suitable	1012	BSk	Arid, steppe, cold
756	Central Anatolia	Yozgat	Şefaatli	0.839080	Extremely Suitable	Suitable	Suitable	838	Csa	Temperate, dry summer, hot summer
904	Central Anatolia	Yozgat	Yerköy	0.834364	Extremely Suitable	Suitable	Suitable	770	BSk	Arid, steppe, cold
155	Central Anatolia	Yozgat	Boğazlıyan	0.815518	Extremely Suitable	Suitable	Suitable	1071	BSk	Arid, steppe, cold
742	Central Anatolia	Yozgat	Sarıkaya	0.776342	Very Suitable	Acceptable	Suitable	1116	BSk	Arid, steppe, cold
215	Central Anatolia	Yozgat	Çekerek	0.744720	Very Suitable	Acceptable	Suitable	936	BSk	Arid, steppe, cold
91	Central Anatolia	Yozgat	Aydıncık/Yozgat	0.707230	Very Suitable	Acceptable	Acceptable	831	BSk	Arid, steppe, cold
488	Central Anatolia	Yozgat	Kadışehri	0.702100	Very Suitable	Acceptable	Acceptable	1036	BSk	Arid, steppe, cold
914	Central Anatolia	Yozgat	Yozgat/Merkez	0.665696	Very Suitable	Acceptable	Acceptable	1317	Dsb	Cold, dry summer, warm summer
736	Central Anatolia	Yozgat	Saraykent	0.622279	Very Suitable	Acceptable	Acceptable	1142	BSk	Arid, steppe, cold
800	Central Anatolia	Yozgat	Sorgun	0.615622	Very Suitable	Acceptable	Acceptable	682	BSk	Arid, steppe, cold
195	Central Anatolia	Yozgat	Çandır	0.525373	Suitable	Marginal Suitable	Acceptable	1235	BSk	Arid, steppe, cold
212	Central Anatolia	Yozgat	Çayıralan	0.336385	Acceptable	Marginal Suitable	Marginal Suitable	1362	BSk	Arid, steppe, cold
24	Central Anatolia	Yozgat	Akdağmadeni	0.291981	Acceptable	Marginal Suitable	Marginal Suitable	1322	BSk	Arid, steppe, cold
852	East Anatolia	Ağrı	Tutak	0.302414	Acceptable	Marginal Suitable	Marginal Suitable	1567	Dsa	Cold, dry summer, hot summer
691	East Anatolia	Ağrı	Patnos	0.291856	Acceptable	Marginal Suitable	Marginal Suitable	1639	Dsb	Cold, dry summer, warm summer
288	East Anatolia	Ağrı	Doğubayazıt	0.237317	Acceptable	Marginal Suitable	Marginal Suitable	1594	BSk	Arid, steppe, cold
421	East Anatolia	Ağrı	Hamur	0.207835	Acceptable	Marginal Suitable	Marginal Suitable	1690	Dsb	Cold, dry summer, warm summer
279	East Anatolia	Ağrı	Diyadin	0.175264	Marginal Suitable	Marginal Suitable	Marginal Suitable	1933	Dsb	Cold, dry summer, warm summer
15	East Anatolia	Ağrı	Ağrı/Merkez	0.150112	Marginal Suitable	Marginal Suitable	Marginal Suitable	1630	Dsb	Cold, dry summer, warm summer
822	East Anatolia	Ağrı	Taslıçay	0.148099	Marginal Suitable	Marginal Suitable	Marginal Suitable	1409	Dsb	Cold, dry summer, warm summer
310	East Anatolia	Ağrı	Eleşkirt	0.140724	Marginal Suitable	Marginal Suitable	Marginal Suitable	1810	Dsb	Cold, dry summer, warm summer
376	East Anatolia	Ardahan	Göle	0.116411	Marginal Suitable	Marginal Suitable	Marginal Suitable	2020	Dfb	Cold, no dry season, warm summer
68	East Anatolia	Ardahan	Ardahan/Merkez	0.105444	Marginal Suitable	Marginal Suitable	Marginal Suitable	1799	Dfb	Cold, no dry season, warm summer
238	East Anatolia	Ardahan	Çıldır	0.099158	Marginal Suitable	Marginal Suitable	Marginal Suitable	1911	Dfb	Cold, no dry season, warm summer
423	East Anatolia	Ardahan	Hanak	0.092548	Marginal Suitable	Marginal Suitable	Marginal Suitable	1826	Dfb	Cold, no dry season, warm summer
251	East Anatolia	Ardahan	Damal	0.086149	Marginal Suitable	Marginal Suitable	Marginal Suitable	2056	Dfc	Cold, no dry season, cold summer
709	East Anatolia	Ardahan	Posof	0.058697	Marginal Suitable	Marginal Suitable	Marginal Suitable	1546	Dfb	Cold, no dry season, warm summer
361	East Anatolia	Bingöl	Genç	0.726087	Very Suitable	Acceptable	Suitable	1018	Dsa	Cold, dry summer, hot summer
149	East Anatolia	Bingöl	Bingöl/Merkez	0.690001	Very Suitable	Acceptable	Acceptable	1159	Dsa	Cold, dry summer, hot summer
798	East Anatolia	Bingöl	Solhan	0.375543	Acceptable	Marginal Suitable	Marginal Suitable	172	Csa	Temperate, dry summer, hot summer
892	East Anatolia	Bingöl	Yayladere	0.282764	Acceptable	Marginal Suitable	Marginal Suitable	1569	Dsa	Cold, dry summer, hot summer
551	East Anatolia	Bingöl	Kiğı	0.281654	Acceptable	Marginal Suitable	Marginal Suitable	1519	Dsa	Cold, dry summer, hot summer
5	East Anatolia	Bingöl	Adaklı	0.227590	Acceptable	Marginal Suitable	Marginal Suitable	1507	Dsb	Cold, dry summer, warm summer
894	East Anatolia	Bingöl	Yedisu	0.171598	Marginal Suitable	Marginal Suitable	Marginal Suitable	1534	Dsb	Cold, dry summer, warm summer
523	East Anatolia	Bingöl	Karlıova	0.164208	Marginal Suitable	Marginal Suitable	Marginal Suitable	358	Csa	Temperate, dry summer, hot summer
651	East Anatolia	Bitlis	Mutki	0.723582	Very Suitable	Acceptable	Suitable	1486	Dsa	Cold, dry summer, hot summer
152	East Anatolia	Bitlis	Bitlis/Merkez	0.603495	Very Suitable	Acceptable	Acceptable	1637	Dsa	Cold, dry summer, hot summer
407	East Anatolia	Bitlis	Güroymak	0.534401	Suitable	Marginal Suitable	Acceptable	1308	Dsa	Cold, dry summer, hot summer
17	East Anatolia	Bitlis	Ahlat	0.499424	Suitable	Marginal Suitable	Acceptable	1703	Dsb	Cold, dry summer, warm summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
7	East Anatolia	Bitlis	Adilcevaz	0.452969	Suitable	Marginal Suitable	Acceptable	1683	Dsb	Cold, dry summer, warm summer
824	East Anatolia	Bitlis	Tatvan	0.435418	Suitable	Marginal Suitable	Acceptable	1656	Dsb	Cold, dry summer, warm summer
446	East Anatolia	Bitlis	Hizan	0.334457	Acceptable	Marginal Suitable	Marginal Suitable	1472	Dsb	Cold, dry summer, warm summer
12	East Anatolia	Elazığ	Ağın	0.883957	Extremely Suitable	Suitable	Very Suitable	889	Dsa	Cold, dry summer, hot summer
582	East Anatolia	Elazığ	Kovancılar	0.870379	Extremely Suitable	Suitable	Very Suitable	967	Dsa	Cold, dry summer, hot summer
73	East Anatolia	Elazığ	Arıcak	0.863032	Extremely Suitable	Suitable	Very Suitable	1092	Csa	Temperate, dry summer, hot summer
612	East Anatolia	Elazığ	Maden	0.859419	Extremely Suitable	Suitable	Very Suitable	1021	Dsa	Cold, dry summer, hot summer
536	East Anatolia	Elazığ	Keban	0.856875	Extremely Suitable	Suitable	Suitable	799	Dsa	Cold, dry summer, hot summer
306	East Anatolia	Elazığ	Elazığ/Merkez	0.855403	Extremely Suitable	Suitable	Suitable	1041	BSk	Arid, steppe, cold
40	East Anatolia	Elazığ	Alacakaya	0.853916	Extremely Suitable	Suitable	Suitable	1147	Dsa	Cold, dry summer, hot summer
688	East Anatolia	Elazığ	Palu	0.840671	Extremely Suitable	Suitable	Suitable	871	Dsa	Cold, dry summer, hot summer
119	East Anatolia	Elazığ	Baskil	0.801710	Extremely Suitable	Suitable	Suitable	1212	Dsa	Cold, dry summer, hot summer
790	East Anatolia	Elazığ	Sivrice	0.795122	Very Suitable	Acceptable	Suitable	1109	BSk	Arid, steppe, cold
510	East Anatolia	Elazığ	Karakoçan	0.761796	Very Suitable	Acceptable	Suitable	821	BSk	Arid, steppe, cold
464	East Anatolia	Erzincan	İliç	0.484917	Suitable	Marginal Suitable	Acceptable	78	Csa	Temperate, dry summer, hot summer
542	East Anatolia	Erzincan	Kemaliye	0.478019	Suitable	Marginal Suitable	Acceptable	947	Dsa	Cold, dry summer, hot summer
831	East Anatolia	Erzincan	Tercan	0.219794	Acceptable	Marginal Suitable	Marginal Suitable	1421	Dsa	Cold, dry summer, hot summer
541	East Anatolia	Erzincan	Kemah	0.195942	Marginal Suitable	Marginal Suitable	Marginal Suitable	1068	Dsa	Cold, dry summer, hot summer
213	East Anatolia	Erzincan	Çayırlı	0.179751	Marginal Suitable	Marginal Suitable	Marginal Suitable	1527	Dsb	Cold, dry summer, warm summer
329	East Anatolia	Erzincan	Erzincan/Merkez	0.154005	Marginal Suitable	Marginal Suitable	Marginal Suitable	1216	BSk	Arid, steppe, cold
872	East Anatolia	Erzincan	Üzümlü	0.143887	Marginal Suitable	Marginal Suitable	Marginal Suitable	1397	Dsb	Cold, dry summer, warm summer
683	East Anatolia	Erzincan	Otlukbeli	0.139278	Marginal Suitable	Marginal Suitable	Marginal Suitable	1741	Dsb	Cold, dry summer, warm summer
713	East Anatolia	Erzincan	Refahiye	0.102230	Marginal Suitable	Marginal Suitable	Marginal Suitable	1602	Dsb	Cold, dry summer, warm summer
505	East Anatolia	Erzurum	Karaçoban	0.286921	Acceptable	Marginal Suitable	Marginal Suitable	518	Csa	Temperate, dry summer, hot summer
447	East Anatolia	Erzurum	Hınıs	0.215949	Acceptable	Marginal Suitable	Marginal Suitable	1713	Dsb	Cold, dry summer, warm summer
451	East Anatolia	Erzurum	Horasan	0.176152	Marginal Suitable	Marginal Suitable	Marginal Suitable	1560	BSk	Arid, steppe, cold
574	East Anatolia	Erzurum	Köprüköy	0.158343	Marginal Suitable	Marginal Suitable	Marginal Suitable	1602	Dfb	Cold, no dry season, warm summer
201	East Anatolia	Erzurum	Çat	0.149058	Marginal Suitable	Marginal Suitable	Marginal Suitable	1921	Dsb	Cold, dry summer, warm summer
690	East Anatolia	Erzurum	Pasinler	0.148091	Marginal Suitable	Marginal Suitable	Marginal Suitable	1661	Dsb	Cold, dry summer, warm summer
830	East Anatolia	Erzurum	Tekman	0.147936	Marginal Suitable	Marginal Suitable	Marginal Suitable	1937	Dsb	Cold, dry summer, warm summer
520	East Anatolia	Erzurum	Karayazı	0.146208	Marginal Suitable	Marginal Suitable	Marginal Suitable	1023	BSk	Arid, steppe, cold
873	East Anatolia	Erzurum	Uzundere	0.136076	Marginal Suitable	Marginal Suitable	Marginal Suitable	1098	Dfb	Cold, no dry season, warm summer
465	East Anatolia	Erzurum	Ilıca	0.128046	Marginal Suitable	Marginal Suitable	Marginal Suitable	1763	Dfb	Cold, no dry season, warm summer
330	East Anatolia	Erzurum	Erzurum/Merkez	0.126717	Marginal Suitable	Marginal Suitable	Marginal Suitable	1923	Dfb	Cold, no dry season, warm summer
841	East Anatolia	Erzurum	Tortum	0.123664	Marginal Suitable	Marginal Suitable	Marginal Suitable	1618	Dfb	Cold, no dry season, warm summer
670	East Anatolia	Erzurum	Olur	0.121386	Marginal Suitable	Marginal Suitable	Marginal Suitable	1334	Dfb	Cold, no dry season, warm summer
765	East Anatolia	Erzurum	Şenkaya	0.116665	Marginal Suitable	Marginal Suitable	Marginal Suitable	373	Dfb	Cold, no dry season, warm summer
80	East Anatolia	Erzurum	Aşkale	0.116295	Marginal Suitable	Marginal Suitable	Marginal Suitable	1661	Dsb	Cold, dry summer, warm summer
654	East Anatolia	Erzurum	Narman	0.114194	Marginal Suitable	Marginal Suitable	Marginal Suitable	1644	Dfb	Cold, no dry season, warm summer
697	East Anatolia	Erzurum	Pazaryolu	0.107087	Marginal Suitable	Marginal Suitable	Marginal Suitable	1482	Dfb	Cold, no dry season, warm summer
669	East Anatolia	Erzurum	Oltu	0.102395	Marginal Suitable	Marginal Suitable	Marginal Suitable	1274	BSk	Arid, steppe, cold
480	East Anatolia	Erzurum	İspir	0.088586	Marginal Suitable	Marginal Suitable	Marginal Suitable	1189	Dfb	Cold, no dry season, warm summer
245	East Anatolia	Hakkari	Çukurca	0.752462	Very Suitable	Acceptable	Suitable	1312	Dsa	Cold, dry summer, hot summer
763	East Anatolia	Hakkari	Şemdinli	0.346403	Acceptable	Marginal Suitable	Marginal Suitable	1867	Dfb	Cold, no dry season, warm summer
915	East Anatolia	Hakkari	Yüksekova	0.193866	Marginal Suitable	Marginal Suitable	Marginal Suitable	1876	Dsa	Cold, dry summer, hot summer
417	East Anatolia	Hakkari	Hakkari/Merkez	0.167292	Marginal Suitable	Marginal Suitable	Marginal Suitable	1756	Dsa	Cold, dry summer, hot summer
511	East Anatolia	Iğdır	Karakoyunlu	0.823913	Extremely Suitable	Suitable	Suitable	1095	Dsa	Cold, dry summer, hot summer

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
66	East Anatolia	Iğdır	Aralık	0.806146	Extremely Suitable	Suitable	Suitable	819	BWk	Arid, desert, cold
457	East Anatolia	Iğdır	Iğdır/Merkez	0.746702	Very Suitable	Acceptable	Suitable	860	BWk	Arid, desert, cold
854	East Anatolia	Iğdır	Tuzluca	0.605203	Very Suitable	Acceptable	Acceptable	1104	BSk	Arid, steppe, cold
274	East Anatolia	Kars	Digor	0.243134	Acceptable	Marginal Suitable	Marginal Suitable	1650	BSk	Arid, steppe, cold
36	East Anatolia	Kars	Akyaka	0.192250	Marginal Suitable	Marginal Suitable	Marginal Suitable	1492	Dfb	Cold, no dry season, warm summer
490	East Anatolia	Kars	Kağızman	0.157082	Marginal Suitable	Marginal Suitable	Marginal Suitable	1.414	BSk	Arid, steppe, cold
762	East Anatolia	Kars	Selim	0.124420	Marginal Suitable	Marginal Suitable	Marginal Suitable	1858	Dfb	Cold, no dry season, warm summer
75	East Anatolia	Kars	Arpaçay	0.120606	Marginal Suitable	Marginal Suitable	Marginal Suitable	1695	Dfb	Cold, no dry season, warm summer
525	East Anatolia	Kars	Kars/Merkez	0.119779	Marginal Suitable	Marginal Suitable	Marginal Suitable	92	Csa	Temperate, dry summer, hot summer
815	East Anatolia	Kars	Susuz	0.108582	Marginal Suitable	Marginal Suitable	Marginal Suitable	1073	Dsb	Cold, dry summer, warm summer
741	East Anatolia	Kars	Sarıkamış	0.076273	Marginal Suitable	Marginal Suitable	Marginal Suitable	2103	Dfb	Cold, no dry season, warm summer
286	East Anatolia	Malatya	Doğanyol	0.860371	Extremely Suitable	Suitable	Very Suitable	929	Dsa	Cold, dry summer, hot summer
893	East Anatolia	Malatya	Yazıhan	0.836834	Extremely Suitable	Suitable	Suitable	828	BSk	Arid, steppe, cold
710	East Anatolia	Malatya	Pütürge	0.829850	Extremely Suitable	Suitable	Suitable	1224	Dsa	Cold, dry summer, hot summer
495	East Anatolia	Malatya	Kale/Malatya	0.822054	Extremely Suitable	Suitable	Suitable	1050	Csa	Temperate, dry summer, hot summer
122	East Anatolia	Malatya	Battalgazi	0.813661	Extremely Suitable	Suitable	Suitable	782	BSk	Arid, steppe, cold
614	East Anatolia	Malatya	Malatya/Merkez	0.812359	Extremely Suitable	Suitable	Suitable	970	BSk	Arid, steppe, cold
20	East Anatolia	Malatya	Akçadağ	0.790862	Very Suitable	Acceptable	Suitable	1056	BSk	Arid, steppe, cold
908	East Anatolia	Malatya	Yeşilyurt/Malatya	0.789684	Very Suitable	Acceptable	Suitable	1010	Dsa	Cold, dry summer, hot summer
71	East Anatolia	Malatya	Arguvan	0.770707	Very Suitable	Acceptable	Suitable	1163	BSk	Arid, steppe, cold
67	East Anatolia	Malatya	Arapgir	0.704605	Very Suitable	Acceptable	Acceptable	1172	Dsa	Cold, dry summer, hot summer
285	East Anatolia	Malatya	Doğanşehir	0.669441	Very Suitable	Acceptable	Acceptable	1225	Dsa	Cold, dry summer, hot summer
441	East Anatolia	Malatya	Hekimhan	0.616528	Very Suitable	Acceptable	Acceptable	1122	BSk	Arid, steppe, cold
252	East Anatolia	Malatya	Darende	0.546468	Suitable	Marginal Suitable	Acceptable	1027	BSk	Arid, steppe, cold
592	East Anatolia	Malatya	Kuluncak	0.302886	Acceptable	Marginal Suitable	Marginal Suitable	1276	BSk	Arid, steppe, cold
648	East Anatolia	Muş	Muş/Merkez	0.589205	Suitable	Acceptable	Acceptable	1334	Dsa	Cold, dry summer, hot summer
578	East Anatolia	Muş	Korkut	0.575967	Suitable	Acceptable	Acceptable	1315	Dsa	Cold, dry summer, hot summer
430	East Anatolia	Muş	Hasköy	0.559577	Suitable	Acceptable	Acceptable	1277	Dsa	Cold, dry summer, hot summer
615	East Anatolia	Muş	Malazgirt	0.470637	Suitable	Marginal Suitable	Acceptable	1532	Dsa	Cold, dry summer, hot summer
175	East Anatolia	Muş	Bulanık	0.417078	Suitable	Marginal Suitable	Marginal Suitable	1488	Dsa	Cold, dry summer, hot summer
877	East Anatolia	Muş	Varto	0.214689	Acceptable	Marginal Suitable	Marginal Suitable	1519	Dsa	Cold, dry summer, hot summer
701	East Anatolia	Tunceli	Pertek	0.834359	Extremely Suitable	Suitable	Suitable	1167	Dsa	Cold, dry summer, hot summer
626	East Anatolia	Tunceli	Mazgirt	0.759087	Very Suitable	Acceptable	Suitable	1413	Dsa	Cold, dry summer, hot summer
220	East Anatolia	Tunceli	Çemişgezek	0.721812	Very Suitable	Acceptable	Suitable	1013	Dsa	Cold, dry summer, hot summer
846	East Anatolia	Tunceli	Tunceli/Merkez	0.721147	Very Suitable	Acceptable	Suitable	922	Dsa	Cold, dry summer, hot summer
452	East Anatolia	Tunceli	Hozat	0.710707	Very Suitable	Acceptable	Suitable	1525	Dsa	Cold, dry summer, hot summer
656	East Anatolia	Tunceli	Nazımiye	0.513539	Suitable	Marginal Suitable	Acceptable	1578	Dsa	Cold, dry summer, hot summer
684	East Anatolia	Tunceli	Ovacık/Tunceli	0.195122	Marginal Suitable	Marginal Suitable	Marginal Suitable	1257	Dsa	Cold, dry summer, hot summer
712	East Anatolia	Tunceli	Pulumur	0.166659	Marginal Suitable	Marginal Suitable	Marginal Suitable	1524	Dsb	Cold, dry summer, warm summer
301	East Anatolia	Van	Edremit/Van	0.463099	Suitable	Marginal Suitable	Acceptable	1736	BSk	Arid, steppe, cold
876	East Anatolia	Van	Van/Merkez	0.368440	Acceptable	Marginal Suitable	Marginal Suitable	1728	BSk	Arid, steppe, cold
408	East Anatolia	Van	Gürpınar	0.332259	Acceptable	Marginal Suitable	Marginal Suitable	1748	BSk	Arid, steppe, cold
319	East Anatolia	Van	Erciş	0.302973	Acceptable	Marginal Suitable	Marginal Suitable	1691	Dsb	Cold, dry summer, warm summer
367	East Anatolia	Van	Gevaş	0.301883	Acceptable	Marginal Suitable	Marginal Suitable	1694	Dsb	Cold, dry summer, warm summer
105	East Anatolia	Van	Bahçesaray	0.205753	Acceptable	Marginal Suitable	Marginal Suitable	1767	Dsb	Cold, dry summer, warm summer
734	East Anatolia	Van	Saray/Van	0.192460	Marginal Suitable	Marginal Suitable	Marginal Suitable	2095	BSk	Arid, steppe, cold
686	East Anatolia	Van	Özalp	0.182257	Marginal Suitable	Marginal Suitable	Marginal Suitable	1999	BSk	Arid, steppe, cold

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LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
118	East Anatolia	Van	Başkale	0.180476	Marginal Suitable	Marginal Suitable	Marginal Suitable	858	BSk	Arid, steppe, cold
202	East Anatolia	Van	Çatak	0.178875	Marginal Suitable	Marginal Suitable	Marginal Suitable	1500	Dsb	Cold, dry summer, warm summer
184	East Anatolia	Van	Çaldıran	0.155304	Marginal Suitable	Marginal Suitable	Marginal Suitable	2046	Dsb	Cold, dry summer, warm summer
645	East Anatolia	Van	Muradiye	0.124864	Marginal Suitable	Marginal Suitable	Marginal Suitable	1705	Dsb	Cold, dry summer, warm summer
792	Marmara	Balıkesir	Sındırgı	0.851105	Extremely Suitable	Suitable	Suitable	228	Csa	Temperate, dry summer, hot summer
752	Marmara	Balıkesir	Savaştepe	0.847138	Extremely Suitable	Suitable	Suitable	284	Csa	Temperate, dry summer, hot summer
546	Marmara	Balıkesir	Kepsut	0.845617	Extremely Suitable	Suitable	Suitable	88	Csa	Temperate, dry summer, hot summer
481	Marmara	Balıkesir	İvrindi	0.842069	Extremely Suitable	Suitable	Suitable	7	Cfa	Temperate, no dry season, hot summer
147	Marmara	Balıkesir	Bigadiç	0.838487	Extremely Suitable	Suitable	Suitable	169	Csa	Temperate, dry summer, hot summer
113	Marmara	Balıkesir	Balya	0.835682	Extremely Suitable	Suitable	Suitable	242	Csa	Temperate, dry summer, hot summer
814	Marmara	Balıkesir	Susurluk	0.829589	Extremely Suitable	Suitable	Suitable	1755	Dfb	Cold, no dry season, warm summer
179	Marmara	Balıkesir	Burhaniye	0.825766	Extremely Suitable	Suitable	Suitable	22	Csa	Temperate, dry summer, hot summer
434	Marmara	Balıkesir	Havran	0.818297	Extremely Suitable	Suitable	Suitable	43	Csa	Temperate, dry summer, hot summer
111	Marmara	Balıkesir	Balıkesir/Merkez	0.817041	Extremely Suitable	Suitable	Suitable	145	Csa	Temperate, dry summer, hot summer
294	Marmara	Balıkesir	Dursunbey	0.813017	Extremely Suitable	Suitable	Suitable	638	Csa	Temperate, dry summer, hot summer
384	Marmara	Balıkesir	Gönen/Balıkesir	0.812515	Extremely Suitable	Suitable	Suitable	41	Csa	Temperate, dry summer, hot summer
115	Marmara	Balıkesir	Bandırma	0.804557	Extremely Suitable	Suitable	Suitable	17	Csa	Temperate, dry summer, hot summer
300	Marmara	Balıkesir	Edremit/Balıkesir	0.804122	Extremely Suitable	Suitable	Suitable	31	Csa	Temperate, dry summer, hot summer
621	Marmara	Balıkesir	Manyas	0.788919	Very Suitable	Acceptable	Suitable	56	Csa	Temperate, dry summer, hot summer
383	Marmara	Balıkesir	Gömeç	0.764559	Very Suitable	Acceptable	Suitable	16	Csa	Temperate, dry summer, hot summer
623	Marmara	Balıkesir	Marmara	0.660273	Very Suitable	Acceptable	Acceptable	38	Csa	Temperate, dry summer, hot summer
97	Marmara	Balıkesir	Ayvalık	0.609769	Very Suitable	Acceptable	Acceptable	6	Csa	Temperate, dry summer, hot summer
320	Marmara	Balıkesir	Erdek	0.554999	Suitable	Acceptable	Acceptable	7	Csa	Temperate, dry summer, hot summer
472	Marmara	Bilecik	İnhisar	0.844136	Extremely Suitable	Suitable	Suitable	837	Dsb	Cold, dry summer, warm summer
148	Marmara	Bilecik	Bilecik/Merkez	0.833301	Extremely Suitable	Suitable	Suitable	513	BSk	Arid, steppe, cold
381	Marmara	Bilecik	Gölpazarı	0.804994	Extremely Suitable	Suitable	Suitable	539	Csb	Temperate, dry summer, warm summer
680	Marmara	Bilecik	Osmaneli	0.803389	Extremely Suitable	Suitable	Suitable	107	BSk	Arid, steppe, cold
696	Marmara	Bilecik	Pazaryeri	0.801016	Extremely Suitable	Suitable	Suitable	806	BSk	Arid, steppe, cold
795	Marmara	Bilecik	Söğüt	0.792063	Very Suitable	Acceptable	Suitable	20	Cfa	Temperate, no dry season, hot summer
901	Marmara	Bilecik	Yenipazar/Bilecik	0.773664	Very Suitable	Acceptable	Suitable	622	BSk	Arid, steppe, cold
169	Marmara	Bilecik	Bozüyük	0.771631	Very Suitable	Acceptable	Suitable	757	BSk	Arid, steppe, cold
610	Marmara	Bursa	Mustafa Kemalpaşa	0.859962	Extremely Suitable	Suitable	Very Suitable	27	Csa	Temperate, dry summer, hot summer
674	Marmara	Bursa	Orhangazi	0.844124	Extremely Suitable	Suitable	Suitable	115	Csa	Temperate, dry summer, hot summer
903	Marmara	Bursa	Yenişehir/Bursa	0.839519	Extremely Suitable	Suitable	Suitable	229	BSk	Arid, steppe, cold
426	Marmara	Bursa	Harmancık	0.835297	Extremely Suitable	Suitable	Suitable	689	Csa	Temperate, dry summer, hot summer
642	Marmara	Bursa	Mudanya	0.826888	Extremely Suitable	Suitable	Suitable	5	Csa	Temperate, dry summer, hot summer
660	Marmara	Bursa	Nilüfer	0.826675	Extremely Suitable	Suitable	Suitable	121	Csa	Temperate, dry summer, hot summer
360	Marmara	Bursa	Gemlik	0.823432	Extremely Suitable	Suitable	Suitable	7	Csa	Temperate, dry summer, hot summer
181	Marmara	Bursa	Büyükorhan	0.822649	Extremely Suitable	Suitable	Suitable	799	Csb	Temperate, dry summer, warm summer
503	Marmara	Bursa	Karacabey	0.821264	Extremely Suitable	Suitable	Suitable	264	Cfa	Temperate, no dry season, hot summer
673	Marmara	Bursa	Orhaneli	0.821128	Extremely Suitable	Suitable	Suitable	491	Csb	Temperate, dry summer, warm summer
409	Marmara	Bursa	Gürsu	0.819320	Extremely Suitable	Suitable	Suitable	112	Csa	Temperate, dry summer, hot summer
681	Marmara	Bursa	Osmangazi	0.815354	Extremely Suitable	Suitable	Suitable	173	Csa	Temperate, dry summer, hot summer
483	Marmara	Bursa	Iznik	0.801136	Extremely Suitable	Suitable	Suitable	1038	Csa	Temperate, dry summer, hot summer
471	Marmara	Bursa	İnegöl	0.800863	Extremely Suitable	Suitable	Suitable	208	BSk	Arid, steppe, cold
550	Marmara	Bursa	Kestel	0.799767	Very Suitable	Suitable	Suitable	122	Csa	Temperate, dry summer, hot summer
911	Marmara	Bursa	Yıldırım	0.796532	Very Suitable	Acceptable	Suitable	160	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
539	Marmara	Bursa	Keles	0.780183	Very Suitable	Acceptable	Suitable	1026	Csb	Temperate, dry summer, warm summer
607	Marmara	Çanakkale	Lapseki	0.835199	Extremely Suitable	Suitable	Suitable	9	Csa	Temperate, dry summer, hot summer
896	Marmara	Çanakkale	Yenice/Çanakkale	0.831609	Extremely Suitable	Suitable	Suitable	275	Csa	Temperate, dry summer, hot summer
146	Marmara	Çanakkale	Biga	0.822592	Extremely Suitable	Suitable	Suitable	51	Csa	Temperate, dry summer, hot summer
128	Marmara	Çanakkale	Bayramiç	0.811647	Extremely Suitable	Suitable	Suitable	106	Csa	Temperate, dry summer, hot summer
192	Marmara	Çanakkale	Çan	0.805204	Extremely Suitable	Suitable	Suitable	83	Csa	Temperate, dry summer, hot summer
342	Marmara	Çanakkale	Ezine	0.796513	Very Suitable	Acceptable	Suitable	50	Csa	Temperate, dry summer, hot summer
358	Marmara	Çanakkale	Gelibolu	0.791458	Very Suitable	Acceptable	Suitable	20	Csa	Temperate, dry summer, hot summer
95	Marmara	Çanakkale	Ayvacık/Çanakkale	0.772264	Very Suitable	Acceptable	Suitable	288	Csa	Temperate, dry summer, hot summer
298	Marmara	Çanakkale	Eceabat	0.688771	Very Suitable	Acceptable	Acceptable	9	Csa	Temperate, dry summer, hot summer
194	Marmara	Çanakkale	Çanakkale/Merkez	0.685228	Very Suitable	Acceptable	Acceptable	11	Csa	Temperate, dry summer, hot summer
370	Marmara	Çanakkale	Gökçeada	0.653153	Very Suitable	Acceptable	Acceptable	50	Csa	Temperate, dry summer, hot summer
162	Marmara	Çanakkale	Bozcaada	0.537200	Suitable	Marginal Suitable	Acceptable	41	Csa	Temperate, dry summer, hot summer
606	Marmara	Edirne	Lalapaşa	0.845637	Extremely Suitable	Suitable	Suitable	161	Cfa	Temperate, no dry season, hot summer
803	Marmara	Edirne	Süloğlu	0.809481	Extremely Suitable	Suitable	Suitable	11	Cfa	Temperate, no dry season, hot summer
634	Marmara	Edirne	Meriç	0.777466	Very Suitable	Acceptable	Suitable	42	Csa	Temperate, dry summer, hot summer
317	Marmara	Edirne	Enez	0.764653	Very Suitable	Acceptable	Suitable	18	Csa	Temperate, dry summer, hot summer
547	Marmara	Edirne	Keşan	0.761236	Very Suitable	Acceptable	Suitable	122	Csa	Temperate, dry summer, hot summer
435	Marmara	Edirne	Havsa	0.749099	Very Suitable	Acceptable	Suitable	78	Csa	Temperate, dry summer, hot summer
474	Marmara	Edirne	İpsala	0.739045	Very Suitable	Acceptable	Suitable	1081	BSk	Arid, steppe, cold
874	Marmara	Edirne	Uzunköprü	0.737045	Very Suitable	Acceptable	Suitable	32	Csa	Temperate, dry summer, hot summer
299	Marmara	Edirne	Edirne/Merkez	0.727589	Very Suitable	Acceptable	Suitable	50	Csa	Temperate, dry summer, hot summer
804	Marmara	İstanbul	Sultanbeyli	0.835218	Extremely Suitable	Suitable	Suitable	1012	BSk	Arid, steppe, cold
140	Marmara	İstanbul	Beykoz	0.824914	Extremely Suitable	Suitable	Suitable	9	Csa	Temperate, dry summer, hot summer
786	Marmara	İstanbul	Şişli	0.817410	Extremely Suitable	Suitable	Suitable	111	Csa	Temperate, dry summer, hot summer
353	Marmara	İstanbul	Gaziosmanpaşa	0.800276	Extremely Suitable	Suitable	Suitable	113	Csa	Temperate, dry summer, hot summer
746	Marmara	İstanbul	Sarıyer	0.796368	Very Suitable	Acceptable	Suitable	81	Csa	Temperate, dry summer, hot summer
865	Marmara	İstanbul	Ümraniye	0.793731	Very Suitable	Acceptable	Suitable	144	Csa	Temperate, dry summer, hot summer
203	Marmara	İstanbul	Çatalca	0.769802	Very Suitable	Acceptable	Suitable	84	Csa	Temperate, dry summer, hot summer
699	Marmara	İstanbul	Pendik	0.767460	Very Suitable	Acceptable	Suitable	35	Csa	Temperate, dry summer, hot summer
489	Marmara	İstanbul	Kağıthane	0.764972	Very Suitable	Acceptable	Suitable	16	Csa	Temperate, dry summer, hot summer
130	Marmara	İstanbul	Bayrampaşa	0.753008	Very Suitable	Acceptable	Suitable	102	Csa	Temperate, dry summer, hot summer
527	Marmara	İstanbul	Kartal	0.732705	Very Suitable	Acceptable	Suitable	9	Csa	Temperate, dry summer, hot summer
331	Marmara	İstanbul	Esenler	0.731619	Very Suitable	Acceptable	Suitable	44	Csa	Temperate, dry summer, hot summer
134	Marmara	İstanbul	Beşiktaş	0.712992	Very Suitable	Acceptable	Suitable	16	Csa	Temperate, dry summer, hot summer
776	Marmara	İstanbul	Silivri	0.711764	Very Suitable	Acceptable	Suitable	510	Csa	Temperate, dry summer, hot summer
341	Marmara	İstanbul	Eyüp	0.689831	Very Suitable	Acceptable	Acceptable	8	Csa	Temperate, dry summer, hot summer
774	Marmara	İstanbul	Sile	0.681857	Very Suitable	Acceptable	Acceptable	19	Csa	Temperate, dry summer, hot summer
102	Marmara	İstanbul	Bağcılar	0.671824	Very Suitable	Acceptable	Acceptable	34	Csa	Temperate, dry summer, hot summer
853	Marmara	İstanbul	Tuzla	0.665100	Very Suitable	Acceptable	Acceptable	9	Csa	Temperate, dry summer, hot summer
404	Marmara	İstanbul	Güngören	0.638087	Very Suitable	Acceptable	Acceptable	69	Csa	Temperate, dry summer, hot summer
343	Marmara	İstanbul	Fatih	0.637382	Very Suitable	Acceptable	Acceptable	33	Csa	Temperate, dry summer, hot summer
617	Marmara	İstanbul	Maltepe	0.634095	Very Suitable	Acceptable	Acceptable	8	Csa	Temperate, dry summer, hot summer
142	Marmara	İstanbul	Beyoğlu	0.632784	Very Suitable	Acceptable	Acceptable	82	Csa	Temperate, dry summer, hot summer
921	Marmara	İstanbul	Zeytinburnu	0.605869	Very Suitable	Acceptable	Acceptable	40	Csa	Temperate, dry summer, hot summer
314	Marmara	İstanbul	Eminönü	0.589200	Suitable	Acceptable	Acceptable	33	Csa	Temperate, dry summer, hot summer
6	Marmara	İstanbul	Adalar	0.587040	Suitable	Acceptable	Acceptable	48	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
486	Marmara	İstanbul	Kadıköy	0.585818	Suitable	Acceptable	Acceptable	32	Csa	Temperate, dry summer, hot summer
104	Marmara	İstanbul	Bahçelievler	0.584235	Suitable	Acceptable	Acceptable	28	Csa	Temperate, dry summer, hot summer
588	Marmara	İstanbul	Küçükçekmece	0.582828	Suitable	Acceptable	Acceptable	72	Csa	Temperate, dry summer, hot summer
107	Marmara	İstanbul	Bakırkoy	0.582141	Suitable	Acceptable	Acceptable	26	Csa	Temperate, dry summer, hot summer
85	Marmara	İstanbul	Avcılar	0.561031	Suitable	Acceptable	Acceptable	85	Csa	Temperate, dry summer, hot summer
180	Marmara	İstanbul	Büyükçekmece	0.559072	Suitable	Acceptable	Acceptable	2	Csa	Temperate, dry summer, hot summer
871	Marmara	İstanbul	Üsküdar	0.554370	Suitable	Acceptable	Acceptable	14	Csa	Temperate, dry summer, hot summer
609	Marmara	Kırklareli	Lüleburgaz	0.842538	Extremely Suitable	Suitable	Suitable	60	Csa	Temperate, dry summer, hot summer
570	Marmara	Kırklareli	Kofçaz	0.823529	Extremely Suitable	Suitable	Suitable	434	Cfb	Temperate, no dry season, warm summer
559	Marmara	Kırklareli	Kırklareli/Merkez	0.801403	Extremely Suitable	Suitable	Suitable	231	Csa	Temperate, dry summer, hot summer
706	Marmara	Kırklareli	Pınarhisar	0.788988	Very Suitable	Acceptable	Suitable	190	Csa	Temperate, dry summer, hot summer
880	Marmara	Kırklareli	Vize	0.788373	Very Suitable	Acceptable	Suitable	174	Csa	Temperate, dry summer, hot summer
258	Marmara	Kırklareli	Demirköy	0.775456	Very Suitable	Acceptable	Suitable	302	Cfa	Temperate, no dry season, hot summer
698	Marmara	Kırklareli	Pehlivanköy	0.764570	Very Suitable	Acceptable	Suitable	28	Csa	Temperate, dry summer, hot summer
100	Marmara	Kırklareli	Babaeski	0.759292	Very Suitable	Acceptable	Suitable	59	Csa	Temperate, dry summer, hot summer
514	Marmara	Kocaeli	Karamürsel	0.806260	Extremely Suitable	Suitable	Suitable	1159	Csa	Temperate, dry summer, hot summer
499	Marmara	Kocaeli	Kandıra	0.804667	Extremely Suitable	Suitable	Suitable	1128	BSk	Arid, steppe, cold
266	Marmara	Kocaeli	Derince	0.800835	Extremely Suitable	Suitable	Suitable	39	Csa	Temperate, dry summer, hot summer
375	Marmara	Kocaeli	Gölcük	0.733079	Very Suitable	Acceptable	Suitable	14	Csa	Temperate, dry summer, hot summer
566	Marmara	Kocaeli	Kocaeli/Izmit	0.673360	Very Suitable	Acceptable	Acceptable	7	Csa	Temperate, dry summer, hot summer
575	Marmara	Kocaeli	Körfez	0.667052	Very Suitable	Acceptable	Acceptable	60	Csa	Temperate, dry summer, hot summer
355	Marmara	Kocaeli	Gebze	0.664111	Very Suitable	Acceptable	Acceptable	184	Csa	Temperate, dry summer, hot summer
796	Marmara	Sakarya	Söğütlü	0.840627	Extremely Suitable	Suitable	Suitable	74	Csa	Temperate, dry summer, hot summer
532	Marmara	Sakarya	Kaynarca	0.829605	Extremely Suitable	Suitable	Suitable	877	Csa	Temperate, dry summer, hot summer
689	Marmara	Sakarya	Pamukova	0.826918	Extremely Suitable	Suitable	Suitable	91	Csa	Temperate, dry summer, hot summer
731	Marmara	Sakarya	Sapanca	0.808791	Extremely Suitable	Suitable	Suitable	43	Cfa	Temperate, no dry season, hot summer
368	Marmara	Sakarya	Geyve	0.805754	Extremely Suitable	Suitable	Suitable	84	Csa	Temperate, dry summer, hot summer
347	Marmara	Sakarya	Ferizli	0.801754	Extremely Suitable	Suitable	Suitable	28	Cfa	Temperate, no dry season, hot summer
443	Marmara	Sakarya	Hendek	0.801738	Extremely Suitable	Suitable	Suitable	167	Cfa	Temperate, no dry season, hot summer
723	Marmara	Sakarya	Sakarya/Adapazarı	0.799172	Very Suitable	Acceptable	Suitable	30	Cfa	Temperate, no dry season, hot summer
818	Marmara	Sakarya	Taraklı	0.786777	Very Suitable	Acceptable	Suitable	449	Cfb	Temperate, no dry season, warm summer
516	Marmara	Sakarya	Karapürçek	0.786395	Very Suitable	Acceptable	Suitable	997	BSk	Arid, steppe, cold
37	Marmara	Sakarya	Akyazı	0.752946	Very Suitable	Acceptable	Suitable	45	Cfa	Temperate, no dry season, hot summer
517	Marmara	Sakarya	Karasu	0.723222	Very Suitable	Acceptable	Suitable	138	Cfa	Temperate, no dry season, hot summer
565	Marmara	Sakarya	Kocaali	0.691754	Very Suitable	Acceptable	Acceptable	35	Cfa	Temperate, no dry season, hot summer
646	Marmara	Tekirdağ	Muratlı	0.836437	Extremely Suitable	Suitable	Suitable	76	Csa	Temperate, dry summer, hot summer
242	Marmara	Tekirdağ	Çorlu	0.821658	Extremely Suitable	Suitable	Suitable	168	Csa	Temperate, dry summer, hot summer
438	Marmara	Tekirdağ	Hayrabolu	0.798278	Very Suitable	Acceptable	Suitable	62	Csa	Temperate, dry summer, hot summer
616	Marmara	Tekirdağ	Malkara	0.784508	Very Suitable	Acceptable	Suitable	222	Csa	Temperate, dry summer, hot summer
222	Marmara	Tekirdağ	Çerkezköy	0.780150	Very Suitable	Acceptable	Suitable	146	Csa	Temperate, dry summer, hot summer
733	Marmara	Tekirdağ	Saray/Tekirdağ	0.774225	Very Suitable	Acceptable	Suitable	148	Csa	Temperate, dry summer, hot summer
828	Marmara	Tekirdağ	Tekirdağ/Merkez	0.710019	Very Suitable	Acceptable	Suitable	28	BSk	Arid, steppe, cold
749	Marmara	Tekirdağ	Şarköy	0.707734	Very Suitable	Acceptable	Suitable	1127	Dfb	Cold, no dry season, warm summer
624	Marmara	Tekirdağ	Marmaraereğlisi	0.624747	Very Suitable	Acceptable	Acceptable	5	Csa	Temperate, dry summer, hot summer
52	Marmara	Yalova	Altınova	0.843037	Extremely Suitable	Suitable	Suitable	15	Csa	Temperate, dry summer, hot summer
231	Marmara	Yalova	Çiftlikköy	0.840436	Extremely Suitable	Suitable	Suitable	13	Csa	Temperate, dry summer, hot summer
240	Marmara	Yalova	Çınarcık	0.838470	Extremely Suitable	Suitable	Suitable	29	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
886	Marmara	Yalova	Yalova/Merkez	0.833267	Extremely Suitable	Suitable	Suitable	6	Csa	Temperate, dry summer, hot summer
832	Marmara	Yalova	Termal	0.830978	Extremely Suitable	Suitable	Suitable	146	Csa	Temperate, dry summer, hot summer
74	Marmara	Yalova	Armutlu	0.696206	Very Suitable	Acceptable	Acceptable	11	Csa	Temperate, dry summer, hot summer
711	Mediterranean	Adana	Pozantı	0.874381	Extremely Suitable	Suitable	Very Suitable	786	Csa	Temperate, dry summer, hot summer
42	Mediterranean	Adana	Aladağ	0.864916	Extremely Suitable	Suitable	Very Suitable	858	Csa	Temperate, dry summer, hot summer
345	Mediterranean	Adana	Feke	0.847203	Extremely Suitable	Suitable	Suitable	558	Dsa	Cold, dry summer, hot summer
508	Mediterranean	Adana	Karaisalı	0.582121	Suitable	Acceptable	Acceptable	928	Csa	Temperate, dry summer, hot summer
916	Mediterranean	Adana	Yumurtalık	0.528708	Suitable	Marginal Suitable	Acceptable	10	Csa	Temperate, dry summer, hot summer
722	Mediterranean	Adana	Saimbeyli	0.484103	Suitable	Marginal Suitable	Acceptable	971	BSk	Arid, steppe, cold
518	Mediterranean	Adana	Karataş	0.478430	Suitable	Marginal Suitable	Acceptable	5	Cfa	Temperate, no dry season, hot summer
586	Mediterranean	Adana	Kozan	0.321109	Acceptable	Marginal Suitable	Marginal Suitable	137	Csa	Temperate, dry summer, hot summer
845	Mediterranean	Adana	Tufanbeyli	0.255958	Acceptable	Marginal Suitable	Marginal Suitable	1415	Dsb	Cold, dry summer, warm summer
225	Mediterranean	Adana	Ceyhan	0.248653	Acceptable	Marginal Suitable	Marginal Suitable	31	Csa	Temperate, dry summer, hot summer
918	Mediterranean	Adana	Yüreğir	0.224247	Acceptable	Marginal Suitable	Marginal Suitable	26	Csa	Temperate, dry summer, hot summer
466	Mediterranean	Adana	İmamoğlu	0.217699	Acceptable	Marginal Suitable	Marginal Suitable	1605	Dsb	Cold, dry summer, warm summer
771	Mediterranean	Adana	Seyhan	0.206636	Acceptable	Marginal Suitable	Marginal Suitable	28	Csa	Temperate, dry summer, hot summer
454	Mediterranean	Antalya	İbradı	0.871678	Extremely Suitable	Suitable	Very Suitable	18	Csa	Temperate, dry summer, hot summer
34	Mediterranean	Antalya	Akseki	0.867822	Extremely Suitable	Suitable	Very Suitable	1057	Csa	Temperate, dry summer, hot summer
579	Mediterranean	Antalya	Korkuteli	0.864896	Extremely Suitable	Suitable	Very Suitable	996	Csa	Temperate, dry summer, hot summer
400	Mediterranean	Antalya	Gündoğmuş	0.823298	Extremely Suitable	Suitable	Suitable	890	Dsb	Cold, dry summer, warm summer
312	Mediterranean	Antalya	Elmalı	0.733743	Very Suitable	Acceptable	Suitable	1085	Csa	Temperate, dry summer, hot summer
349	Mediterranean	Antalya	Finike	0.603107	Very Suitable	Acceptable	Acceptable	5	Csa	Temperate, dry summer, hot summer
528	Mediterranean	Antalya	Kaş	0.583359	Suitable	Acceptable	Acceptable	814	BSk	Arid, steppe, cold
43	Mediterranean	Antalya	Alanya	0.569988	Suitable	Acceptable	Acceptable	9	Csa	Temperate, dry summer, hot summer
619	Mediterranean	Antalya	Manavgat	0.537806	Suitable	Marginal Suitable	Acceptable	21	Csa	Temperate, dry summer, hot summer
767	Mediterranean	Antalya	Serik	0.527292	Suitable	Marginal Suitable	Acceptable	30	Csa	Temperate, dry summer, hot summer
62	Mediterranean	Antalya	Antalya/Merkez	0.524001	Suitable	Marginal Suitable	Acceptable	62	Csa	Temperate, dry summer, hot summer
594	Mediterranean	Antalya	Kumluca	0.507144	Suitable	Marginal Suitable	Acceptable	35	Csa	Temperate, dry summer, hot summer
494	Mediterranean	Antalya	Demre	0.489177	Suitable	Marginal Suitable	Acceptable	12	Csa	Temperate, dry summer, hot summer
354	Mediterranean	Antalya	Gazipaşa	0.415253	Suitable	Marginal Suitable	Marginal Suitable	20	Csa	Temperate, dry summer, hot summer
545	Mediterranean	Antalya	Kemer/Antalya	0.220991	Acceptable	Marginal Suitable	Marginal Suitable	5	Csa	Temperate, dry summer, hot summer
13	Mediterranean	Burdur	Ağlasun	0.883689	Extremely Suitable	Suitable	Very Suitable	1144	Csa	Temperate, dry summer, hot summer
172	Mediterranean	Burdur	Bucak	0.877169	Extremely Suitable	Suitable	Very Suitable	811	Csa	Temperate, dry summer, hot summer
55	Mediterranean	Burdur	Altınyayla/Burdur	0.869845	Extremely Suitable	Suitable	Very Suitable	1245	Csa	Temperate, dry summer, hot summer
377	Mediterranean	Burdur	Gölhisar	0.866771	Extremely Suitable	Suitable	Very Suitable	1009	Csa	Temperate, dry summer, hot summer
827	Mediterranean	Burdur	Tefenni	0.859835	Extremely Suitable	Suitable	Very Suitable	1161	Csa	Temperate, dry summer, hot summer
219	Mediterranean	Burdur	Çeltikçi	0.859045	Extremely Suitable	Suitable	Very Suitable	859	Csa	Temperate, dry summer, hot summer
907	Mediterranean	Burdur	Yeşilova	0.855879	Extremely Suitable	Suitable	Suitable	1205	Csa	Temperate, dry summer, hot summer
513	Mediterranean	Burdur	Karamanlı	0.848111	Extremely Suitable	Suitable	Suitable	1063	BSk	Arid, steppe, cold
207	Mediterranean	Burdur	Çavdır	0.846270	Extremely Suitable	Suitable	Suitable	1081	Csa	Temperate, dry summer, hot summer
178	Mediterranean	Burdur	Burdur/Merkez	0.828672	Extremely Suitable	Suitable	Suitable	963	BSk	Arid, steppe, cold
544	Mediterranean	Burdur	Kemer/Burdur	0.826156	Extremely Suitable	Suitable	Suitable	1145	Csa	Temperate, dry summer, hot summer
431	Mediterranean	Hatay	Hassa	0.807495	Extremely Suitable	Suitable	Suitable	416	Csa	Temperate, dry summer, hot summer
432	Mediterranean	Hatay	Hatay/Merkez	0.727099	Very Suitable	Acceptable	Suitable	89	Csa	Temperate, dry summer, hot summer
891	Mediterranean	Hatay	Yayladağı	0.722717	Very Suitable	Acceptable	Suitable	419	Csa	Temperate, dry summer, hot summer
328	Mediterranean	Hatay	Erzin	0.653809	Very Suitable	Acceptable	Acceptable	172	Csa	Temperate, dry summer, hot summer
433	Mediterranean	Hatay	Hatay/Belen	0.645690	Very Suitable	Acceptable	Acceptable	496	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
291	Mediterranean	Hatay	Dörtyol	0.597572	Suitable	Acceptable	Acceptable	48	Csa	Temperate, dry summer, hot summer
53	Mediterranean	Hatay	Altınözü	0.593197	Suitable	Acceptable	Acceptable	258	Csa	Temperate, dry summer, hot summer
727	Mediterranean	Hatay	Samandağ	0.573220	Suitable	Acceptable	Acceptable	39	Csa	Temperate, dry summer, hot summer
476	Mediterranean	Hatay	İskenderun	0.541069	Suitable	Marginal Suitable	Acceptable	5	Csa	Temperate, dry summer, hot summer
556	Mediterranean	Hatay	Kırıkhan	0.532666	Suitable	Marginal Suitable	Acceptable	155	Csa	Temperate, dry summer, hot summer
715	Mediterranean	Hatay	Reyhanlı	0.395292	Acceptable	Marginal Suitable	Marginal Suitable	170	Csa	Temperate, dry summer, hot summer
593	Mediterranean	Hatay	Kumlu	0.378127	Acceptable	Marginal Suitable	Marginal Suitable	91	Csa	Temperate, dry summer, hot summer
816	Mediterranean	Isparta	Sütçüler	0.882034	Extremely Suitable	Suitable	Very Suitable	1030	BSk	Arid, steppe, cold
764	Mediterranean	Isparta	Senirkent	0.869056	Extremely Suitable	Suitable	Very Suitable	961	Csa	Temperate, dry summer, hot summer
385	Mediterranean	Isparta	Gönen/Isparta	0.867653	Extremely Suitable	Suitable	Very Suitable	1040	Csa	Temperate, dry summer, hot summer
304	Mediterranean	Isparta	Eğirdir	0.859881	Extremely Suitable	Suitable	Very Suitable	926	Csa	Temperate, dry summer, hot summer
861	Mediterranean	Isparta	Uluborlu	0.853315	Extremely Suitable	Suitable	Suitable	1054	Csa	Temperate, dry summer, hot summer
82	Mediterranean	Isparta	Atabey	0.849893	Extremely Suitable	Suitable	Suitable	1042	Csb	Temperate, dry summer, warm summer
479	Mediterranean	Isparta	Isparta/Merkez	0.843589	Extremely Suitable	Suitable	Suitable	1058	Csa	Temperate, dry summer, hot summer
537	Mediterranean	Isparta	Keçiborlu	0.832901	Extremely Suitable	Suitable	Suitable	1004	Csa	Temperate, dry summer, hot summer
887	Mediterranean	Isparta	Yalvaç	0.802007	Extremely Suitable	Suitable	Suitable	1103	Csb	Temperate, dry summer, warm summer
748	Mediterranean	Isparta	Şarkıkaraağaç	0.774223	Very Suitable	Acceptable	Suitable	1234	BSk	Arid, steppe, cold
357	Mediterranean	Isparta	Gelendost	0.770884	Very Suitable	Acceptable	Suitable	952	Csa	Temperate, dry summer, hot summer
902	Mediterranean	Isparta	Yenişarbademli	0.759008	Very Suitable	Acceptable	Suitable	1181	Dsb	Cold, dry summer, warm summer
35	Mediterranean	Isparta	Aksu/Isparta	0.726694	Very Suitable	Acceptable	Suitable	1223	Csa	Temperate, dry summer, hot summer
694	Mediterranean	Kahramanmaraş	Pazarcık	0.867818	Extremely Suitable	Suitable	Very Suitable	750	Csa	Temperate, dry summer, hot summer
491	Mediterranean	Kahramanmaraş	Kahramanmaraş/Merkez	0.856424	Extremely Suitable	Suitable	Suitable	889	BSk	Arid, steppe, cold
182	Mediterranean	Kahramanmaraş	Çağlayancerit	0.851565	Extremely Suitable	Suitable	Suitable	1103	Dsa	Cold, dry summer, hot summer
61	Mediterranean	Kahramanmaraş	Andırın	0.814585	Extremely Suitable	Suitable	Suitable	1047	Csa	Temperate, dry summer, hot summer
850	Mediterranean	Kahramanmaraş	Türkoğlu	0.787049	Very Suitable	Acceptable	Suitable	488	Csa	Temperate, dry summer, hot summer
663	Mediterranean	Kahramanmaraş	Nurhak	0.699232	Very Suitable	Acceptable	Acceptable	1401	Dsb	Cold, dry summer, warm summer
9	Mediterranean	Kahramanmaraş	Afsin	0.645162	Very Suitable	Acceptable	Acceptable	1237	BSk	Arid, steppe, cold
308	Mediterranean	Kahramanmaraş	Elbistan	0.630109	Very Suitable	Acceptable	Acceptable	1139	BSk	Arid, steppe, cold
305	Mediterranean	Kahramanmaraş	Ekinözü	0.568827	Suitable	Acceptable	Acceptable	1282	BSk	Arid, steppe, cold
372	Mediterranean	Kahramanmaraş	Göksun	0.391638	Acceptable	Marginal Suitable	Marginal Suitable	1347	Dsb	Cold, dry summer, warm summer
190	Mediterranean	Mersin	Çamlıyayla	0.819349	Extremely Suitable	Suitable	Suitable	1168	Csa	Temperate, dry summer, hot summer
394	Mediterranean	Mersin	Gülnar	0.723135	Very Suitable	Acceptable	Suitable	965	Csa	Temperate, dry summer, hot summer
650	Mediterranean	Mersin	Mut	0.616523	Very Suitable	Acceptable	Acceptable	314	Csa	Temperate, dry summer, hot summer
455	Mediterranean	Mersin	İçel/Mersin	0.579767	Suitable	Acceptable	Acceptable	765	Csa	Temperate, dry summer, hot summer
321	Mediterranean	Mersin	Erdemli	0.512646	Suitable	Marginal Suitable	Acceptable	13	Csa	Temperate, dry summer, hot summer
775	Mediterranean	Mersin	Silifke	0.507809	Suitable	Marginal Suitable	Acceptable	11	Csa	Temperate, dry summer, hot summer
90	Mediterranean	Mersin	Aydıncık/Mersin	0.485752	Suitable	Marginal Suitable	Acceptable	21	Csa	Temperate, dry summer, hot summer
170	Mediterranean	Mersin	Bozyazı	0.479074	Suitable	Marginal Suitable	Acceptable	6	Csa	Temperate, dry summer, hot summer
60	Mediterranean	Mersin	Anamur	0.414958	Suitable	Marginal Suitable	Marginal Suitable	33	Csa	Temperate, dry summer, hot summer
819	Mediterranean	Mersin	Tarsus	0.358249	Acceptable	Marginal Suitable	Marginal Suitable	25	Csa	Temperate, dry summer, hot summer
103	Mediterranean	Osmaniye	Bahçe	0.863413	Extremely Suitable	Suitable	Very Suitable	594	Csa	Temperate, dry summer, hot summer
296	Mediterranean	Osmaniye	Düziçi	0.850910	Extremely Suitable	Suitable	Suitable	401	Dsa	Cold, dry summer, hot summer
428	Mediterranean	Osmaniye	Hasanbeyli	0.839051	Extremely Suitable	Suitable	Suitable	753	Csa	Temperate, dry summer, hot summer
682	Mediterranean	Osmaniye	Osmaniye/Merkez	0.672777	Very Suitable	Acceptable	Acceptable	121	Csa	Temperate, dry summer, hot summer
839	Mediterranean	Osmaniye	Toprakkale	0.584666	Suitable	Acceptable	Acceptable	57	Csa	Temperate, dry summer, hot summer
809	Mediterranean	Osmaniye	Sumbas	0.528164	Suitable	Marginal Suitable	Acceptable	762	BSk	Arid, steppe, cold
485	Mediterranean	Osmaniye	Kadirli	0.343499	Acceptable	Marginal Suitable	Marginal Suitable	93	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	**REGION**	**PROVINCE**	**LOCATION**	**HCSI**	**EIC**	**PC**	**NBC**	**ALTITUDE (m)**	**CLIMATE TYPE**	**CLIMATE TYPE DEFINITION**
374	Sout-East Anatolia	Adıyaman	Gölbaşı/Adıyaman	0.865679	Extremely Suitable	Suitable	Very Suitable	902	Csa	Temperate, dry summer, hot summer
851	Sout-East Anatolia	Adıyaman	Tut	0.854323	Extremely Suitable	Suitable	Suitable	929	Csa	Temperate, dry summer, hot summer
782	Sout-East Anatolia	Adıyaman	Sincik	0.844740	Extremely Suitable	Suitable	Suitable	27	Cfa	Temperate, no dry season, hot summer
217	Sout-East Anatolia	Adıyaman	Çelikhan	0.785424	Very Suitable	Acceptable	Suitable	1388	Dsa	Cold, dry summer, hot summer
364	Sout-East Anatolia	Adıyaman	Gerger	0.782999	Very Suitable	Acceptable	Suitable	750	Csa	Temperate, dry summer, hot summer
136	Sout-East Anatolia	Adıyaman	Besni	0.562534	Suitable	Acceptable	Acceptable	902	Csa	Temperate, dry summer, hot summer
8	Sout-East Anatolia	Adıyaman	Adıyaman/Merkez	0.534574	Suitable	Marginal Suitable	Acceptable	701	Csa	Temperate, dry summer, hot summer
728	Sout-East Anatolia	Adıyaman	Samsat	0.484980	Suitable	Marginal Suitable	Acceptable	593	Csa	Temperate, dry summer, hot summer
492	Sout-East Anatolia	Adıyaman	Kahta	0.440637	Suitable	Marginal Suitable	Acceptable	562	Csa	Temperate, dry summer, hot summer
751	Sout-East Anatolia	Batman	Sason	0.828331	Extremely Suitable	Suitable	Suitable	908	Dsa	Cold, dry summer, hot summer
587	Sout-East Anatolia	Batman	Kozluk	0.412876	Suitable	Marginal Suitable	Marginal Suitable	874	Csa	Temperate, dry summer, hot summer
362	Sout-East Anatolia	Batman	Gercüş	0.349696	Acceptable	Marginal Suitable	Marginal Suitable	955	Csa	Temperate, dry summer, hot summer
135	Sout-East Anatolia	Batman	Beşiri	0.339692	Acceptable	Marginal Suitable	Marginal Suitable	751	Csa	Temperate, dry summer, hot summer
429	Sout-East Anatolia	Batman	Hasankeyf	0.327298	Acceptable	Marginal Suitable	Marginal Suitable	513	Csa	Temperate, dry summer, hot summer
121	Sout-East Anatolia	Batman	Batman/Merkez	0.309302	Acceptable	Marginal Suitable	Marginal Suitable	570	Csa	Temperate, dry summer, hot summer
248	Sout-East Anatolia	Diyarbakır	Çüngüş	0.857964	Extremely Suitable	Suitable	Suitable	978	Dsa	Cold, dry summer, hot summer
608	Sout-East Anatolia	Diyarbakır	Lice	0.843756	Extremely Suitable	Suitable	Suitable	997	Dsa	Cold, dry summer, hot summer
223	Sout-East Anatolia	Diyarbakır	Çermik	0.843714	Extremely Suitable	Suitable	Suitable	686	Csa	Temperate, dry summer, hot summer
590	Sout-East Anatolia	Diyarbakır	Kulp	0.837299	Extremely Suitable	Suitable	Suitable	1015	Dsa	Cold, dry summer, hot summer
325	Sout-East Anatolia	Diyarbakır	Ergani	0.826049	Extremely Suitable	Suitable	Suitable	951	Csa	Temperate, dry summer, hot summer
272	Sout-East Anatolia	Diyarbakır	Dicle	0.706536	Very Suitable	Acceptable	Acceptable	939	Csa	Temperate, dry summer, hot summer
424	Sout-East Anatolia	Diyarbakır	Hani	0.683465	Very Suitable	Acceptable	Acceptable	900	Dsa	Cold, dry summer, hot summer
303	Sout-East Anatolia	Diyarbakır	Eğil	0.489108	Suitable	Marginal Suitable	Acceptable	855	Csa	Temperate, dry summer, hot summer
440	Sout-East Anatolia	Diyarbakır	Hazro	0.476580	Suitable	Marginal Suitable	Acceptable	1012	Dsa	Cold, dry summer, hot summer
567	Sout-East Anatolia	Diyarbakır	Kocaköy	0.408773	Suitable	Marginal Suitable	Marginal Suitable	969	Csa	Temperate, dry summer, hot summer
280	Sout-East Anatolia	Diyarbakır	Diyarbakır/Merkez	0.350073	Acceptable	Marginal Suitable	Marginal Suitable	674	Csa	Temperate, dry summer, hot summer
239	Sout-East Anatolia	Diyarbakır	Çınar	0.335062	Acceptable	Marginal Suitable	Marginal Suitable	673	Csa	Temperate, dry summer, hot summer
151	Sout-East Anatolia	Diyarbakır	Bismil	0.324918	Acceptable	Marginal Suitable	Marginal Suitable	548	Csa	Temperate, dry summer, hot summer
778	Sout-East Anatolia	Diyarbakır	Silvan	0.315571	Acceptable	Marginal Suitable	Marginal Suitable	808	Csb	Temperate, dry summer, warm summer
662	Sout-East Anatolia	Gaziantep	Nurdağı	0.872895	Extremely Suitable	Suitable	Very Suitable	529	Csa	Temperate, dry summer, hot summer
478	Sout-East Anatolia	Gaziantep	Islahiye	0.837135	Extremely Suitable	Suitable	Suitable	503	Csa	Temperate, dry summer, hot summer
758	Sout-East Anatolia	Gaziantep	Şehitkamil	0.804652	Extremely Suitable	Suitable	Suitable	1391	Dsa	Cold, dry summer, hot summer
721	Sout-East Anatolia	Gaziantep	Şahinbey	0.798927	Very Suitable	Acceptable	Suitable	325	Csb	Temperate, dry summer, warm summer
667	Sout-East Anatolia	Gaziantep	Oğuzeli	0.498683	Suitable	Marginal Suitable	Acceptable	687	Csa	Temperate, dry summer, hot summer
63	Sout-East Anatolia	Gaziantep	Araban	0.467763	Suitable	Marginal Suitable	Acceptable	530	Csa	Temperate, dry summer, hot summer
890	Sout-East Anatolia	Gaziantep	Yavuzeli	0.440696	Suitable	Marginal Suitable	Acceptable	568	Csa	Temperate, dry summer, hot summer
661	Sout-East Anatolia	Gaziantep	Nizip	0.336367	Acceptable	Marginal Suitable	Marginal Suitable	535	Csa	Temperate, dry summer, hot summer
522	Sout-East Anatolia	Gaziantep	Karkamış	0.253678	Acceptable	Marginal Suitable	Marginal Suitable	387	BSk	Arid, steppe, cold
649	Sout-East Anatolia	Kilis	Musabeyli	0.707824	Very Suitable	Acceptable	Suitable	745	Csa	Temperate, dry summer, hot summer
707	Sout-East Anatolia	Kilis	Polateli	0.603291	Very Suitable	Acceptable	Acceptable	840	Csa	Temperate, dry summer, hot summer
552	Sout-East Anatolia	Kilis	Kilis/Merkez	0.510024	Suitable	Marginal Suitable	Acceptable	660	Csa	Temperate, dry summer, hot summer
307	Sout-East Anatolia	Kilis	Elbeyli	0.334027	Acceptable	Marginal Suitable	Marginal Suitable	519	Csa	Temperate, dry summer, hot summer
627	Sout-East Anatolia	Mardin	Mazıdağı	0.418049	Suitable	Marginal Suitable	Marginal Suitable	1048	Csa	Temperate, dry summer, hot summer
754	Sout-East Anatolia	Mardin	Savur	0.412542	Suitable	Marginal Suitable	Marginal Suitable	877	Csa	Temperate, dry summer, hot summer
671	Sout-East Anatolia	Mardin	Ömerli	0.404215	Suitable	Marginal Suitable	Marginal Suitable	1089	Csa	Temperate, dry summer, hot summer
637	Sout-East Anatolia	Mardin	Midyat	0.384756	Acceptable	Marginal Suitable	Marginal Suitable	944	Csa	Temperate, dry summer, hot summer
906	Sout-East Anatolia	Mardin	Yeşilli	0.375341	Acceptable	Marginal Suitable	Marginal Suitable	822	Csa	Temperate, dry summer, hot summer

GRAPE CLIMATE SUITABILITY INDEX and CLASSIFICATIONS										
LOCATION ID	REGION	PROVINCE	LOCATION	HCSI	EIC	PC	NBC	ALTITUDE (m)	CLIMATE TYPE	CLIMATE TYPE DEFINITION
253	Sout-East Anatolia	Mardin	Dargeçit	0.336360	Acceptable	Marginal Suitable	Marginal Suitable	902	Csa	Temperate, dry summer, hot summer
265	Sout-East Anatolia	Mardin	Derik	0.332546	Acceptable	Marginal Suitable	Marginal Suitable	799	Csa	Temperate, dry summer, hot summer
622	Sout-East Anatolia	Mardin	Mardin/Merkez	0.310205	Acceptable	Marginal Suitable	Marginal Suitable	938	Csa	Temperate, dry summer, hot summer
564	Sout-East Anatolia	Mardin	Kızıltepe	0.233202	Acceptable	Marginal Suitable	Marginal Suitable	485	Csa	Temperate, dry summer, hot summer
664	Sout-East Anatolia	Mardin	Nusaybin	0.201638	Acceptable	Marginal Suitable	Marginal Suitable	475	Csa	Temperate, dry summer, hot summer
127	Sout-East Anatolia	Siirt	Baykan	0.843826	Extremely Suitable	Suitable	Suitable	720	Dsa	Cold, dry summer, hot summer
327	Sout-East Anatolia	Siirt	Eruh	0.830135	Extremely Suitable	Suitable	Suitable	1164	Csa	Temperate, dry summer, hot summer
785	Sout-East Anatolia	Siirt	Şirvan	0.824596	Extremely Suitable	Suitable	Suitable	905	Csa	Temperate, dry summer, hot summer
702	Sout-East Anatolia	Siirt	Pervari	0.743662	Very Suitable	Acceptable	Suitable	1376	Dsa	Cold, dry summer, hot summer
92	Sout-East Anatolia	Siirt	Aydınlar	0.487180	Suitable	Marginal Suitable	Acceptable	118	Csa	Temperate, dry summer, hot summer
598	Sout-East Anatolia	Siirt	Kurtalan	0.460137	Suitable	Marginal Suitable	Acceptable	715	Csa	Temperate, dry summer, hot summer
773	Sout-East Anatolia	Siirt	Siirt/Merkez	0.444491	Suitable	Marginal Suitable	Acceptable	887	Csa	Temperate, dry summer, hot summer
789	Sout-East Anatolia	Şanlıurfa	Siverek	0.562712	Suitable	Acceptable	Acceptable	1273	Dsa	Cold, dry summer, hot summer
444	Sout-East Anatolia	Şanlıurfa	Hilvan	0.382198	Acceptable	Marginal Suitable	Marginal Suitable	592	Csa	Temperate, dry summer, hot summer
418	Sout-East Anatolia	Şanlıurfa	Halfeti	0.348175	Acceptable	Marginal Suitable	Marginal Suitable	664	Csa	Temperate, dry summer, hot summer
167	Sout-East Anatolia	Şanlıurfa	Bozova	0.297687	Acceptable	Marginal Suitable	Marginal Suitable	582	Csa	Temperate, dry summer, hot summer
150	Sout-East Anatolia	Şanlıurfa	Birecik	0.290115	Acceptable	Marginal Suitable	Marginal Suitable	343	Csa	Temperate, dry summer, hot summer
812	Sout-East Anatolia	Şanlıurfa	Suruç	0.285736	Acceptable	Marginal Suitable	Marginal Suitable	46	Csa	Temperate, dry summer, hot summer
867	Sout-East Anatolia	Şanlıurfa	Şanlıurfa/Merkez	0.284954	Acceptable	Marginal Suitable	Marginal Suitable	985	Csb	Temperate, dry summer, warm summer
879	Sout-East Anatolia	Şanlıurfa	Viranşehir	0.271594	Acceptable	Marginal Suitable	Marginal Suitable	566	Csa	Temperate, dry summer, hot summer
427	Sout-East Anatolia	Şanlıurfa	Harran	0.236375	Acceptable	Marginal Suitable	Marginal Suitable	374	Csa	Temperate, dry summer, hot summer
21	Sout-East Anatolia	Şanlıurfa	Akçakale	0.227744	Acceptable	Marginal Suitable	Marginal Suitable	359	BSh	Arid, steppe, hot
226	Sout-East Anatolia	Şanlıurfa	Ceylanpınar	0.193232	Marginal Suitable	Marginal Suitable	Marginal Suitable	364	Csa	Temperate, dry summer, hot summer
862	Sout-East Anatolia	Şırnak	Uludere	0.806858	Extremely Suitable	Suitable	Suitable	1227	Dsa	Cold, dry summer, hot summer
794	Sout-East Anatolia	Şırnak	Şırnak/Merkez	0.699685	Very Suitable	Acceptable	Acceptable	49	Csa	Temperate, dry summer, hot summer
391	Sout-East Anatolia	Şırnak	Güçlükonak	0.311596	Acceptable	Marginal Suitable	Marginal Suitable	791	Csa	Temperate, dry summer, hot summer
456	Sout-East Anatolia	Şırnak	İdil	0.261460	Acceptable	Marginal Suitable	Marginal Suitable	870	Dfb	Cold, no dry season, warm summer
145	Sout-East Anatolia	Şırnak	Beytüşşebap	0.249901	Acceptable	Marginal Suitable	Marginal Suitable	1546	Dsa	Cold, dry summer, hot summer
237	Sout-East Anatolia	Şırnak	Cizre	0.226910	Acceptable	Marginal Suitable	Marginal Suitable	374	Csa	Temperate, dry summer, hot summer
777	Sout-East Anatolia	Şırnak	Silopi	0.202796	Acceptable	Marginal Suitable	Marginal Suitable	840	Csa	Temperate, dry summer, hot summer