Draft

WHEAT LANDRACES INVENTORY OF TURKEY

Mustafa KAN, Murat KÜÇÜKÇONGAR, Mesut KESER,
Alexey MORGOUNOV, Hafiz MUMINJANOV,
Fatih ÖZDEMIR, Calvin QUALSET


K A R A D E N İ Z
A K D E N İ Z
BULGARISTAN
YUNANISTAN
GÜRCİSTAN
AZERBAYCAN
ERMENISTAN
İRAN
İRAK
SURİYE
MARMARA DENİZİ
EGE DENİZİ
T.C.
BAYINDIRLIK VE İSKAN BAKANLIĞI
KARAYOLLARI GENEL MÜDÜRLÜĞÜ
BAKIM ŞUBESİ MÜDÜRLÜĞÜ
ENVANTER VE YOLAĞI ŞEFLİĞİ
İŞARETLER
LEGEND

CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

BV	Botanical Variety
CIMMYT	International Maize and Wheat Improvement Center
CGR	Conservation of Genetic Resources
EU	European Union
FAO	Food and Agriculture Organization
GDAR	General Directorate of Agricultural Research and Policies
GDP	Gross Domestic Production
GEF	Global Environment Facility
GI	Geograhical Indication
HR	Head Rows
ICARDA	International Center for Agricultural Research in the Dry Areas
LR	Land Races
MEU	Ministry of Environment and Urbanization
MFAL	Ministry of Food, Agriculture and Livestock
MV	Modern Varieties
NGO	Non Government Organization
OECD	Organisation for Economic Co-operation and Development
SGP	Small Grants Programme
TL	Turkish Lira

TSI	Turkish Statistical Institute
TTSM	Variety Registration and Seed Certification Center
TUBITAK	Turkish Scientific and Techno-logical Council
TSI (TUIK)	Turkish Statistic Institute
UNDP	United Nations Development Programme
WWF	World Wide Fund

LIST OF FIGURES AND PHOTOS

LIST OF TABLES

ACKNOWLEDGEMENT

This research has been conducted in 65 provinces between 2009-2014 years with 1973 farmers in Turkey. I would like to thank and extend my best regards to the following people for their invaluable help throughout the research: Province / District Directorates of Food, Agriculture and Livestock directors and experts, the United Nations Food and Agriculture Organization (FAO) for all kinds of financial and moral support, Dr. Hafiz Muminjanov (FAO), IWWIP Coordinator and Director of Bahri Dagdas International Agricultural Research Institute, Dr. Fatih OZDEMİR, CIMMYT and ICARDA stuffs, the scientist from different universities and research institutes; Dr. Enver KENDAL, Dr. Hakan HEKİMHAN, Dr.Mustafa GÜLLÜ, Ass. Prof. Köksal KARATAŞ, Dr. Emin DÖNMEZ, Sevinç KARABAK, Rahmi TAŞÇI, Oğuzhan ULUCAN, Soner YÜKSEL, Mustafa ÇAKMAK, Dr. Ümran KÜÇÜKÖZDEMİR, Enis YAKIŞIR, İbrahim KAÇMAZ, Ercan DOĞAN, Erdal KABLAN, Adem ESKİCİ, Fatih SARI, Prof. Dr. Ela ATIŞ, Muhittin BÖGET, Süleyman BAKIRCI, Dr. Arzu KAN, Ass. Prof. Sezen KÜÇÜKÇONGAR and all the participating farmers in the study area. 01/11/2014

EXECUTIVE SUMMARY

Turkey is located at a unique position from the view point of plant genetic diversity. Due to its great variety in geomorphology, topography and climate, Turkey has large diversity of habitats so it is very rich in plant species and endemism. One of them, even the most important one is wheat. Wheat is one of the most important agricultural commodities in Turkey, and the country ranks among the top ten producers in the world. It is a staple and strategic crop and an essential food in the Turkish diet, consumed mostly as bread, but also as bulgur, yufka (falt bread) and cookies. Total annual wheat production is estimated at 19.6 million tones, valued at approximately US$6,9 billion in 2010. Total production area is approximately 8 million hectares (FAO, 2012). Value addition via processing make the wheat industry one of the major sectors in the economy.

Turkey, both in terms of environmental conditions and in terms of culture is very suitable for wheat cultivation. At the same time Turkey is the mother land of wheat. Wheat is generally produced in Thrace, Mediterranean and Aegean and Marmara Seaside places as spring type and in the other places it is produced as winter type. The average yield of the wheat is 2441 kg/ha in Turkey (FAO, 2012[1]).

The cultivation of wheat in Turkey for over 8,000 years has resulted in a large number of named wheat varieties in addition to the existing wild and semi domesticated wheat relatives. Modern (improved) varieties have been available in Turkey since the early part of 20th century and semi dwarf varieties were introduced from Mexico in 1966; however, the level of adoption in the country varies greatly from region to region. After the introduction of new varieties to the country there was big take-off on the wheat yield. Same time these results were an indication of the increase in the use of inputs such as fertilizers and pesticides as well as the use of modern wheat varieties.

Now Turkey achieved self-sufficiency in many products such as wheat and it is also one of the wheat exporting countries. In this case, improved new varieties and production techniques have a great contribution. While on the one hand the increasing wheat production depending to high yield potential can be seen as positive development, on the other hand, Accessing the new wheat varieties to production process led to extinction of genetic resource (local wheat

[1] FAO, (2012). Production Statistics, http://faostat.fao.org/

varieties/landraces). Some research report from Turkey showed that the share of modern wheat varieties in Turkish agriculture was very high and the share of local landraces was under the 1% percent in total wheat production area in the country (Mazid and et all., 2009[2]). This result showed that there has been a decline in crop genetic diversity in side of the wheat crop.

Turkey is one of the ***Centers of Origin*** of wheat and wheat has been grown around 8.5 million ha with production of around 20 million tons annually. Though modern varieties have been widely grown in most areas, some Land Races (LR) have still been planted in some niches, especially in remote and mountainous areas mainly for home consumptions with small marketing. With these studies, in Turkey, the average altitude of currently grown wheat landrace populations is 1,133 m and 93.22% of the wheat landrace producers is producing wheat landraces for subsistence aiming were determined.

Main data of the research have consisted of the questionnaire forms being fulfilled by the researchers with the wheat landrace producers. In 2009, with collaboration of CIMMYT, ICARDA and Turkey, surveys were started to address the questions of where and why the LR's have still been planted. Surveys and collections from the fields of LR's have been made in 2009-2014. FAO contributed and supported in 2012 and 2013. Botanical Variety (BV) descriptions have been made for each collected samples and single Head Rows (HR) of all collections planted accordingly with BV grouping in 2009-2014. Selected HR's were harvested and planted as yield trials using modern varieties as checks in the trials for 2009-2013 years.

The study can be divided to the two parts. In the first part, the project was carried out CIMMYT-ICARDA and Turkey partnerships under the project named "Improvement of traditional wheat varieties and landraces in drylands of Turkey through utilization of modern breeding tools and participatory selection" in 2009-2010-2011 and the second part, in 2012 and 2013, FAO joined the collaboration and in 2014, the project was completed with CIMMYT-ICARDA and Turkey collaboration. In total, 1873 questionare forms were fulfilled with wheat landrace producers via face to face in 65 provinces of Turkey and the some socio-economic results of them were summarized and presented in the research. The main aim of the research was to determine the general condition of wheat landraces in Turkey and seek an answer to

- ***"Where the wheat landraces are being produced"***,

[2] Mazid A, Amegbeto K.N, Keser M, Morgounov A,Peker K, Bağci A, Akın M, Küçükçongar M, **Kan M,** Karabak S, Semerci A, Altıkat A, Yaktubay S. 2009. Adoption and Impacts of Improved Winter and Spring Varieties in Turkey. ICARDA, ALEPPO, SYRIA.

- "***Why and how the farmers are producing landraces"***
- ***"How can be provided the maintainance of wheat landraces production in their own area (in situ conservation)"*** questions.

The study was consisted of 6 chapters. At the first chapter ***"Introduction"*** Turkey agriculture and its geographical and historical position were introduced. At the second chapter ***"The State of Wheat Diversity"***, the brief information on wheat in Turkey was wxplained with its historical process. The third chapter ***"National Inventory of Wheat Landraces and Mapping"*** is the part where the research area was introduced and some general situation of the collected wheat landrace material in there. The wheat landrace producers were divided to two groups as***"Only Wheat Landrace Producers (1320 farmers)"*** and ***"Both Wheat Landrace and Modern Wheat Varieties Producers (468 farmers)"***and all analyses were done according to this classification. At the foruth chapter ***"Farmer Practises and Decision Making of Wheat Landraces"***, the producers' agronomic practices were compared by the regions. It is seen that the wheat landraces are mostly produced by the farmers at the harsh condion with basic equipments.At the fifth chapter "Valuing of Local Wheat Landreces", the answer to the question ***-which factors are presenting to the decision of farmers-*** was looked. The age and educaton level of farmers, the number of household, the share of wheat landracesin total area, marketing distance, altitude, socio-economic index of district, modern wheat varieties pre-trial statusof the farmers are statistically significant factors on decision of the farmers on wheat landrace production. At the sixth chapter ***"Sustainability ofWheat Landraces-NGO"***, we evaluated the NGO's position on mainteinance of wheat landrace production at the farm level (ex-situ conservation). At the last chapter"Conclusion and Recommendation", we did SWOT Analysis and tried to put new approaches for preventing genetic erosion on wheat landraces.

As a brief result of the study, wheat landraces are being produced by the farmers in generally remote areas for subsistence farming in Turkey. But day by day, the number of farmers producing wheat landraces and different wheat landrace populations are decreasing. As a country, we have good strategy to conserve them in gene banks as *ex situ* conservation, but we should need to focus more for mainteinance of them in farmer condition as *in situ* conservation and improve conservation and sustainability strategies as using different devices like organic farming, geographical indications, mountainous product, local product etc. We also need to raise the awairness of public on importance of genetic resources and valuation strategies of them.

CHAPTER 1

INTRODUCTION

1.1 Description of the Country and Geographical Information

Turkey lies in the Northern Hemisphere near the centre of the "Old world Continents", i.e. Asia, Africa, and Europe. More specifically, it lies near the western and central part of the European and North African countries. Turkey also occupies a middle position between the North Pole and the Equator. With this geographical position, Turkey extends between the 42N and 36N latitudes and between the 25 40'E, longitudes. In the west, it borders on Greece and Bulgaria, in the east on Georgia, Armenia, Nakhchevan and Iran, and in the south on Iraq and Syria (Anonymous, 2012a).

Turkey's area is 774 815 square kilometres, 97% of which lies in Asia (the Anatolian Plateau) and the remaining 3% in Europe (Thrace). The Turkish shoreline stretches for 8,210 kilometres along the Meditterranean in the South, the Aegean in the west and the Black Sea in the North. In the northwest there is also the important inland Sea of Marmara, between the straits of the Dardanelles and the Bosphorus, important waterways that connect the Black Sea with the rest of the world. The country is roughly rectangular in shape, measuring 1 600 kilometres from east to west, and 650 from north to south (Anonymous, 2012a).

The high plateau region of Anatolia rises progressively towards the east and is divided by valleys formed by 15 rivers, including the Tigris and Euphrates, which originate in eastern Anatolia and flow southward to the Persian Gulf through Syria and Iraq. The largest river entirely within Turkey is the Kızılırmak, which flows northward past Ankara into the Black Sea. Among the numerous lakes there are some, such as Lake Van, which are as large as inland seas (Anonymous, 2012a).

With its geographically important position, its vast land its constantly increasing population, Turkey is a powelful entity and a valuable element of stability especially in this part of the world.

Turkey's borders are very long and bear various characteristics. Its land borders cover 2753 km, and its sea borders are 6,000 km. long. Turkey's border with Syria is 877 km, long. Its border

with Iraq: 331 km, with Iran: 454 km, with the former Soviet Union: 610 km, with Greece: 212 km, and with Bulgaria 269 km (Anonymous, 2012b).

It is country of high elevation with an average altitude of 1,130 metres. Mountain ranges extend from the west to the east along the northern and southern coasts of the country. There are, however a good many plains, plateaus, highlands and basins (Anonymous, 2012b)..

With 81 administrative provinces, Turkey is divided seven geographical regions: the Marmara Region, the Black Sea Region, the Mediterranean Region, the Eastern Anatolian Region, the Aegean Region, and the Central Anatolian Region, each of which possesses unique climatic and ecological features.

Although Turkey is situated in large Mediterranean geographical location where climatic conditions are quite temperate, diverse nature of the landscape, and the existence in particular of the mountains that run parallel to the coasts, result in significant differences in climatic conditions from one region to the other. While the coastal areas enjoy milder climates, the inland Anatolian plateau experiences extremes of hot summers and cold winters with limited rainfall (Sensoy and et al., 2012).

Turkey receives most of the rainfall in the winter season. In this season, mean temperature usually is below 5°C and there is no too much evaporation. But summer rainfall is very limited and could not be enough to remove water deficit resulted from increased temperature and evaporation (Sensoy and et al., 2012).

The Aegean and Mediterranean coasts have cool, rainy winters and hot, moderately dry summers. Annual precipitation in those areas varies from 580 to 1,300 millimeters, depending on location. The Black Sea coast receives the greatest amount of rainfall. The eastern part of that receives 2,200 millimeters annually and is the only region of Turkey that receives rainfall throughout the year. A big difference is observed when the total rainfall between coastal and inland stations, are compared. The Black Sea coasts (Rize, Hopa) receive 2,200 mm rainfall while Konya and Iğdır 250-300 mm. annual precipitation amount of Turkey is mainly determined by elevation. The Aegean and Mediterranean coasts have rainy conditions in winters but dry in summers. Annual precipitation in those areas varies from 580 to 1,300 mm. The Black Sea coast receives the greatest amount of rainfall and is the only region of Turkey that receives rainfall throughout the year (Sensoy and et al., 2012).

Turkey's diverse regions have different climates because of irregular topography. Taurus Mountains are close to the coast and rain clouds cannot penetrate to the interior part of the country. Rain clouds drop most of their water on the coastal area. As rain clouds pass over the mountains and reach central Anatolia they have no significant capability to produce of rain. In the Eastern region of Anatolia, the elevation of mountains exceeds 2500-3000 m. Northern Black Sea Mountains and Caucasian Mountain hold the rain clouds, and therefore the area is affected by the continental climate with long and very cold winter. Minimum temperatures of -30°C to -38°C are observed in the mountainous areas in the east, and snow may lie on the ground 120 days of the year. Winters are bitterly cold with frequent, heavy snowfall. Villages in thee region remain isolated for several days during winter storms (Sensoy and et al., 2012).

According to Thornthwaite method; semi dry areas are the inland Anatolia, Iğdır and Şanlıurfa; very wet region is the Eastern Black Sea; humid regions are Black sea and the around of Bitlis and Muğla and the other large areas of Turkey are semi dry and less humid climatic regions (Figure 1.1)

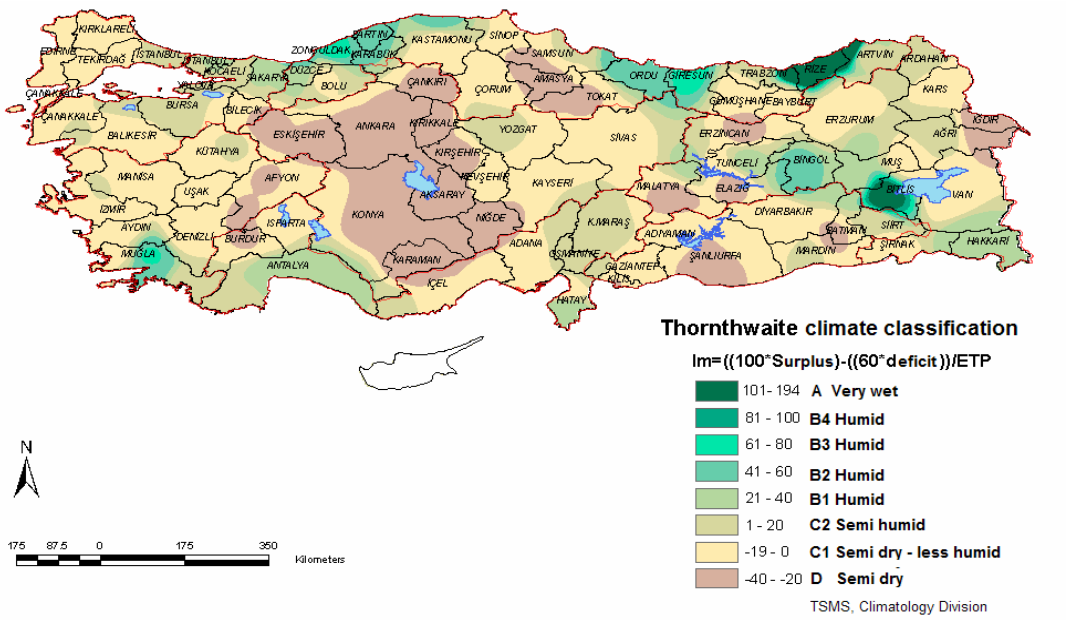


Figure 1.1 Climate Classification of Turkey via Thornthwaite Method (Sensoy et al, 2008)

Soil is a heterogeneous system whereby various characteristics dynamically affect one another. Physical features of the soil include different aspects such as depth of the soil, granularity, internal structure of the soil, its texture and related water content, soil air, soil

temperature and color (Kantarcı, 1987). In determining the vegetative growth surroundings all of these features are jointly evaluated with topographic and climatic conditions (Musaoglu, 1999).

The total area of Turkey is about 78 million hectares of which about 16 million hectares are physically suitable for cultivation and 4 million hectares for irrigation. Alluvials constitutes the most important group of arable soils. The dominat soils of central Turkey belong to the reddish brown and brown groups, most of which are devoted to the growing of small grains. Grumusol and rendzina groups are found in Thraceand South of the Marmara Sea (Oakes, 1959)

Turkey is a mountainous and hilly country, average altitude is 1132 m, surrounded by the seas from the north (Black Sea), south (Mediterranean Sea) and the west (Aegean Sea). It is a peninsula which accounts for the great differences in climate, soil and the other ecological properties. Climate, topographical, vegetational and geological diversities of Turkey affect soil forming and also soil diversity (Aksoy and et al., 2010).

Although Turkey is in the subtropical belt having a semi-arid climate with extremes in temperatures, the diverse nature of the landscape and particularly the existence of mountains results in great differences in climatic conditions from region to region (Özden et al., 1998). Actually there are two main climatic types in Turkey (Temperate and Mediterranean); there are also 10 subdivisions of these two main climatic types due to effect of topography on climate. (Figure 1.2)

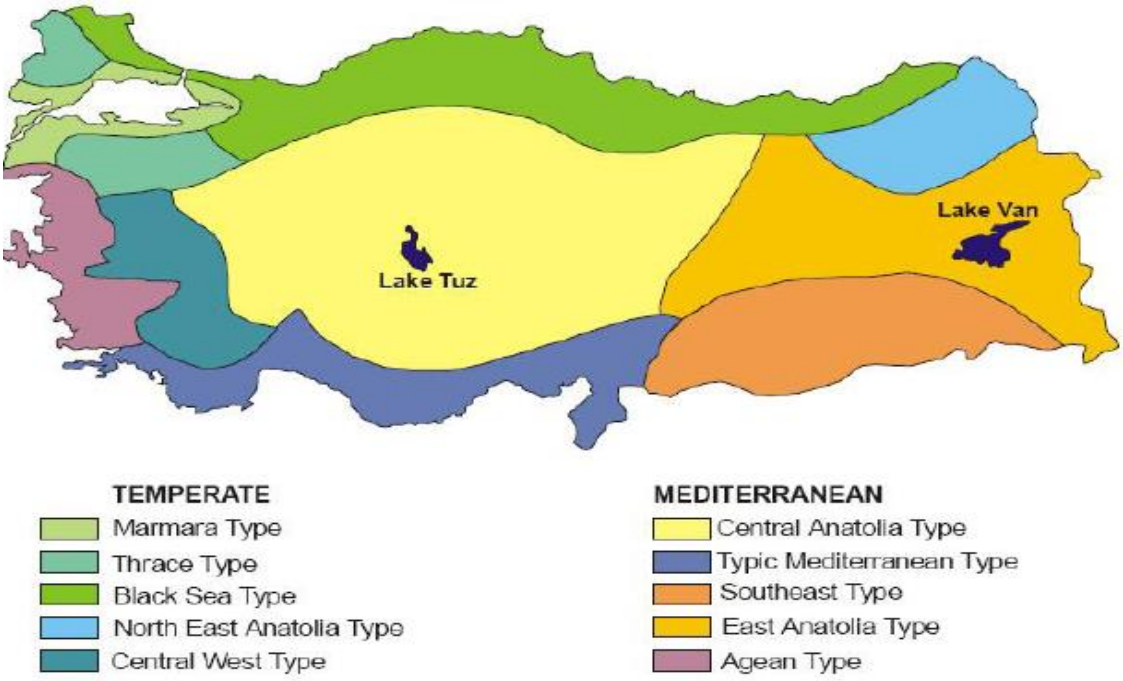


Figure 1.2 Climatic Regions of Turkey (Kapur et al. 2003)

Major causes of topographic diversity are due to the tectonic movements of the recent geologic periods and the accumulation of volcanic products, which have created an elevated mass with an average altitude of 1132m. Thus, plains of 0 to 250m altitude cover only one tenth of the country, whereas places higher than 800m cover two thirds and half of the country is higher than 1000m (Özden et al, 2001) (Figure 1.3). Most mountain ranges extend from west to east and great ranges appear in forms of arches. The Taurus Mountains in the south can be considered a good example of this type. The highlands and basins among the mountains have formed similar geomorphologic features.

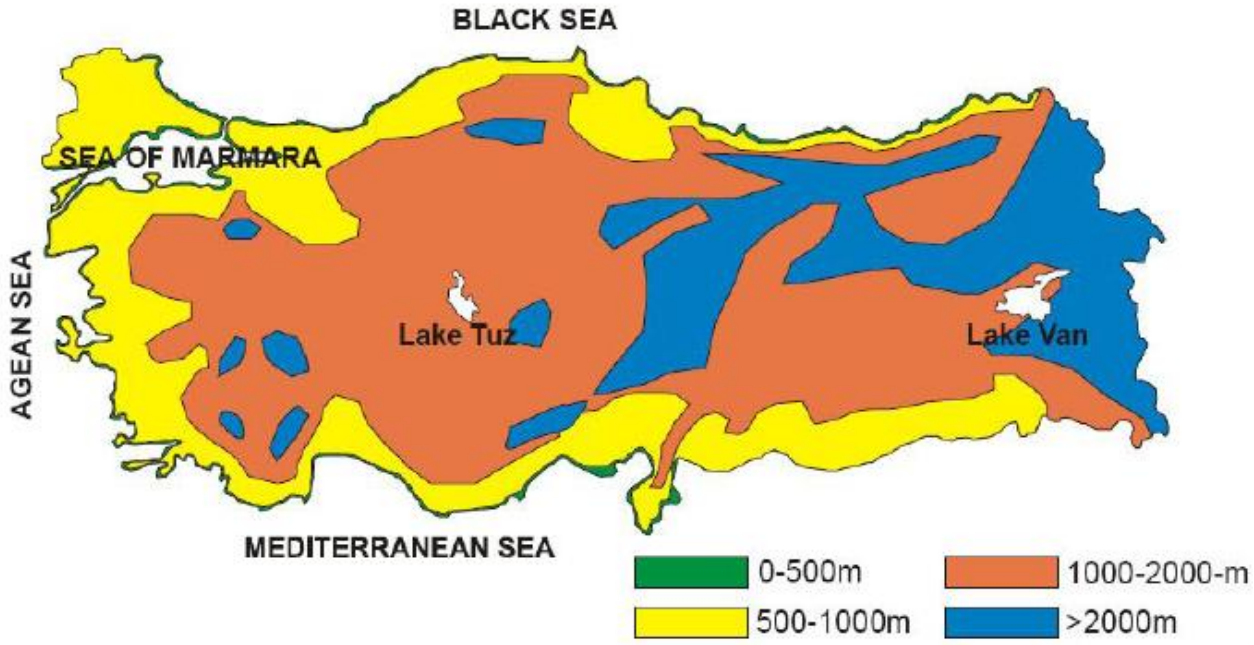


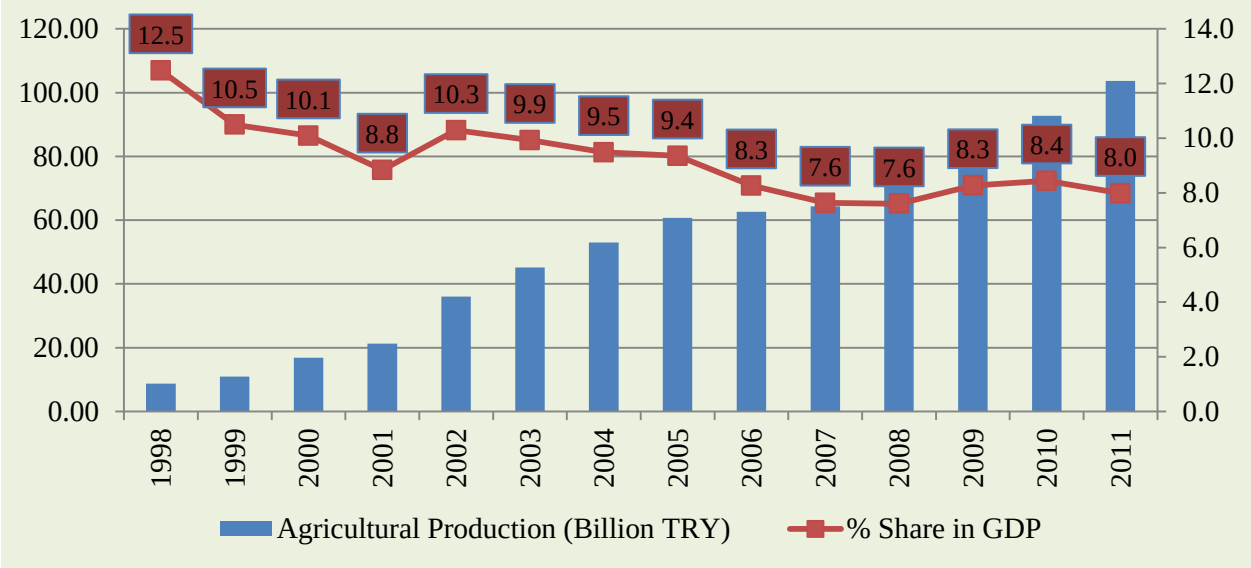
Figure 1.3 Average Elevation of Turkey (Kapur et al. 2003)

1.2 Agricultural Sector in Turkey

Turkey is considered to be one of the leading countries in the world in the field of agriculture and related industries with its favourable climate and geographical conditions, rich soil sources and biological diversity. Its position is attested by rising exports in almost every kind of agricultural products, placing the country amongst the world's largest producers. Agriculture is of key importance to Turkey, both in social and economic terms. Agriculture is still the occupation of the majority of Turkish people, despite the share of industry and services are rising constantly. Turkey is one of the few self-sufficient countries in the world in terms of food. Turkey's fertile soil, adeguate climate, and abundant rainfall permit growing almost any kinds of crops. The

farming is conducted in all of the regions in Turkey, but it's less practiced in the mountainous eastern regions where the main activity is based on animal husbandry (Anonymous 2012d)

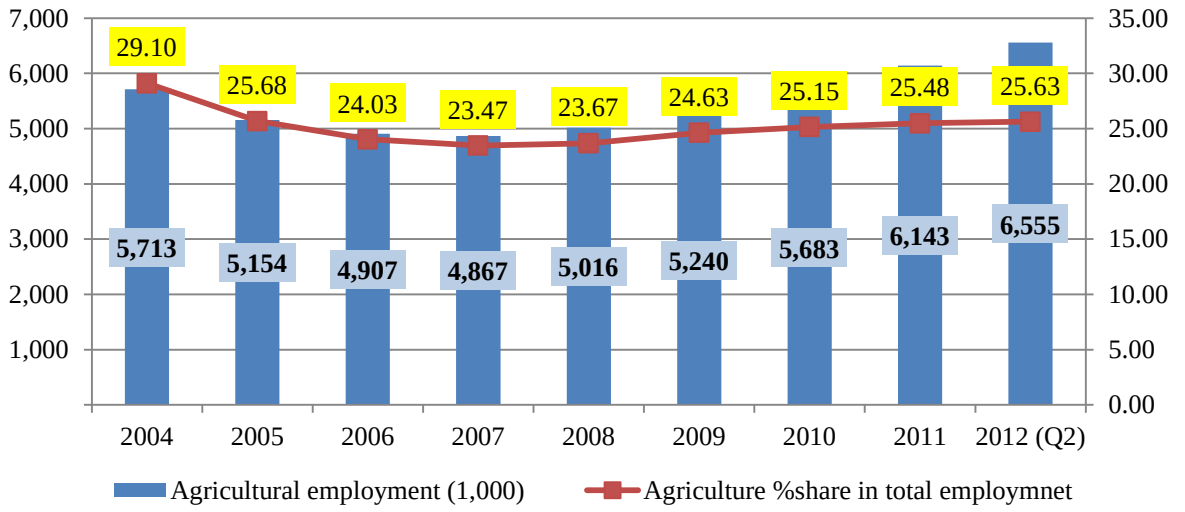
The rapid industrialization of Turkey after 1930's and government policies caused agriculture's share to decline in overall income. The share of the agricultural sector in the GDP was almost 50% in 1950, 25% in 1980, 15.3% in 1990, 10.1% in 2000 and 8.0% in 2011. During this period, Turkey continued its economic transformation from agriculture towards industry and the services sector. Despite the decreasing share in GDP, agricultural production has been rising. Agricultural production in 2011 was TRY 103 billion (Figure 1.4)



Source: Anonymous 2012c

Figure 1.4 Agricultural Production (Billion TRY) and Its Share in GDP (%)

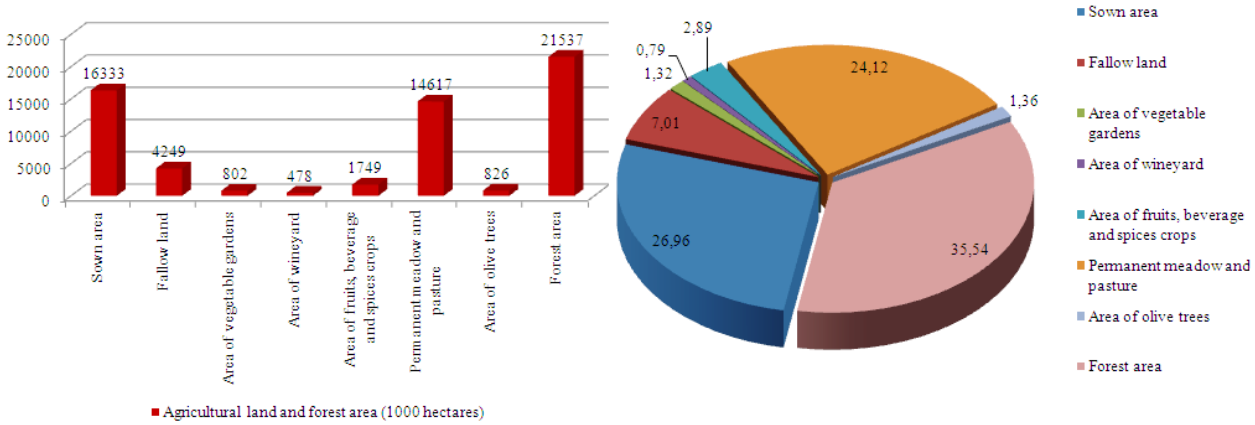
Turkish agriculture sector employs 6.5 million people which constitutes approximately 25 percent of the total employment in Turkey. Employment in agriculture has been steadily declining, by approximately 29 percent from 2004 to 25 percent Q2 2012 (Figure 1.5). Considering the increase in the production during the same period, the efficiency of the agricultural sector in Turkey has risen significantly (Anonymous 2010).



Source: Anonymous 2012c

Figure 1.5 Agricultural Employment (Thousands) and Its Share in Total Employment (%)

In terms of agricultural lands, Turkey is also one of the largest countries in the world. Total land utilized for agriculture in Turkey is 39,011 thousand hectares, 16,333 thousand hectares of which is sown. About 35.5% of the country is arable lands and 15% consists of forests. The cultivated land is around 24,4 million hectares in 2011. Around 18.4% of the cultivated land is irrigated. Vegetable products account for 76% of total agricultural production, then animal husbandary, meanwhile forestry and fishing contribute a minimal amount. Fruits and field crops make up the most of vegetable products, wheat being the leading crop (Figure 1.6).



Source: Anonymous 2012i and Anonymous 2012g

Figure 1.6 Agricultural Land and Forest Area (1000 hectares) and Its Share in Total Area (%)

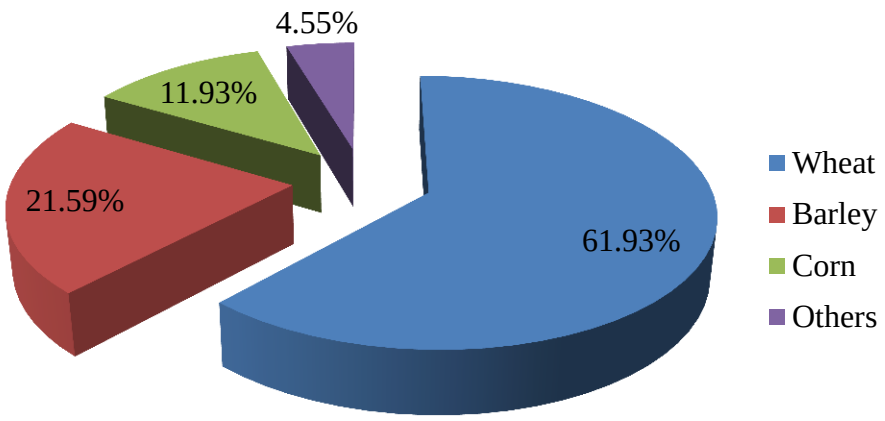
According to Farmer Record System in 2011, there are approximately 2,292,380 farmers in Turkey, most of which are family farms employing family labour. The average area occupied by a Turkish farm is 6.63 hectares (Anonymous 2012h)

Subsistence and semi-subsistence farming is an important characteristic of Turkish agriculture. These farms are typically characterised by productivity of the factors of production being low and only a small fraction of production being marketed.

With its rich soil, vast arable land and favorable climate, Turkey offers a wide range of agricultural product groups including grains, pulses, fruits, vegetables and livestock. Turkey retains the top ranks in many different agricultural products. Turkey is the top producer of hazelnuts, figs, apricots and cherries by far; second in melons, leeks and sour cherries and third in other products such as spices, chillies and peppers, strawberries, chestnuts, chick peas, pistachios, walnuts, vetches, lentils, green beans, cucumbers, watermelons and natural honey (Anonymous 2012h).

In the arable crops sector, Turkey is a major producer. In 2011 the production of cereals in Turkey (including rice) was 35.2 million tonnes. Grain production in Turkey is highly dependent on governmental policies. The Turkish government supports grain production through intervention prices and by direct subsidies on fertilizer, fuel, and certified seed costs. Although Turkey is an important producer of grains, with wheat yield of 2.71 tons per hectare, it is still lagging behind the EU-27 average yield of 5.66 tons per hectare. The main reasons behind this deficiency are; the production in small-sized farms and the inefficiency in input usage as well as climatic condition (Anonymous, 2010; Anonymous, 2012g; Anonymous 2012h and Anonymous 2012i)

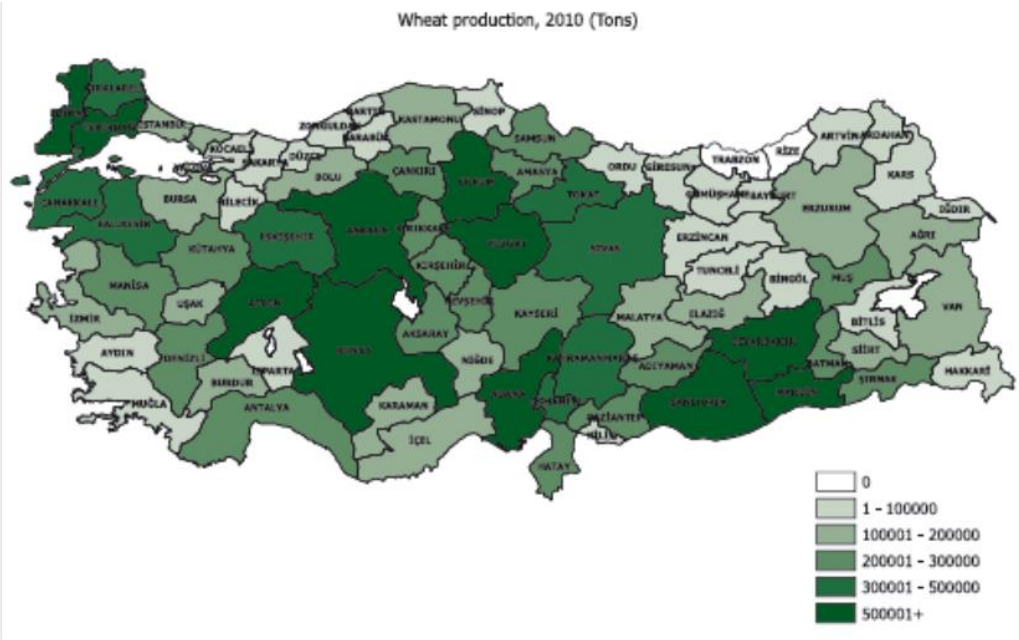
The main products in the grain group are wheat, barley and corn which constituted approximately 61.93 percent, 21.59 percent and 11.93 percent of the total grain production quantity in 2011, respectively (Figure 1.7).



Source: Anonymous 2012i

Figure 1.7 Share of Some Cerals in Total Grain Production (2011) (%)

Wheat is the main product in the grain group and is produced almost every province (Figure 1.8). It is also main crop in many provinces especially in the Central Anatolian Region. The production of wheat is approximatelly 21 million tones levels. Average yield of wheat is 2.71 ton/ha in 2011 (Anonymous 2012g), despite of changing to the regions. The wheat market is supported by the government with price-related and other subsidies (fertilizer, fuel oil and certified seed) directly.



Source: Anonymous 2012i

Figure 1.8 Wheat Productions by Regions in Turkey (2010)

Turkey is a major world producer and net exporter of fruit and vegetables. Despite agriculture's share in GDP decline relatively in the last 30 years, the sector still plays an important role in foreign trade. Turkey exports many agricultural products such as cereals, pulses, industrial crops, sugar, nuts, fresh and dried fruits, vegetables, olive oil, and livestock products. The main export markets are the European Union, the United States, and the Middle East. Total exports of agricultural products 12,5 billion USD (as of 2011) (Anonymous 2012j).

1.3. Biodiversity in Turkey

Turkey is one of the fortunate countries in the world as a country possessing vital resources for people's food security and has the responsibility to protect and use this important wealth rationally for the welfare of the future generations. Turkey has a vast array of geobotanical systems with cultural and botanical influences from the Euro-Siberian, Irano-Turanian and Mediterranean regions (Inalcik and Quataert, 1994; OECD, 1994; Kaya et al., 1997; Tan, 1998, Anonymous, 2007). Because its climatic and geographical features change within short intervals of space due to its position as a bridge between two continents, Turkey has acquired the character of a small continent from the point of biological diversity. Turkey has forest, mountain, steppe, wetland, coastal and marine ecosystems and different forms and combinations of these systems (Anonymous, 2007, Anoymous 2012e). Turkey is recognised as a primary centre of diversity for many globally important agricultural species, including wheat (*Triticum spp*.), barley (*Hordeum vulgare*.), oats (*Avena sativa.),* peas (*Pisum sativum*) and lentils (*Lens culinaris*) (World Bank, 1993; Nesbitt, 1995; Diamond, 1997). Its importance in relation to progenitor species used in Mediterranean and temperate agricultural systems is virtually unprecedented (Brush, 1992; Harlan, 1995; Bennett et al., 1998).

This extraordinary ecosystem and habitat diversity has produced considerable species diversity. It is noted that fauna biological diversity is quite high in Tuurkey compared with the biological diversity of other countries in the temperate zone. Despite lack of data, the invertebrates constitute the largest number among the identified living species. The total number of invertebrate species in Turkey is about 19,000, of which about 4,000 species/subspecies are endemic. The total number of vertebrate species identified to date is near 1,500. While there are 12,500 gymnospermous and angiospermous plant species in the entire continent of Europe, it is known that there are such species close to this number (about 11,000) in Anatolia alone, with

some one third of them endemic to Turkey. Eastern Anatolia and Southern Anatolia among the geographical regions, and the Irano-Turanian and Mediterranean regions among the phytogeograhical regions, are rich in endemic plant species (Anonymous, 2007).

Turkey's genetic diversity becomes important with plant genetic resources in particular because Turkey is located at the intersection of the Mediterranean and Near Eastern gene centres. These two regions have a key role in the emergence of cereals and horticultural crops. In our country, there are 5 micro-gene centres in which more than 100 species display a wide variation and which are the origin or centre of a large number of important crop plants and other economically important plant species such as medical plants. These centres offer very important genetic resources for the future sustainability of many plant species cultivated across the world (Anonymous, 2007).

The importance of crop genetic resources and the providing of its sustainability are vital for future generations. Record numbers of humans, agricultural science and technology, and economic integration of the world's many diverse cultures, globalisation of agriculture threaten to destroy this legacy, enhance the unification of practises and lead to genetic erosion. These threats to crop genetic resources have led to the creatioon of conservation programs to preserve crop resources. One type of crop genetic conservation is *ex situ*- maintenance of genetic resources in gene banks, botanical gardens, and agricultural research stations (Plucknett et al. 1987). Turkey has two National Gene Banks one in Ankara at the Field Crops Central Research Institute and and one in Izmir at the Aegean Agricultural Research Institute, both of which are affiliated to the Ministry of Food Agriculture and Livestock have assumed the leading role in the ex-situ conservation of the wild relatives of crop plants and of other herbaceous plant species. The *ex-situ* conservation activities for forest trees are performed by organizations affiliated to the Ministry of the Forestry and Water Affairs, including the Forest Tree Seeds and Tree Breeding Research Directorate in particular (Anonymous, 2007).

Up to now, 12,054 species and 3,905 endemic species have been identified in Turkey. Trees and grapevine materials are protected in field conditions in sixteen Gene Gardens throughout the country. In Total, 62,210, numbers of seed samples in 2,500 species are preserved in İzmir and Ankara gene banks. In terms of animal genetic resources, many domestic animal races were originally bred in Anatolia as a result of its location and spread from here to other regions of the world (Anonymous, 2007, WIPO, 2010).

Another type of crop genetic conservation is in situ- maintenance of genetic resources on-farm or in natural habitats (Brush, 1991; Maxted et al. 1997). In actuality, two types of in situ conservation can be distinguished. First, *in situ* conservation refers to the persistence of genetic resources in their natural habitats, including areas where everyday practises of farmers maintain genetic diversity on their farm. This type is a historic phenomenon, but it is now especially visible in regions where farmers maintain local, diverse crop varieties (landraces), even though modern, broadly adapted, or higher yielding varieties are available (Brush, 1999). Second, in situ conservation refers to specific projects and programs to support and maintenance of crop diversity, sponsored by national governments, international programs and private organisations (Brush, 1999). Natural in situ conservation units are the first priority for dynamic conservation because their demographic and ecological conditions allow for dynamic gene conservation totally controlled by the natural disturbance of the ecosystem (de Vries, and Turok, 2001)

In Turkey, in-situ conservation efforts were started in the 1950s, long before the concept of 'in-situ conservation' gained wide acceptance. In our country, in-situ protected areas have been designated under various statuses including National Park, Nature Park, Nature Conservation Area, Natural Site, Wildlife Development Area, Special Environment Conservation Area and internationally signifi cant wetland. The in-situ protected areas established for different purposes to date have reached about 4.6 million hectares in total, corresponding to some 6 % of the country's surface area (Anonymous, 2007). Tan (2002) informed that the advantages of conservation studies at on-farm level are below,

- Conservation of cultivated plants together with processes of evolution and adaptation in the surrounding area where they are grown,
- Conservation of biodiversity at different levels as like in ecosystem, interspecific and intraspesific,
- To ensure active participation of the farmers to conservation activities,
- Indirectly contributing to sustainable agro-eco system with less pesticide and fertilizer use,
- To provide economic benefits and means of existence for farmers using scarce resources, and,

- Able to maintain and check genetic resources and access to the resources at any time of farmers,

However, the existing protected areas do not adequately represent the components of biological diversity that our country has, including the steppe and marine ecosystems in particular. The conservation of biological diversity outside its natural habitat is considered a method of conservation that complements in-situ conservation. In our country, such activities were started in the 1930s with a view to protecting agricultural biological diversity and in the 1970s with a view to protecting forest biological diversity (Anonymous, 2007).

Biodiversity research in Turkey is mainly conducted by the Ministry of Food, Agriculture and Livestock (MFAL), the Ministry of Environment and Urbanization (MEU), Universities and the Turkish Scientific and Techno-logical Council (TUBITAK). MFAL coordinates and implements the agricultural R&D activities through the General Directorate of Agricultural Research and Policies (GDAR). The GDAR is the centre of the national agricultural research system. Under the Administration of GDAR, there are 10 Central, 10 Regional and 26 subject-oriented Research Centers and Stations. Mandates of GDAR are plant breeding and production, plant protection, animal breeding and husbandry, animal health, fishery and aquaculture, food and feed, postharvest technologies, biodiversity/genetic resources, organic agriculture, bio-safety, soil and water resources management (Anonymous 2012f).

Ministry of Food, Agriculture and Livestock (MFAL) has adopted a strategy on agriculture for the period of 2010-2014 which sets also the agricultural policy and priorities. Furthermore one of the main research area established by the agricultural research master plan is the biological diversity and genetic resources and the plan encourages the research activities for the purpose of identification of biological diversity and resources and associated traditional knowledge having value for nutrition, food security and safety as well as agricultural production (Anonymous 2012f).

1.4 References

Aksoy, E., Panagos, P., Montanarella, L., Jones, A., (2010). Integration of the Soil Database of Turkey into European Soil Database 1:1.000.000. Research report, European Commission Joint Research Centre Institute for Environment and Sustainability, Italy.

Anonymous, (2007). The National Biological Diversity Strategy And Action Plan 2007. Republic of Turkey, Ministry of Environment and Forestry, General Directorate of Nature Conservation and National Parks, Department of Nature Conservation, National Focal Point of Convention on Biological Diversity, Ankara, Turkey.

Anonymous, (2010). Turkish Agriculture Industry Report. Republic of Turkey Prime Ministry, Investment Support and Promotion Agency of Turkey, p:18, http://www.invest.gov.tr/en-US/infocenter/publications/Documents/AGRICULTURE.INDUSTRY.PDF

Anonymous, (2012)a. General Information on Turkey. http://www.igeme.org.tr.

Anonymous, (2012)b. Turkey.www.myturkiye.com/turkey_geography.html.

Anonymous, (2012)c. National Accounts "Gross National Product by Production Approach", Turkish Statistical Institute, http://turksat.gov.tr

Anonymous, (2012)d. Agriculture in Turkey. http://www.allaboutturkey.com/agriculture.htm

Anonymous, (2012)e. Ministry of Food Agriculture and Livestock. http://www.biodiversa.org/111

Anonymous, (2012)f. The General Directorate of Agricultural Research and Policies (GDAR) http://www.tagem.gov.tr

Anonymous, (2012)g. Turkey in Statistics 2011, The Summary of Turkey's Statistical Yearbook, Publication number: 3689, www.tuik.gov.tr/IcerikGetir.do?istab_id=5

Anonymous, (2012)h. BUGEM Faaliyetleri. Gıda Tarım ve Hayvancılık Bakanlığı, Bitkisel Üretim Genel Müdürlüğü, Ağustos 2012, http://www.tarim.gov.tr

Anonymous, (2012)i. Plant Production Statistics. www.tuik.gov.tr

Anonymous, (2012)j. Foreign Trade Statistics. www.tuik.gov.tr

Bennett, S. J., Maxted, N. and Sabanci, C. O., (1998). The ecogeography and collection of grain, forage and pasture legumes in south-west Turkey, Genetic Resources and Crop Evolution, 45, pp. 253 – 262.

Brush S. (1991). A farmer-based approach to conserving crop germplasm. Economic Botany 45: 153–165.

Brush, S. B., (1992). Reconsidering the Green Revolution: diversity and stability in cradle areas of crop domestication, Human Ecology, 20, pp. 145 – 167.

Brush, S. B., (1999). The issues of in situ conservation of crop genetic resorces, Genes in the Field (On-Farm Conservation of Crop Diversity), Edited by Stephen B. Brush, International Plant Genetic Resources Institute, pp:3-26 Rome, Italy.

de Vries, S. M.G. and Turok, J., (2001). Introduction, Lefèvre, F., N. Barsoum, B. Heinze, D. Kajba, P. Rotach, S.M.G. de Vries and J. Turok. 2001. EUFORGEN Technical Bulletin: In situ conservation of Populus nigra. International Plant Genetic Resources Institute, Rome, Italy.

Diamond, J., (1997). Location, location, location: the first farmers, Science, 278, pp. 1243 – 1244.

Harlan, J. R., (1995). The Living Fields: Our Agricultural Heritage (Cambridge: Cambridge University Press).

Inalcik, H. and Quataert, D., (1994). An Economic and Social History of the Ottoman Empire, 1300-1914(Cambridge: Cambridge University Press).

Kantarcı, M.D., (1987). Toprak İlmi, İstanbul Üniversitesi Matbaası, İstanbul

Kapur, S., Akca, E., Ozden, D.M., Sakarya, N., Cimrin, K.M., Alagoz, U, Ulusoy, R., Darıcı,C., Kaya,Z., Düzenli,S., and Gülcan, H., (2003). Land Degredation in Turkey,The JRC Enlargement Action, International Workshop on Land Degradation, 5-6 December 2002, Ispra, Italy

Kaya, Z., Kün, E. and Güner, A., (1997). National Plan for in situ Conservation of Plant Genetic Diversity in Turkey (Istanbul: Milli Egitim Basimevi).

Maxted, N., Ford-Lloyd, B., and Hawkes, J.G., (1997). Plant Genetic Conservation: The in situ Approach. London: Chapman&Hall.

Musaoğlu, N., (1999). Possibilities of Determining The Types of Tree Stocks In The Forest Lands And The Units of Growing Sites By Means of Satellite Images Obtained From The Electro-Optical And Active Microwave Sensors,Phd. Thesis, ITU Institute of Science And Technology, Istanbul.

Nesbitt, M., (1995). Plants and people in ancient Anatolia, Biblical Archaeologist, 58, pp. 68 – 81.

Oakes, H., (1959). The Soils of Turkey. Soil Science: January 1960 - Volume 89 - Issue 1 – p: 62

OECD, (1994). National Policies and Agricultural Trade, Country Study: Turkey (Paris: OECD).

Özden, D.M., Dursun, H., and Sevinç, A.N., (1998). The Land Resources of Turkey And Activities of General Directorate of Rural Services, United Nation Convention to Combat Desertification, International Forum on European Policies to Combat Desertification in the Mediterranean Basin, Matera 29 – 31 October 1998, Ankara, Turkey

Özden,M.O., Keskin,S., Dinc,U., Kapur,S., Akca,E., Senol,S. and Dinç, O., (2001). Soil Geographical Database of Turkey at a Scale 1:1.000.000 - 4th Approximation, Research Report, Agriculture Services Ministry National Information Center for Soil and Water Resources&Cukurova University Soil Department Collaboration, Ankara-Adana, Turkey.

Plucknett, D.L., Smith, N.J.H., Williams, J.T., and Anishetty, N.M., (1987). Gene Banks and the World's Food. Princeton, NJ: Princeton University Press.

Sensoy, S., Demircan, M., Ulupinar, Y., and Balta, I., (2012). Cimate of Turkey. Turkish State Meteorological Service. http://www.mgm.gov.tr/files/en-US/climateofturkey.pdf

Sensoy, S., Demircan, M., Ulupınar, U., and Balta, İ., (2008). Türkiye İklimi, http://www.dmi.gov.tr/iklim/iklim.aspx

Tan, A., (1998). Current status of plant genetic resources conservation in Turkey, in: N. Zencirci, Z. Kaya, Y. Anikster & W. T. Adams (Eds) Proceedings of the International Symposium on in situ Conservation of Plant Genetic Diversity, pp. 5 – 16 (Ankara: CRIFC).

Tan, A., (2002). In Situ (On Farm) Conservation of Landraces from Transitional Zone in Turkey, Project No: TOGTAG-2347, TUBİTAK, İzmir.

World Bank, (1993). Republic of Turkey: in-situ conservation of genetic diversity. Global Environment Coordination Division 11295-TU (Washington DC: World Bank).

WIPO, (2010). Intergovernmental Committee on İntellecual Property And Genetic Resources, Traditional Knowledge And Folklore. Polıcıes, Measures and Experıences Regarding ıntellectual Property And Genetic Resources: Submission By Turkey. May 3 to 7, 2010, Geneva.

CHAPTER 2

THE STATE OF WHEAT DIVERSITY

2.1. History of Wheat in Turkey

Wheat is among the oldest and most extensively grown of all grain crops. The period over which people have influenced the cultivation of wheat is, however, short in terms of human existence on earth. It is widely accepted that wheat was first grown as a food crop about 10,000-8,000 B.C.E. Presumably, wheat's unique dough-forming property was seized upon by early people, so that wheat grain was treasured above other grain species for baking. Along with other ceral grains, wheat became a major reason for the transition from the hunter-gatherer nomad to the settled agriculturalist. The cultivation of storable grains meant that the family or tribe did not need to keep moving in search of whatever plant and animal food could be found. Instead, it was able to setle in one place, growing crops that could be stored safely for the long period after harvest. This major change in attitude led to a changed life style, leaving time for the development of cultural exploits beyond the day-to-da necessity of seeking food (Diamond 1997).

Wheat is a grain crop that takes many forms in the world today. The two most common are common wheat, *Triticum aestivum*, also known as bread wheat and accounting for some more than 90% of all the consumed wheat in the world today; and durum wheat *T. Turgidum* ssp. durum, which is that used in pasta and semolina products (Feldman and Sears, 1981; Wrigley,2009).

The genus name for wheat, *Triticum*, comes from the Latin tero (I thresh). *Triticum vulgare* is the old (no longer accepted) species name for bread wheat, in which vulgare means "common". The current binomial name, *Triticum aestivum*, refers to hexaploid common wheat (genomes A, B, and D), distinguishing it from tetraploid macaroni wheat (*Triticum turgidum*) (genomes A and B), which is used primarily for pasta production. Most of the wheat grown worldwide (>90%) is the *aestivum* species; despite its being referred to as "bread" wheat, it is used for the full range of applications, even including pasta production in some regions. In addition, *T. manoeoccum* (including "smail spelt" wheat as a subspecies) and *T. timopheevii* (including "Georgian" wheat)

are cultivated to a limited extent, the former in Yugoslavia and Turkey, and the latter in the former Soviet Union (Feldman and Sears 1981). The main cultivated form of spelt is the hexaploid *T. aestivum* var. *spelta*, also classified as *T. spelta* (Fig. 2.1) (Morrison and Wrigley 2004).

The ancestral diploid wheat species are *T. monococcum*, *Aegilops speltoides*, and *T. tauschii* and a wild *Aegilops* species that is probably most closely related to the modern *A. speltaides*. Each of these species has seven pairs of chromosomes (2n = 14). *T turgidum* is tetraploid *(2n* = 14), having been derived from the natural hybridization of *T monococcum* (A genome) and the ancestral *A. speltoides* (B genome). Common wheat (AABBDD) is a hexaploid *(2n* = 42) resulting from the natural hybridization of *Triticum dicoccoides* (AABB) and *T tauschii* (DD) (Mangelsdorf 1953, Feldman 2001, Shewry et al 2003). The diversity of spike morphology for these and other ancestral wheats is shown in Figure 2.1. Although it is not clear from the spike illustrations, these various primitive wheats differ greatly in the ease of threshing out grains from the heads, an important characteristic for successful cultivation and harvesting of any grain species (Wrigley, 2009).

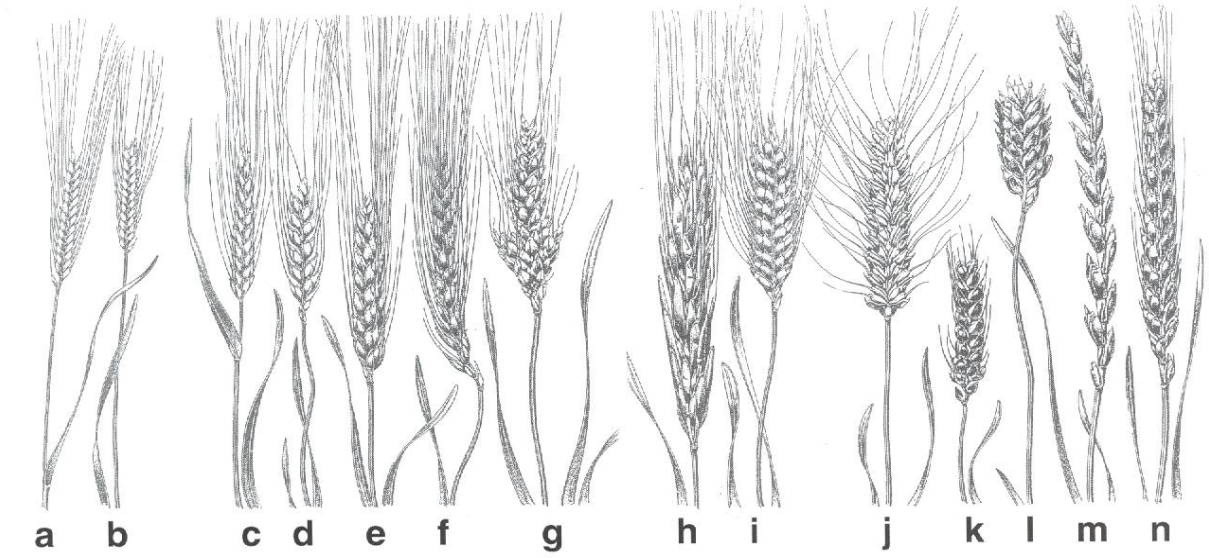


Figure 2.1 Variations in the Appearance of Heads of Wheat Species, One of Many Morphological Characteristics Used For Their Taxonomic Classification. The wheat species are (including their genome assignments and common names) **a,** *Tritieum boeotieum (2x:* wild einkorn); **b,** *T monocoeeum (2x:* einkorn); **c,** *T dicoccoides (4x:* wild emmerı; **d,** *T. dicoceum (4x:* emmerı; **e,** *T durum (4x:* macaroni wheat); **f,** *T. carthlicum (4x:*Persian wheat); **g,** *T. turgidum (4x:* rivet wheat); **h,** *T polonieum (4x:* Polish wheat); **i,** *T. timopheevii (4x:* Timopheev's wheat); **j,** *T aestivum (6x:*bread wheat); **k,** *T. sphaerocoeeum (6x:* shot wheat, Indian dwarf wheat); **I,** *T compactum (6x:* club wheat); **m,** *T spelta (6x:* spelt wheat); and **n,** *T macha (6x:* macha wheat). The diploid A-genome species, *T. urartu*, is not shown here. *2x* = diploid; *4x* = tetraploid; *6x* = hexaploid. (Adapted from Mangelsdorf 1953)

Sometime around 10,000 BC though, the area around Mesopotamia and Egypt became crowded enough, and the climate hot enough, that there was no longer enough food to go around just by picking it, and people had to begin growing it on purpose. In what is now known as the Fertile Crescent. The archelogical findings have shown that Eastern Mediterrenean regions surrounding the rivers Tigris and Euphrates were the first places (Especially wheat cultivation comes from Syria, Jordan, Turkey, Armenia, and Iraq), where the wheat was processed. Wheat is one of the oldest plants that human beings started to cultivate. Archaelogical excavations showed that ancient people living around Şanlıurfa (Karacadağ mountains), a province in the Southeastern part of Turkey, planted Einkorn wheat (*Triticum boeoticum*) around between 10.000 and 12.000 years ago, which is the wild form of today's commercial wheat. Today it is still used for animal feed in some areas (Nesbitt and Samuel 1996; Tanno and Willcox 2006; Yavuz, 2010,).

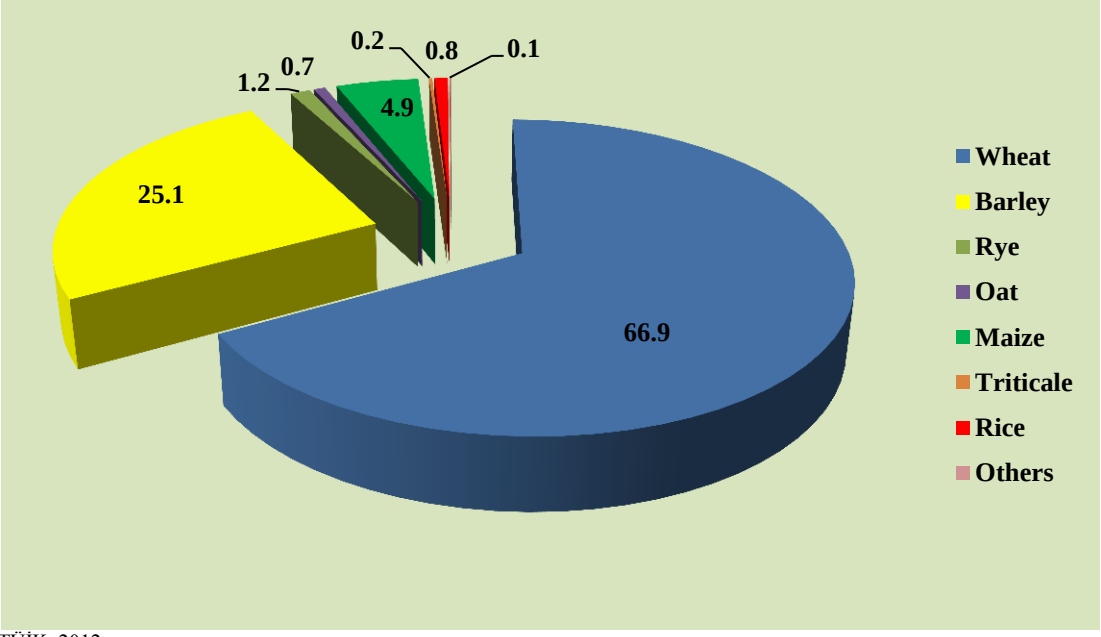
Turkey is the centre of origin for many crop species, possibly also of plant domestication (Davis, 1985; The World Bank, 1993; Kaya et al., 1997; Tan, 1998). Diverse geological and climatic conditions of Turkey have given rise to unique plant species represented nowhere else in the world. Over 30% of the 8,800 species found in the country are endemic to Turkey (World Bank, 1999). The country is the center of origin and a source of genetic diversity for globally important plants which were first domesticated from wild species and still exist in Turkey (In fact, Turkey's importance in relation to progenitor species, such as wheat, barley, oats, lentil chickpea, apple and pear, used in Mediterranean and temperate agricultural systems is virtually unprecedented (Harlan, 1995; Bennett et al., 1998).

Turkey falls within the Vavilov centers of crop genetic diversity, as two of these centers, namely, Near Eastern and Mediterranean centers are located in Turkey. For example, Zencirci and Birsin (2004) note that two wheat species, durum (*Triticum turgidum* var. dicoccum) and bread wheat (*T. aestivum*) originated in the agricultural lands of the historic and productive Fertile Crescent in the Near East, located between the Euphrates and the Tigris rivers, today mostly taking place in Turkey. As they underline, wheat not only contributed to production in Anatolia, but also to other countries' wheat production, for example, one Turkish wheat landrace was found to carry genes for resistance and tolerance to various rusts, smuts, and other fungal pathogens, and it was used a source of resistance genes and is a parent of many of the wheat cultivars now grown in the United States (FAO, 1998). Landraces and wild relatives of crops

from Turkey continue to provide new sources of important traits needed to maintain and improve agricultural production and efficiency worldwide (Fırat and Tan, 1997).

2.2. Wheat Policy of Turkey

30% of Turkey's total surface area (24.4 million hectares) is agricultural land. 67.8% the agricultural land, excluding fallow land, (16.3 million hectares), is divided into arable land. 74.2% of arable land (12.1 million hectares) is sown as cereals. Wheat land with 66.9% share in cereals land ranked at the first order (Figure 2.2).

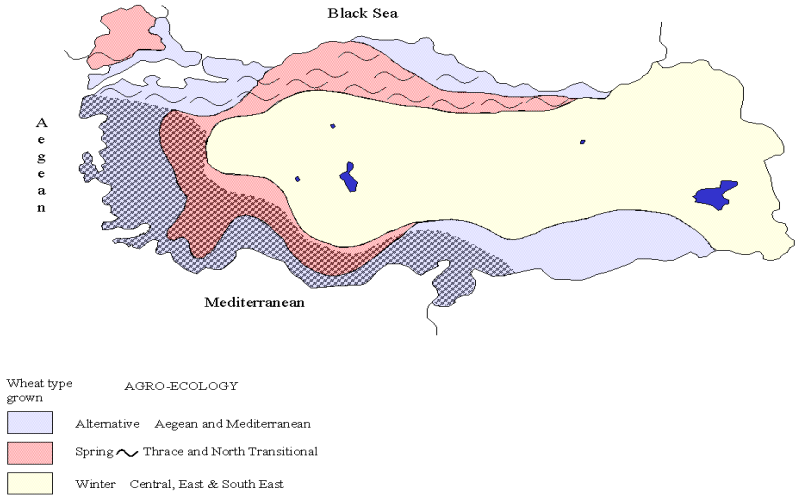


Source: TÜİK, 2012

Figure 2.2 Cereal Land Distributions in Turkey (%)

Wheat is one of the most important agricultural commodities in Turkey, and the country ranks among the top ten producers in the world. It is a staple and strategic crop and an essential food in the Turkish diet, consumed mostly as bread, but also as bulgur, yufka (falt bread) and cookies. Total annual wheat production is about 20 million tones, valued at approximately US$6,9 billion in 2010. Total production area is approximately 8 million hectares (FAO, 2012). Value addition via processing make the wheat industry one of the major sectors in the economy.

Turkey, both in terms of environmental conditions and in terms of culture is very suitable for wheat cultivation. At the same time Turkey is the mother land of wheat. Wheat is generally produced in Thrace, Mediterranean and Aegean and Marmara Seaside places as spring type and in the other places it is produced as winter type (Figure 2.3). The average yield of the wheat is 2441 kg/ha in Turkey in 2010 (FAO, 2012) and this value changes by agri-ecological regions and wheat types (bread and durum).

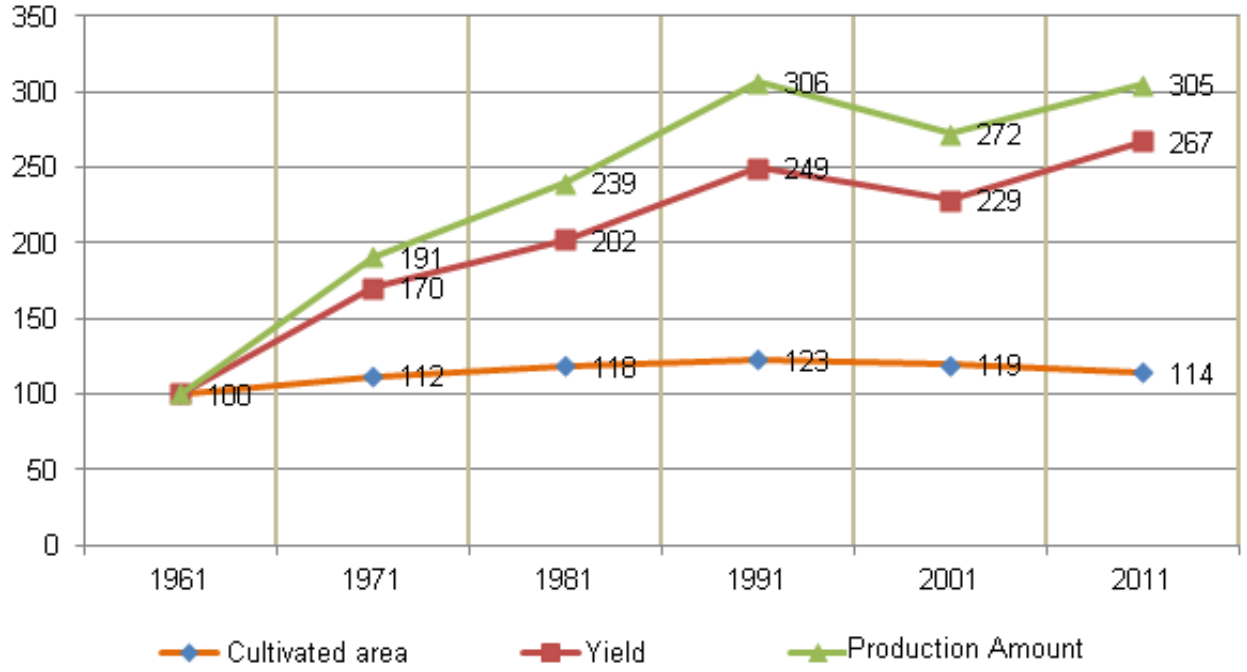


Source: Anonymous 2012

Figure 2.3 Map of Agro-ecological Zones for Wheat in Turkey

The cultivation of wheat in Turkey for over 8,000 years has resulted in a large number of named wheat varieties in addition to the existing wild and semi domesticated wheat relatives. Modern (improved) varieties have been available in Turkey since the early part of 20th century and semi dwarf varieties were introduced from Mexico in 1966; however, the level of adoption in the country varies greatly from region to region. After the introduction of new varieties to the country there was big take-off on the wheat yield. Same time these results were an indication of the increase in the use of inputs such as fertilizers and pesticides as well as the use of modern wheat varieties. In figure 2.4, the development process of wheat in Turkey after 1960 year on production, yield and cultivation area by years was showed. Wheat yield averages of the last 21 years as 2190 kg/ha, has been realized by cultivation of new varieties, planting techniques, irrigation, fertilization, the increase of best practices in plant protection (Altuntaş and Demirtola

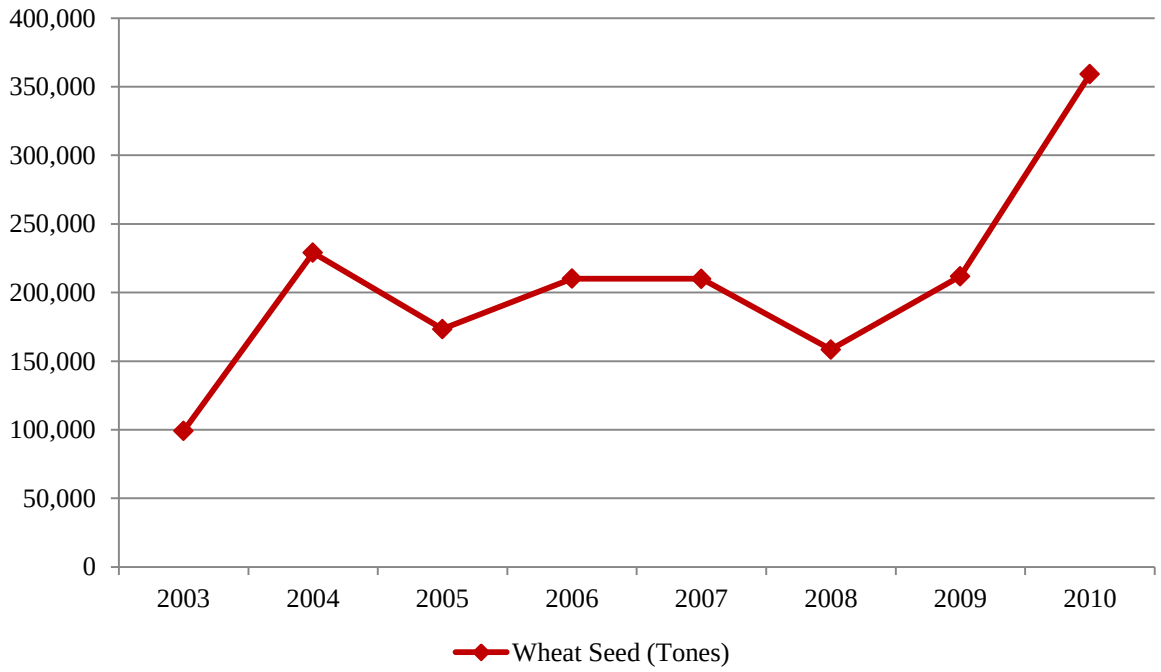
2004). Wheat cultivation area 14%, yield 167% and the amount of production 205% have increased in 2011 year compared to 1961 year in Turkey (Figure 2.4).



Source: TUIK, 2012

Figure 2.4 The The Changes in Wheat Cultivation Area, Yield and The Amount of Production in Turkey (index 1961=100)

Especially in yield increase, Turkish Governments plays important roles via agricultural supporting system. Grain, which is the most important crop group in Turkey, corresponds 20% of the total national production value (TUİK, 2012). Grain production in Turkey is highly dependent on governmental policies. Grain, because of the strategic products, is within the scope of state support procurements. 4 different agricultural subsidies as field-based are implemented in Turkey. These are Diesel Support, Fertilizer Support, Soil Analysis and Certified Seed Supports (TUGEM, 2012). In Turkey, 45 public institutions and 177 private sector organizations have registered varieties in all herbal crops in 2012. Particularly, seed breeding in grain and seeds bred in recent years show the huge advances in terms of both quality and efficiency. In addition, encouraged subsidies to certified seed have been effective in the use of certified seed. The use of certified wheat seed in 2003 was 99 thousand tons, rose to 359 thousand tons in 2010 (Figure 2.5). In Turkey, the shares of private and public sectors in production of certified wheat seed are as 46% and 54% respectively.



Source: BUGEM 2012

Figure 2.5 The Change in Certified Wheat Seed Purchase Amounts in Turkey (tones) by Years

Agricultural support system in Turkey is also shaped by the "Agricultural Basins". With "Basin Based Crop Support Model" 30 agricultural basins were determined for intensification, supported, organized, specialized, integrated implementation and preparation of agricultural inventory of agricultural products in their own ecological areas, and initiated in 2009. As of 2010, the deficiency payment premiums were determined based on the supported crops for every basin and suitable products were supported in their own basins (MFAL, 2012). Wheat is a unique crop supported in every basin in Turkey according the model.

Now Turkey achieved self-sufficiency in many products such as wheat and it is also one of the wheat exporting countries. In this case, improved new varieties and production techniques have a great contribution. While on the one hand the increasing wheat production depending to high yield potential can be seen as positive development, on the other hand, accessing the new wheat varieties to production process led to extinction of genetic resource (local wheat varieties/landraces). Some research report from Turkey showed that the share of modern wheat varieties in Turkish agriculture was very high and the share of local landraces was under the 1% percent in total wheat production area in the country (Mazid et all., 2009). This result showed that there has been a decline in crop genetic diversity in side of the wheat crop.

2.3. Wheat Breeding Studies in Turkey

Wheat is a staple food crop all over the world and is the most widely grown crop in the world and Turkey. Wheat is produced in almost every part of the Turkey, but especially the Central Anatolian Region is the one of the most important production part. During the last 35 years wheat production in Turkey steadily increased, reaching about 21 million tons/year out of 9 million ha (the seventh largest area in the world). Meanwhile, genetic resources from Turkey contributed greatly to the increase of wheat production in many countries. Germplasm exploration and collection missions led to the evaluation of sampled materials in different countries, and several landraces (e.g. Turkey Red) were largely utilized to breed new varieties. In Turkey modern wheat breeding started in 1925: its main goal was to select, from local population, lines adaptated to the different regions of the country. The breeding initiatives could be divided to three main parts. The first period was from 1960 to 1970 and cultivars such as 'Kose', 'Surak', 'Yayla-305', "Ak–702" and 'Kunduru-149' were released, followed by 'Gerek-79', 'Haymara-79', 'Kırkpınar-79', and 'Cakmak-79'. In 1967 the National Wheat Release and Training Project was established, with the contribution of international organizations, resulting in the Turkish Green Revolution. During the second period (1971-1989), 'Bezostaya-1' (a widely grown cultivar from the former Soviet Union) and 'Hawk' were introduced. With its research infrastructure and a core of well-trained scientists, Turkey has also made a significant contribution to international efforts to improve winter wheat production. In 1986, the government of Turkey and CIMMYT, joined by ICARDA in 1990, established the International Winter Wheat Improvement Program (IWWIP). Several improved wheat varieties have since been jointly developed, disseminated and grown by producers both in Turkey and elsewhere in the world. Other varieties were also introduced into the country, particularly with the implementation of new agricultural policies in the 1980s, and both private companies and public agencies introduced new varieties at an accelerated rate. After 1990, many new cultivars were released with high yield, good quality, and yellow rust (incited by *P. striiformis* Westend. f.sp. *tritici*) resistance (Akar et al., 2007). The objective of wheat breeding programs was the selection of lines for the diverse wheat producing regions in Turkey. As the part of the breeding effort wheat germplasm from around the world was introduced into the Turkey to develop wheat cultivars for specific areas. The national breeding program,

meanwhile, developed over 100 wheat cultivars, many of which had a significant impact on the economy (Altıntas et al., 2008).

Commercial wheat varieties are very common in Turkey and every year new wheat varieties access the wheat markets. There are also national and international wheat breeding programs (IWWIP) and these programs are carried out by the agricultural research institutes. The public institutes have the largest share in the wheat breeding studies and now 13 public agricultural research institutes and/or stations are engaged with the wheat breeding program in Turkey and they are working under the Ministry of Food, Agriculture and Livestock. The mandate areas of these agricultural research institutes are shown in Figure 2.6.

1. Bahri Dağdaş International Agricultural Research Institute-KONYA
2. Central Agricultural Research Institute for Field Crops-ANKARA
3. Transtional Zone Agricultural Research Institute-ESKİŞEHİR
4. Aegean Agricultural Research Institute-İZMİR
5. Tracian Agricultural Research Institute-EDİRNE
6. East Anatolian Agricultural Research Institute-ERZURUM
7. GAP International Agricultural Research and Training Center-DİYARBAKIR
8. Maize Research Station-SAKARYA
9. Agricultural Research Institute of the Western Mediterreneam -ANTALYA
10. Agricultural Research Institute of the Eastern Mediterrenean -ADANA
11. Black Sea Agricultural Research Institute-SAMSUN
12. Agricultural Research Station of Eastern Mediterrenean Transition Zone –KAHRAMANMARAŞ
13. GAP Agricultural Research Institute-ŞANLIURFA

Figure 2.6 The Distribution of Agricultural Research Institutes and Stations Engaged with Wheat Breeding (winter or spring type) in Turkey

There are many commercial wheat varieties in Turkey. The access of the commercial wheat varieties based on the 1966 with introduced the new wheat varieties from Mexico. Now, There are 178 (130 bread wheat and 48 durum wheat) registered and 38 (34 bread wheat and 4 durum wheat) production allowed wheat varieties. 75,93% of the wheat varieties is bread wheat and the others is durum wheat (TTSM, 2012)).

2.4. The State of Wheat Landraces in Turkey

Landraces, or traditional varieties, are defined as crop varieties whose morphological and genetic composition is shaped by household crop management practices and natural selection pressure over generations of cultivation (Belay et al. 1995, Smale et al. 2001), while modern varieties refer to varieties that have been improved scientifically, usually by professional breeders (Kruzich and Meng 2006), and usually have a broader genetic base and can therefore provide valuable characteristics important for breeding (Keller et al. 1991; Tesemma et al. 1998).

Wheat landraces are composed of traditional crop varieties developed by farmers through years of natural and human selection and are adapted to local environmental conditions and management practices. As distinct plant populations, landraces are named and maintained by traditional farmers to meet their social, economic, cultural, and environmental needs. They are alternately called farmers' varieties or folk varieties to indicate the innovative role of farmer communities in their development and maintenance (Jaradat, 2012).

Many modern cultivars, in wheat and in other crops as well, are often genetically similar, with a rather narrow genetic base. Therefore, in breeding we need to also utilize sources of new diversity. Landraces, which have arisen through a combination of natural selection and the selection performed by farmers (Belay et al. 1995), usually have a broader genetic base and can therefore provide valuable characteristics important for breeding (Keller et al. 1991; Tesemma et al. 1998). Tolerance to local stresses (Li et al. 1997) and the resulting good yield stability are also often referred to in landraces (Tesemma et al. 1998). Landraces and obsolete cultivars can be considered as a valuable portion of the gene pool (Vojdani and Meybodi 1993; Zou and Yang 1995), because they represent the broad intra-specific genetic diversity of crops, from which new cultivars have arisen. Due to those valuable characteristics, the direct practical utilization of some landraces by farmers is also discussed (Brush and Meng, 1998).

Landraces is important to conserve genetic sources. Awareness of the need for biodiversity conservation is now universally accepted, but most often recent conservation activities have focused on wild species. Crop species and the diversity between and within them has significant socioeconomic as well as heritage value. The bulk of genetic diversity in domesticated species is located in traditional varieties maintained by traditional farming systems. These traditional varieties, commonly referred to as landraces, are severely threatened by genetic extinction primarily due to their replacement by modern genetically uniform varieties (Villa et al 2005).

Extinction of genetic resources and genetic erosion are some of the facing main problems of Turkey like many countries. Modern agriculture and conventional breeding and the liberal use of high inputs have resulted in the loss of genetic diversity and the stagnation of yields in cereals in less favourable areas. Increasingly landraces are being replaced by modern cultivars which are less resilient to pests, diseases and abiotic stresses and thereby losing a valuable source of germplasm for meeting the future needs of sustainable agriculture in the context of climate change. Where landraces persist there is concern that their potential is not fully realised (Newton and et all 2010)

Wheat landraces are valuable sources to broaden the genetic base of cultivated wheat. The development of new varieties from landrace populations is a viable strategy to improve landrace yield and yield stability, especially under stress and future climate change conditions; also, these landraces harbor genes and gene complexes for quality traits, tolerance to biotic and abiotic stresses, and adaptation under a wide range of low-input and organic farming systems (Jaradat, 2012).Genetic diversity of the wheat landraces must be investigated for use in wheat breeding. More information about the genetic diversity within and relationships among landraces would be invaluable for the conservation and utilization of existing genetic resources (Warburton and Hoisington, 2001; Zhang et al., 2006).

Turkey lies within the broad region of domestication of wheat (Zohary and Hopf, 1988). The first collection was completed at the first quarter of 20th century, pioneering Turkish scientist Mirza Gökgöl collected wheat landraces from all over Turkey and evaluated them for basic characteristics. The name of the book is “Türkiye Buğdayları”. Gökgöl identified about 18.000 types of wheat and among them he identified 256 new varieties. His publications are still the most notable sources for the breeders and scientists dealing with plant genetic resources. The analyses of these material convinced Gökgöl that almost all wheat varieties existing in the world

were present in Turkey and that Turkish landraces provide an endless treasure to the breeders (Gökgöl 1939).

In the same period as Gökgöl, well known Russian scientist Zhukovsky conducted 3 collecting missions to Turkey during 1925-1927. Zhukovsky was encouraged by Vavilov and his missions were supported by The Botany Society of the Soviet Union. During three years in Turkey, Zhukovsky collected around 10,000 samples of cereals, forages and vegetables. The material was an enormous contribution to plant varieties of the Soviet Union (Zhukovsky, 1951).

Another landrace collection was done by Harlan in 1948 to 1949 with contribution of Agronomy Department of the University of Ankara[3]*, the Toprak Ofisi of the Ministry of Trade*, and the Plant Breeding Stations of the Office of the Director General of Agriculture*. The collection include in 2,121 wheats accession (incl. *T.monococcum*), and 55 wild relatives of wheat. These populations was analysed for botanical and agronomic composition, providing an unusual opportunity for studies on the behavior of botanical varieties in mixed populations under diverse climatic conditions. The wheats in Turkey were represented by remarkable diversity and great varietal wealth (Harlan, 1950).

Turkish farmers cultivated their landraces widely untill the second half of 20th century. After the World War II, a program was started in Turkey through an agreement with Rockfeller Foundation. Although it was a modest start in agriculture research, mechanization, use of fertilizers and chemicals, it resulted in unexpected consequences. Among several plant groups involved, wheat program had the greatest impact. It didn't take long for the new varieties to replace the landraces. The heritage begun to be demolished after so called high yielding "Mexican wheats" were introduced to the country (Karagöz, 2014)

In the early years of wheat breeding in Turkey, Like Köse 220/39, Sürak 1593/51, Topbaş 111/33, Sertak 52 varieties were improved with selection and Köse 220/39 bread wheat variety was used a quality standard. This situation is an indication of how important the landraces are for Turkey. In recent years, landraces weren't used in breeding so much and foreign-origin wheat materials were forming a basis for the crossbreeding studies in Turkey. These applications have narrowed the genetic variation on bread wheat varieties (Karagöz ve Zencirci 2005).

[3] The names of the institutions are former name of Field Crop Department of Ankara University, Turkish Grain Board, and General Directorate of Agricultural Research and Policies in Turkey.

Damania et all (1996) evaluated the collection of 2,420 accessions derived from single-spike population samples of durum wheat landraces collected in 1984 from 172 sites in 28 provinces in Turkey done by Mertzher's team. They found differentiation of these accessions for number of days to headi,ng, maturity, grain filling day as well as for plant height, peduncle length, number of spikelets per spike, spike length, awn length, and kernel weight. As resesult of the canonical analysis, significant correlation amonggs province mean temparatures, altitude, latitude and length of growing season. Eight distinct groups of provinces were identified by cluster analysis. They concluded that accessions could be utilized in crop improvement programs targeted at either favorable or stressed environments.

The other important collection and evaluation was done by Zannata's team in 1996 in western part of Turkey. They got the seed farmers' seed stores in 35 villages, 6 districts and 3 provinces in western Turkey, respectively, Merkez and Banaz in Usak; Altintas, Çavdarhisar, and Simav in Kütahya, and Seyitgazi in Eskisehir province. A total of 126 populations, representing 22 landraces, were planted in Eskisehir and compared to modern varieties of wheat recommended for cultivation in Turkey; Bezostaja-1, Cakmak-79, Gerek 79 and Kunduru 1149. They found that the significant differences between wheat landraces and modern wheat varieties' yields. The yields for the modern varieties ranged from 1800 to 2900 kg/ha in the first year, and from 3500 to 4500 kg/ha in the second year. At the same time, the landraces showed very good performance in relation to the modern germplasm in both years, with yields variying from 1400 to 3100 and 3200 to 5600 kg/ha in the first and second years, respectively (Zanatta and et all, .1996, Zanatta and et all, .1998).

Akçura ve Topal (2006) in their studies, they evaluated genetic diversity of seven quantitative characters in 307 winter bread wheat landraces which are collected 21 different provinces in Turkey and calculated Shannon-Weaver diversity index (H') The researchers concluded that these landraces must be considered as a reservoir of genes that plant breeders need in their winter wheat improvement programs in Turkey.

Brush and Meng (1998) studied on farmer's valuation of wheat landraces in three provinces (Eskisehir, Kutahya and Usak). They synthesized the two approaches in order to examine farmer selection of local wheat landraces in relation to that of modern varieties in three provinces in western Turkey. They found that Multiple farmer concerns (e.g. yield, risk, quality), environmental heterogeneity, and missing markets contributed to the persistence of landraces.

Household characteristics informing variety choice also affected the household's perceptions of the importance and value of landraces.

Bardsley and Thomas (2005) in their study, they discussed why the Northeast of Turkey is marginal in terms of wheat production. The de facto conservation of the local wheat landrace was analyzed in light of stakeholders' opinions on agrobiodiversity conservation within the marginal agricultural community of Northeast Turkey. They stated that marginal rural communities retained local wheat landraces because of their own interpretations of the value of these varieties. As results of their study, they conclused that while formal opportunities for supporting farmers' perceptions of local diversity with effective policy initiatives were available, they would require ongoing support from both international and national organisations.

The contribution of landraces to breeding and genetic researches, the farmers who are living remote areas and also environment can't be denied. They are also a cultural heritage and an indication for our wealth as a country. In many studies, landraces was evaluated in terms of social and private values. The social value of landraces has been described anecdotally by examples of the economic contribution of exotic crops and crop varieties and analytically by the contribution of germplasm to breeding programs (Evenson and Gollin 1994; National Research Council 1993). The private value of landraces is suggested by their persistence in farming systems where alternative varieties exist (Brush 1995) and by studies on the evaluation and selection of local varieties (Bellon 1996; Zimmerer 1996; Sperling et al. 1993). As results of these studies, landraces should be considered an important natural resource and they can be conserved and used for future generations.

2.5 References

Akar, T., Yazar, S., Dönmez, E., Avcı, M. and Düşünceli. F., (2007). Current status of national winter wheat breeding in Turkey. J. Agric. Res. 45(1):1-8.

Akçura, M. ve Topal, A., (2006). Türkiye Kışlık Yerel Ekmeklik Buğday Çeşitlerinde Fenotipik Çeşitlilik, Gıda, Tarım ve Hayvancılık Bakanlığı, Bahri Dağdaş Uluslararası Tarımsal Araştırma Enstitüsü Müdürlüğü, Bitkisel Araştırma Dergisi, 2, 8-16, Konya..

Altıntas, S., Toklu, F., Kafkas, S., Kilian, B., Brandolini, A., and Ozkan, H.,(2008). Estimating Genetic Diversity in Durum and Bread Wheat Cultivars from Turkey using AFLP and SAMPL Markers. Plant Breeding 127, 9—14 (2008). http://onion81.mpiz-koeln.mpg.de/downloads/Publikationen_2008/altintas_plant_breeding_2008.pdf

Altuntaş, E., and Demirtola H., (2004). Ülkemizin Tarımsal Mekanizasyon Düzeyinin Coğrafik Bölgeler Bazında Değerlendirilmesi. GOÜ. Ziraat Fakültesi Dergisi, 21(2), s: 63-70.

Anonymous (2012). Asian Wheat Producing Countries-Turkey. http://www.fao.org/ag/AGP/AGPC/doc/field/Wheat/asia/turkey.htm

Bardsley, D. and Thomas, I., (2005). Valuing local wheat landraces for agrobiodiversity conservation in Northeast Turkey Agriculture, Ecosystems and Environment 106 (2005) 407–412

Belay G., Tesemma T., Bechere E., and Mitiku D., (1995). Natural and human selection for purple-grain tetraploid wheats in the Ethiopian highlands. Genetic Resources and Crop Evolution, 42: 387–391.

Bellon, M.R, (1996). The dynamics of crop infraspecific diversity: A conceptual framework at the farmer level. *Economic Botany* 50: 26-39.

Bennett, S. J., Maxted, N. and Sabanci, C. O., (1998). The ecogeography and collection of grain, forage and pasture legumes in south-west Turkey, Genetic Resources and Crop Evolution, 45, pp. 253 – 262.

BUGEM, (2012). Tarım İstatistikleri. www.bugem.gov.tr

Brush, S. B., (1995). In situ conservation of landraces in centers of crop diversity. Crop Science 35: 346–354.

Brush S.B., and Meng E. (1998). Farmers' valuation and conservation of crop genetic resources. Genetic Resources and Crop Evolution, 45: 139–150.

Daimond, J., (1997). Guns, Germs, and Steel. The Fates of Human Societies. W. W. Norton and Co., New York.

Damania, A.B., Pecetti, L., Qualset, C.Q., and Humeid, B.O., (1996). Diversity and geographic distribution of adaptive traits in Triticum turgidum L. (durum group) wheat landraces from Turkey. Genetic Resources and Crop Evolution 43:409-422, The Netherland

Davis, P.M., (1985). Flora of Turkey and the East Aegean Islands. Edinburgh University Press, Edinburgh, UK.

Evenson, R. E. and Gollin, D., (1994). Genetic resources, international organizations and rice varietal improvement. Center Discussion Paper No. 713. Economic Growth Center, Yale University, New Haven, CN.

FAO, (1998). State of the World's Plant Genetic Resources for Food and Agriculture (Rome, 1998).

FAO, (2012). FAOSTAT-Agricultural Production and Production Value Statistics, http://faostat.fao.org

Feldman, M., and Sears, E.R., (1981). The wild gene resources of wheat. Sci. Am., 244:98-109.

Feldman, M., (2001). Origin of cultivated wheat. P: 3-53, in: The World Wheat Book. A History of Wheat Breeding. A.P. Bonjean and W.J. Angus, Eds. Lavoisier Publishing, Paris.

Fırat, E., and Tan, A., (1997). "In Situ Conservation of Genetic Diversity in Turkey" in Maxted et. al. (eds) Plant Genetic Conservation: The In Situ Approach (Chapman and Hall).

Gökgöl, M. (1939). Turkish wheat. Istanbul

Harlan, J. R. (1950). Collection of crop plants in Turkey. Agron. J. 42:258-59.

Harlan, J. R., (1995). The Living Fields: Our Agricultural Heritage (Cambridge: Cambridge University Press).

Jaradat, A.A., (2012). Wheat Landraces: Genetic Resources for Sustenance and Sustainability. USDA-ARS, 803 Iowa Ave., Morris, MN 56267 USA. http://www.ars.usda.gov/SP2UserFiles/Place/36450000/products-wheat/AAJ-Wheat%20Landraces.pdf

Karagöz, A., (2014). Wheat Landraces of Turkey, Emir. J. Food Agric. 2014. 26 (2): 149-156, http://www.ejfa.info/

Karagöz, A. and N. Zencirci. (2005). Variation in Wheat (Triticum spp.) Landraces from Different Altitudes of Three Regions of Turkey. Genetic Resources and Crop Evolution. 52:6 (775-785)

Kaya, Z., Kün, E., and Güner, A., (1997). National Plan for In situ Conservation of Plant Genetic Diversity in Turkey. Milli Egitim Basimevi, Istanbul.

Keller L., Schmid J.E., and Keller E.R., (1991). Are cereal landraces a source for breeding? Landwirtschaft Schweiz, 4: 197–202.

Kruzich, T.J. and Meng, E., (2006). Wheat Landrace Cultivation in Turkey: Household Land-use Determinants and Implications for On-Farm Conservation of Crop Genetic Resources. International Association of Agricultural Economists Conference, August 12-16, 2006, Gold Coast, Australia.

Li S., Sun F., Guo B., Liu L., Pang Ch. (1997). Evaluation of abiotic stress resistance in Hebei winter wheat genetic resources. Wheat Information Service, 85: 1–6.

Mangelsdorf, P. C. (1953). Wheat Science Am., 189:50-59.

Mazid A, Amegbeto K.N, Keser M, Morgounov A,Peker K, Bağci A, Akın M, Küçükçongar M, Kan M, Karabak S, Semerci A, Altıkat A, Yaktubay S. (2009). Adoption and Impacts of Improved Winter and Spring Varieties in Turkey. ICARDA, ALEPPO, SYRIA.

MFAL, (2012). Information on Agricultural Basins. Ministry of Food Agriculture and Livestocks. www.tarim.gov.tr.

Morrison, L.A., and Wrigley, C.W., (2004). Taxonomic classification of grain species, pp:271-280 in Encyclopedia of Grain Science, Vol. 3. C. Wrigley, C. Walker, and H. Corke, Eds. Elseiver Ltd. Oxford, UK.

National Research Council, (1993). Managing Global Genetic Resources: Agricultural Crop Issues and Policies. National Academy Press, Washington, D. C.

Nesbitt, M., and Samuel, D., (1996). From stable crop to extinction? The archaeology and history of the hulled wheats. In: Padulosi S, Hammer K, Heller J (eds) Hulled wheats. International Plant Genetic Resources Institute, Rome, pp 41–100

Newton, A.C., Akar, T., Baresel, J.P., Bebeli, P.J., Bettencourt, E., Bladenopoulos, K.V., Czembor, J.H., Fasoula,, D.A., Katsiotis, A., Koutis, K., Koutsika-Sotiriou, M., Kovacs, G., Larsson, H., Pinheiro de Carvalho, M.A.A., Rubiales, D., Russell, J., Dos Santos, T.M.M., and Vaz Patto, M.C., (2010). Cereal landraces for sustainable agriculture. A review, Agron. Sustain. Dev. 30 (2010) 237–269

Shewry, P.R., Halford, N.G., and Lafiandra, L., (2003). Genetics of wheat gluten proteins. Adv. Genet. 49:111-184.

Smale, M., Bellon M. R., and Aguirre J. A. G., (2001). “Maize Diversity, Variety Attributes, and Farmers’ Choices in Southeastern Guanajuato, Mexico.” Economic Development and Cultural Change 50(1): 201-225.

Sperling, L., Loevinsohn, M. E., and Ntabomvura, B., (1993). Rethinking the farmer's role in plant breeding: Local bean experts and on station selection in Rwanda. Experimental Agriculture 29: 509–519.

Tan, A., (1998). Current status of plant genetic resources conservation in Turkey. In: Zencirci, N., Kaya, Z., Anikster, Y., Adams, W.T. (Eds.), Proceedings of the International Symposium on In situ Conservation of Plant Genetic Diversity, CRIFC, Ankara, pp. 5– 16.

Tanno, K, and Willcox, G., (2006). The origins of cultivation of *Cicer arietinum* L. and *Vicia faba* L.: early finds from north west Syria (Tell el-Kerkh, late 10th millennium BP). Veg Hist Archaeobot 15:197–204

Tesemma, T., Tsegaye, S., Belay, G., Bechere, E., and Mitiku, D., (1998). Stability of performance of tetraploid wheat landraces in the Ethiopian highland. Euphytica, 102: 301–308

TTSM, (2012). Variety Registration Statistics in Turkey. Variety Registration and Seed Certification Center, www.ttsm.org.tr.

TUGEM, (2012). www.tugem.gov.tr.

TUIK, (2012). Production Statisticas. Turkish Statistical Institute. www.tuik.gov.tr.

Villa T.C.C., Maxted, N., Scholten, M., and Ford-Lloyd, B., (2005). Defining and identifying crop landraces, Characterization and Utilization. Plant Genetic Resources: Characterization and Utilization (2005), 3: 373-384

Warburton, M., and Hoisington, D., (2001). Applications of molecular marker techniques to the use of international germplasm collections. In: Henry R (ed.). Plant Genotyping-The DNA Fingerprinting of Plants. CAB International, Oxon, UK.

Vojdani P., Meybodi M. (1993). Distribution and genetic diversity of primitive bread wheats in Iran. In: Damania A.B. (ed.): Biodiversity and Wheat Improvement. John Wiley & Sons, Chichester, 409–415.

World Bank, (1993). Republic of Turkey: In-situ Conservation of Genetic Diversity. Report no. 11295-TU, Global Environment Coordination Division, World Bank, Washington

World Bank, (1999). Republic of Turkey: In-situ Conservation of Genetic Diversity. Report no. 11295-TU, Global Environment Coordination Division, World Bank, Washington

Wrigley, C.W., (2009). Wheat: A Unique Grain for the World. P:1-17 in: Wheat: Chemistry and Technology. Khan, K., and Shewry, P.R., Eds. AAAC International, USA.

Yavuz, M., (2010). Wheat Flour From Turkey. Export Promotion Center of Turkey. http://www.economy.gov.tr/upload/sectoralreports/Wheat%20Flour.pdf

Zanatta, A.C.A, Keser, M., Kilinc, N., Brush, S.B., and Qualset, C.O., 1996. Agronomic performance of wheat landraces from western Turkey: bases for in situ conservation practices by farmers. 5th International Wheat Conference, June 10-14, 1996 Ankara, Turkey.

Zanatta, A.C.A, Keser, M., Kilinc, N., Brush, S.B., and Qualset, C.O., (1998). Competitive performance of wheat landraces from western Turkey: Basis for locally based conservation of genetic resources, Proceedings of the 9th International Wheat Genetics Symposium, 2-7 August 1998, Saskatoon, Saskatchewan, Canada.

Zencirci, N., and Birsin, M., (2004). "From Wheat in Turkey to Bread of World" Paper to be presented in Agronomy and Crop Science Society Meeting.

Zhang, P., Dreisigacker, S., Buerkert, A., Alkhanjari, S., Melchinger, A.E., and Warburton, M.L., (2006). Genetic diversity and relationships of wheat landraces from Oman investigated with SSR markers. Genet. Res. Crop Evol. 53: 1351-1360.

Zimmerer, K. S., (1996). Changing fortunes: Biodiversity and peasant livelihood in the Andes. University of California Press, Berkeley

Zohary, D., and Hopf, M., (1988). Domestication of plants in the old World. Clarendon Press, Oxford, England.

Zou Z.T., and Yang W.Y. (1995). Development of wheat germplasm research in Sichuean province. Crop Genetic Resources, 2: 19–20

CHAPTER 3

NATIONAL INVENTORY OF WHEAT LANDRACES AND MAPPING

3.1. Introduction

The evaluation of landraces is important to define and conserve them. Up to now, there are a few studies on landrace potential of Turkey. While some scientist collect the landraces and research their agronomical features to determine usage opportunities in breeding studies (Gökgöl, 1939, Harlan, 1950, Metzger, 1984, Zanatta et all., 1996, Zanatta et all., 1998, Damania et all, 1996, Damania et all, 1997, Akçura and Topal, 2006), there are few studies on characteristics of farmers who grow them and in situ conservation of landraces (Meng,1997; Qualset et al., 1997; Brush and Meng, 1998; Tan, 2002; Kruzich, 2006; Kruzich and Meng, 2006). In almost every study done in Turkey, scientists mentioned that landraces are important potential for breeding and they should be adapted to breeding studies (Keller et al. 1991; Zanatta et all., 1996; Zanatta et all., 1998; Tesemma et al. 1998; Dotlačil, 2010, Jaradat, 2012.). However, the landraces importance has been emphasized by many scientists in Turkey (e.g Harlan, 1950; Çetin et al. 2007), genetic erosion and existences of some species haven't been prevented and it has been in progress.

The first evaluation and important study on landraces is Mirza GOKGOL's book (Gökgöl, 1936). It is very big reference for wheat gene resources. This study shed light on genetic diversity studies on wheat and also gives information in which region and which type landraces were grown. After this study small scale researches completed but their scope and space were very limited.

ICARDA and CIMMYT are international organizations and they carry out agricultural researches in different agricultural subjects and crops. They are also partners many agricultural project with Turkey. One of the important projects has been carried out on International Winter Wheat Improvement Project (IWWIP). In 1986, the government of Turkey and CIMMYT, joined by ICARDA in 1990, established the International Winter Wheat Improvement Program

(IWWIP). Several improved wheat varieties have since been jointly developed, disseminated and grown by producers both in Turkey and elsewhere in the world.

Wheat landraces study was started in 2009 with CIMMY-ICARDA and Turkey partnership under the IWWIP. The study's main framework was based on previous visits and surveys in Kutahya, Sivas and Erzurum provinces. Follow-up from research of 1993 and 1999 and the others study, which completed Erica Meng and others and supported by the USA, NSF and CIMMYT, constituted main framework of this study. In the meanwhile, there was a need to update of Gökgöl's book on wheat landrace in Turkey. This study aims to update the Mirza GÖKGÖL's study and also put forward the last situation of wheat landraces in farmers' conditions. Up to now, 65 provinces have been completed to determine the state of wheat landraces. In this chapter, according to wheat types, the survey results were mapped by using geocoordinates on Turkey map where wheat landrace spikes or/and seeds were collected in the research area.

3.2. General Information on Research Area

Turkey is located in the eastern Mediterranean and creates a bridge between the continents of Europe and Asia. Turkey's geography (topography and climate), natural resources including biological resources and culture exhibits a wide spectrum. From east to west part of Turkey, in the east part, rugged, and snow-capped mountains with cool and long summers, and cold and long winters, in Central Anatolia, rising and falling mountains, barren cliffs and wheat fields in dry steppes, and in the west part, fertile valleys between the cultivated foothills extending to the west coast of the Aegean with warm and temperate climate are seen. North-south cross-section begins with mostly nuts, corn, and tea planted mountain chains overlooking coastal fields of Black Sea and fertile, and temperate lands. There are intact forest ecosystems and high grasslands with rich biological diversity peculiar to northern Anatolia in high altitude of the North Anatolian Mountains. From Black Sea to south part of Turkey, Konya Plain in Central Anatolia, coniferous forests of the Taurus Mountains with mild Mediterranean climate and cotton and banana plantations in Mediterranean region are seen. As Turkey's natural structure consists of combination of the three old continents (Europe, Africa, and Asia) qualities, it's ecological and biological diversity leaves behind other places in 40°N longitude (Tan, 2010). Turkey displays

great diversity in climate and eco-geographical areas and agricultural sector plays a major role in the economy and maintainance of rural communities.

Turkey, hosting main genes and diversity centers, is also an important center for the forage crops products being important at the global level. Local varieties of these crops are still being used in traditional production systems and in pastures and wild relatives of cultivated plants and endemic plant species spread to natural habitats of different ecosystems (Tan, 2010).

Turkey is composed of 3 different bio-geographic regions, each of which has unique species and natural ecosystems peculiar to their own (Mediterranean, Euro-Siberian, and Iranian-Turan). Each of these regions has its own endemic species and natural ecosystems. These regions are Eastern Blcak Sea Mountain Forests involving Alpine Pastures, the steppes of Central Anatolia and Eastern Anatolia, and Mediterranean region hosting the largest cypress forests available in the world. Turkey is located at the intersection of two major Vavilovian gene centers: the Mediterranean and the Near Eastern. This location also plays a very significant role in the origins of cereals and horticultural plants (Tan, 2010).

Some of the cultivated plant species originated of Anatolian; *Linum sp.*, *Allium sp.*, *Hordeum sp.*, *Triticum sp.*, *Avena sp.*, *Cicer sp.*, *Lens sp.*, *Pisum sp.*, *Vitis sp.*, *Amygladus sp.*, *Prunus sp.*, *Beta sp.*, etc. There are five different "micro gene centers" in Turkey (Tan, 2010).

Tracian and Aegean Region: Bread wheat, durum wheat, Poulard wheat, degnek wheat, small red wheat, lentil, chickpea, melon, vetch, lupine and alfalfa.

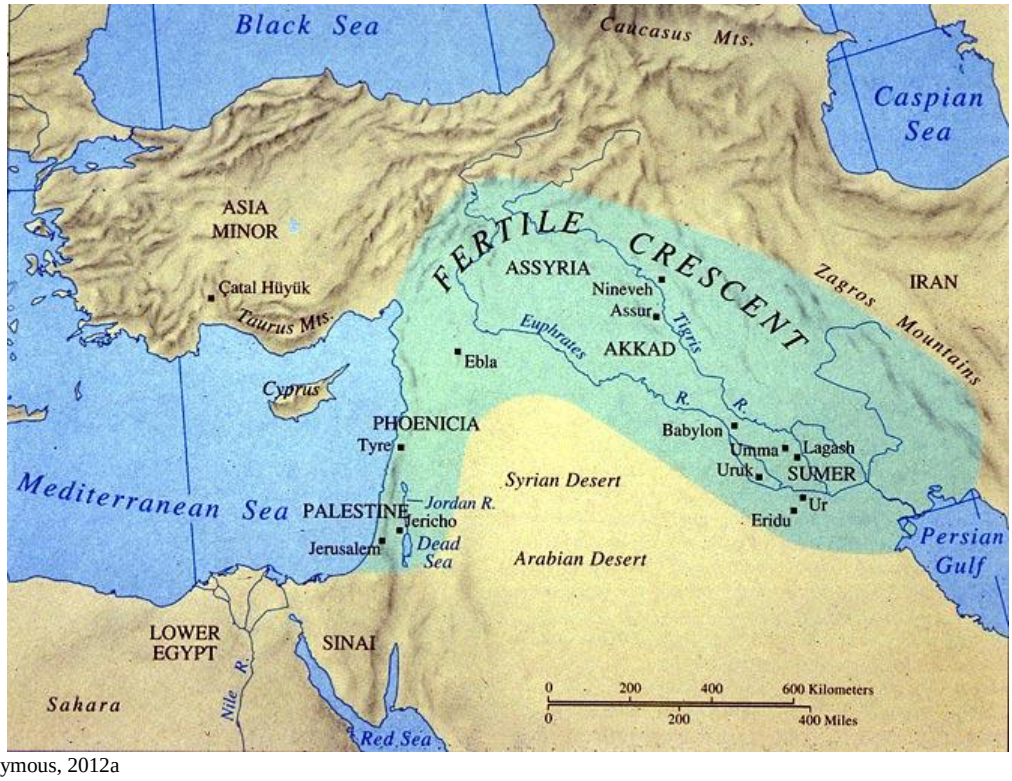
Southern and South Eastern Anatolia: *Tritucum dicoccum*, small red wheat, *Aegilops speltoides*, pumpkin, water melon, cucumber, bean, lentil, broad bean, grape vine and forage crops.

Samsun Tokat and Amasya: A large number of fruit species, bean, lentil, broad and legumes for animal feed.

Kayseri and its surrounding: Badem, apple, bezelye, different fruit species, grape vine, lentil, chickpea, alfalfa ve evliyaotu.

Ağrı and its surrounding: Apple, apricot, cherry, sour cherry, water melon and legumes for animal feed.

The research area carried out for inventory of wheat landraces were Black Sea Region (Eastern Black Sea Region and Western Black Sea Region), Eastern Anatolian Region (North Eastern Anatolian Region and Middle Eastern Anatolian Region) and South Eastern Anatolian Region. These three regions are in the parth of north, east and south east parts of Turkey. These areas are important in terms of bio-geographic, gene centers and agro-biodiversity. Especially, the region where the South Eastern Anatolian Region consists of a part is called as "Fertile Crescent" throughout history and this region, which is in Iranian-Turan vegetation geography, is gene center of especially many grains, including wheat and barley and their wild ancestors (Figure 3.1.).

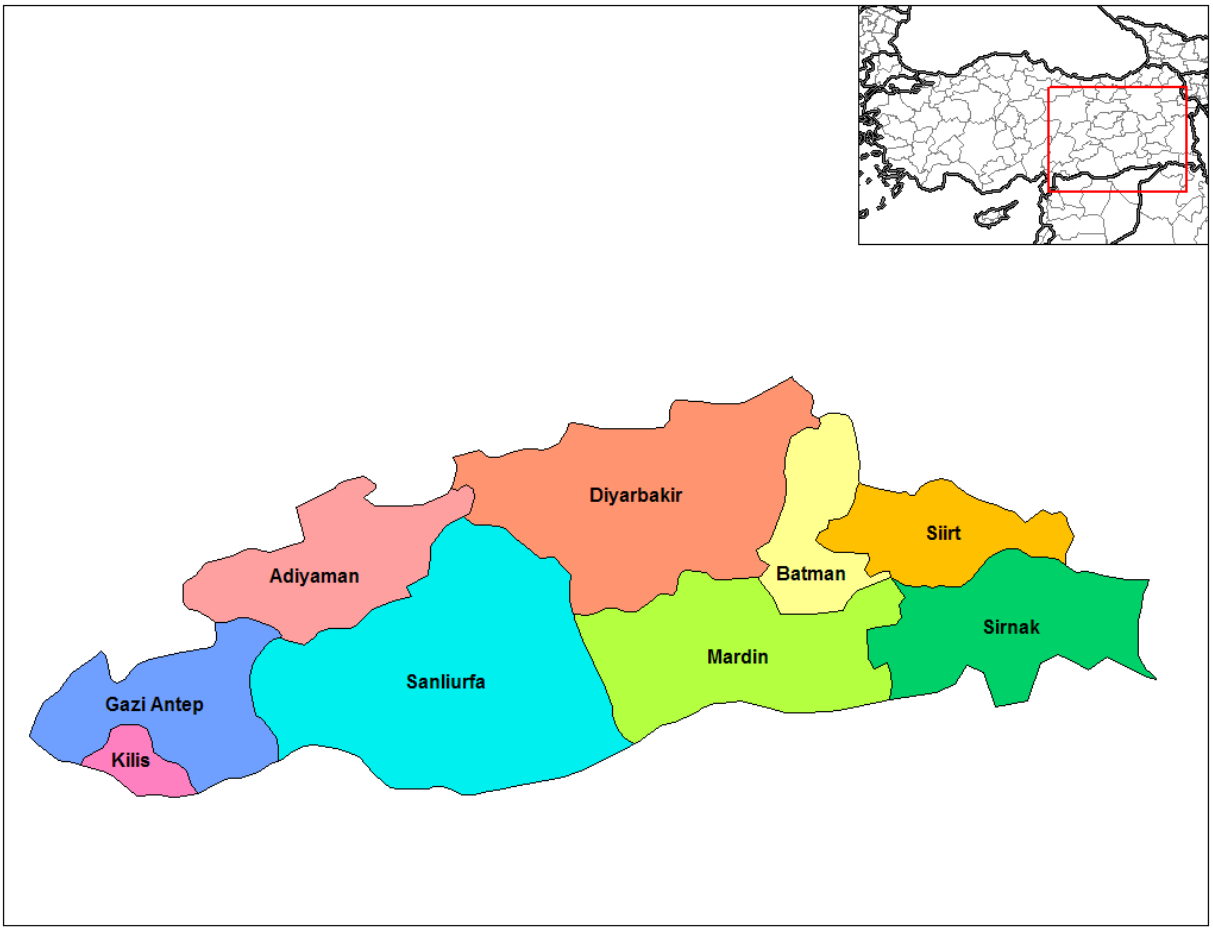


Source. Anonymous, 2012a

Figure 3.1. The map of Fertile Crescent

3.2.1. South Eastern Anatolian Region

South Eastern Anatolia Region which is the first one of the 3 regions on which the study is being conducted involves the following cities: Adıyaman, Batman, Diyarbakır, Gaziantep, Kilis, Mardin, Siirt, Sanlıurfa and Sırnak. Square measure of the region is 75,308 km^2 and it constitutes 9.7 % of Turkey's square measure (Anonymous 2007a) (Figure3.2).



Source. Anonymous, 2012b

Figure 3.2 The map of South-East Anatolian Region in Turkey.

The most important feature of South Eastern Anatolia Region is the simplicity of land forms. The region is covered with plateaus and plains which do not have much height. However, east and west halves of the region has slightly different features in terms of land forms. The altitude in

the region starts from 375 meters and rises up to 3,358 meter in the very east (Altındag). The part of the region which is between the cities of Gaziantep, Diyarbakır and Mardin and which is named especially as "fertile moon" through which the "Silk Road" passes has a softer topography compared to the lands in north east and east (Anonymous 2007a).

The climate of South Eastern Anatolia Region has a feature formed under the effect of arid tropical region in the south as well as Eastern Anatolia and Mediterranean Regions. It is located in a region which is away from sea effect. For this reason, continental climate feature overweigh. This feature shows itself in terms of heat and precipitation. Winter season passes humid, cold and rainy. Beginning from June, desert conditions in the south begin to dominate in the region and drought rises to the top level. Therefore, there is much evaporation. The highest temperature of our country is calculated around Sanlıurfa (46.5 ºC) and Diyarbakır (46.2 ºC). Most of the precipitation falls in winter months. Precipitations decreases towards the border of Syria. The amount of annual average precipitation is 796 mm in the north while it is 331 mm in the regions close to the border of Syria. Winter months passes cold in high places. Snowfall and frost are so frequent. It is the feature of continental climate that in high places, there is a big difference in the heats of summer and winter temperatures. The average of the coldest month varies between 1,5°C and 6°C. The average of the hottest month is about 30°C (Anonymous 2007a).

Agricultural sector is effective in the region. Almost 60 % of the working population is being employed agriculture sector. Especially in the medium scaled cities which are small and the population of which is below 100.000, a great deal of the population deals with agriculture as their main means of existence and source of employment. The underdeveloped traditional economical and social structure of the region as well as its rapid population growth rate reflects on the income per capita. The income per capita in the region is almost half of Turkey's average. South Eastern Anatolia Region constitutes 8% of total employment with 1,960,014 people. In the region, 62,6% of the employed population is male while 37,4% of it is female population. It is observed that women are mostly employed in agriculture sector. In the region, 61,5% of the employed population is in agriculture (1,202,525) while 13% of it (255,192) is in service and 6,7% of it (131,111) is in industry whereas 3,7% of it (72,390) is in construction sector (Anonymous 2007a).

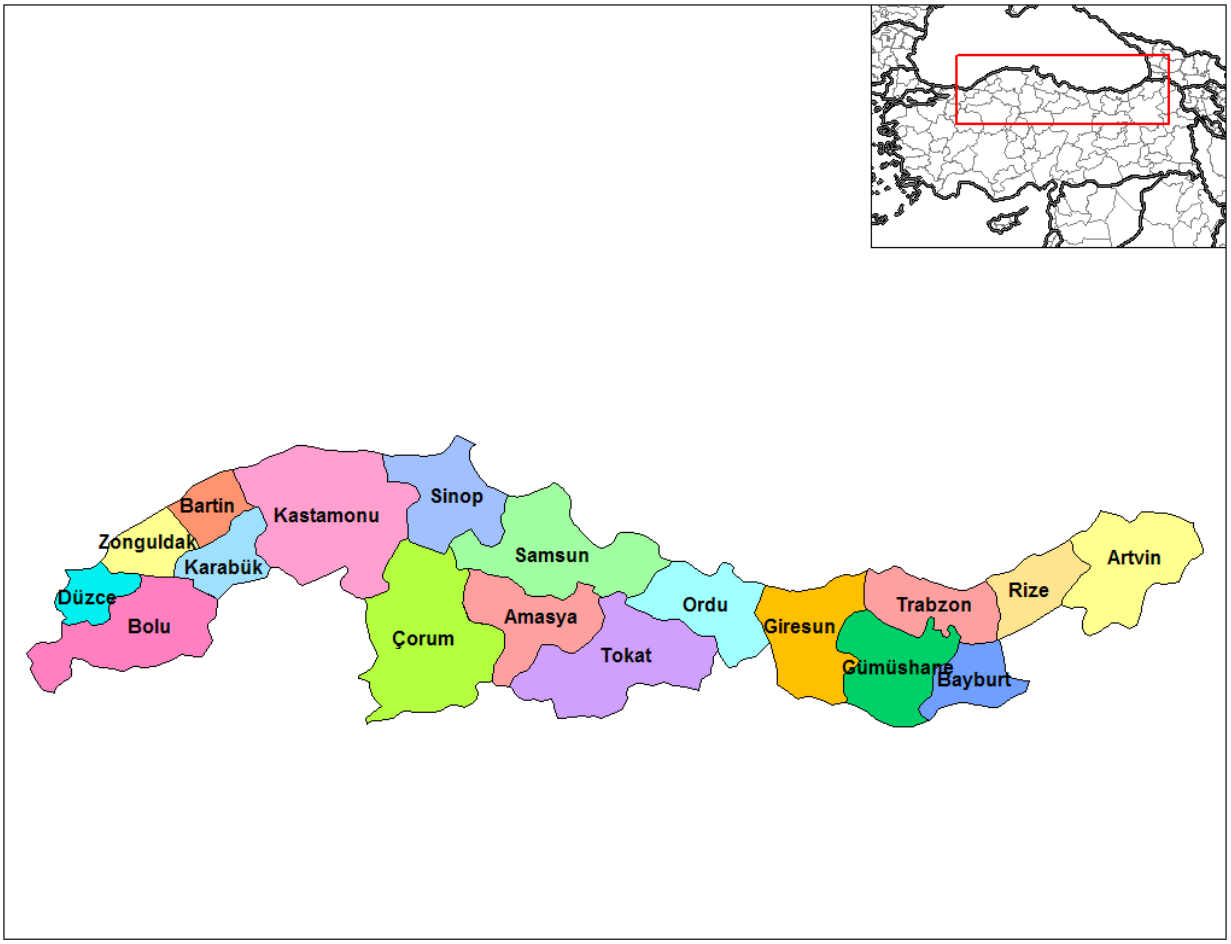
South Eastern Anatolia Region is the poorest region of Turkey in terms of forest existence. Land existence of South Eastern Anatolia Region is almost 7.5 million hectare and 3.3 million

hectare of this land is suitable for agricultural purposes. In South Eastern Anatolia Region, according to the distribution of Land Usage Capability Classes, the amount of land sufficient for processable agriculture (I. II. and III. class) in the region is almost as 33.2% of the total area. When the land, sufficient for limited processing (IV. class), is evaluated together, 42.3%of the lands of the region is available for agriculture. 50% (1,760,728 hectare) of agricultural land of South Eastern Anatolia Region which is totally 3,373,188 hectare is suitable for watering but only 40% of this can be watered. This rate is well below Turkey average. The enterprises in South Eastern Anatolia Region are above the Turkey average generally but they are not economical. In general, vast majority of the enterprises in the region are, in terms of the land they operate on, insufficient, scattered, unsuitable for machine agriculture, dispersed family businesses. 8.6% of Turkey's enterprises are in South Eastern Anatolia Region (Anonymous 2007a).

South Eastern Anatolia Region constitutes 13% of Turkey's agricultural lands with3.373.188 hectare agricultural land. From the aspect of processed land, the region owns 15% cultivated area throughout the country. In fallow land, it is almost 6%. In the field of vegetable gardens, it is 10% and in terms of orchards, it has 14% of Turkey's orchards in general. South Eastern Anatolia Region, according to the cultivation sites of wheat, barley, corn, garbanzo, bean, sugar beet, tobacco, cotton, red pepper, soybeans and sesame which are available in the cultivation sites of land products countrywide has the cultivation area at the following rates: 13% for wheat, 18% for barley, 4% for corn, 13% for garbanzo, 1% for beans, 9% for tobacco, 47% for cotton, 61% for red pepper, 98% for red lentil and 38% for sesame (Anonymous 2007). According to the 2011 TSI data, in the region, there is 1,281,520 hectare wheat cultivation area and average wheat yield is 3054 kg/hectare (TÜİK, 2012).

3.2.2. Black Sea Region

One another region where the investigation is being conducted is Black Sea Region. Black Sea Region was examined in 2 sub regions from the aspects of both geographical and agricultural structure. The first sub region is West Black Sea Region and the other is East Black Sea Region (Figure 3.3.).



Source. Anonymous, 2012c

Figure 3.3 The map of Black Sea Region in Turkey.

3.2.2.1. Western Black Sea Region

Western Black Sea Region involves the following cities: Zonguldak, Karabuk, Bartın, Kastamonu, Cankırı, Sinop, Samsun, Tokat, Corum and Amasya. Square measure of the region is 74.178 km^2 and this constitutes 9,5% of Turkey's square measure. The altitude of the region varies between the sea level and 2,565 m (Catalılgaz hill suited in the city of Kastamonu). The region has a quite rough structure in terms of land forms and heights constitute a great majority of region (Anonymous 2007b).

In the coastal regions of the region, black sea climate which is rainy in all seasons and during which annual heat changes is less is dominant. When moved towards inner sides from the coastal parts, precipitation decreases and the climate gets continental. But, in the cities of Tokat and Amasya, a transition climate between black sea climate and continental climate is observed.

Annual average temperature is 12,5 ºC in West Black Sea Region and annual average high temperature is 20 ºC and average low temperature is 7 ºC. Average relative humidity is 70%. Average annual precipitation is 633,4 mm. Average number of sunny days is 86 while the number of average frost days is 37 (Anonymous 2007b).

Natural vegetation of the region is forests. As the slopes of the mountains facing the sea get abundant precipitation, it is covered with exuberant forests. When you go towards interiors, cold resistant types of tree and steppes constitute the vegetation (Anonymous 2007b).

The region shelters 7.2 % of Turkey's population. While in Turkey the population per km^2 is 88 people, it is 66 in Western Black Sea Region. The village population in Western Black Sea Region is 50,6% and this is well beyond the country rate that is 35,1%. While the urbanization rate in Turkey in general is 64,9%, it is 49,4% in Western Black Sea Region. In Western Black Sea Region, the rate of literate population is 85,5% (Anonymous 2007b).

The value of agricultural production per rural population is 1.124 TL in Turkey while it is below country average with 998 TL in the region (Anonymous 2007b).

Western Black Sea Region owns 9.5% of country lands with 7.417.829 hectare. Square measure of the region is composed of the sub regions as Samsun with 51,3%, Kastamonu with 35.7% and Zonguldak with 13%. Western Black Sea Region owns the 10,2% of Turkey's agriculture areas. In the region, agriculture areas have a share of 36.7%, meadows-posture areas have a share of 11.2%, forests and shrubberies have a share of 43.1% and other areas have a share of 9%. In terms of area, the city having the most agricultural area is Corum; the one having the least area is Bartın. In the Western Black Sea Region, there are 433,473 hectares of lands which have first class usage capability and are suitable for processable agriculture. Among the first class agriculture lands in the region are Bafra and Carsamba plains which are the most important and fertile plains of our country. The region has totally 1,996,956 hectares of lands which have second, third and fourth class usage capability and are suitable for processable agriculture. 61% (1,651,130 hectares) of agricultural land of Western Black Sea Region which is totally 2,723,621 hectares is suitable for watering but only 30% of this can be watered. In Western Black Sea Region, average enterprise size is 41 decares and 15,3 % of the enterprises in Turkey having a land below 50 decares, 13,6% of the enterprises having a land of 50-99 decares and 14,4% of the enterprises bigger than 100 decares are in Western Black Sea Region (Anonymous 2007b).

A great deal of enterprises making herbal production is small ones and the enterprises are scattered and disjoined. In also the Western Black Sea Region, grains come first among arable crops cultivated area with a share of 82,9% while legume family comes second with a share of 8%. Industrial crops, tuber plants and oleiferous follow these and these have a share of 9,1% among arable crops cultivated area. When we examine the cultivation areas of field crops of Western Black Sea Region, it is seen that wheat comes first and respectively barley, corn, sugar beet, garbanzo, tare follow it (Anonymous 2007b). Western Black Sea Region, according to the 2011 data of TSI, has 9,89% of Turkey total wheat areas with its total 800,613 hectare cultivation area. In the region, average wheat yield of the year of 2011 is 2,702 kg/hectare (TUİK, 2012)

3.2.2.2. Eastern Black Sea Region

Eastern Black Sea Region involves the cities of Trabzon, Ordu, Giresun, Rize, Artvin and Gumushane. The square measure of the region is 35,174 km^2 and it constitutes 4,48% of Turkey's square measure. In the region, the altitude starts from sea level and rises up to 3,932 m (Mount Kackar). Eastern Black Sea Region constitutes the most raining part of Turkey. The precipitation changes in short range according to the topographic structure but, in general, it decreases from east to west and when it rises above the sea level. The most and heavy rainfalls are on coastal regions. It has been effective on the formation of micro-climate areas that the topographic structure in the region changes in short ranges. The precipitation in the region changes from 451 mm to 2292 mm. While the coastal region of the region has precipitation in all seasons, in interior parts the precipitation decreases in summer (Anonymous 2007c).

Eastern Black Sea Region has a rich flora and vegetation as it shelters various ecological units as a result of altitude difference changing from the coast to 3376 m, mountains lying parallel to the sea, The Black Sea forming its north border, numerous rivers, large and small lakes, soil and climate features. Each one of these rich vegetation hosts for many endemic plants identified as plants having a narrow area of spreading, growing up in special ecological conditions, being unique to the area it grows in and not being able to grow up outside that area. Thanks to this biological richness, it has a great importance as they are evaluated as biogenetic reserve areas, for the protection of natural sources and the continuation of biological diversity (Anonymous 2007c).

4.6 % of total population of Turkey lives in TR9 Eastern Black Sea Region. In the region, almost 51% of the population lives in villages while almost 49 % of it lives in cities. The region, while covering almost 4,5% of Turkey's square measure, shelters 4,61% of country population. While the number of people for per km2 is 88 in Turkey, it is 89 in TR9 Eastern Black Sea Region (Anonymous 2007c).

In Eastern Black Sea Region, the rate of agriculture sector in total employment is 63,3% thus, proportionally, it comes second after North Eastern Anatolia Region which has the most share (Anonymous 2007c).

Cultivated areas constitute 20,9% of the total square measure in Eastern Black Sea Region and this rate is below country average. When the lands of the region are classified according to their agriculture potentials, 13% of cultivation areas constitute the first degree important cultivation areas while 9,5 % the second degree important cultivation areas and 77,5% the third degree important cultivation areas. When the lands of the region are examined in terms of inclination, 1% is plain, 0,6% are slight, 2,1% are medium, 6,4% are steep, 20,6% are very steep and 69,3% are scarped. While Gumushane is the city having the most plain areas in the region with a percentage of 75%, the one having the least is Trabzon with the percentage of 2,8% (Anonymous 2007c).

In the region, agricultural enterprises are small and scattered and the percentage of the enterprises having a land of less than 20 decares is 61,8 %. It is observed that when the place of the field crops is evaluated in total Turkey cultivation, the region does not have an important share in terms of cultivated area in total but it has respectively almost the shares of 30 %, 20 %, 12 % and 11% for respectively the crops of fodder beat, adulterated, corn and potatoes (Anonymous 2007c). According to TSI 2011 data, only 37,960 hectares of wheat is being planted in the region and average yield is 1217 kg/hectare. This rate is equal to 0,47% of Turkey's wheat planting area (TÜİK, 2012)

3.2.3. Eastern Anatolia Region

The last region on which the investigation is being conducted is Eastern Anatolia Region. Eastern Anatolia Region was examined in two different sub regions and these are North Eastern Anatolia Region and Middle Eastern Anatolia Region (Figure 3.4.).

Source. Anonymous, 2012d

Figure 3.4 The map of Eastern Anatolia Region in Turkey.

3.2.3.1. North Eastern Anatolia Region

North Eastern Anatolia Region involves the following cities: Erzurum, Erzincan, Bayburt, Agrı, Kars, Igdır and Ardahan. The square measure of the region is 70,990 km^2 and it constitute 9,05 %of Turkey's square measure. In the region, the altitude starts from Dilucu plain (805 m.) and rises up to Mount Agrı (5,137 m) (Anonymous 2007d).

Continental climate is effective in North Eastern Anatolia Region as it is away from the sea and has a big altitude. Winters are really cold and snowy; summers are cool in high places and hot and drought in low places. Annual average temperature is 7,2 ºC in North Eastern Anatolia Region and annual maximum temperature is 37,3 ºC and annual minimum temperature is -31,6ºC. Average relative humidity is 66,2%. Annual average precipitation is 460,9 mm (Anonymous 2007d).

In Northeastern Anatolia Region average 34 people are there per km^2 while there are 88 people per km^2 in Turkey. 1,217,864 (48,56%) of the population living in TRA North Eastern Anatolia Region lives in villages while 1,289,874 (51,44%) of them live in city centers (Anonymous 2007d).

While agricultural employment has the biggest share, agricultural production value per rural population is well below the country average. It is seen that agricultural production value per rural population is 1,124 TL in Turkey while it is 960 TL in Northeastern Anatolia Region and thus it is below country average. 4,37 % of Turkey's total agricultural production value is attained from TRA Northeastern Anatolia Region. The cities of Ardahan and Erzincan come first in the region in terms of agricultural production value per rural population. The least production value, on the other hand, is in Bayburt (Anonymous 2007d).

In Northeastern Anatolia Region, there are 241,685 hectares of fields sufficient for processable agriculture which has first class usage capability. Inside the first class agriculture fields in the region are the most important and fertile plains like Erzurum, Kars, Igdır, Agrı-Eleskirt and Erzincan. The region has 1,878,416 hectares of fields sufficient for processable agriculture which has the second, third and fourth class usage capability. 8% of the fields suitable for processable agriculture in Turkey are in Northeastern Anatolia Region. 8,2% of the fields not suitable for processing are again in the same region (Anonymous 2007d).

Total irrigable areas in Northeastern Anatolia Region are 1,141,241 hectares and 59,8% of these are already watered. The field watered most is in the city of Agrı in Northeastern Anatolia Region. Erzurum and Erzincan cities follow this city (Anonymous 2007d).

In also North Eastern Anatolia Region, grains take the first place with the percentage of 81,4% in field crops cultivated areas while forage crops come second with a share of 12,8%. Industry crops follow this with a share of 2,5%. Later on, comes the legumes, tuber plants and oil seeds and their share in field crops cultivated areas is 3,3%. In Northeastern Anatolia Region, the sum of production of field crops meets 5,8% of Turkey's production. In the region, planting amounts of the products available in the category of oil seeds are rather low. Wheat has the biggest share among the grain products produced in the region. Wheat is grown almost in all region and cities except for a small seaboard in Eastern Black Sea Region. When the cultivated areas of the important field crops grown in Northeastern Anatolia Region are examined, it is observed that wheat comes first and respectively barley, sugar beet, potatoes, beans, sun flower,

garbanzo and onion follow it. When we have look at the rates of the region in the country; the products like wheat (5,7%), barley (8,5%), sugar beet (8,3%), potatoes (6,1%), beans (6,8%), sun flower (0,8%), garbanzo (0,4%) and onion (1,1%) have important places (Anonymous 2007d). Average wheat yield is, according to 2011 TSI data, 1659 kg/hectare (TÜİK, 2012)

3.2.3.2. Middle Eastern Anatolia Region

Middle Eastern Anatolia Region involves the cities of Malatya, Van, Elazıg, Bingol, Bitlis, Mus, Hakkari and Tunceli. The square measure of the region is 78.110 km^2 which constitutes 9,96% of Turkey's square measure. The altitude in the region starts from 900 m. and rises up to 4.049 m (Mount Suphan) (Anonymous 2007e).

Middle Eastern Anatolia Region is a region which is under the effect of typical continental climate. Summers are hot and droughty; winters are stiff and cold. Annual average temperature in Middle Eastern Anatolia Region is 11,3 ºC, annual maximum temperature is 23,1 ºC and annual minimum temperature -0,4 ºC. Average relative humidity is 58,7%. Average annual precipitation is 718 mm (Anonymous 2007e).

In TRB Middle Eastern Anatolia Region, average 48 people are there per km2 while 88 people are there per km^2 in Turkey. 1,746,656 (46,53%) of the population living in TRB Middle Eastern Anatolia Region lives in villages; 2,007,378 (53,47%) of them live in city centers (Anonymous 2007e).

Agricultural production value per rural population is 1,124 TL in Turkey and it is below country average with 828 TL in TRB Middle Eastern Anatolia Region. 5,32% of Turkey's total agricultural production value is attained from Middle Eastern Anatolia Region. The cities of Tunceli and Elazıg come first in terms of agricultural production value per rural population in the region. The least production value, on the other hand, is in Hakkari (Anonymous 2007e).

In Middle Eastern Anatolia Region, 22,4% of total square measure is consisted of cultivated area and this rate is below country average. Meadows and pasture lands constitute 52,5% of Middle Eastern Anatolia Region's land existence and this rate is quite above Turkey average. In Middle Eastern Anatolia Region, there are 223.921 hectares of fields sufficient for processable agriculture which has first class usage capability. Inside the first class agriculture fields in the region are the most important and fertile plains like Malatya, Mus, Malazgirt, Tohma. The region

has 1.851.246 hectares of fields sufficient for processable agriculture which has the second, third and fourth class usage capability. 7,9% of the fields suitable for processable agriculture in Turkey are in Middle Eastern Anatolia Region. 11,5% of the fields not suitable for processing are again in the same region (Anonymous 2007e).

61,8% of 1.762.378 hectares of Middle Eastern Anatolia Region's agricultural land is irrigable but only 53,3% of this is already watered. The field watered most is in the city of Malatya in Middle Eastern Anatolia Region. Elazıg and Van cities follow this city (Anonymous 2007e). In this region, average wheat yield, according to 2011 TSI data, is 1606 kg/hectare (TÜİK, 2012)

3.2.4 Marmara Region

3.2.4.1 West Marmara Region

The region covers the provinces of Balikesir, Canakkale, Tekirdag , Edirne and Kırklareli. It is surrounded by the Aegean Sea in the west, Bulgaria in the north, the Black Sea, Bursa and Istanbul in the east, Manisa and Kutahya in the south.

The region is between 39 º 06 'and 42 º 05' North latitude, and 25 º 35 'and 28 º 58' East longitude. The surface area of the region is 43409 km^2, and constituting 5.64% Turkey's square area. In the region, the altitude starts from the sea level and rises up 1774 m (Kazdağ's Karataşhill) . The region has the west coast of the Aegean Sea starting from the Gulf of Edremit in Ayvalık to the Gulf of Saros, on the northeast it has the coast of the Black Sea extending -from İğneada to Kıyıköy, as well as the north side of Marmara Sea starting from Marmara Ereğli to Canakkale(Dardanelles).

The general climatic characteristic of Çanakkale province has the same characteristic with Mediterranean climate. The average temperature in the northern part of the province in winter is very low. Because of north winds and prolapsed temperatures through the Balkans and the absence of a natural obstacle in front of it, the year passes with winds through most of the year. The dominant wind direction is north. North-east, stars and southWest winds blow most respectively. Rainfall is mostly in the form of rain. The total annual rainfall is 636.3mm.

Balikesir and its around remain under the influence of air masses Inserted in the north cold in winter period (mP) and very cold (cP) and air masses relatively mild and acting inserted through the Mediterranean (Med). This is the most important effect of air masses in the winter period, first creates a system in the Central Mediterranean coast of Turkey, the West, in other words, mobile low-pressure systems affecting around Balikesir. (Mid-latitude cyclones) in cold period around Balikesir will not be effective as much as the Siberian high pressure (anticyclone) system does in East Anatolia. Cool, warm and hot air masses which are effective in the summer around Balikesir do not bring much rainfall; but, as it is referred in the section of rainfall, amount of rainfall increases towards the heights and north. The total annual precipitation is 522.3mm.

According to the 2000 population data, 4.3% of Turkey's total population, which accounts for 2.895.980 million people, live in the West Marmara region. While 55.47% percent of the population live in the city, 44.53% percent live in the villages. The density of population in the region, which is much less than throughout Turkey, is higher than the total population growth rates. Between 1990-2000, while the rate of population growth in rural areas across the country is 0.21.71%, the urban population growth rate was 0.18.28%. Rural-urban population growth rates in the region for the same period were observed as 0.24.76% and 0.11.18%, respectively. According to the 2000 census, 3.65% of the total urban population in the country and 5.40% of the rural population were living in this region.

According to the 2001 Census of Agriculture, the presence of the region's total cultivated land area is 55.21%, which is very high when compared to total land, and this reveals the high level of the existing agricultural potential. Only a total of 258. 511 decares of land lie fallow out of the total cultivated12,012,439 decares land. 617.725 acres are used in the production of field vegetables and ornamental plants (5%), half of it takes place in Balıkesir Province. When it comes to fruit growing, it is totally about 757. 271 acres (6.3%) of total processed area, and it has been seen that the production area with 683 000 acres of production is concentrated in this region.

When it comes to Agricultural Production values per rural population in the West Marmara Region, Balikesir province ranks first with 2.024 million TL, and the province of Tekirdag is located in the last row with 1472 million TL. Value of agricultural production per rural population is over Turkey's average.

Agricultural areas of the West Marmara region represent 44% of total area and they are10% higher than the national average. The region, compared to 26% in the country in terms of area of forest and heath land, is one of the wealthiest parts of the country with 38%, above the average of this ratio. When the non-agricultural areas were compared, the proportion in Turkey is 13%, while the West Marmara Region is 7%.

While irrigable land in Turkey is 32% of total agricultural land, in the west Marmara Region it is 54%. This is because of the flat or nearly flat land structure of the region, and it is conveniently located for irrigation. While 18% of agricultural areas in Turkey is irrigable, only 16% of agricultural land in the region can be watered. Of the existing irrigated agricultural areas in Turkey, 12% is in this region.

The managements having 20-49 da. land area size constitute nearly 41% of total enterprises. Enterprises with the 50-99 da land size represent about 1/3 of the total enterprises . Nearly 89% of business enterprises are smaller businesses than 100 decares. Even the number of enterprises engaged only in livestock is less than the 2% of all the enterprises. If production quantities of the prominent agricultural products in the area are examined, wheat is the first and, sunflower, rice, bean, rape and garlic follow respectively.

3.2.4.2 East Marmara Region

East Marmara Region includes the provinces of Bursa, Eskisehir, Kocaeli, Sakarya, Düzce, Bolu, Yalova. The Region is between 39 º 06 'and 41 º 13' north latitudes and 30 º 32 'and 40 ° 42' east longitudes. Surface area of the Region is 49.096 km^2 and represents 6.36% of Turkey. The altitude of the region starts from sea level, and rises up 2543 m(Uludağ/Grand Mountain). The region is surrounded by the coast of the Black Sea beginning from the northern part and mountains in the south as Uludag, Emirdag, Seben ,and Ardıç(Juniper) Mountains. West part of the region begins from the East part of Karacabey and Kemal Paşa plains, extends to the plains of the east Megri, Mengen and Gerede plains taking into East part of the Marmara Sea .

Black Sea and the Mediterranean climates are seen in the parts close to the Sea of Marmara, and continental climate prevails in Bilecik and in the southern parts of Bursa and Eskisehir Provinces. The average temperature in the Continental climate parts is 10.6° C, and in the semi-Mediterranean climate prevailing regions average temperature is15^o C. Average rainfall

decreases from the coast away with the influence of the continental climate. Although summers are dry in the cities in this region, in the province of Sakarya it is rainy in summers as it is located between the Black Sea and Marmara Sea, and it is separated by high mountains.

East Marmara region holds 8.92% of the urban population, and 7.62% of the village population in Turkey. The Region constitutes 37% of the agricultural area of the total land, and this ratio remains above the 3.8% average in Turkey. When we look at meadow pasture areas, the area of the region 4% is below the average in Turkey and lack of meadow is a significant pasture. The ratio of the forest and heath land areas is 41%.

The 6% of agricultural land in Turkey is in the East Marmara Region and it is about 563,934 ha. This land has 5.5% of the field area, 10% of vegetable gardens, 9.7% of fruit and 5.5% of fallow field. The most agricultural area of the region is in Eskisehir, and the least agricultural area is in Yalova. About 2/3 per cent of agricultural area is cultivated and planted. The total economically irrigated area is 812 104 ha., but only 50% of it is irrigated. For the presence of irrigated agricultural land in the region, Bursa is the first province ,and Yalova is the last province.

In the region, a large part of agricultural enterprises carry on their activities in the form of small businesses less than 50 da. Number of holdings with land size of less than 50 da (together with no land) is 162 651 units and the amount of total land area of these businesses is 3,536,694 decares. The average land size of Maximum number of enterprises with less than 50 da is 21.74 hectars. The average size of land per farm 51.31 decares.

3.2.5 Aegean Region

TR3 Aegean Region covers Izmir, Aydin, Denizli, Muğla, Manisa, Afyon, Kutahya and Usak provinces. Aegean region is surrounded by Aegean Sea in the west; Balikesir, Bursa, Bilecik in the north; Eskişehir, Konya and Isparta in the east; Burdur and Antalya in the south; the Aegean and the Mediterranean Seas in the west. The region's land area is 9,039,000 (1,201,300 +3,312,200 +4,525,600) ha. and this represents 11.54% percent (1.53 +4.23 +5.78) of the surface area of Turkey. Altitude in the region starts from the sea level, and rises up 2528 m (Honaz Mountains). The region has Aegean and Mediterranean coasts starting in Balıkesir-İzmir border and covering Izmir, Aydin and Mugla, reaching Antalya-Mugla border. Honaz in the

vicinity of Denizli in the Aegean region, and Akdag, Great Çökelez, and Small Çökelez Mountains, Bozdaglar and Akdag Mountains and the Aydin Mountains located between Dinar-Uşak, hold an important place. Madran Baba, Karıncalı Mountain, the Five-Finger Mountains, Kır Mountains, Sandros Mountain Yellice Mountain at the Interior Department of West Anatolia, Eğrigöz Mountains, Murat Mountains and Burgaz Mountains lie in the region.

Typical Mediterranean climate prevails in the part of the Aegean coast, and the continental climate is effective in the progression to higher regions. The average annual temperature is 17 ^{0}C where the Mediterranean climate is effective, and the average temperature is 12.8 ^{0}C in the places with the continental climate. Average temperature is 15.6 ^{0}C, the average rainfall is 672.98 mm and the average relative humidity is % 62.44 percent in the region respectively.

Aegean Region holds 12.32% of agricultural lands, 17.85% of forest areas, 8.71% in non-agricultural areas and 4.48% of meadow pastureland of Turkey. The region has 35.45% of agricultural areas of total land area, which is over Turkey's average (18.65%). Meadow and pasture lands 7.25%, are quite lower than Turkey's average (33.2%). Forest and heath land areas in the region are the richest areas of Turkey which is much higher than the national average. Muğla province has the highest forest and shrub land (22.46%) in the Aegean region, and Afyonkarahisar has the least with 5.66%.

In the region,11.60% of agricultural land is the field area, 19.30% is vegetable gardens, 24.57% percent is orchard and 7.18% is fallow field. The total economically irrigable area is 1,946,444 ha. but 56.78% percent is irrigated.

2001 Census of Agricultural Enterprises (household) survey concluded that 67.42% of the total 3,075,516 units of agricultural enterprises both produce crop and breed animals , 30.22% produce only crop and 2.36% perform only animal husbandry. A large part of agricultural enterprises in the region have continued their activities in the form of small businesses less than 50 da. Number of holdings with the land size of less than 50 da (with no-land owners) are 318 390 units and the land amount of these businesses is 6,229,518 acres. Maximum number of enterprises are enterprises with less than 50 da and they have average land size of 19.57 hectares. Hectares of land per farm size is 44.2. According to the General Agricultural Census of 2001, land presence is 61.01 acres of land per farm in Turkey.

Figure 3.5 The map of Aegean Region in Turkey.

3.2.6 West Anatolia Region

West Anatolia Region covers Ankara, Konya and Karaman provinces. It has Bolu and Çankırı Provinces in the north , Mersin and Antalya Provinces in the south, Kırıkkale , Kırşehir Aksaray and Nigde in the east, and Isparta, Afyon and Eskişehir in the west. Surface area of region is 76 793 km² , and it forms the 9,8% percent area of Turkey.

Ankara is located between 38º 43'-40º 41'north latitudes and 30º51'-34º05' east longitudes. Its surface area is 25.706 km^2 . On average, it is 890 meters above sea level. Konya is situated between 36º 41 'and 39º 16' north latitudes, and 31º 14 and 34º 26' east longitudes. Its surface area is 41 694 km². On average its altitude is 1016 meters. Karaman lies between 32º27'-34º09' east longitudes and 36º26'-33º39' north latitude . Its surface area is 9393 km² , the average height is 1033 m.

Continental climate continues throughout the region, but the northern part of the Ankara province has Black Sea climate ,and in the southern part of Konya and Karaman Mediterranean climate is seen. In the parts with Continental climate characteristic, the annual average temperature is 11.6 ° C. Temperature values vary between -28.2 and 40.8. Average rainfall 351.5 mm,and average relative humidity is 60.3% .

West Anatolia Region includes 15.29% of agricultural land, 6.75% of grassland areas, 4.62% of forest areas, and 16.91% of non-agricultural areas in Turkey. In the West Anatolian region, agricultural land is 55.86% of total surface area, and it is quite over the average of Turkey (36.01%). This distribution suggests a significant potential of agriculture in the region. Its forest and heath land areas of 13.98% ,and grassland and pasture of 18.90% are lower than the average in Turkey. Economically, the total irrigable area is 2,002,497 ha. and only 28.86% percent of which is irrigated.

In the region, most agricultural enterprises continue operations as 100-199 acres enterprises. The number of enterprises with the size of 100-199 is 43 497, and the total amount of land owned by these enterprises is 6,114,385 decares. The average land size per farm is 131 decares. A total 60.66% of agricultural enterprises in the region make crop and livestock production together, and 36.66% of enterprises produce only crop. The 2.68% percent of the enterprises in the region is engaged in only livestock production.

3.2.7 Central Anatolia Region

Central Anatolia Region covers Kayseri, Yozgat, Sivas, Kırşehir, Nevşehir, Kırıkkale, Aksaray and Niğde provinces. In the west of the Region are Ankara, Konya; in the North Çankırı, Çorum, Tokat, Ordu and Giresun, in the east Erzincan, Malatya; in the south Kahramanmaraş, Adana, Mersin. The surface area of the Region is 91.539 (31.885 +59.654) km^2, and constitutes 11,23% (3,91+7,32) of Turkey's square area. The altitude starts from 650 m., reaches up to 3.917 m (Mount Erciyes).

Typical continental climate prevails in the Region: hot and dry in summers; cold and hard in winters. The annual average temperature is 11,5 C. The annual average rainfall changes between 343,8-438 mm (374,9 mm. mean). 1.823.34 of the population (43,54%) live in villages, 2.363.664 (56,46%) in city centres.

The total surface of %49, 2 in the Central Anatolia Region is agricultural land, and this proportion is 14.8% over the country mean. With a 36,6% grassland area, it is over Turkey mean which is 18.6%. Moreover, arboricultural land with a proportion of 9.6% is way under Turkey mean. Wheat is cultivated in the 73% of the agricultural land.

The proportion of non-agricultural land in Turkey is 21.7%, that of in the Central Anatolia

Region is 7.2%.

Economically, the 2.280.502 ha (77,34%) of irrigable land is not irrigated. The irrigated land in the Central Anatolia Region is maximum in Sivas province followed by Yozgat, Niğde and Nevşehir provinces.

According to the result of the 2001 General Agriculture Census Agricultural Managements (household) Survey, out of a total of 3.076.650 agricultural managements, 67,42% is engaged in both plant growing and livestock raising, 30.22% only in plant growing, 2.36% only in livestock raising.

40% of the managements in the Region have 1-49 land property, and the average enterprise size of these managements is 26 da. The Region's average scale of enterprise is 100 da and more than Turkey average.

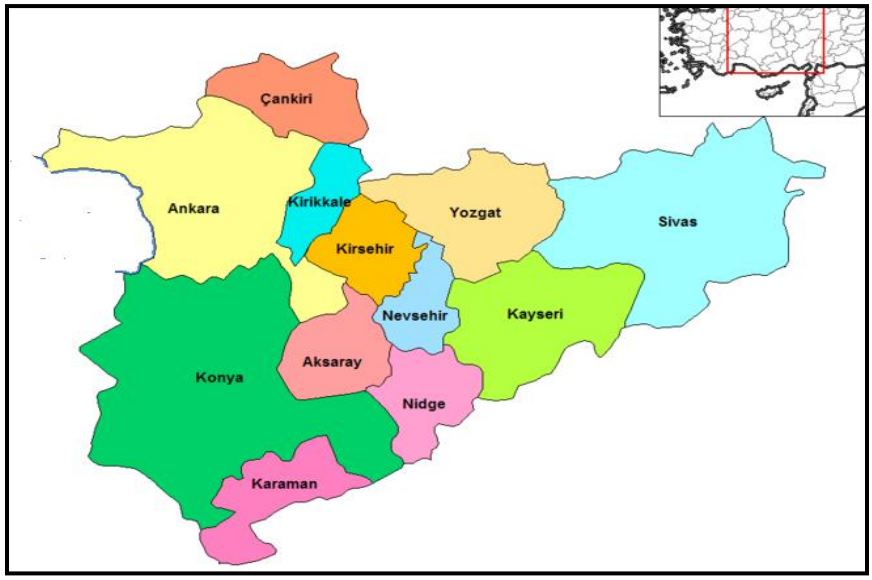


Figure 3.6 The map of West and Central Anatolia Region in Turkey

3.2.8 Mediterranean Region

Mediterranean Region covers provinces of Antalya, Isparta, Burdur, Adana, Mersin, Kahramanmaraş, Hatay and Osmaniye. In the west of the region are Muğla and Denizli; in the north are Afyonkarahisar, Konya, Karaman, Niğde, Kayseri and Sivas; in the east are Malatya, Adıyaman, Gaziantep and Kilis; in the south are Mediterranean Sea and Syria. The Region is located between the latitudes of 35º 52 and 38º 36 North, and between longitudes of 29º 20' and 37º 42' East. The surface area of the region is 89.723 km^2 and covers 11,4% of Turkey's total

square measure. The altitude starts from the sea level and reaches up to 3756 m (Aladağ). The region has a coast on the Mediterranean Sea beginning from Eşen river on the west to the end of Samandağı on the east. Taurus Mountains have an important place in the Mediteranean Region. Akdağs and Beydağs forming West Taurus, Dedegöl, Geyik and Bolkar Mountains constituting Middle Taurus, Aladağs, Tahtalı, Dibek, Binboğa mountains comprising the west part of SouthEast Taurus are within the Region. Together with these, the east border of the Region covers Amanoses which are within Taurus Mountain Range.

The region has a typical Mediterranean climate, while having a typical continental climate in the elevated parts. The average annual temperature is 13.1 ^{0}C in the parts with the typical continental climate, and is 18,5 ^{0}C in the parts with the Mediterranean climate. The annual rainfall is around 450-750 mm between Antalya-Adana, and 570-1160 mm between Hatay and Kahramanmaraş.

The 9.97% of the total agricultural area of Turkey is in the Mediterranean Region and is 2.594.764 ha. The 10.70% of this is farming land, 20.00% is vegetable gardens, 12.21% is orchard and 3.12% is fallowing land. The largest cultivated land is in Adana, while the smallest is in Osmaniye. The largest fallowing is in Antalya, and the smallest is in Osmaniye. Out of 777.104 ha. (39, 8%), 1.951.477 ha. economically irrigable land is not being irrigated.

The managements having 20-49 da land size comprise nearly 2/3 of the total managements. Approximately 96% of the managements are less than 100 da. The number of the ranching managements cannot even reach 2% of all managements and all of them are less than 5 da.

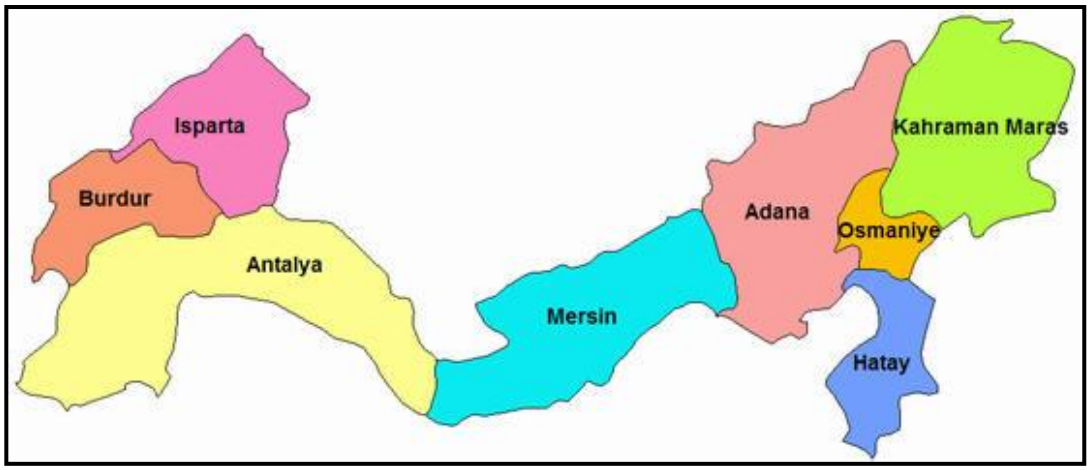


Figure 3.7 The map of Mediterranean Region in Turkey

3.3. Material and Methods

The data were collected on household level showing the socio-economic status by questionare forms applicated to 1873 households in the research area. The survey was conducted in 523 villages in 172 districts selected from the 65 provinces in 2009-2014 years. The selection of provinces and districts was done according to Mirza Gokgol study and previous studies had been carried out in different regions by ***"Purposive Sampling Method".*** Provincial Directorates of Food, Agriculture and Livestock assistances were utilised to select the survey areas in chosen provinces. In the meantime, interviews were done by agricultural experts working in different institutes, universities, NGO's and government agencies in aims to make clear definite area where we would visit.

The study consists of 2 stages. The first stage is to collect wheat landrace spikes from the field. We visited the farmers before the harvesting time of wheat to get the spikes. Sometimes we accepted seed when we missed the harvesting time because of time limitation and geographical conditions. Firstly we determined the wheat landrace production field (Tan et al. 2013). We fallowed Aegean National Gene Bank collection rules for spike collection. We prepared paper bags and tags showing province, district, village, and local name of wheat landraces and geo-coordinates with GPS device. Geocoordinates were collected with Magellan GPS devices and then transferred to the Turkey Map presented by Magellan Company (Wantage Point). In 2009, 2010,and 2011 years, the geocoordinates were collected according to the villages coordinate as local wheat landrace's name and in 2012, 2013,and 2014 years, it was done according to the land coordinate where wheat landraces were grown as local wheat landrace's name. After that, these coordinates were ploted on Turkey map. The study area being carried out was shown in Figure 3.8. In total, 65 provinces, 172 districts and 523 villages[4] in terms of wheat landraces were evaluated.

At second step is the questionnaire form to get information for socio-economic and agronomic data from the farmers. For that, we fulfilled survey forms with the farmers involving different number of wheat landraces' general and agronomic information with the farmers' persosonel information. We also evaluated wheat landrace production field with evaluation form

[4] Wheat Landrace Project was carried out under the IWWIP Project between 2009-2014 years collaboration with CIMMYT, ICARDA and Ministry of Food, Agriculture and Livestock, and FAO joined the project in 2012 and 2013 years.

to understand the general condition of wheat landraces for production season when collected of the spikes.

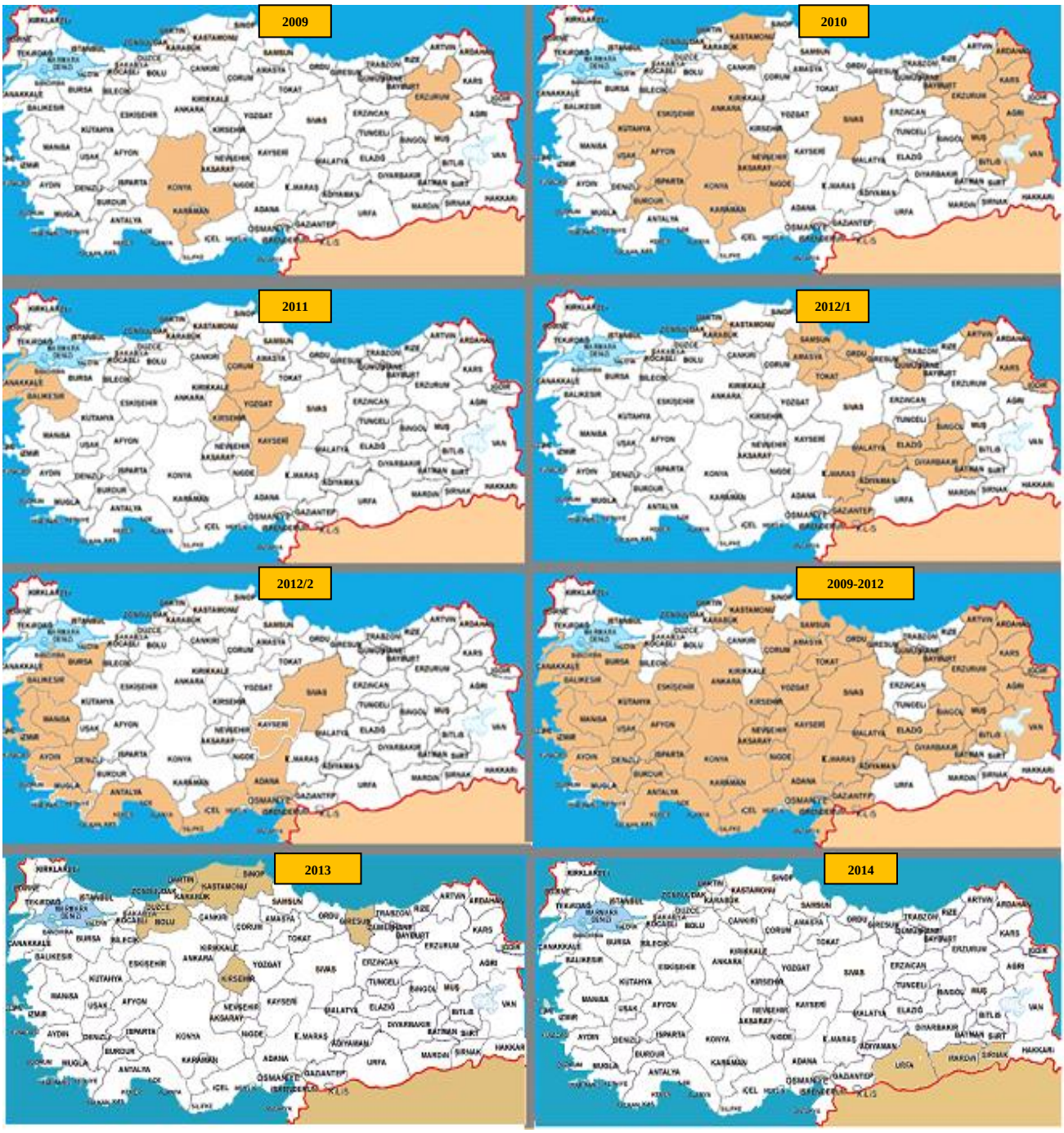


Figure 3.8 Wheat Landrace Survey Areas by Provinces and Years in Turkey

Figure 3.8 (Cont.) Wheat Landrace Survey Areas by Provinces and Years in Turkey

In the study, Geographical Information System was used for mapping. Longitutudes and Latitudes of distrcits were defined for every single data. Village and farmer level coordinates were ignored to provide uniformity among years. To find information district level, arithmetic mean was used. When considered that the study was done in two different parts of Turkey (2 research area), and the mapping study was done according to the 2 research areas. These are;

1. ***Black Sea, East Anatolian and South East Anatolian Regions***
2. ***Marmara, Aegea, Mediterrenean, and Central Anatolian Regions***

Four different maps were formed.The first map is giving idea on the distribution of wheat landraces acording to the local names. For this aim, the map was formed as showing most commonly produced 6 wheat landraces for both two research areas.

The second map about wheat types as bread, durum and feed (*T. Monococcum*) (Figure 3.7.). For this aim, 3 maps were formed on district level. The first one showed bread wheat situation according to the proportional Distribution of farmers who is producing “Bread Wheat” or “Durum Wheat”. If the production area of one of both was higher that 75%, this area had been named in that’s name as like “Bread Wheat Common Area”, “Durum Wheat Common Area” or “Both of Them”.

The third map is about the farmers' preferred wheat variety features. Two different farmers' prefferences were identified. Those were;

- If the farmers produced only wheat landraces in their production system, it was coded as ***"Only Wheat landraces".***
- If the farmers produced both wheat landraces and commercial wheat varieties together in their production system, it was coded as ***"Both Wheat landraces and Commercial Wheat Varieties"***

After coding the farmers' preferrences, the map was forming in situation of farmers in the research area according to the second map scale (75% percent rule). This scale is showing the proportion of farmers who is planting whether only wheat landraces or both wheat landraces and commercial wheat varieties together on province level.

The last map is about wheat production systeam as rainfed and irrigated (Figure 3.8.). The last map was showing the situtation of famers' production system. For this aim, the same scale was used to determine common production system.

The data gathering from the farmers via survey entered the computer via Excel program and analysed in STATA-13 Statistical program. The descriptive data about the research area presented as tables. Pearson's chi-squared was used to assess two types of comparison tests of independence. A test of independence assesses whether paired observations on two variables, expressed in a contingency table, are independent of each other. The value of the test-statistic is; (Kesici and Kocabaş, 2007)

$$\mathrm{X}^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

where

X^2 = Pearson's cumulative test statistic, which asymptotically approaches a $\chi 2$ distribution.

O_i = an observed frequency;

E_i = an expected (theoretical) frequency, asserted by the null hypothesis;

n = the number of cells in the table.

3.4. Results and Discussion

According to only IWWIP landrace activities in 2009, 2010, 2011, and 2014 and collaborative activities with FAO in 2012 and 2013 years, some collections were made and geocoordinates were saved in 65 provinces where wheat landraces growth. The provinces and also the disricts and the villages were determined by helps of the local institutes, NGO's, researchers and private and public sector's organisations. Acocording to interviews with them, the survey areas in the district level were shaped. Some provinces like Rize, and Trabzon provinces and also some districts weren't included to the evaluation as lack of data on wheat production area in Turkish Statistics. Some provinces and also some districts weren't included because commercial wheat varieties were produced commonly and finding the wheat landraces mentioned in Mirza GOKGOL's book was almostly impossible in those areas. To save time and to reach many places where we know that wheat landraces are being produced, in total 61 province, 172 districts and 523 villages were included in the research area and the survey study was completed. The information obtained from the research area showed that local wheat landraces have been grown especially in the high places and the places away from the main centers. It has become impossible to find these varieties in plains and close to the main center. The wheat landraces generally have been replaced by more productive and merchantable improved wheat varieties in there.

As a result of the survey, 162 different local wheat landraces' names were detected and were shown table 3.1. Although these landraces were produced in different names, many of them could be same each others. In different region and also in different villages in same region, producers could be use different local name for same landraces. At this point, the definition and classification of landraces come to the fore. For this aim, the collected materials were all planted in different places (Konya, Eskisehir, Ankara and Erzurum provinces) for every year. In table 3.1, the frequency of wheat landraces was presented for Turkey, The wheat landraces were ordered according from highest frequency to the lowest frequency. In Turkey, the most common 10 wheat landraces according to the frequency were shown below. These were;

1. ***Ak Buğday***
2. ***Sarı Buğday***
3. ***Kırmızı Buğday***
4. ***Karakılçık***
5. ***Zerun***
6. ***Kırik***
7. ***Koca Buğday***
8. ***Siyez Buğdayı***
9. ***Topbaş***
10. ***Üveyik Buğdayı***

Table 3.1 Local Names of Collected Wheat Landraces and Their Frequencies in Turkey

No	WL Local Name	Wheat Species	Frequency	Percent (%)	Cumulative Percent (%)	No	WL Local Name	Wheat Species	Frequency	Percent (%)	Cumulative Percent (%)
1	AK BUĞDAY	C/D	140	7.47	7.47	49	AMERİKAN BEYAZ	C	9	0.48	81.95
2	SARI BUĞDAY	D/C	116	6.19	13.67	50	KILÇIKSIZ BUĞDAY	C	9	0.48	82.43
3	KIRMIZI BUĞDAY	C/D	114	6.09	19.75	51	POLATLI	C	9	0.48	82.92
4	KARAKILÇIK	D/C	89	4.75	24.51	52	ŞERGUN	C	9	0.48	83.40
5	ZERUN	C	74	3.95	28.46	53	MENCEKİ	D	8	0.43	83.82
6	KIRİK	C	61	3.26	31.71	54	OHLEMAZ	D	8	0.43	84.25
7	KOCA BUĞDAY	D/C	59	3.15	34.86	55	ALİBAYIR	D/C	7	0.37	84.62
8	SİYEZ	O	56	2.99	37.85	56	GACER BUĞDAYI	O	7	0.37	85.00
9	TOPBAŞ	C	48	2.56	40.42	57	GÜLÜMBÜR	C	7	0.37	85.37
10	ÜVEYİK BUĞDAY	D	46	2.46	42.87	58	HAVRANİ	D/C	7	0.37	85.74
11	GÖDEREDİ	C	45	2.40	45.27	59	KAFKAS KIRMIZISI	C	7	0.37	86.12
12	YEREL POPULASYON	C/D	45	2.40	47.68	60	KILÇIKLI KIRİK	C	7	0.37	86.49
13	ŞAHMAN	D	43	2.30	49.97	61	KIRMIZI PAZARCIK	C	7	0.37	86.87
14	ÇALIBASAN	D/C	42	2.24	52.22	62	AK DİMENİT	C	6	0.32	87.19
15	AĞ BUĞDAYI	C	29	1.55	53.76	63	BEJRES	D/C	6	0.32	87.51
16	KAMÇI	C	29	1.55	55.31	64	BOZBUĞDAY	C/D	6	0.32	87.83
17	SARI BURSA	D	29	1.55	56.86	65	DIĞRAK	D/C	6	0.32	88.15
18	AŞURELİK BUĞDAY	C	25	1.33	58.20	66	GEVRO	D/C	6	0.32	88.47
19	YAZLIK BUĞDAY	C/D	23	1.23	59.42	67	HAKKI BUĞDAYI	D/C	6	0.32	88.79
20	SORGÜL	D	22	1.17	60.60	68	KATIKLI	C	6	0.32	89.11
21	KABAK BUĞDAYI	C	20	1.07	61.67	69	KÖY BUĞDAYI	C	6	0.32	89.43
22	SARI KELLE	D	20	1.07	62.73	70	SÜNTER	C	6	0.32	89.75
23	GÖĞALA	D	18	0.96	63.69	71	101	C	5	0.27	90.02
24	SERT BUĞDAY	D	18	0.96	64.66	72	GERNİK	O	5	0.27	90.28
25	ÇAM BUĞDAYI	C	17	0.91	65.56	73	RUS BUĞDAYI	C/D	5	0.27	90.55
26	KUNDURU	D	17	0.91	66.47	74	SORİK	D	5	0.27	90.82
27	ALBOSTAN	C	16	0.85	67.33	75	YUSUFİ	D/C	5	0.27	91.08
28	ERZURUM YAZLIĞI	C	16	0.85	68.18	76	AMERİKAN KIRMIZI	C	4	0.21	91.30
29	SİVEREK	D/C	16	0.85	69.03	77	KARA BUĞDAY	C	4	0.21	91.51
30	BAĞACAK	D	15	0.80	69.83	78	KAVLICA	O	4	0.21	91.72
31	BAHARİYE	C	15	0.80	70.64	79	KILCIKLI BUGDAY	D/C	4	0.21	91.94
32	ÇİRPUZ	C	15	0.80	71.44	80	KIRAÇ 66	C	4	0.21	92.15
33	SOFU BUĞDAYI	D	15	0.80	72.24	81	KOCABAŞ BUĞDAY	D	4	0.21	92.37
34	GÖLE	C	14	0.75	72.98	82	MAHSUL	O	4	0.21	92.58
35	AKBAŞAK	D/C	13	0.69	73.68	83	MEMELİ	C	4	0.21	92.79
36	CONKESME	C	13	0.69	74.37	84	ÖRMECE	C	4	0.21	93.01
37	IZA BUĞDAYI	O	13	0.69	75.07	85	SARI SEREZ	D	4	0.21	93.22
38	KÖSE BUĞDAYI	C	13	0.69	75.76	86	URUMELİ	C	4	0.21	93.43
39	KELKİT BUĞDAYI	C	12	0.64	76.40	87	ZENİT	D	4	0.21	93.65
40	MENGEN BUĞDAYI	C	12	0.64	77.04	88	ZINEBE	C	4	0.21	93.86
41	YAYLA BUĞDAYI	C	12	0.64	77.68	89	AĞ SÜNTERİ	C	3	0.16	94.02
42	HACI ALİ	D	11	0.59	78.27	90	BEYAZ KILÇIK	C	3	0.16	94.18
43	ANKARA YAZLIĞI	C/D	10	0.53	78.80	91	ÇAKMAK	D	3	0.16	94.34
44	ARI BUĞDAY	C/D	10	0.53	79.34	92	ÇOMAK	C	3	0.16	94.50
45	BİNDANE	C	10	0.53	79.87	93	ELBİSTAN KERTMENİ	C	3	0.16	94.66
46	DEVEDİŞİ	C/D	10	0.53	80.41	94	GICIK BUĞDAY	C	3	0.16	94.82
47	KELBUĞDAY	C/D	10	0.53	80.94	95	HAMZABEY	D	3	0.16	94.98
48	MEKSİKA	C/D	10	0.53	81.47	96	HAVRAN BUĞDAYI	D	3	0.16	95.14

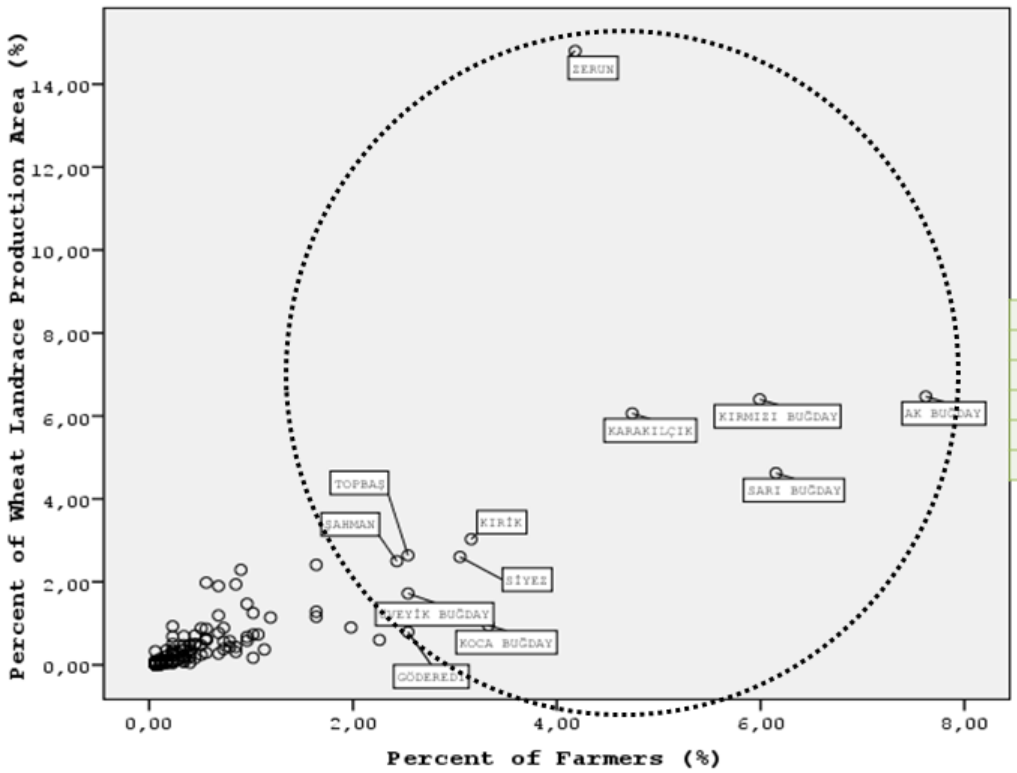
Table 3.1 (Cont) Local Names of Collected Wheat Landraces and Their Frequencies in Turkey

No	WL Local Name	Wheat Species	Frequency	Percent (%)	Cumulative Percent (%)	No	WL Local Name	Wheat Species	Frequency	Percent (%)	Cumulative Percent (%)
97	KARIŞIK BUĞDAY	C	3	0.16	95.30	130	ERMENİ BUĞDAYI	C	1	0.05	98.29
98	KAVAK	C	3	0.16	95.46	131	GEVRE YUMUŞAK	C	1	0.05	98.34
99	KIZIL BUĞDAY	C	3	0.16	95.62	132	GOKCEKADIR	C	1	0.05	98.40
100	SARI BAŞ BUĞDAY	D	3	0.16	95.78	133	GÜNEY	D	1	0.05	98.45
101	SARI MENEMEN	D	3	0.16	95.94	134	HARTLAK BUĞDAYI	C	1	0.05	98.51
102	YÖRÜK BUĞDAY	C	3	0.16	96.10	135	HAVRANİYE	C	1	0.05	98.56
103	AKOVA	C	2	0.11	96.21	136	HEZERE	C	1	0.05	98.61
104	AMİK BUĞDAYI	D	2	0.11	96.32	137	HINTA	D	1	0.05	98.67
105	BOZBAŞ	C	2	0.11	96.42	138	İRİ TAHIL	D	1	0.05	98.72
106	ÇILPİZ	C	2	0.11	96.53	139	İSTASYON	C	1	0.05	98.77
107	DAĞ BUĞDAYI	D	2	0.11	96.64	140	KAHYA BUĞDAYI	C	1	0.05	98.83
108	DIGE BUGDAYI	C	2	0.11	96.74	141	KAPLICA BUĞDAYI	O	1	0.05	98.88
109	DÖL BUĞDAYI	C	2	0.11	96.85	142	KARA YAZLIK	C	1	0.05	98.93
110	EĞRİ BUĞDAY	C	2	0.11	96.96	143	KARAKULAK	C	1	0.05	98.99
111	KOBAK	C	2	0.11	97.06	144	KARNIYARIK	C	1	0.05	99.04
112	ORMANYARAN	C	2	0.11	97.17	145	KIRKPINAR	D	1	0.05	99.09
113	RUS ÇAVDARI	C	2	0.11	97.28	146	KIRMIZI DİMENİT	C	1	0.05	99.15
114	TOKMAR	D	2	0.11	97.38	147	KIRMIZI EVLEK	C	1	0.05	99.20
115	YEM BUĞDAYI	O	2	0.11	97.49	148	KIRMIZI KAFKAS	C	1	0.05	99.25
116	AK KILÇIK	D	1	0.05	97.54	149	KISA BUĞDAY	D	1	0.05	99.31
117	AK PAMUCAK	C	1	0.05	97.60	150	KÜPELİ	C	1	0.05	99.36
118	ANKARA KIRİĞİ	C	1	0.05	97.65	151	LİCAS	C	1	0.05	99.41
119	BANKA BUĞDAYI	C	1	0.05	97.70	152	MAL BUĞDAYI	O	1	0.05	99.47
120	BAYIR	D	1	0.05	97.76	153	MALATYA BEYAZI	D	1	0.05	99.52
121	BOGVİ	D	1	0.05	97.81	154	MALATYA KIRMIZISI	D	1	0.05	99.57
122	BÖĞRÜALA	C	1	0.05	97.86	155	OVA BUĞDAYI	D	1	0.05	99.63
123	CİNGAN BUĞDAYI	C	1	0.05	97.92	156	RUMELİ	D	1	0.05	99.68
124	CUMAKALESİ	C	1	0.05	97.97	157	RUTO	C	1	0.05	99.73
125	CUMHURİYET -75	C	1	0.05	98.02	158	SARI MİSLİ	D	1	0.05	99.79
126	ÇAKIRLI	C	1	0.05	98.08	159	SİYORE	D	1	0.05	99.84
127	ÇAVDAR BUĞDAYI	C	1	0.05	98.13	160	TAŞHAN BUĞDAYI	C	1	0.05	99.89
128	EDİRNE BUĞDAYI	D	1	0.05	98.18	161	TİLKİKUYRUĞU	C	1	0.05	99.95
129	ELBİSTAN YAZLIĞI	C	1	0.05	98.24	162	YUNAN BUĞDAYI	C	1	0.05	100.00
							Total		**1873**	**100.00**	**100.00**

C:Common Wheat
D:Durum Wheat
O: Other Wheat

The percent of farmer grown the every landraces is not enough indicator to show dominance of the single variety in the region. Because of that the percent of farmer grown every single wheat landrace population was associated to the percent of land allocated to every single wheat landrace population. The data in Fig. 3.9 shows the distribution of wheat landraces among the farms within the study region. As can be seen from the figure, Zerun wheat landrace population dominates in the country level as percent of wheat landrace production area, Ak Buğday and Sarı Buğday in the country level as percent of farmer producing wheat landrace. In side of percent of land and percent of farmer, the most common 11 wheat landrace population is;

1. Zerun
2. Ak Buğday
3. Sarı Buğday
4. Kırmızı Buğday
5. Karakılçık
6. Siyez
7. Üveyik Buğdayı
8. Kırik
9. Topbaş
10. Şahman
11. Koca Buğday



1	ZERUN	7	SİYEZ
2	AK BUĞDAY	8	KOCABUĞDAY
3	KIRMIZIBUĞDAY	9	TOPBAŞ
4	SARI BUĞDAY	10	ŞAHMAN
5	KARAKILÇIK	11	ÜVEYİK BUĞDAYI
6	KIRİK	12	GÖDEREDİ

Figure 3.9 Relative Importance of Wheat Landrace Populations by Area and Farmers in the Turkey

Photo 3.1 Kırik Wheat

Photo 3.2 Uveyik Wheat

Photo 3.3 Siyez Wheat

Photo 3.4 Topbaş Wheat

Photo 3.5 Karakılçık wheat

Photo 3.6 Kırmızı Wheat

Photo 3.7 Zerun Wheat

Photo 3.8 Ak Wheat

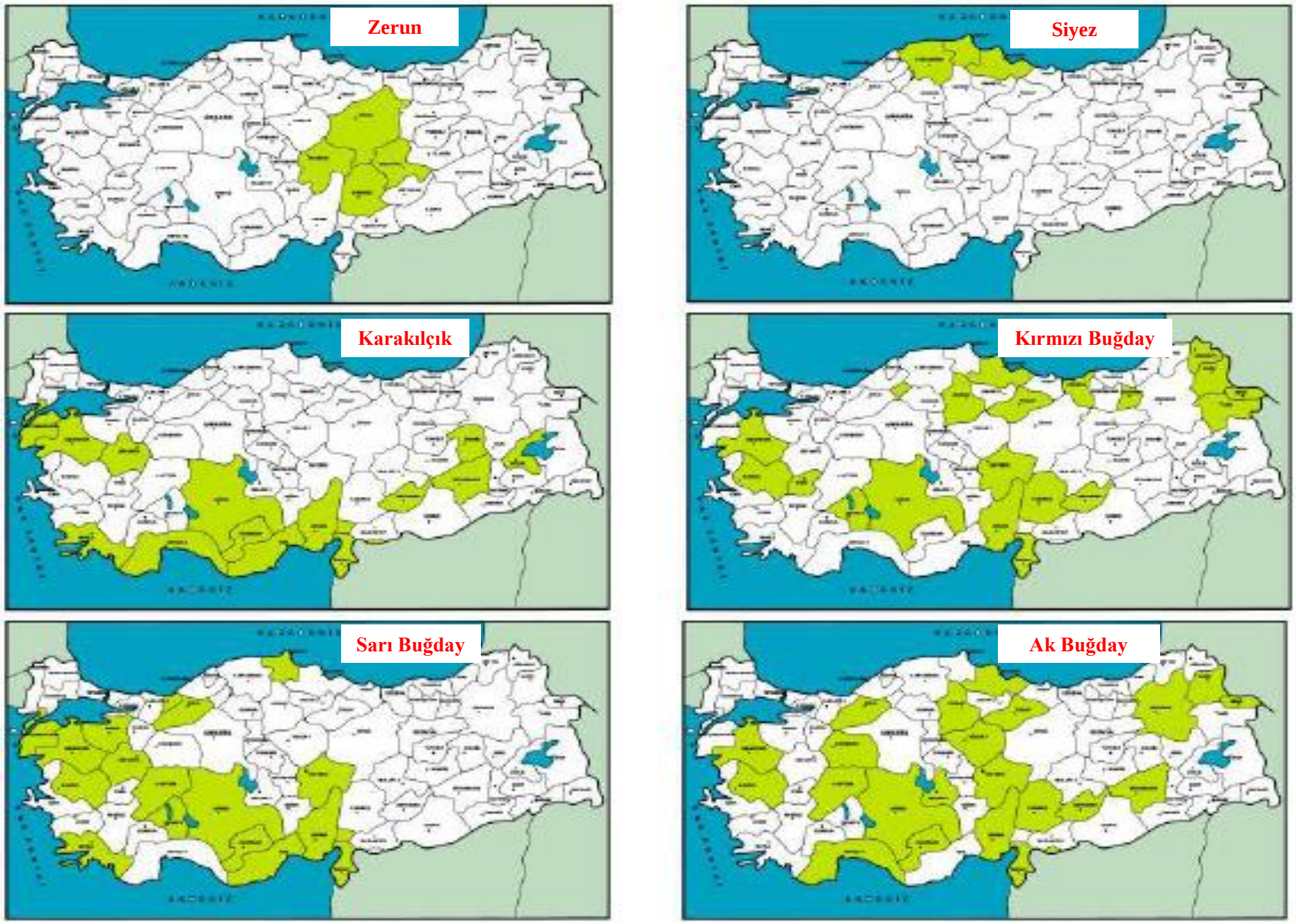


Figure 3.10. The Map on 10 Most Common Growth Wheat Landraces (Zerun, Siyez, Karakılçık, Kırmızı Buğday, Sarı Buğday, Ak Buğday, Koca Buğday, Topbaş, Kırik, and Şahman)

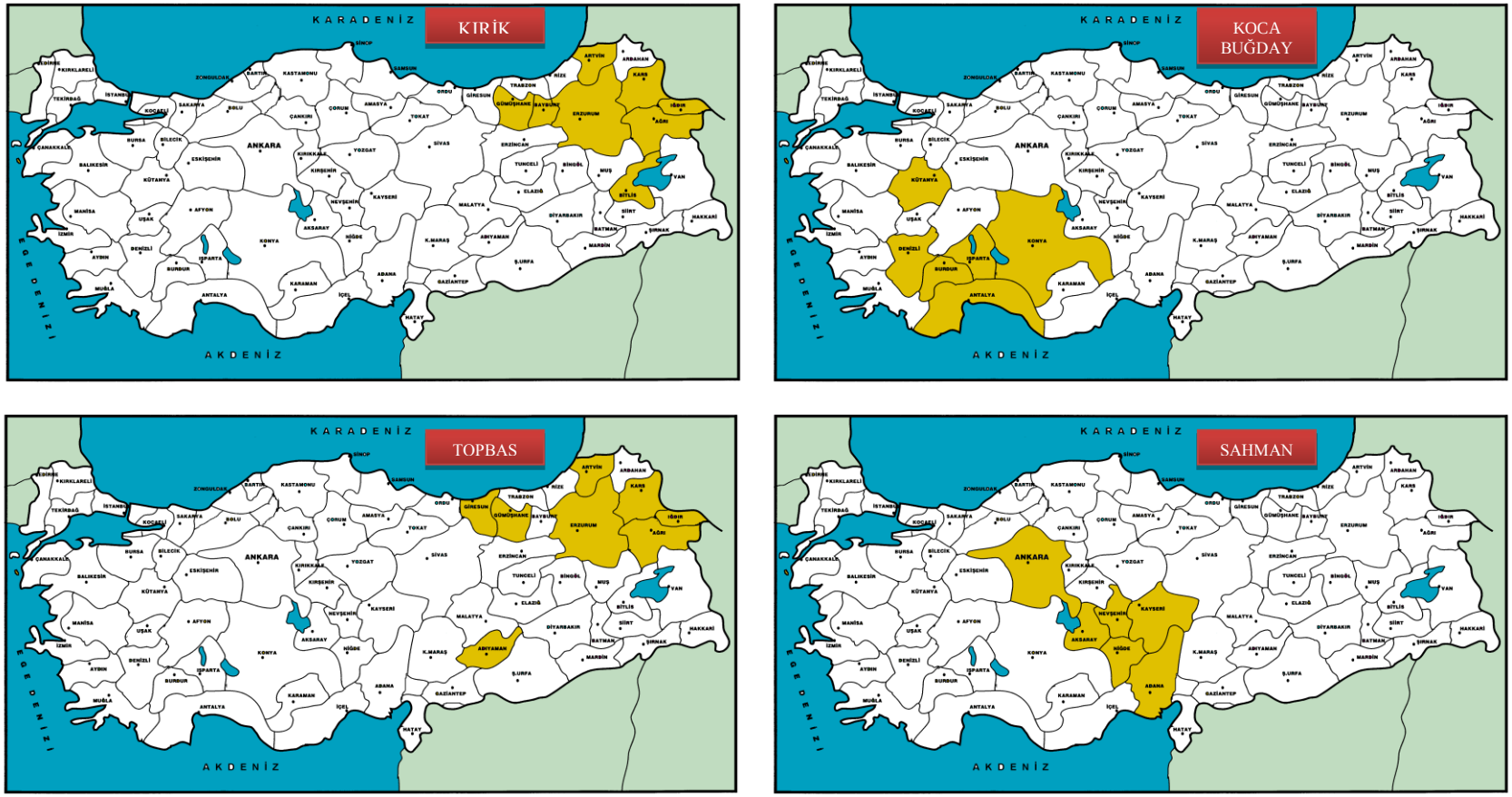


Figure 3.10 (Cont.). The Map on 10 Most Common Growth Wheat Landraces (Zerun, Siyez, Karakılçık, Kırmızı Buğday, Sarı Buğday, Ak Buğday, Koca Buğday, Topbaş, Kırik, and Şahman)

The second map is about wheat types as bread, durum and feed (*T. monococcum*) collected from the farmers. Wheat landraces types were detected both farmers's answers and the evaluation results of the spikes collected. Collected wheat landraces were grouped in 3 categories as "Bread Wheat", "Durum Wheat" and "Wheat for Feed (*T.monococcum*)" and they were shown in figure 3.11. The proportion of wheat types according to the region was showed in table 3.2. The wheat landraces in feature of bread whaet charectersitics were common in the research area. This proportion of farmers' numbers according to the produced wheat landrace specifies is changing by production regions. This change is also statistically significant in 99% confidence level. As bread wheat was grown usually in North Eastern Anatolian (97.97%) and Eastern Black Sea (96.39%) regions, durum wheat was grown South Eastern Anatolian Region (68.47%), and wheat for feed was grown in Western Black Sea Region (27.87%). Especially Western Black Sea Region is the the most intense mixed production area for bread, durum and feed wheats.

Table 3.2. Classification of collected wheat landraces according to their features (%)

Regions	**Wheat variety specify**			**Total**
	Bread	**Durum**	**Feed**	
Aegean Region	59.69	40.31		100.00
Central Anatolia Region	72.40	27.60		100.00
Eastern Black Sea Region	96.39	3.61		100.00
Eastern Marmara Region	40.19	59.81		100.00
Mediterranean Region	47.04	52.96		100.00
Middle Eastern Anatolian Region	56.88	43.13		100.00
North Eastern Anatolian Region	97.97	0.81	1.22	100.00
South Eastern Anatolian Region	31.53	68.47		100.00
Western Anatolia Region	50.86	49.14		100.00
Western Black Sea Region	37.30	34.84	27.87	100.00
Western Marmara Region	70.59	29.41		100.00
Total	58.28	37.93	3.79	100.00
χ : 790.88 S.D.:20 p value:0.000 φ:0.650 Statistically significant at 99% confidence level				

Figure 3.11. The Map on Wheat Types (Bread, Durum and Feed)

The fourth map is about the farmers' preferred wheat variety features. Two different farmers' prefferences were identified. Those were;

- If the farmers produced only wheat landraces in their production system, it was coded as ***"Only Wheat landraces".***
- If the farmers produced both wheat landraces and commercial wheat varieties together in their production system, it was coded as ***"Both Wheat landraces and Commercial Wheat Varieties"***

This map is also giving idea on genetic erosion of wheat landraces. Genetic erosion Maxted and Guarino (2006) define genetic erosion as follows: "Genetic erosion is the permanent reduction in richness (or evenness) of common local alleles, or the loss of combinations of alleles over time in a defined area." The Food and Agriculture Organization of the United Nations (FAO) described genetic erosion as "the loss of genetic diversity as a result of social, economic and agricultural changes" (FAO 1996). The International Plant Genetic Resources Institute (IPGRI) defined genetic erosion as "loss of genetic diversity between and within populations of the same species over time, or reduction of the genetic base of a species" (Jarvis et al. 2000). As genetic diversity exists at various levels (ecosystem, species, gene and gene-complex), genetic erosion needs to be assessed at these levels. Information on the loss of varietal diversity at landscape (field plot), household and community levels is regarded as a good indicator of genetic erosion at the social level. This research showed that the genetic erosion is a continuous process and many wheat landraces has been lost in Turkey. Because, when we compare our findings with Mirza Gökgöl's, Harlan's and Mertzgel's collections, it can be seen that many wheat landraces lost and they are no longer produced. For instance, in Balıkesir province, there are 37 wheat landraces having different local names in his collection, but we have found only 7 wheat landrace population having different local names. At this process, there are many factors triggering it but there is a reality as we are getting lost our genetic resources and this statistic is a prove on genetic erosion on wheat landrace.

To understand the factors effecting of farmers' decision between to grow wheat landrace and modern wheat varieties is an important to prevent the genetic erosion for wheat landraces, In this stage, the decisions of farmers on that were shown in figure 3.12 and table 3.3.

Table 3.3. Farmers' Land Use Decisions on Wheat (%)

Region Name	Prroduction Feature		Total
	Only Landrace	Both Landrace and Commercial	
Aegean Region	72.97	27.03	100.00
Central Anatolia Region	73.18	26.82	100.00
Eastern Black Sea Region	82.35	17.65	100.00
Eastern Marmara Region	54.84	45.16	100.00
Mediterranean Region	78.26	21.74	100.00
Middle Eastern Anatolian Region	91.61	8.39	100.00
North Eastern Anatolian Region	92.68	7.32	100.00
South Eastern Anatolian Region	73.66	26.34	100.00
Western Anatolia Region	88.57	11.43	100.00
Western Black Sea Region	36.36	63.64	100.00
Western Marmara Region	54.00	46.00	100.00
Total	**73.83**	**26.17**	**100.00**
χ : 290.86 S.D.:10 p value:0.000 φ:0.403 Statistically significant at 99% confidence level			

It can be seen that the farmers' land use decison is different by regions. In general, the average of farmers grown only landraces is about 73.83%. It means that the big proportion of farmers grown wheat landraces still has been acting in conservative behaviours. These farmers generally produce wheat landraces for their own needs, not for commercial aims. When examined the table 3.3. and figure 3.11, such these type of farmers generally are continuing their activities in Eastern regions in the research area, especially North Eastern Anatolian (92.68%), Middle Eastern Anatolian (91.61%), and Eastern Black Sea (82.35) Regions. In the Western Black Sea Region (36.36%), the proportion of farmers who grows only landraces is below to 50%. In that region, landrace displacement by modern varieties is verry common. It signs the genetic erosion in that region.

Figure 3.12 The Map on The Farmers' Land Use Decision in The Research Area As" Only Landraces" and "Both Landrace and Modern Varieties"

The last map is about the wheat production system of the farmers. In production system, irrigation state of the farmers on wheat landraces was examined. Agriculture is the largest user of fresh water globally. Irrigation is a vital element for agriculture; with irrigated crops yielding up to 400% more than rain fed crops. Irrigation availability reduces the risk of weather variability in production conditions. As food insecurity continues to grow and climate instability looms, the importance of irrigated agriculture is growing: by 2030, irrigated crop production is expected to grow by 80% in order to meet global demand (World Bank, 2010). Taking into account the negative effects of global climate change in the world, it is unavoidable fact that we should give more importance the plant species and varieties having more tolerance to the drought problem in future. Landrace cultivars undoubtedly represent an important source of genetic variation in wheat. One of the prime examples is the use of Rht dwarfing genes that became available through the Japanese wheat 'Norin 10', derived from the LC Shiro Daruma (Kihara, 1982). Two important genes *Rht1* and *Rht2*, were observed to directly effect yield because of reduced lodging. Moreover, a considerable LC diversity was found for resistance to pests such as stem rust (caused by *Puccinia graminis* Pers.: Pers. f. sp. *tritici* Eriks. & E. Henn.), leaf rust [*P. recontidita* Roberge ex Desmaz. f. sp. *tritici* (Eriks.&E. Henn.) D.M. Henderson], or Russian wheat aphid (*Diuraphis noxia* Mordv.) (Skovmand and Rajaram, 1990; Skovmand et al., 1994), and for tolerance to abiotic stresses, like heat (Hede et al., 1999; Skovmand et al., 2001). In that time, landraces will be important to struggle against to the climatic changes. Landraces are generally more adaptive the dry condition and could be produced rainfed condition. But, as known, reaching the farmers to irrigation facilities could led to genetic erosion in that area. In that situation, the farmers generally prefer modern and profitable varieties instead of landraces. In general, the smaller the diversity of cultivated species, the greater the expenditure required on pesticides, fertilizers, irrigation, and so on (Perrings et al, 1995). Access of the farmers to irrigation facities is important indicators affecting the farmers' decision on landraces whether to produce or not. Kruzich and Meng (2006) indicated that the irrigation on the plot has negative and significant affect on preferance of the farmers about producing wheat landrace, implying that modern varieties are preferred over landraces in more optimal growing conditions in Turkey.

In the study, whether the farmers irrigate or not for their wheat landraces production was investigated and the results were presented in table 3.4. and figure 3.13. When examined the table and figure, it can be seen that wheat landraces were grown in rainfed condition and the proportion

farmers producing wheat landraces in rainfed condition was calculated as 87.22%. This proportion is changing by the production regions in the research area. While Eastern Marmara (100.00%), Aegean (99.09%), Eastern and Western Black Sea Regions (98.70% and 96.68%) are the regions where irrigation for wheat landraces are in minimum level, In the North and Middle Eastern Anatolian Regions (39.02% and 38.06%), the the proportion of farmers doing irrigation to wheat landraces reach about 40% level.

Table 3.4 The Distribution of Farmers According to Their Production Systems for Wheat Landraces (%)

Regions	**Irrigation Situation**		**Total**
	Irrigated	**Rainfed**	
Aegean Region	0.91	99.09	100.00
Central Anatolia Region	5.00	95.00	100.00
Eastern Black Sea Region	1.30	98.70	100.00
Eastern Marmara Region	0.00	100.00	100.00
Mediterranean Region	6.32	93.68	100.00
Middle Eastern Anatolian Region	38.06	61.94	100.00
North Eastern Anatolian Region	39.02	60.98	100.00
South Eastern Anatolian Region	8.87	91.13	100.00
Western Anatolia Region	13.14	86.86	100.00
Western Black Sea Region	3.32	96.68	100.00
Western Marmara Region	0.00	100.00	100.00
Total	12.78	87.22	100.00
χ : 328.41 S.D.:10 p value:0.000 φ:0.424 Statistically significant at 99% confidence level			

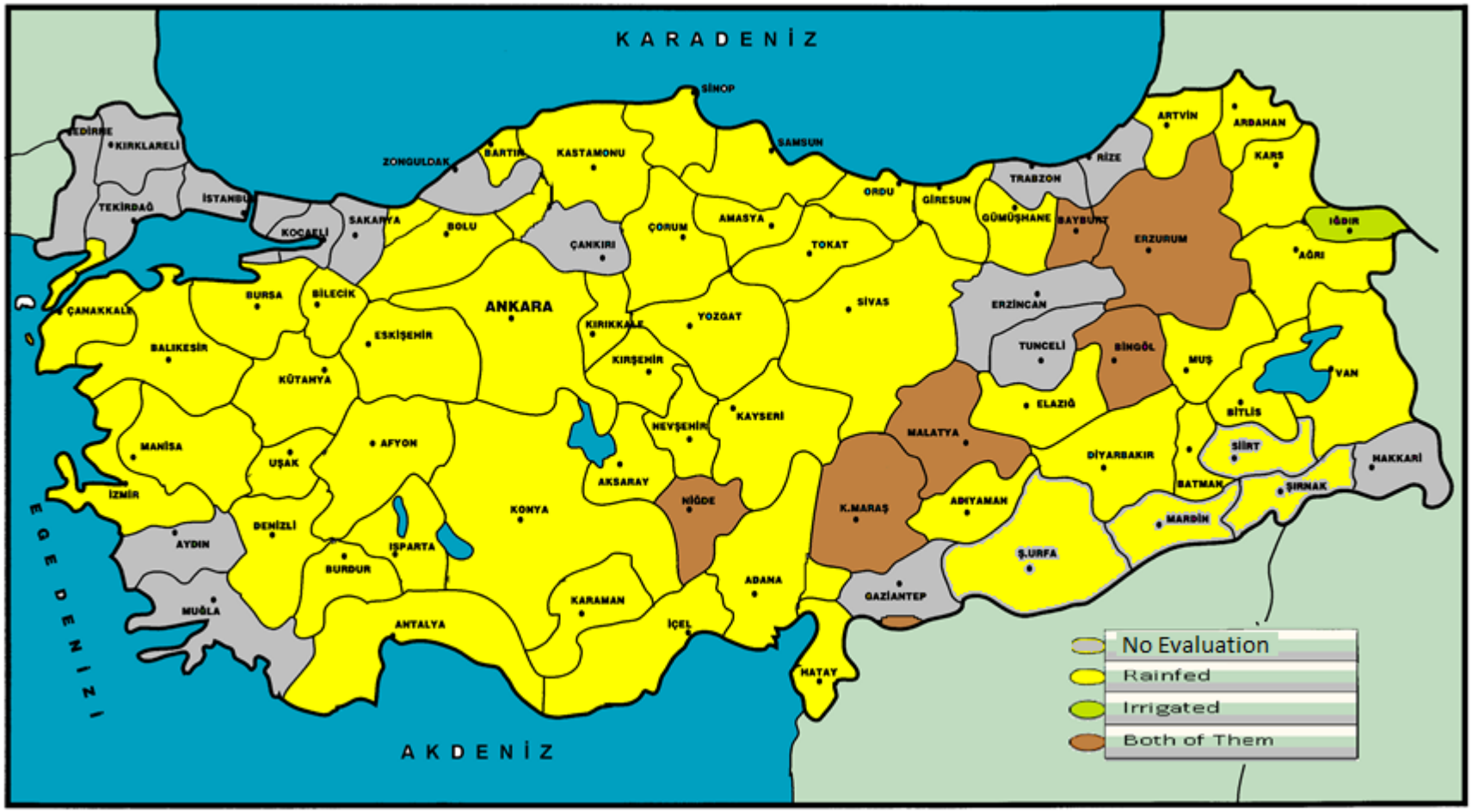


Figure 3.13. The Map on The Farmers' Production System As "Irrigated" and "Rainfed" Condition

3.5 References

Anonymous, (2007)a. TRC Güneydoğu Anadolu Bölgesi Tarım Master Planı, Gıda, Tarım ve Hayvancılık Bakanlığı, Strateji Geliştirme Başkanlığı, Ankara.

Anonymous, (2007)b. TR8 Batı Karadeniz Bölgesi Tarım Master Planı, Gıda, Tarım ve Hayvancılık Bakanlığı, Strateji Geliştirme Başkanlığı, Ankara.

Anonymous, (2007)c. TR9 Doğu Karadeniz Bölgesi Tarım Master Planı, Gıda, Tarım ve Hayvancılık Bakanlığı, Strateji Geliştirme Başkanlığı, Ankara.

Anonymous, (2007)d. TRA Kuzey Doğu Anadolu Bölgesi Tarım Master Planı, Gıda, Tarım ve Hayvancılık Bakanlığı, Strateji Geliştirme Başkanlığı, Ankara.

Anonymous, (2007)e. TRB Orta Doğu Anadolu Bölgesi Tarım Master Planı, Gıda, Tarım ve Hayvancılık Bakanlığı, Strateji Geliştirme Başkanlığı, Ankara.

Anonymous, (20012)a. The Map of Fertile Crescent. http://www2.lhric.org/eastchester/schools/ms/teachers/hill/fertilecrescent.htm

Anonymous, (2012)b. The map of South Eastern Anatolia. http://www.turkeyvacationplaces.com/maps-of-turkey.html

Anonymous, (2012)c. The map of Black Sea Region. http://www.turkeyvacationplaces.com/maps-of-turkey.html

Anonymous, (2012)d. The map of East Anatolian Region, http://www.turkeyvacationplaces.com/maps-of-turkey.html

Brush, S.B., and Meng, E., (1998). Farmers' valuation and conservation of crop genetic resources. Genet. Resour. Crop Evol. 45, 139–150.

Çetin, S. C., Karaca, A., Haktanır, K., and Yildiz, H. (2007). Global Attention to Turkey Due to Desertification. Environ Monit Assess (2007) 128:489–493

Damania, A.B., Pecetti, L., Qualset, C.Q., and Humeid, B.O., (1996). Diversity and geographic distribution of adaptive traits in Triticum turgidum L. (durum group) wheat landraces from Turkey. Genetic Resources and Crop Evolution 43:409-422, The Netherland

Damania, A.B., Pecetti, L., Qualset, C.Q., and Humeid, B.O., (1997). Diversity and geographic distribution of stem solidness and environmental stress tolerance in a collection of durum wheat landraces from Turkey. Genetic Resources and Crop Evolution 44:101-108, The Netherlands

Dotlačil, L. Hermuth, J. Stehno, Z. Dvořáček, V. Bradová J. and Leišová L. (2010). How Can Wheat Landraces Contribute to Present Breeding? Czech J. Genet. Plant Breed., 46, 2010 (Special Issue): S70–S74

FAO. (1996). 'The State of the World's Plant Genetic Resources: Diversity and Erosion'. Third World Resurgence. Farmers' Rights and the Battle for Agrobiodiversity. Issue No. 72/73 KDN PP6738/1/96. An excerpt from the Report on the State of the World's Plant Genetic Resources prepared by the FAO Secretariat for the International Technical Conference on Plant Genetic Resources at Leipzig, Germany, 17-23 June1996.

Gökgöl, M. (1939). Turkish wheat. Istanbul

Harlan, J. R. (1950). Collection of crop plants in Turkey. Agron. J. 42:258-59.

Jaradat, A.A., (2012). Wheat Landraces: Genetic Resources for Sustenance and Sustainability. USDA-ARS, 803 Iowa Ave., Morris, MN 56267 USA. http://www.ars.usda.gov/SP2UserFiles/Place/36450000/products-wheat/AAJ-Wheat%20Landraces.pdf

Jarvis DI, Myer L, Klemick H, Guarino L, Smale M, Brown AHD et al. (2000). A training guide for *in situ* conservation on-farm. Version 1. International Plant Genetic Resources Institute, Rome, Italy Kaya, Z., Kün, E., Gu¨ner, A., 1997. National Plan for In situ Conservation of Plant Genetic Diversity in Turkey. Milli Egitim Basimevi, Istanbul.

Hede A.R., Skowmand, B., Reynolds, M.P., Crossa, J., Vilhelmsen, A.L. and Stolen, O., (1999). Evaluating genetic diversity for heat tolerance traits in Mexican wheat landraces. Genet. Resour. Crop Evol. 46: 37–45.

Keller L., Schmid J.E., and Keller E.R., (1991). Are cereal landraces a source for breeding? Landwirtschaft Schweiz, 4: 197–202.

Kesici, T., ve Kocabaş, Z., (2007). Biyoistatistik. Ankara Üniversitesi Eczacılık Fakültesi Biyoistatistik Yayin No: 94, Ankara.

Kihara, H. (1982). Wheat studies: Retrospect and prospects. Elsevier Science Ltd., St. Louis, MO.

Kruzich, T., (2006). Why do households cultivate landraces? Wheat variety selection and in-situ conservation in Turkey. MSc. Thesis. Montana State University, Bozeman, Montana.

Kruzich, T.J. and Meng, E., (2006). Wheat Landrace Cultivation in Turkey: Household Land-use Determinants and Implications for On-Farm Conservation of Crop Genetic Resources. International Association of Agricultural Economists Conference, August 12-16, 2006, Gold Coast, Australia.

Mangelsdorf, P. C. (1953). Wheat Science Am., 189:50-59.

Maxted, N. and Guarino, L. (2006) Genetic erosion and genetic pollution of crop wild relatives. In: Ford-Lloyd, B.V., Dias, S.R. and Bettencourt, E. (eds.) Genetic erosion and pollution assessment methodologies. IPGRI, Rome, Italy. pp. 35-46.

Meng, E., (1997). Land allocation decisions and In-situ conservations of crop genetic diversity resources. The case of wheat land races in Turkey, PhD Thesis, Department of Agricultural and Resource Economics, University of California, Davis.

Perrings C., Barbier E.B., Brown G., Dalmazzone S., Folke C., Gadgil M., Hanley N., Holling C.S., Mäler K.-G., Mason P., Panayotou T. and Turner R.K., (1995). The Economic Value of Biodiversity. In: Heywood V. and Watson R., eds, Global Biodiversity Assessment, Cambridge, Cambridge University Press: 823-914.

Qualset, C.O., Damania, A.B., Zanatta, A.C.A and Brush, S. (1997). Locally based crop plant conservation. Plant Genetic Conservation: The in situ Approach, Edited by N.Maxted, B.V. Ford-Lloyd and J.G. Hawkes.

Skovmand, B., and Rajaram. S. (1990). Utilization of genetic resources in the improvement of hexaploid wheat. In J.P. Srivastava and A.B. Damania (ed.) Wheat genetic resources: Meeting diverse needs. J. Wiley & Sons, Chichester, UK.

Skovmand, B., Bertschinger, L. and Robinson. J. (1994). Quantifying heterogeneity for reactions to the Russian wheat aphid in accessions of Turkish hexaploid wheat landraces previously identified as resistant. p. 139–142. In Proc. of the Russian Wheat Aphid Workshop, CO. 23–25 Jan. 1994.

Skovmand, B., Reynolds, M.P. and DeLacy. I.H. (2001). Mining wheat germplasm collections for yield enhancing traits. Euphytica 119:25–32.

Tan, A., (2002). In Situ (On Farm) Conservation of Landraces from Transitional Zone in Turkey, Project No: TOGTAG-2347, TUBİTAK, İzmir.

Tan, A., (2010). Türkiye Gıda ve Tarım Bitki Genetik Kaynaklarının Durumu. Gıda ve Tarım İçin Bitki Kaynaklarının Muhafazası ve Sürdürülebilir Kullanımına İlişkin Türkiye İkinci Ülke Raporu. http://www.pgrfa.org/gpa/tur/docs/turkey2_tur.pdf

Tan, A., Taşkın, T., ve İnal A., (2013). Bitki Genetik Kaynaklarının Toplanması, Ege Tarımsal Araştırma Enstitüsü, Teknik Broşür, No:7, İzmir.

Tesemma, T., Tsegaye, S., Belay, G., Bechere, E., Mitiku, D., (1998). Stability of performance of tetraploid wheat landraces in the Ethiopian highland. Euphytica, 102: 301–308

The World Bank, (2010)., Valuing Protected Areas, Washington, D.C. 20433 U.S.A.

TÜİK, (2012). Production Statistics in Turkey. Turkish Statistical Institute, Ankara. www.tuik.gov.trZanatta, A.C.A, Keser, M., Kilinc, N., Brush, S.B., and Qualset, C.O., (1996). Agronomic performance of wheat landraces from western Turkey: bases for in situ conservation practices by farmers. 5th International Wheat Conference, June 10-14, 1996 Ankara, Turkey.

Zanatta, A.C.A, Keser, M., Kilinc, N., Brush, S.B., and Qualset, C.O., (1998). Competitive performance of wheat landraces from western Turkey: Basis for locally based conservation of genetic resources, Proceedings of the 9th International Wheat Genetics Symposium, 2-7 August 1998, Saskatoon, Saskatchewan, Canada.

CHAPTER 4

FARMER PRACTISES AND DECISION MAKING OF WHEAT LANDRACES

4.1. Introduction

Researchers have documented that smal1-scale farmers in areas of crop diversity often plant several crop varieties in one season (Brush, Carney, and Huaman 1981; Dennis 1987; Richards 1986; Bellon and Smale, 1998). Smal1-scale farmers usual1y have multiple interests or concems and confront numerous problems in attempting to address them. Because it is unlikely that one variety has all of the traits demanded by the farm household, and because desirable traits may be associated with undesirable ones, the choice of varieties can be seen as a process by which farmers assemble various bundles of traits to suit specific production conditions, consumption preferences, or marketing requirements (Bellon 1996; Bellon and Smale, 1998). There are trade-offs in the selection of varieties, and the farmer can change the bundle of traits by changing the allocation of crop area among varieties (Bellon and Smale, 1998).

The landraces being in the center of the domestication and diversity are important for the conservation of crop genetic resources. These are also important both the breeding of new varieties and the income source of livelihoods living in rural area. Because of that, we can look the landraces as both food and means of existence for human. Turkey is the one of the rare country so having the rich genetic material. Especially Turkey is seen as homeland of the wheat.

Turkey took part in a process of agricultural modernisation in conjunction with a subsidised industrial development program, from the early 1960s to the mid 1970s (Aydin, 1986; Olgun, 1989; Ergüder, 1991; Bardsley and Thomas, 2005). On the Anatolian Plateau, new wheat varieties were primarily adopted because they allowed higher yields in dryland production systems (Aresvik, 1975; Breth, 1977). They responded to high inputs of agricultural fertilisers and irrigation, and were resistant to some important diseases. Modern varieties were readily adopted by wealthy farmers, who had the capital, education, land and other inputs to more fully exploit their potential (Demir, 1976; Kronstad, 1981; Tansey, 1984). Many farmers with smaller holdings also gained access to modern varieties and local wheat landraces were lost as the agricultural systems altered or as agriculture lost viability (Brush, 1995; Kaya et al., 1997; Tan, 1998).

This chapter focuses on three questions:

1) How is the characterization of farms producing the wheat landraces?

2) What are the production inputs of the wheat landraces?

3) What is the reason of production of the wheat landraces and preferences and unpreferenced characteristics of them?

To address these questions, we incorporate data about production inputs like seed, fertilizer and pesticide amount, yield data, socioeconomic characteristics, the reason why the farmers maintain the wheat landraces at the household level from 61 provinces in Turkey with survey method in 2009-2014 years.

4.2. Materials and Methods

The main material of the study was the primary data obtained from the surveys performed in the farms grown wheat landrace population in 65 provinces from Turkey between the years of 2009-2014 for 6 years.

The Purposive Aimed Sampling Method was used in the research. Before starting the study, research area was shaped with the gathering information from the Agricultural research Institutes, the Province and/or District Directorates of Food, Agriculture and Livestock, NGO's, agricultural consultants working in private sector and also universities.

The research was completed at 2 stages. The first stage was collecting the samples. To collect wheat landrace samples, wheat harvesting time was fallowed. The survey and collection activity were done in same time shortly before harvesting. First of all, tried to gather spikes from the land, but if we didn't find spikes, we took seed from the farmers.

Collected spikes were evaluated and classified at the Institutes by researchers (especially breeders) accordingly to species and spike morphology (bread/durum wheat, awned/awnless, spike color etc.) in each sample of landrace and planted all spikes having distinctive features were sowed separately as headrows in Research Institutes.

The second stage was survey with farmers. For this aim, socio-economic survey forms were prepared by economists and agronomists. The socioeconomic survey covered a broad range of information regarding household characteristics, production data (yield, seed amount, fertilizer amount and the other production and harvesting techniques), and landrace features (height, seed color, preferred and non-preferred characters of landraces, usage aims, wheat type). Households participating in the surveys ranged from those which cultivated only traditional varieties and those which cultivate both modern and traditional varieties. Survey forms were fulfilled with farmers face to face. The farmers living chosen villages were determined according to getting information from the chief of the village "Muhtar".

To analyse the data gathered from the research area via survey method were analysed with the different statistical methods. Stata-13 statistical software was used for statistical analyses. Firstly, descriptive analysis was used the definition of the data. This method of analysis provides statistics that are used to describe the basic features of the data in a study. They provide simple summaries of the characteristics of the sample such as measures of dispersion and central tendency. The limitation with this analytical procedure is that descriptive statistics do not show the relationship among the variables and the influence that each variable may have on the response. Descriptive analysis does, however often provide guidance for more advanced quantitative analyses. The descriptive data about the research area was presented as tables.

In the research categorical varieables were showed with cross tabulations. Cross tabulation are useful for summarizing categorical variables The crosstabs chi square test is used to measure whether there is some level of association among categorical variables in two-way and multi-way contingency tables. Variables for which the test statistic is significant at a set cut-off point are considered associated, while those for which the test statistic is not significant are not associated. However, the test does not indicate the direction, or even the magnitude of the association, thus it is not sufficient to use this analytical approach alone.

Pearson's chi-squared was used to assess two types of comparison tests of independence. A test of independence assesses whether paired observations on two variables, expressed in a contingency table, are independent of each others. The value of the test-statistic is; (Kesici and Kocabaş, 2007)

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

where

χ^2 = Pearson's cumulative test statistic, which asymptotically approaches a $\chi 2$ distribution.

O_i = an observed frequency;

E_i = an expected (theoretical) frequency, asserted by the null hypothesis;

n = the number of cells in the table.

The maximum 20% of total cells' frequency values should be less than 5 in created cross-tables to accept the Chi Square analyse results as reliable and no cell frequency also should fall below 1. If this limit is exceeded, reliability of the results obtained from chi-square analysis is questioned (Bayazıt ve Oğuz 1998). In that situation, the "Likelihood Ratio" value was used instead of Chi-Square Analysis. Data was tested in 90%, 95% and 99% confidence intervals. "Variance Analyses" was used in case of continuous variable and if the number of variable is more than two. If the number of variable was more than two, F Test was used, and if the number of variable was two, T Test used to compare means of two independent variables was utilized in the research. "Levene's Test" was used to control of the variances equality of 2 groups. If the result of Levene Test is $p<0,05$, the variances are not equal in each group can be concluded. In this case, t test used in the absence of equal variance was utilized (Büyüköztürk 2010; Ergün 1995). If the statistically difference was found among the variables on the results of F test, these variables were grouped with "Duncan Test" (Düzgüneş, Kesici, and Gürbüz, 1983).

To compare the means belonging to independent two variables, T-test was used (for independent variables). This test was used to compare two small sets of quantitative data when samples are collected independently of one another. The criterion of this test is that the samples must be collected from two different populations or from randomly selected individuals from the same population at different times.

One of the factors taken into account while the farm enterprises were determining their production strategies was the presence of labor they own. Because, agriculture is a labour-intensive activity. The presence of labor is an important variable in the sustainability of the farm enterprises in the research area where subsistence farming systems is common. Therefore, the presence of labor enterprises was investigated in this study. To calculate of the farms' labour force in their household, conversions of the all person living the household to "Man Labour Unit (MLU)" was done. Not all workers have the same capacity for work. A child of twelve can do useful work, but he cannot yet do the heavy work that a man can. A

woman, in addition to working in the fields, fetches water and cooks the meals, so she does not work in the fields as long as the men do. It is therefore difficult to make a direct comparison of the work that can be done by different households. The coefficients presented in Table 4.1 were considered in this conversion.

Table 4.1. The Coefficients for Man Labour Unit Conversions

Demographic Groups	α coefficient
Children (6 age<)	0.00
Children (7-14 age)	0.50
Men (15-49 age)	1.00
Women (15-49 age)	0.75
Men (50 age +)	0.75
Women (50 age +)	0.50

Source: Erkuş, 1979

4.3. Results and Discussion

One of the objectives obtained in this study is to be propounded the results with production techniques of wheat landrace producers. In this section, firstly, the information on the field where wheat landraces were produced was presented by analyzing the data obtained from the research area. In the next sections, the socio-economic structures of the farmers producing wheat landrace were propounded. Both geographic data and socio-economic structure of the farms will give an idea on that we should focus on which kind of farms to provide maintainance of wheat landraces and in which geographical conditions the farms are carrying out wheat landraces producing activities. Geographical conditions and the farm characteristics were the important factors affecting the farmers' willingness to prduce wheat landraces were indicated in the previous studies conducted in different countries and Turkey (Kruzich, 2006; Brush and Meng, 1998; Brush, 1995, Smale and et all., 2003).

Another topic covered in this chapter is the production techniques, inputs and their quantities used by wheat landrace producers. This information is important in side of showing performance of wheat landraces, having different types and characters, in different locations.

4.3.1 Geographical Characteristics of Research Area

As like geographical structure is affecting both quality and yield in the production process, it is also effective factor on farmers' decision in what products and what extent they will produce. There are many elements that make up the geographical structure. One of them is value of altitude. Altitude is an effective factoron the maintanence of wheat landrace production and it has also a positive impact on diversity in farm level (Kruzich, 2006). In this study, generally high-altitude areas were prefered for the productions of wheat landraces was determined. The altitude values in the research area were presented in Figure 4.1 by regions and provinces. The fields that wheat landraces were grown were places whose altitudes were up to 2000 m could be seen in Figure 4.1. In the research area, the lowest altitude value was in Western Marmara Region, Çanakkale province with 355 m and the highest altitude value was in North Eastern Anatolia Region, Ardahan province with 1899 m were recorded.

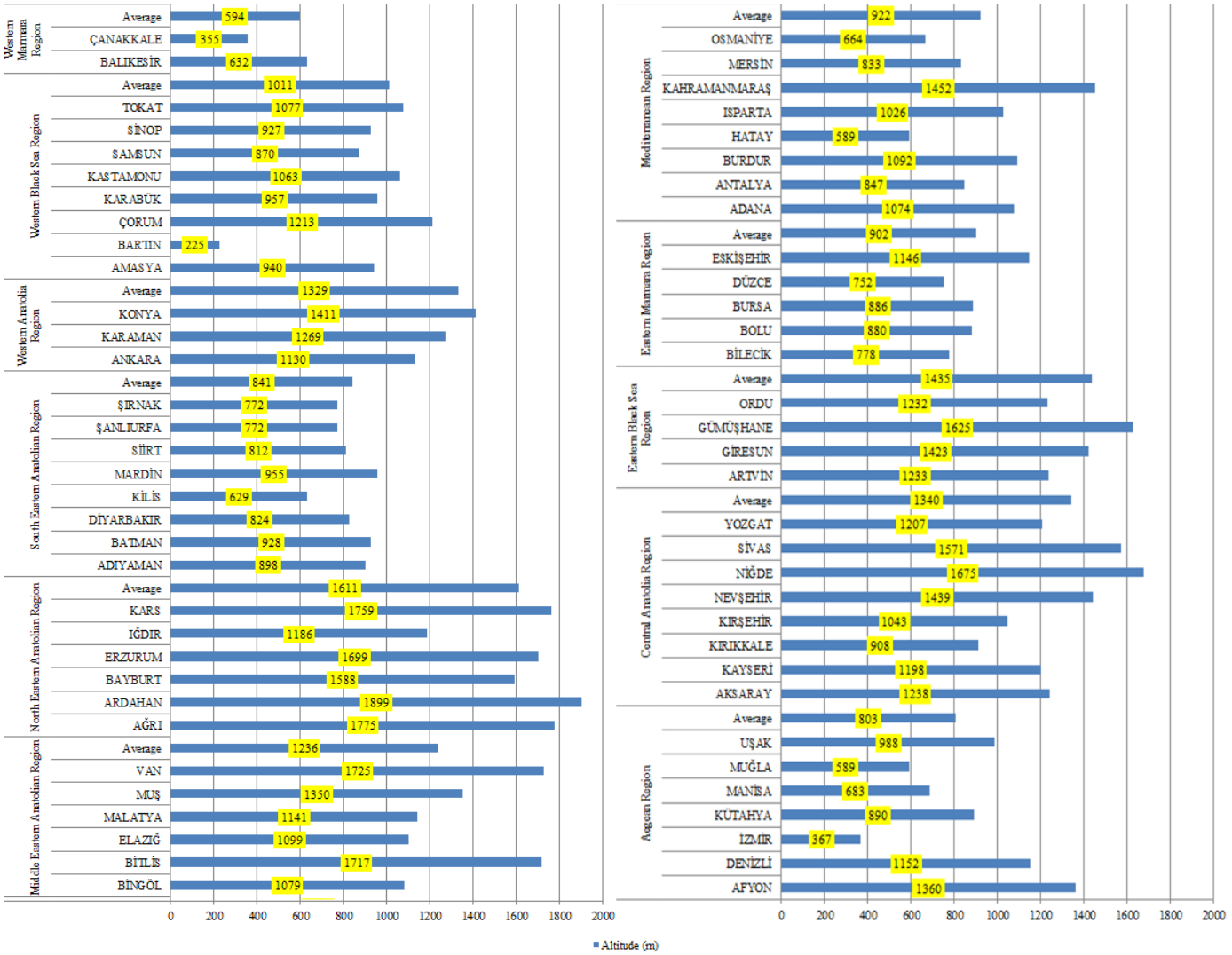


Figure 4.1 Altitudes of The Places Grown Wheat Landraces (m)

As regards to affect of altitude on willingness to farmers' wheat landrace growing attitude in the research area, when the altitude increase (at high altitudes), the proportion of farmers growing only only wheat landraces is higher than the proportion of farmers growing both modern and wheat landraceas together. This relationship is also statistically significant as result of Chi Square Analyse at 99% confidence interval (Table 4.2)

Table 4.2 The Change on Production Features of The Farmers According To The Altitude Codes

Production Features	**Altitude Codes**				**Total**	
	Lowland (1200 m and above)		**Highland (1200 m+)**			
	Count	**%**	**Count**	**%**	**Count**	**%**
Only Landrace	639	66.1	615	88.2	1254	75.4
Both Landrace and Commercial	327	33.9	82	11.8	409	24.6
Total	966	100,0	697	100,0	1663	100,00
χ : 106.49 S.D.:1 p value:0.000 φ:-0.253 Statistically significant at 99% confidence level						

Another variable laid down in the research areas was the distance of the producers to the market. Distance to market is an important variable in shaping the agricultural activities of producers. While the probability of farmers to engage with subsistence agricultural activities increase in remote areas, the probability decrease in the place closer the market. The average market distances of the farmers were presented by region and provinces in Fig. 4.2. In the research area, the distance of the 23.68% farms to market was found as over 25 km. As the distance to the market increase, the increase on the proportion of farmers keeping only wheat landraces in their production system was observed (Table 4.3). Similar studies showed that the market charectersitics are affecting factors on the biodiversity outcomes. Van Dusen (2000) was measured market integration as distance to a regional market, use of hired labor,and international migration, and he found that the charecters negatively affect diversity outcomes. Brush, and et al (1992) studied the diversity of potato CGR in Peru and compared two valleys with different levels of market integration. They found that the level of market integration decreased the overall level of diversity, as commercial production increased the area under simplified production systems with improved varieties. Meng's 1997 study of the diversity of wheat varieties in Turkey integrated several possible explanations into a comprehensive model. Market variables were important explanatory factors in the probability of planting landraces.

Table 4.3 The Change on Production Features of The Farmers According To The Market Distance

Production Features	Market Distance				Total	
	0-25 km		25 km+			
	Count	%	Count	%	Count	%
Only Landrace	981	72.35	329	78.15	1310	73.72
Both Landrace and Commercial	375	27.65	92	21.85	467	26.28
Total	1356	100.00	421	100.00	1777	100.00
χ : 5.58 S.D.:1 p value:0.018 φ:-0.056 Statistically significant at 90% confidence level						

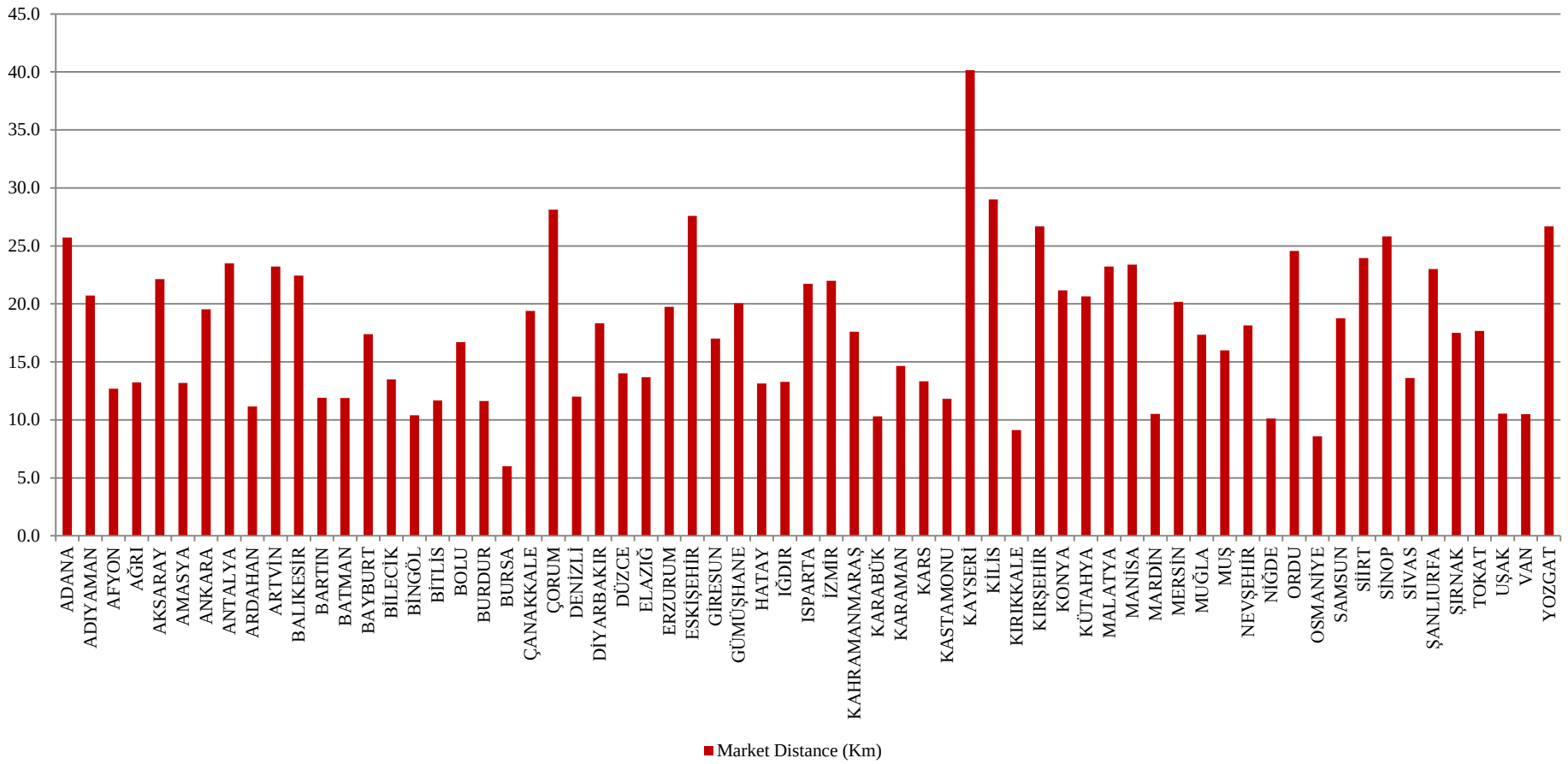


Figure 4.2 Distance of The Farmers to The Nearest Market By Provinces

4.3.2 Socio-Economic Characteristics of Farm Households

One of the issues examined in the study was socio-economic characteristics of the farm households and investigated of their behaviors and attitudes. In this context, the variables interested in age, and education levels of household heads, the distribution of existing labour forces acoording to the sex and usage of labour forces in households were investigated in the research area. In this section, the socio-economic characteristics of the farm households were examined as like demographic characteristics, land assets and land use of the farm households wthin the sub-headings. The demographic structure of the farm households is also a variable affecting willingness of the farmers' to produce wheat landraces. Therefore, the evaluated variables were analyzed in comparison with the willingness of farmers to produce wheat landraces.

Socio economic charectersitics of the place maintained the agricultural activitieas is an important variable as well as socio economic charectersitics of the farm households. The variable on socio economic charectersitics of the place can give information on the dimension of reaching technology, inputs, markets and social facilities. There is a study on this variable indicating the farms operate their activities in which type society, which was done by Ministry of Developmnet in 2003. An index was constituted in the study that brings all the socio-economic characteristics of county in Turkey by the Ministry of Development. According to this index, the counties were divided into 6 development classes from 1 to 6. 3.70% of the 189 districts in the research area have index values belonging to 1. and 2. development classes. While 38.10% of 189 counties was placing in 3. development class, 28.57%, 14.81% and 14.81% of 189 counties were in 4., 5. and 6. development classess respectively (Figure 4.3). From the results, the research areas were consisted of the middle and less developed counties can be said.

Socio-economic situations of settlement are also affecting the preferance of the wheat landrace producers. In the study, it was found that the farmers producing only wheat landrace in their farms were living less developed places when compared with the farmers producing wheat landrace and commercial wheat varieties together (Figure 4.4).

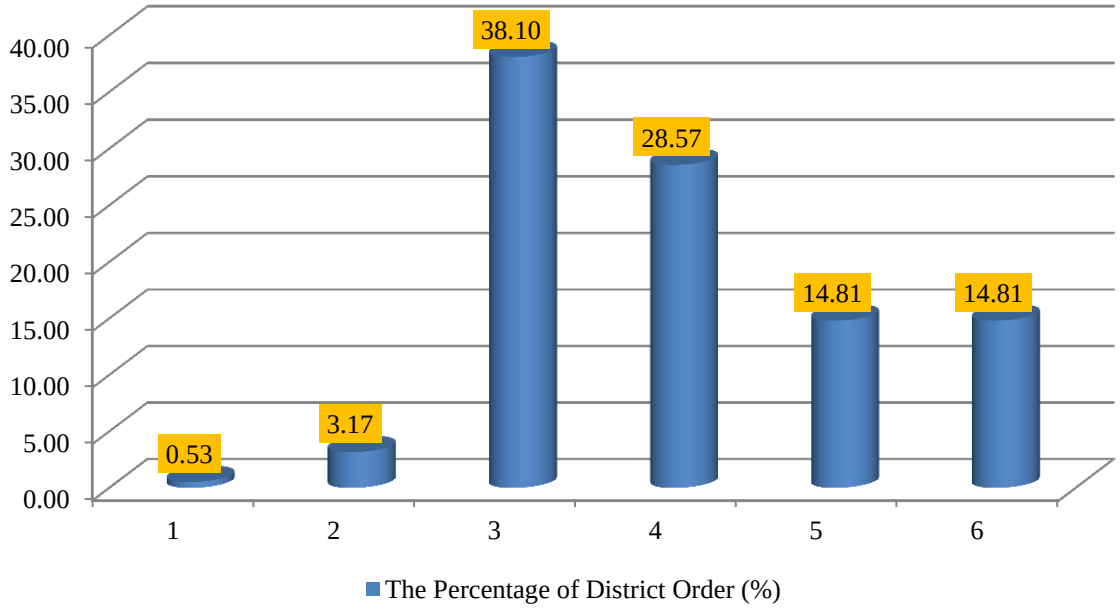


Figure 4.3 The Distribution of Districts Order According to the Development Index

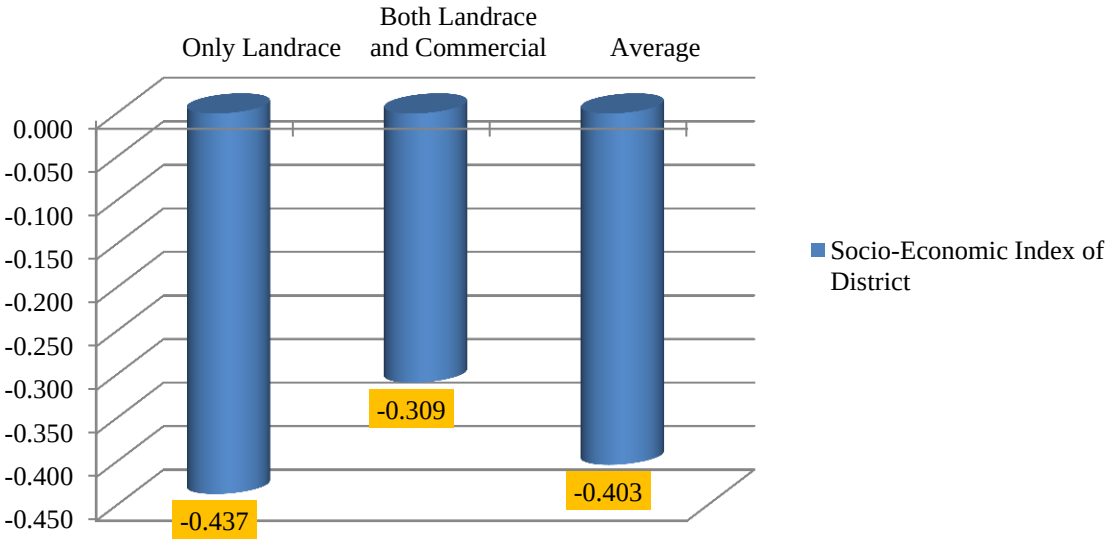


Figure 4.4 Socio-Economic Index Values of Districts According to Wheat Landrace Production Features.

The first factor examined in demographic factors is the population. The average household size was stated as 4.50 people according to the Turkey Statistical Institute (TSI) census statistics in 2000 (www.tuik.gov.tr 2011). When eaxamined the distribution of household size according to the research regions, it was calculated as household sizes of all

regions, only except Eastern Marmara and Western Marmara Regions, were over the average household size and the most populous region was South Eastern Anatolian Region with average 6.98 people. The household size varies according to the regions and these differences are significant at 99% confidence interval as regards of the Variance Analyse results (Table 4.4).

Household size does not mean alone so much. What matters is distribution of the population according to the sex and age and labour force existence of the farm household can be calculated from that point. The presence of labor is important for the continuity of the agricultural sector, which is labor-intensive sector. In the research labour force of the farm household was calculated as Man Labour Unit (MLU) considering the age and sex of the population. When examined the table 4.4, the average MLU was calculataed as 3.73 and 41.06% of it consisted of the male labour force. The labour force potential of the farm households vary according to the regions as statistically significant at 99% confidence interval. The presence of labour force in the farm households situated in East and Western Black Sea Regions resemble to each others and the farm households situated in the North ve Middle Anatolian Regions were the most populous farm households in the research area (Table 4.4).

Another factor examined was the ages of household heads. Supposed that the farms growing wheat landraces have more patriarchal family structure, household heads play an important role in decision-making processes. Some of the variables affecting the household heads decision-making proces are age and education variables. Increase in the age could bring the experience. However, it is known that old people could behave conservatively and they couldn't be open to new ideas. As the age progressed, it is known that the people do tend to maintain current behaviours instead of change them. In that situation, it can be thought that these people could allow more places for wheat landraces in their production system.

The average age of household heads in the research area was calculated as 53 years and this value is varying according to the regions, but in all the regions, the age is above the 50 years old. It shows that the farmers engaged with the wheat landrace production constitute the elder parts of the population. The differences in the regions are important statistically at 95% confidence level. Except age factors, none of socio economic factors like the number of people and the potential of labour force in the households, and sex of people are affecting of the farmers' behaviours alone on which wheat production system they will prefer between only wheat landrace or both modern and wheat landraces production together. The age of household heads was found as an important factor at the 90% confidence level (Chi square:

2.95, p:0.08). In the research area, the farmersbeing above the 50 years old mostly preferred to produce only wheat landraces when compared the farmers being below the 50 years old (Fig.4.5)

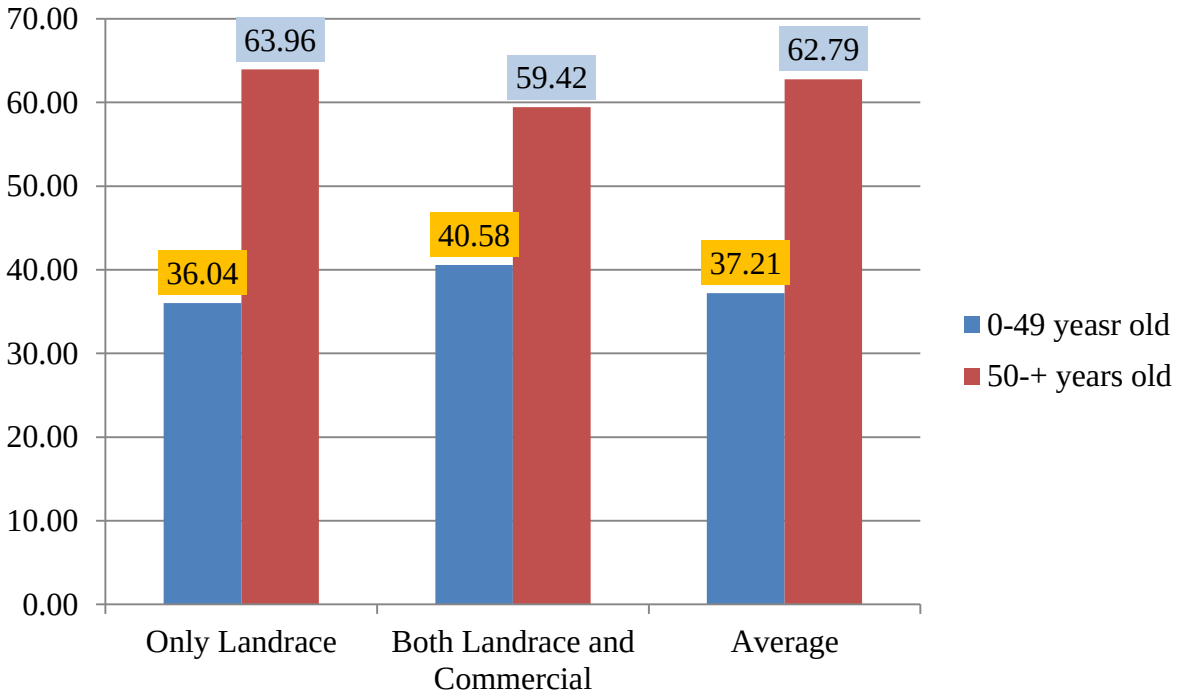


Figure 4.5 The Preferences of The Farmers on Wheat Landrace Production System According to the Their Ages

Table 4.4 The Socio Economic Characters of Farms Producing Wheat Landraces by Regions .

Regions	**Farmer's Age (Year)**	**Total Number of Male in HH[1]**	**Total Number of Female in HH**	**Number of People in HH**	**Male MLU[2]**	**Female MLU**	**Total MLU**	**Total MLU/Number of People in HH**
Aegean Region	55.35	2.31	2.27	4.58	1.66	1.26	2.92	0.64
Central Anatolia Region	53.68	2.73	2.68	5.40	2.01	1.57	3.58	0.66
Eastern Black Sea Region	55.08	2.29	2.28	4.57	1.90	1.29	3.19	0.70
Eastern Marmara Region	56.37	2.17	1.87	4.04	1.58	1.03	2.61	0.65
Mediterranean Region	54.83	2.51	2.13	4.64	1.85	1.24	3.09	0.67
Middle Eastern Anatolian Region	52.69	3.99	3.25	7.25	3.23	2.07	5.30	0.73
North Eastern Anatolian Region	51.82	3.52	3.15	6.66	2.59	1.80	4.40	0.66
South Eastern Anatolian Region	51.85	3.62	3.37	6.98	2.78	2.00	4.78	0.68
Western Anatolia Region	53.34	2.33	2.19	4.53	1.89	1.28	3.17	0.70
Western Black Sea Region	52.72	2.65	2.35	5.00	2.06	1.40	3.46	0.69
Western Marmara Region	55.52	1.94	1.86	3.80	1.53	1.03	2.56	0.67
Average	53.48	2.88	2.61	5.48	2.20	1.53	3.73	0.68
F Values	2.39	30.70	21.97	34.40	31.47	25.80	37.33	
	*	***	***	***	***	***	***	

[1] HH: Household [2]: MLU: Man Labour Unit
* 90% significant at confidence interval
** 95% significant at confidence interval
*** 99% significant at confidence interval

Another demographic factor examined in the study was educational level of household heads. It is known that literacy rate is generally high in place where the agricultural activities are being done consciously (Şahin ve Yılmaz 2008). Educational status is also one of the most important factors in determining people's behavior and decisions (Kan, 2012). Increase in the level of education can make two different domains. First, as the level of education increases, people may engage in more commercialization activity and as result of it, a production model used more modern technology and materials and allocated more places for modern wheat varieties can occur. Secondly, as the level of education increases, people may want to engage with more organic, local, subsistence or recreational agricultural activities. In this system, despite of low yield potential, local varieties are preferred much more in the production system in terms of flavor and aroma is thought to be different from generic ones. The educational levels of household heads vary according to the regions and it is statistically significant at 99% confidence interval. 70.00% of total household heads has in primary school educational level. The household heads in Middle Eastern, North Eastern Anatolian and Mediterrenean Regions have slightly higher level of education compared to other regions (Table 4.5).

Table 4.5 The Farmers' Education Level by The Regions (%)

Regions	Farmer's education level (%)					
	Illitarate	Literate	Primary school	Secondary school	University	Total
Aegean Region	7.30	8.20	77.30	7.30		100.00
Central Anatolia Region	4.50	11.80	80.00	3.20	0.50	100.00
Eastern Black Sea Region	5.50	5.50	82.20	6.80		100.00
Eastern Marmara Region		5.90	94.10			100.00
Mediterranean Region	5.90	10.70	73.10	7.10	3.20	100.00
Middle Eastern Anatolian Region	11.20	21.10	54.60	9.90	3.30	100.00
North Eastern Anatolian Region	5.30	11.00	72.80	9.30	1.60	100.00
South Eastern Anatolian Region	17.10	47.10	31.60	3.20	1.10	100.00
Western Anatolia Region	5.10	8.60	79.40	5.70	1.10	100.00
Western Black Sea Region	4.30	14.20	71.70	9.40	0.40	100.00
Western Marmara Region	4.00	12.00	80.00	4.00		100.00
Total (Average)	6.80	15.30	70.00	6.60	1.30	100.00
χ 295.44 S.D.:40 p value:0.000 φ:0.409 Statistically significant at 99% confidence level						

The affects of educational levels of hosehold heads on farmers willingness to produce wheat landraces was shoved in Table 4.6, and as so the educational level of household heads

increased, it was determined that the number of farms allowing more place to wheat landraces in their production system were increasing.

Table 4.6 The Change on Production Features of The Farmers According To Their Education Level

Education Level	Only Landrace (%)	Both Landrace and Commercial (%)	Total (%)
Illiterate	6.46	8.00	6.85
Literate	16.60	10.89	15.13
Primary School	69.72	71.33	70.13
Secondary School	5.61	9.33	6.57
University	1.61	0.44	1.31
Total	100.00	100.00	100.00
χ 19.04 S.D.:4 p value:0.001 φ:0.104 Statistically significant at 95% confidence level			

The situation of the farms' land assets and the share of wheat landrace area in total cultivated area were presented in Table 4.7. Previous research has demonstrated a positive relationship between farm size and the adoption of modern varieties (Perrin and Winkelmann 1976; Feder et al. 1985). Larger farmers may benefit from economies of scale, be able to dedicate some proportion of land to experimenting with modern varieties, or face lower information costs relative to small farmers (Kruzich and Meng 2006). When examined Table 4.7, the average of farm size was found as 7.16 ha and 86.68% of it consisted of dry area (rainfed production system). It was determined that 45.69% of total cultivated area was allocated to wheat production and 68.84% of total wheat area was allocated to wheat landrace production. The farm size varies according to the regions and it is statistically significant at 99% confidence interval. It was ascertained that the narrow farm size was in the Western Anatolian region and the Eastern Black Sea Region, and the large farm size was in the Central Anatolian Region and Eastern Marmara Region. The region where the share of wheat landrace area in total wheat area was the lowest was the Western Black Sea Region and the region where the share of wheat landrace area in total wheat area was the highest was the Western Anatolian Region (Figure 4.6). It was seen that as so the farm size increase, modern wheat varieties were being produced more in large area. If the farmer has large area, they think producing more markentable products and they don't allocate more wheat landrace production area (Table 4.8).

Table 4.7 Land Use of The Farms Producing Wheat Landraces by Regions

	Total Cultivated Area (Ha)			Total Wheat Planted Area (Ha)			Total Wheat Landrace Planted Area (Ha)		
Region Name	Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	Irrigated	Rainfed	Total
Aegean Region	0,30	5,48	5,78	0,08	2,12	2,19	0,01	1,35	1,36
Central Anatolia Region	0,35	10,80	11,15	0,10	5,10	5,20	0,06	4,08	4,15
Eastern Black Sea Region	0,30	5,77	6,07	0,11	2,58	2,68	0,11	2,38	2,49
Eastern Marmara Region	0,00	6,10	6,11	0,00	2,29	2,29	0,00	1,06	1,06
Mediterranean Region	0,49	4,85	5,34	0,14	2,36	2,50	0,07	1,79	1,86
Middle Eastern Anatolian Region	1,50	4,47	5,97	0,47	2,62	3,09	0,36	2,47	2,83
North Eastern Anatolian Region	2,99	6,91	9,90	0,60	3,19	3,78	0,53	2,45	2,98
South Eastern Anatolian Region	1,25	5,67	6,90	0,48	2,97	3,45	0,37	1,84	2,22
Western Anatolia Region	0,83	3,70	4,53	0,18	1,54	1,72	0,08	0,86	0,94
Western Black Sea Region	0,44	6,10	6,54	0,38	3,60	3,97	0,21	1,36	1,57
Western Marmara Region	0,08	8,14	8,22	0,01	3,27	3,28	0,00	2,22	2,22
Total (Average)	0,96	6,21	7,16	0,28	2,99	3,27	0,20	2,05	2,25
F Value	21,17	7,87	9,17	7,53	5,73	5,82	11,62	13,76	15,12
	***	***	***	***	***	***	***	***	***

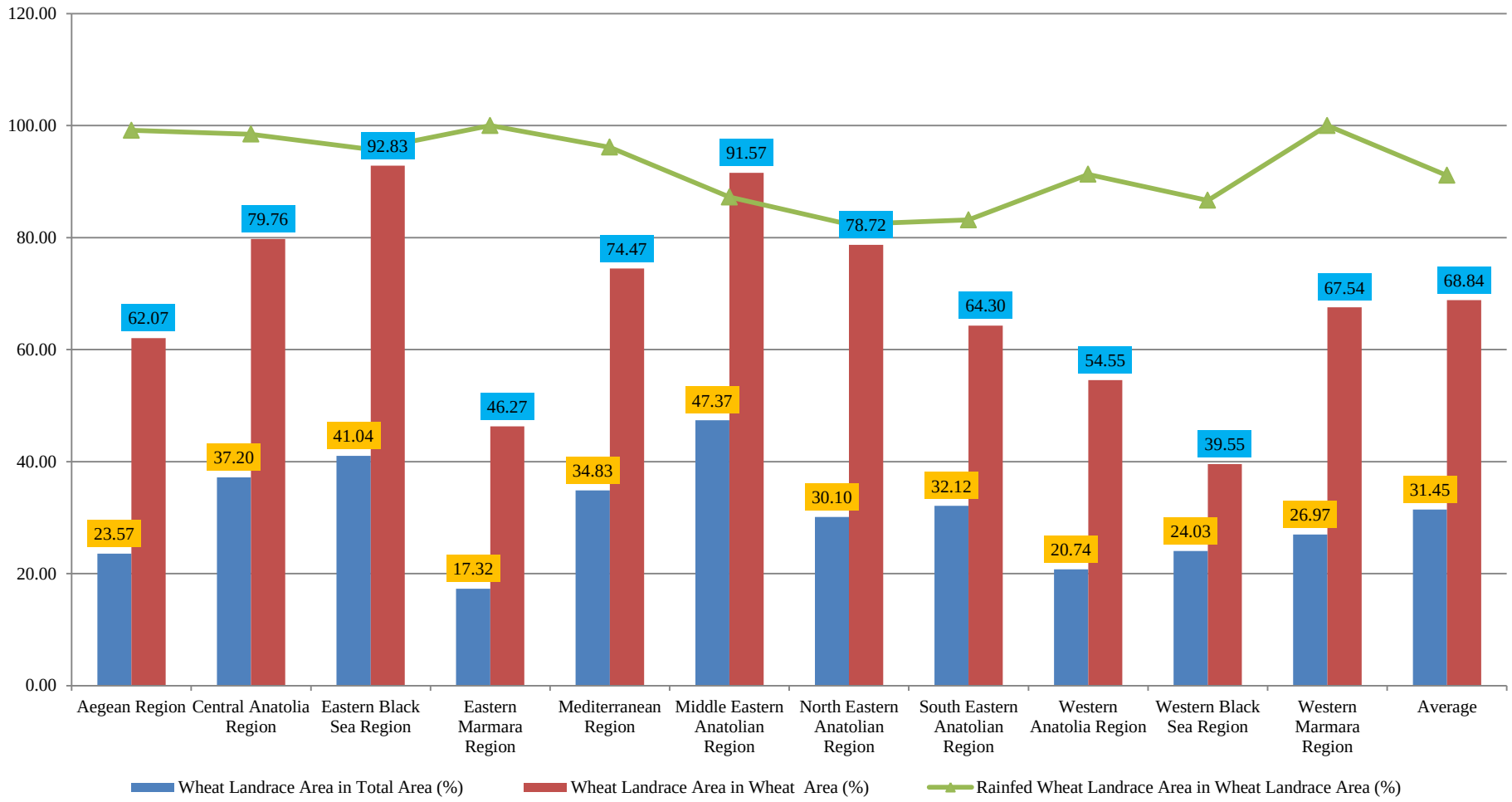


Figure 4.6 The Distribution of Wheat Landrace Area in Total, Wheat and Rainfed Area By Regions

Table 4.8 The Change on Production Features of The Farmers According To Their Farm Size

Production Feature	Total Cultivated Land (Ha)	Total Wheat Land (Ha)	Total Wheat Landrace Land (Ha)
Only Landrace	6,01	2,48	2,43
Both Landrace and Commercial	10,40	5,49	1,74
Total	7,16	3,27	2,25
T Value	-5.65	-7.45	-4.00
	***	***	***

* Significant at 90% confidence interval
** Significant at 95% confidence interval
*** Significant at 99% confidence interval

4.3.3 Agricultural Practises of Wheat Landrace Producers

Agricultural practices of the farmers that produce wheat landraces have been examined in this section. Examined the all stages of wheat production, from sowing to marketing, in this section, agronomic practices and reaction of wheat landraces yield values against to them were analysed and presented at region, province and county-levels.

The intended use of local wheat in the research area differs according to sub-areas, which is found important statistically in 99% confidence limit. In average, the wheat landraces are used 55.72% in bread-making (village bread, phyllo, lavash), 35.85% in bulghur-making and 2.61% in macaroni-making (noodle, pasty, kadayıf, etc.). Moreover, the straws are used as fodder by being converted into hay. While all the wheat landraces are produced in the Eastern Marmara Region is used in bread-making, in the Mediterranean Region and South Eastern Anatolian about half of them (56.52% and 47.27%) is used in bulghur-making. The region where the macaroni products are made mostly is the Aegean Region (12.61%). Especially in the Western Black Sea region, wheat landraces (*T. monococcum*) are used for feed (8.33%). (Table 4.9).

Table 4.9 The Distribution of the Farmers' Intended-Use of the Wheat Landraces (%)

Regions	**Bread (%)**	**Durum (%)**	**Bulgur (%)**	**Feed (%)**	**Other[5] (%)**	**Total (%)**
Aegean Region	53.78	12.61	33.61	0.00	0.00	100.00
Central Anatolia Region	59.87	2.34	34.11	0.00	3.68	100.00
Eastern Black Sea Region	67.14	0.00	21.43	11.43	0.00	100.00
Eastern Marmara Region	100.00	0.00	0.00	0.00	0.00	100.00
Mediterranean Region	42.14	1.00	56.52	0.00	0.33	100.00
Middle Eastern Anatolian Region	70.30	2.48	25.74	1.49	0.00	100.00
North Eastern Anatolian Region	75.71	0.00	15.46	0.95	7.89	100.00
South Eastern Anatolian Region	48.64	4.09	47.27	0.00	0.00	100.00
Western Anatolia Region	52.84	0.00	43.62	0.00	3.55	100.00
Western Black Sea Region	36.33	5.67	37.00	8.33	12.67	100.00
Western Marmara Region	62.71	1.69	30.51	0.00	5.08	100.00
Total (Average)	55.72	2.61	35.85	1.79	4.03	100.00

[5] Eriste, Helva, Keskek, Kadayif etc.

Durum Wheat (pasty)

Bulghur

Durum Wheat (pasty)

Cracked Wheat

Durum Wheat (Noodle)

Village bread

Village bread

Phyllo

Kadayıf

Straw making

In the research area the case of the farmers' planting commercial wheat before was studied. There is a difference in the region with respect to the sub-areas, which is considered important in 99% confidence level (Chi Square: 242.39; p:0.00; φ: 0.37). The region average is 35.47%, and the proportion of farmers planting commercial wheat types was high (71.00%, 55.22%, 56.82%, and 52.00%) in the Western and Eastern Black Sea and the Eastern and Western Marmara Regions, and was low (18.86%) in the Western Anatolia Region (Fig. 4.7). In average of Turkey, The more than half of the farmers tried commercial wheat varieties haven't sustain to produce them in their field (Fig.:4.8). The farmers tried commercial wheat varieties before were living in the place having better socio-economic index (-0.32), and vica versa (-0.45). This situation is statistitcaly important at 99% confidence level (t value: 4.22) and it confirms our thesis on the relationship with development and adaption the farmers to wheat landrace production.

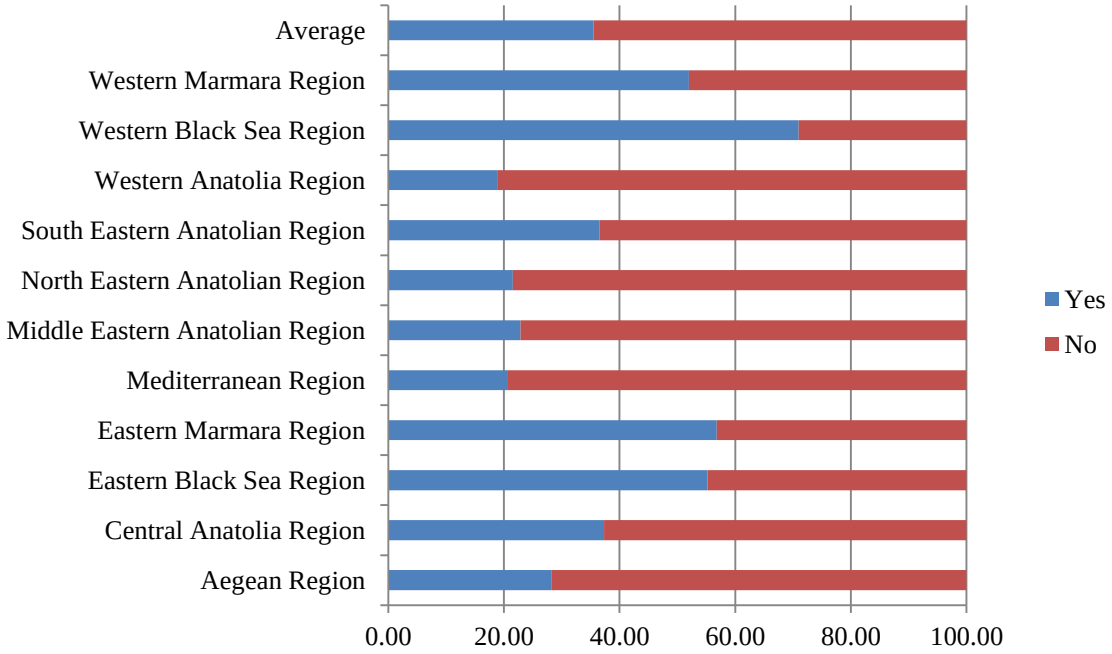


Figure 4.7 The Case of Whether The Farmers Have Tried Commercial Wheat Varieties

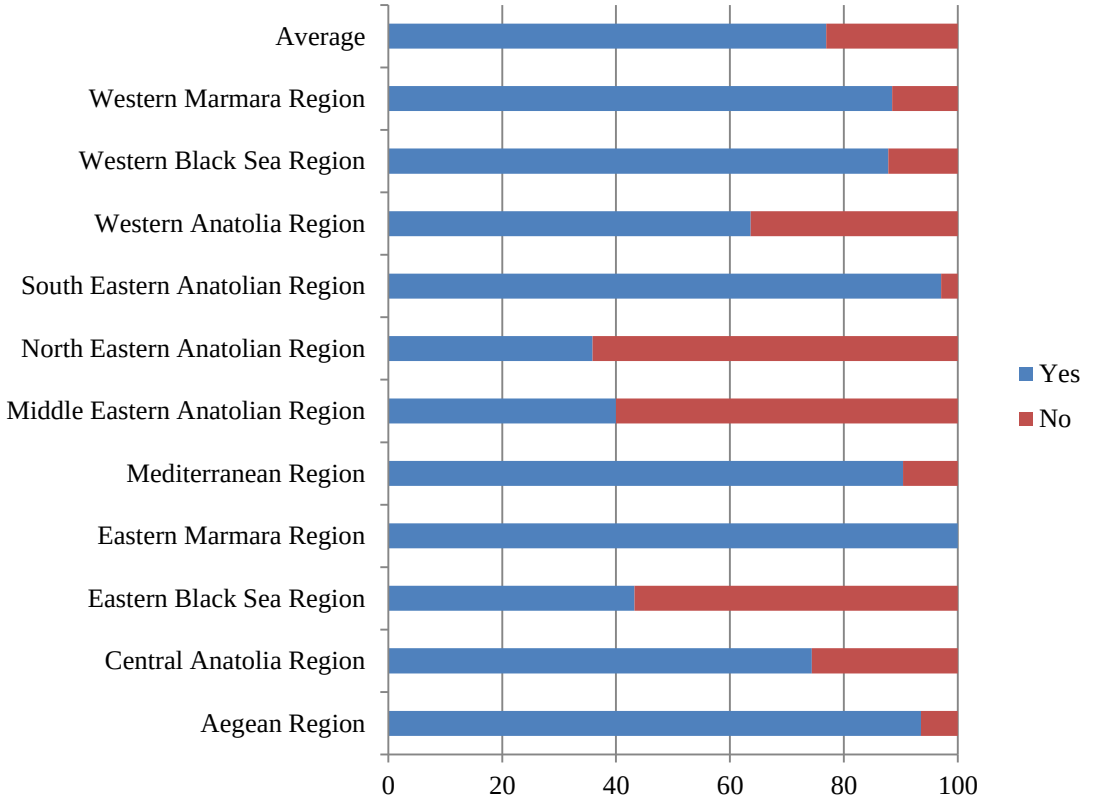


Figure 4.8 The Case of Whether The Farmers Have Continued Producing Commercial Wheat Varieties

Agronomic practices of the farmers give an ides on which condition wheat landraces are grown. Sowing time and sowing methods are the beginning activites of the farmers, analysed

as first agronomic practises. Wheat varieties can be in two types (winter, and spring). Sowing time of wheat cultivation by region in determining the nature of the training period, the climatic conditions of the region are also important. Climatic condition of the region is important factor as well as wheat types to determine of sowing time of wheat varieties. For this reason, wheat cultivation is able to be done in spring time especially in the places with high altitudes and long winter period as like North Eastern and Middle Eastern Anatolian Regions. In the research area, 90.90% of wheat landraces was sowed in winter time and 9.10% of them are sowed spring time (Fig. 4.9). There is a difference in the region with respect to the sub-areas, which is considered important in 99% confidence level (Chi-Square: 351.50; p:0.00; φ:0.44).

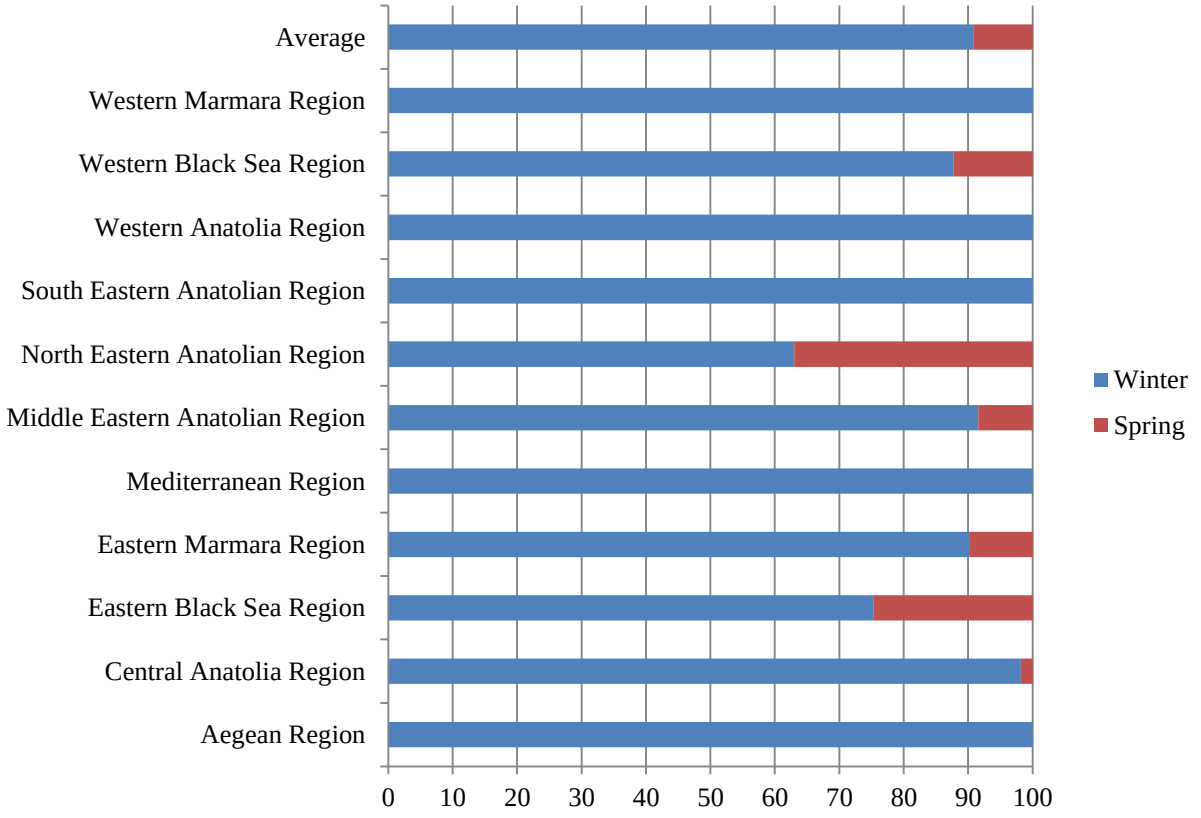


Figure 4.9 Sowed Times of the Wheat Landraces (%)

Generally, wheat landraces' sown areas are slopping lands rather than 1. class agricultural land and the soil capability is normal or low levels. Thease areas are generally not suitable to mechanization, usually human and/or animal labour power intensive agricultural activities are practiced. Therefore, the adaptation of technological development to such areas is difficult. Most of local producers produce wheat varieties for subsistence production rather than commercial production and that adversely affects the use of new technologies at the farm level. One of the production procedures required technology use is sowing activity. Sowing

method determined for wheat landraces in the research area was shown in Figure 4.10 at the region level. Even though sowing method varries at region level, wheat landraces in the research area were sowed generally by hand (59.02%). While the proportion of springer sowed method was 18.50%, the wealthy farms having large farm size and technology preferred drill to sow wheat landraces (22.47%).

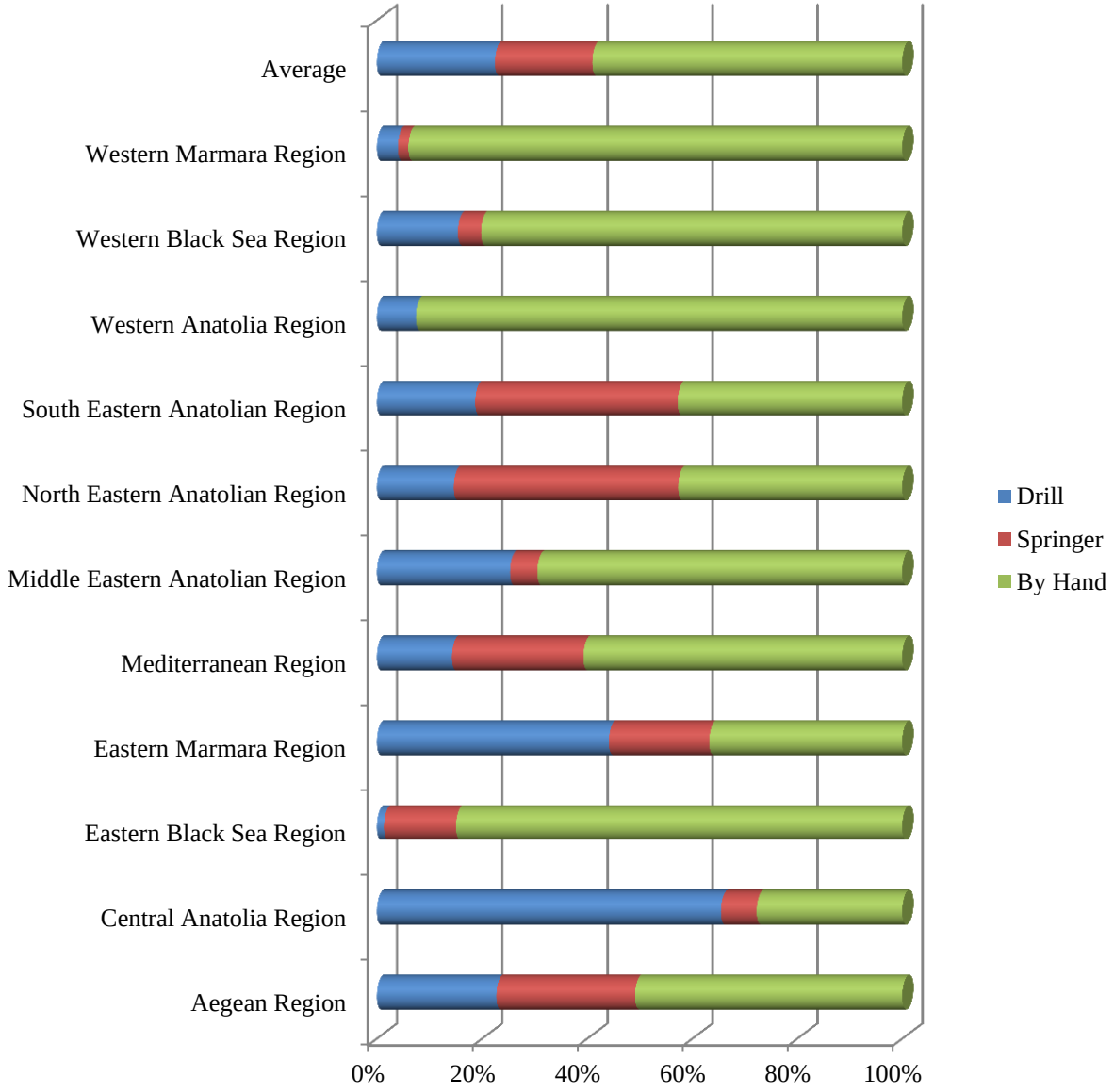


Figure 4.10 Sowed Methods of the Wheat Landraces (%)

Hand-scattering

Hand-scattering

Drilling

Slit-seeder

Mostly, planted of seed by hand and based to human labour force intensively are also affecting the amount of seed planted. The amount of seed can vary according to geographical structure, technology used in sowing, variety features, sowing time and irrigation facilities. Amount of seed used wheat landrace production was shown in Figure 4.11 by regions. The amount of seed varies according to the regions and it is statistically significant at 99% confidence interval (F value: 30.45, p:0.00).

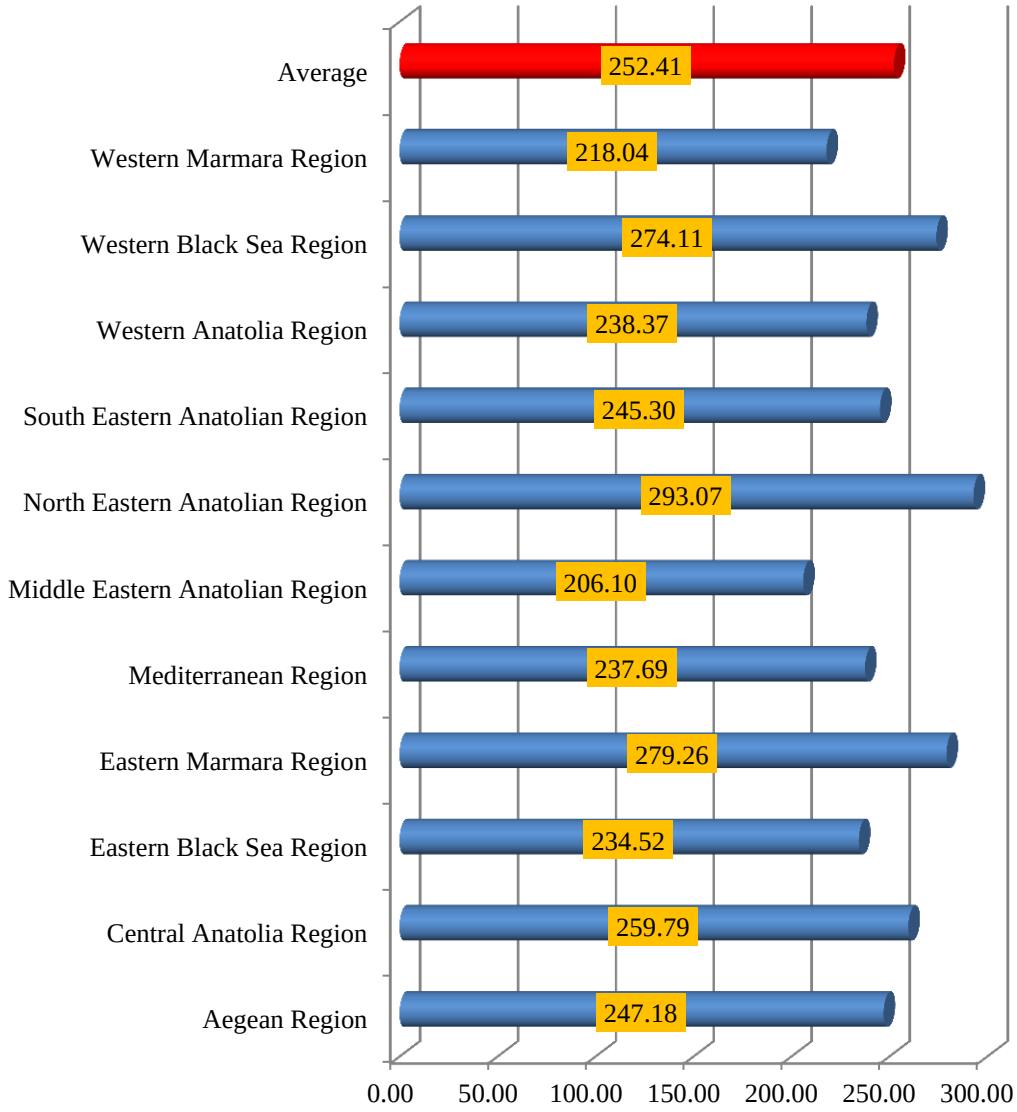


Figure 4.11 The Amount of Wheat Landrace Seed (Kg/Ha)

As the average amount of seed was 252.41 kg/ha, the amount of seed in irrigated condition was 271.35 kg/ha and 249.49 kg/ha in rainfed conditions (Table 4.11). When examined the Table 4.11, contrary to expectations, the amount of the seed thrown by springer (271.73 kg/ha) is greater than the amount of the seed thrown by hand (245.45). More seed was sowed in irrigated condition than rainfed condition. The amount of seed varies according to the regions, the presence of irrigation facilities and the sowed methods. It is statistically significant at 99% confidence interval (Table 4.10).

Table 4.10 The Amount of Wheat Landrace Seed According To the Regions, Irrigation State and Sowed Methods of the Farmers

Region	Seed Amount (Kg/Ha)
Aegean Region	247,18
Central Anatolia Region	259,79
Eastern Black Sea Region	234,52
Eastern Marmara Region	279,26
Mediterranean Region	237,69
Middle Eastern Anatolian Region	206,10
North Eastern Anatolian Region	293,07
South Eastern Anatolian Region	245,30
Western Anatolia Region	238,37
Western Black Sea Region	274,11
Western Marmara Region	218,04
Total (Average)	252,41
F Value	30.45***
Irrigation	
Irrigated	271,35
Rainfed	249,49
Total	252,41
T Value	4.07***
Sowed Method	
Drill	251,51
Springer	271,73
By Hand	245,45
Total	252.41
F Value	20.38***

*** Statistically significant at 99% level

Another variable is the source of wheat landrace seeds. It is known that the wheat landraces is getting loss and have been substituted by modern wheat varieties because of miscellaneous reasons. Some specific reasond as like culturel diversity, flavor, taste, suitable to bad conditions etc., are effective factors on maintainance of wheat landraces. The decrease in the number of farmers growing wheat landraces leads no to reach wheat landrace seed easily. The wheat landraces seed sources were shown in Figure 4.12 regions level. According to the figure, 83.66% of total wheat landraces producers provided their seeds from their own wheat landrace production, 12.11% of them provided from relatives and neighbours and 3.54% of them provided their seeds from seed traders. The percentages are changing according to the regions and the difference mong the regions is important statistically at 99% confidence interval (Chi square: 166.49, p:0.00, φ:0.31). The main source of wheat landraces

seeds are farmers themselves. This shows that the seed of wheat landraces stayed in the process of change hence changes in environmental conditions within the same region and the pressure on election of seeds from the production by the farmers.

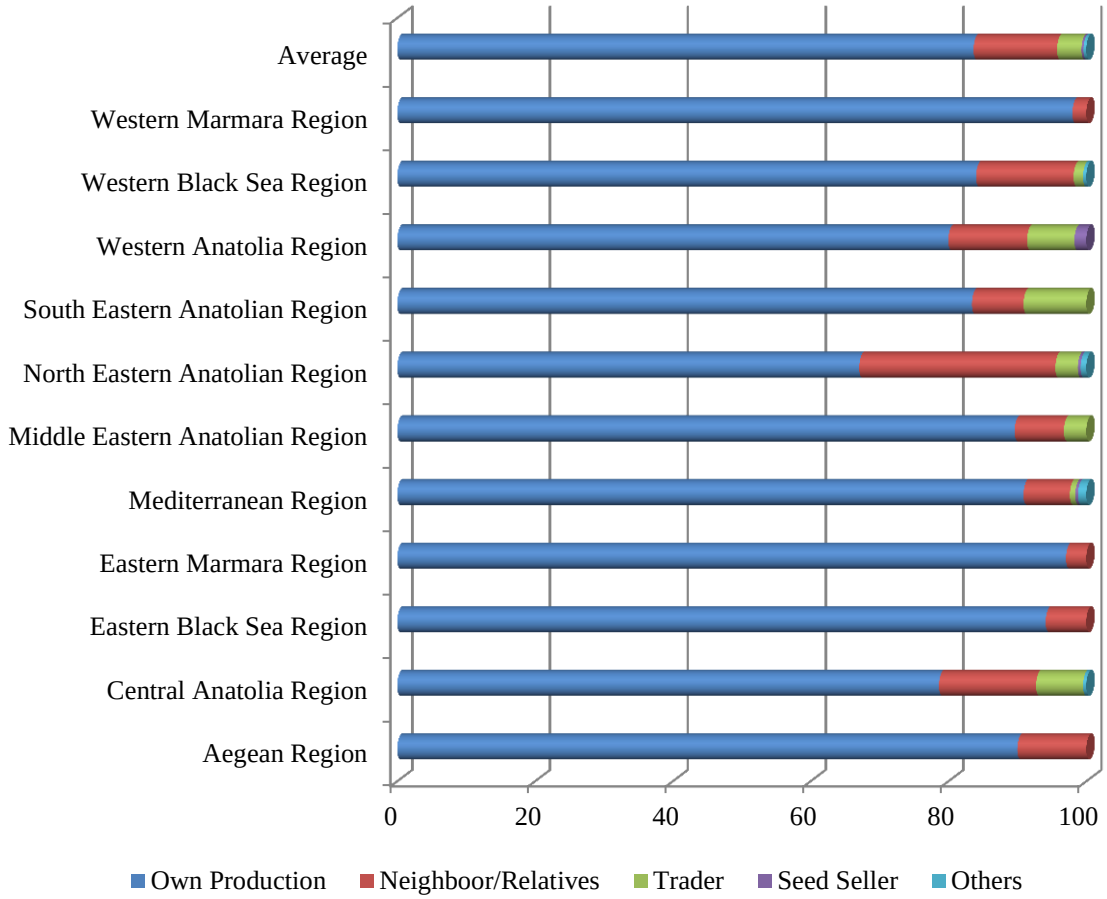


Figure 4.12 Distributions of Seed Sources by Regions (%)

Other agronomic applications in used the production processes by wheat landrace farmers are the seed cleaning and the seed pesticide application. While seed cleaning is important in terms of extracting the foreign seeds, seed pesticide application is important in preventing infection of seed-borne diseases. Especially in Turkey, the bunt disease named in colloquially as “Kör”, “Karadoğu” and “Karamuk” is a spike disease sourced from seed and able to be prevented by seed pesticide application. Lack of certified seeds for local varieties (excluded Kırik), exisiting of wheat landraces as a population rather than a pure line in farmer condition and generally produced in harsh conditions lead to exposure biotic and abiotic conditions more. Seed cleaning and seed pesticide applications are important agronomic application to struggle with them.

The states of farmers to practise seed cleaning and seed pesticide were shown by regions, provinces and counties in Figure 4.13, and Figure 4.14. While 68.82% of wheat landrace

producers made seed cleaning with simple hand sieves, 68.36% of them used seed pesticide in wheat landrace production.

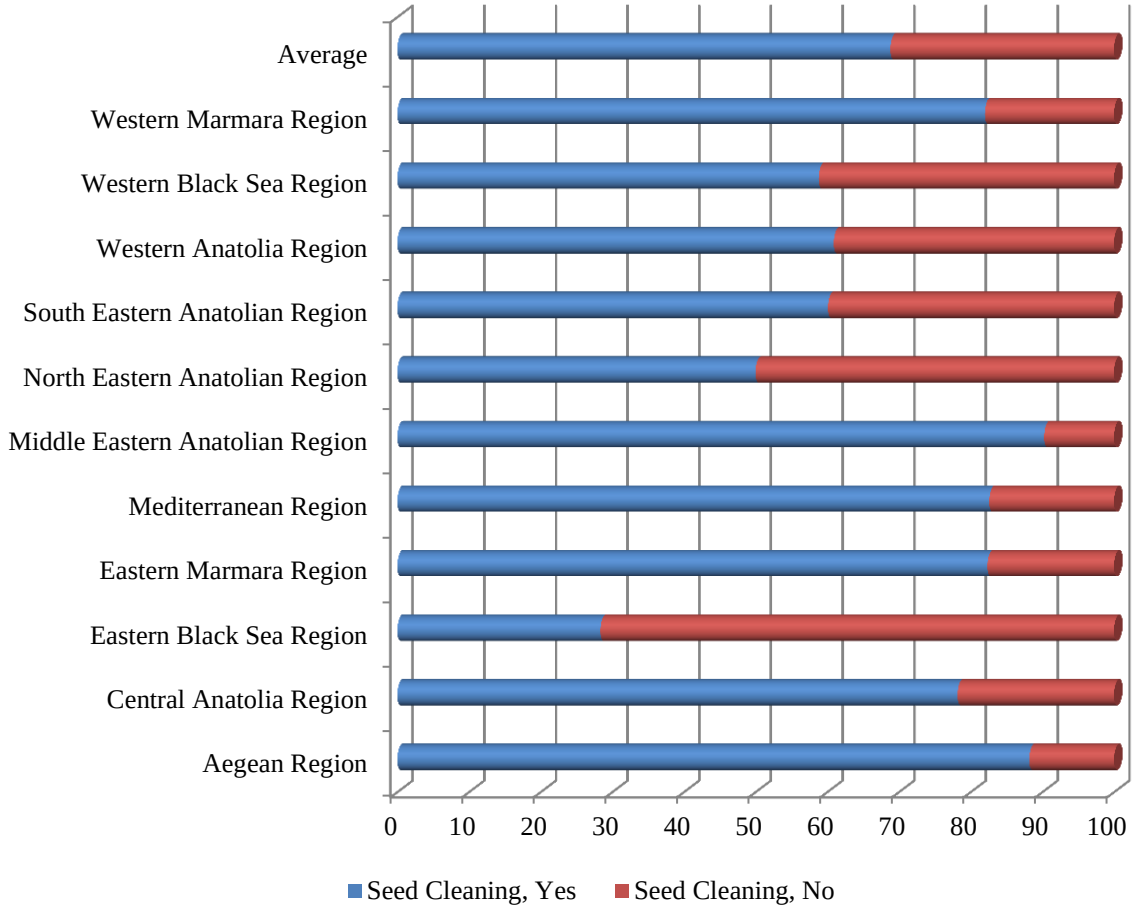


Figure 4.13 Distributions of Farmers' Behaviours on Seed Cleening by Regions (%)

Applications of farmers on seed cleaning and seed pesticide use are varying by regions with statistically significant at 99% confidence interval (Chi square: 207.18, p:0.00, φ:0.34; Chi square: 147.09, p:0.00, φ:0.21). While the least proportion of farmers practicing seed cleaning was in Eastern Black Sea Region, the most proportion of farmers practicing seed cleaning was in Middle Eastern Anatolian and Aegean Regions (9.74% and 11.82%). While the least proportion of farmers practicing seed pesticide application was in Eastern Black Sea and North Eastern Anatolian Regions (43.28% and 50.41%), the most proportion of farmers practicing seed pesticide application was in Western Marmara and Aegean Regions (90.00% and 89.09)(Figure 4.13 and Figure 4.14).

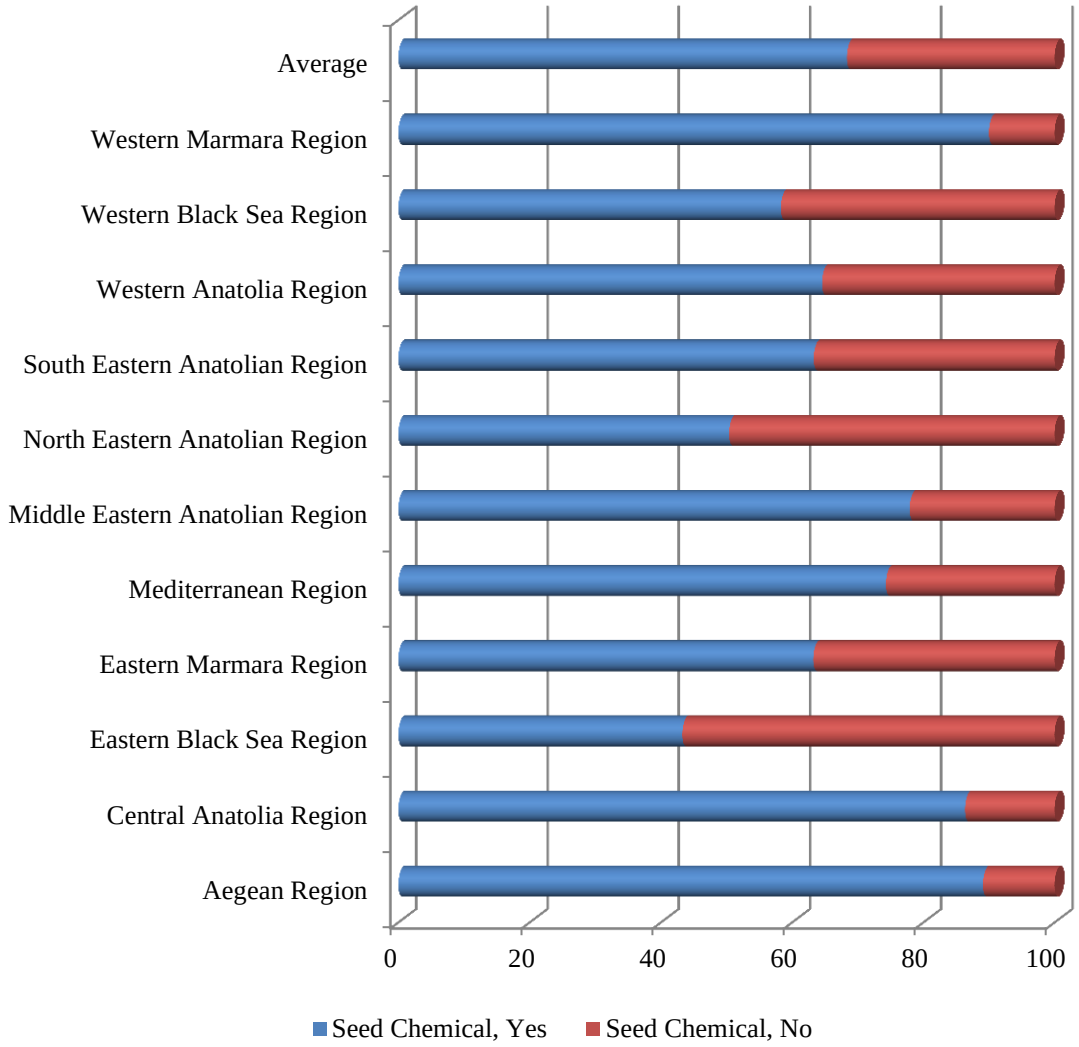


Figure 4.14 Distributions of Farmers' Behaviors on Seed Chemical Use by Regions (%)

Seed-Cleaning **Seed-Cleaning Equipment (sieve)**

As with all plants, plant of wheat needs fertilizers, especially nitrogen and phosphorus to achieve sufficient yield and quality. Especially, the most important problem is the organic

matter deficiency in the soil in many regions of Turkey. Animal manure constitutes an important part to troubleshoot for organic matter deficiency in the soil. In the research area, while 25.23% of wheat landrace producers didn't use animal manure (Figure 4.15), this proportion for chemical fertilizer was the 17.58%. The producers not use chemical fertilizers were generally in North Eastern Anatolian (34.55%), Eastern Black Sea (34.04%), Central Anatolian (32.51%), and Western Black Sea Regions (30.16%) (Figure 4.16)

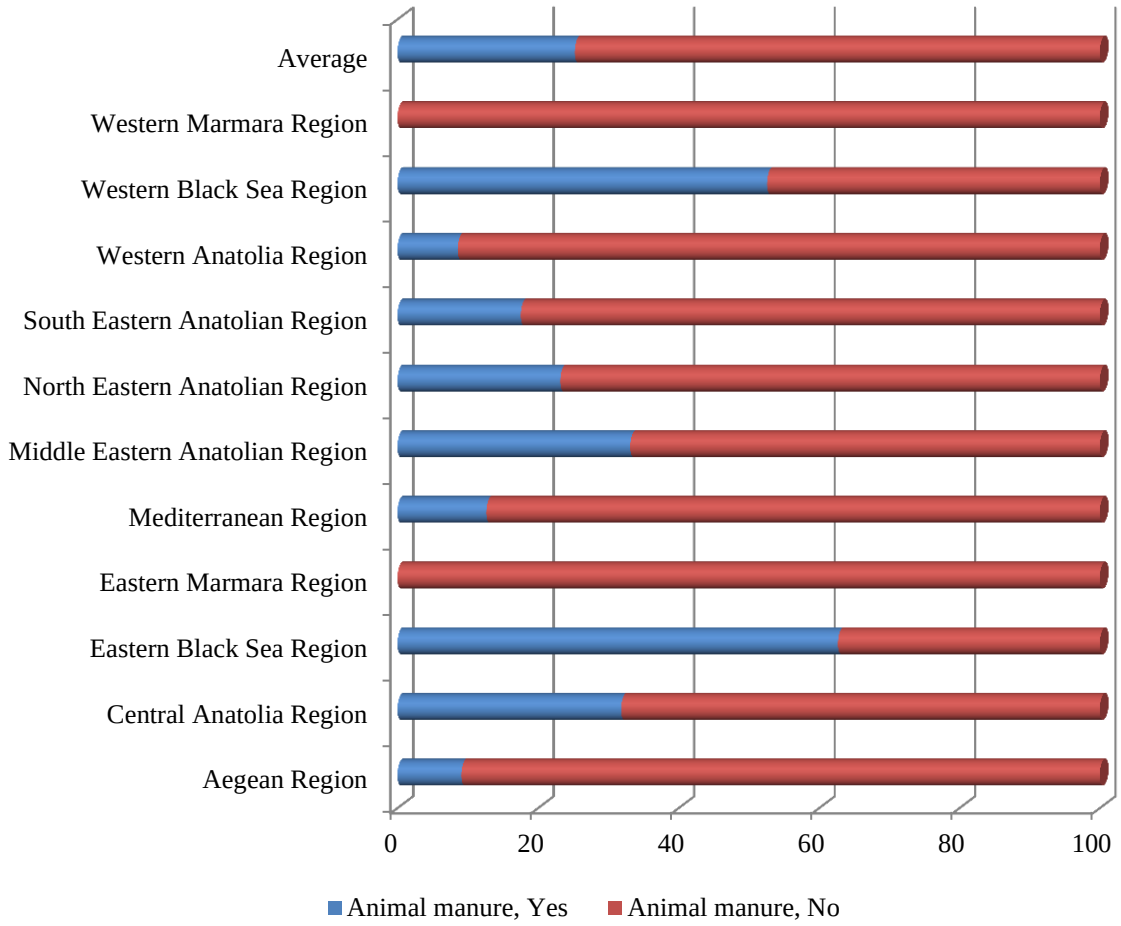


Figure 4.15 Distributions of Farmers' Behaviors on Animal Manure Use by Regions (%)

Use of Animal Manure

Use of Animal Manure

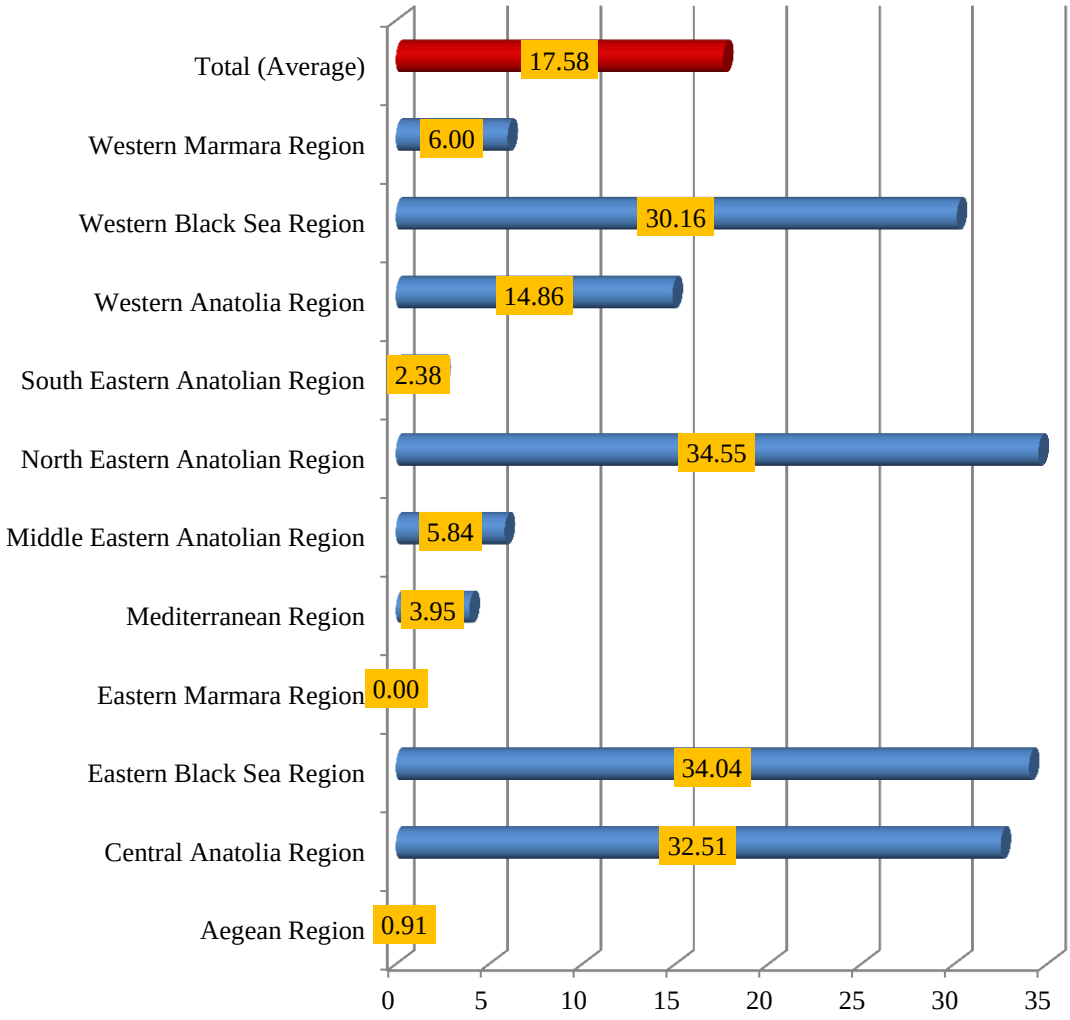


Figure 4.16 The Distribution of The Farmers' Percentage Using No Fertilizer

The amounts of pure nitrogen, phosphorus and potassium used in the research area were presented in Table 4.11. and Figure 4.17. The average of the research area was found as 59.77 kg/ha N, 35.28 kg/ha P_2O_5, and 0.50 K_2O. The values changed by the regions and it is significant statistically at 99% confidence (Table 4.11). The most amounts of nitrogen and phosphorus usage per hectar with 83.28 kg/ha and 53.74 kg/ha respectively were found in the Mediterrenean Region and the least amounts of them with 34.10 kg/ha and 3.91 kg/ha were in Eastern Black Sea Region (Figure 4.17). The amount of fertilizer used in irrigated and rainfed areas varried in the research area. As it was 64.05 kg/ha N, 30.18 kg/ha P_2O_5, and 1.24 kg/ha K_2O in irrigated area, it was found as 59.02 kg/ha N, 36.17 kg/ha P_2O_5, and 0.37 kg/ha K_2O in rainfed area.

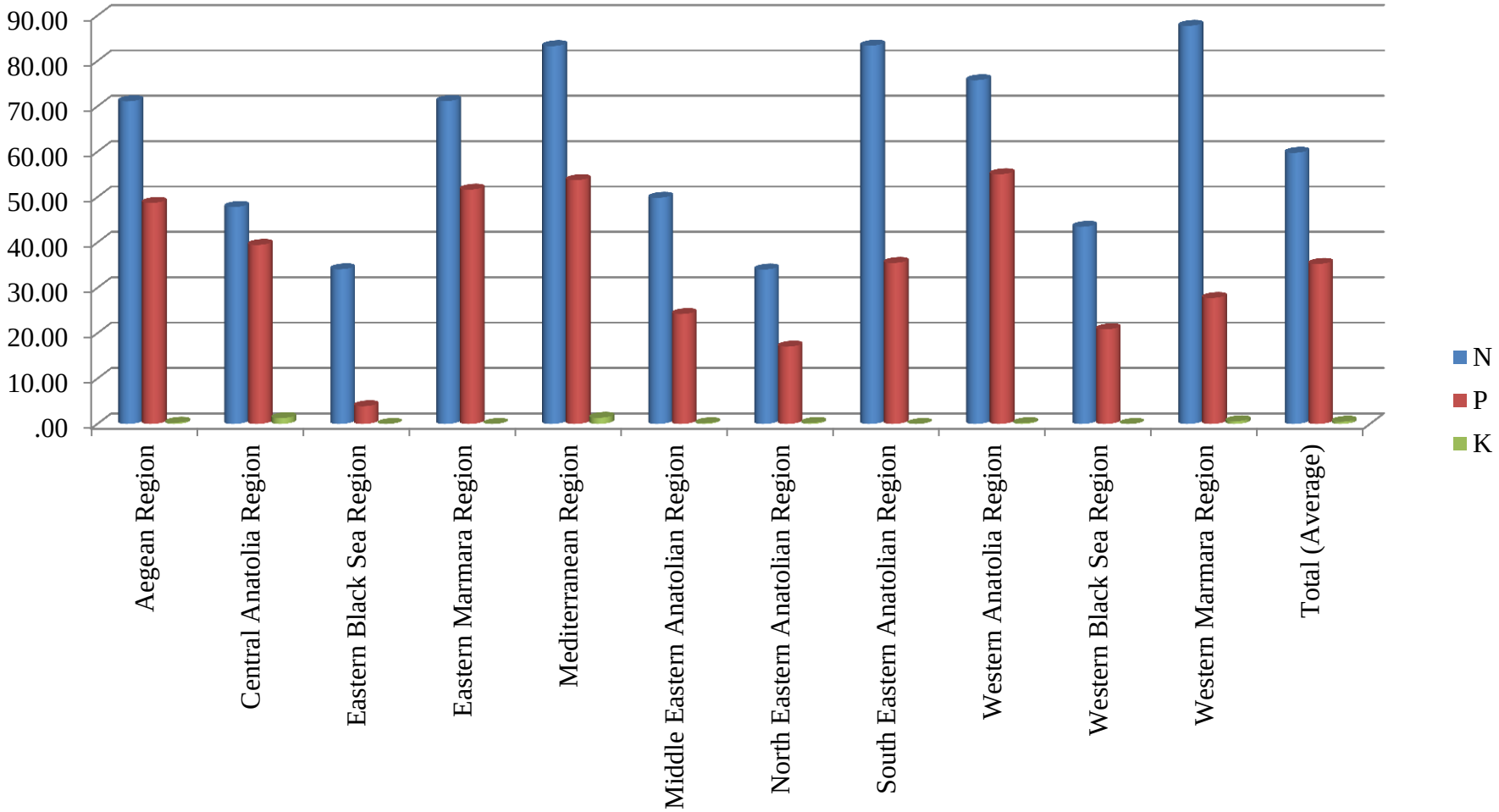


Figure 4.17 The Amount of Fertilizer Used for Wheat Landraces (Kg/Ha)

Table 4.11 The Amount of Used Fertilizer on Wheat Landrace Production in Different Production Conditions (Kg/ha)

Regions	Irrigation	N	P_2O_5	K_2O
Aegean Region	Irrigated	110.00	40.00	0.00
	Dry	70.76	48.81	0.28
	Total	71.12	48.73	0.27
Central Anatolia Region	Irrigated	78.53	75.49	0.00
	Dry	46.07	37.40	1.37
	Total	47.83	39.46	1.29
Eastern Black Sea Region	Irrigated	0.00	0.00	0.00
	Dry	34.84	4.00	0.00
	Total	34.10	3.91	0.00
Eastern Marmara Region	Dry	71.18	51.65	0.00
	Total	71.18	51.65	0.00
Mediterranean Region	Irrigated	72.88	52.88	16.88
	Dry	83.98	53.80	0.32
	Total	83.28	53.74	1.36
Middle Eastern Anatolian Region	Irrigated	60.71	20.81	0.00
	Dry	43.30	26.30	0.26
	Total	49.86	24.24	0.16
North Eastern Anatolian Region	Irrigated	53.44	12.72	0.19
	Dry	21.62	19.82	0.27
	Total	34.04	17.05	0.24
South Eastern Anatolian Region	Irrigated	105.08	29.44	0.00
	Dry	79.76	36.50	0.00
	Total	83.37	35.49	0.00
Western Anatolia Region	Irrigated	78.41	89.49	0.00
	Dry	75.37	49.84	0.21
	Total	75.77	55.05	0.18
Western Black Sea Region	Irrigated	46.59	33.75	0.00
	Dry	43.32	20.29	0.00
	Total	43.46	20.86	0.00
Western Marmara Region	Dry	87.75	27.77	0.60
	Total	87.75	27.77	0.60
Total (Average)	Irrigated	64.05	30.18	1.24
	Dry	59.02	36.17	0.37
	Total	59.77	35.28	0.50
F Value (Region)		40.36***	24.09***	2.69***
T Value (Irrigation)		1.63*	-2.06**	1.41

* Statistically significant at 90% level
** Statistically significant at 95% level
*** Statistically significant at 99% level

Another variable examined in the research was the seed change frequency of wheat lanrace producers. The seed change gives also extra information on seed network. In Table 4.12, the seed change frequency of wheat landrace producers was presented by regions. When examined the table, 41.70% of wheat landrace producers don't change their seeds. They separated the seeds from their wheat landrace production after harvesting to sow next year. There are also producers who select spikes from their wheat landrace fields and grow wheat landrace seeds as small parts inside of wheat landrace fields for the next year seed. The most proportion of producers not change their seed were in Western Marmara with 92.16% and Eastern Black Sea Region with 77.61%. 35.60 percent of wheat landrace producers changed their seeds between 1-5 years. When regarding the most important seed source as relatives and neighbours, wheat landrace seed network is limited at village or county level and extremely at province level (Çorum and Samsun provinces for Üveyik Wheat) local seed material can be exchanged by the producers. According to the Seed Law (Law No. 5553 of October 31, 2006), In Turkey, in Seedling Trade part of the law, Article 7, "Domestically, the trade of seedlings belonging to registered varieties shall be permitted" was indicated. Because of that, the landraces aren't generally registered the national registration system, the local seed sale is banned legally; therefore, the seed barter takes place in the form of swap.

Table 4.12 Distributions of Seed Change Frequency According to the Regions

Region	How often do you change the seed (%)						Total
	No change	1-5 years	6-10 years	11-20 years	21-30 years	31 and below years	
Aegean Region	51,82	6,36	17,27	21,82	0,91	1,82	100.00
Central Anatolia Region	50,96	39,90	5,29	2,40	1,44		100.00
Eastern Black Sea Region	77,61	20,90	1,49				100.00
Eastern Marmara Region	10,29	5,88	45,59	22,06	16,18		100.00
Mediterranean Region	60,87	8,70	5,93	11,46	10,67	2,37	100.00
Middle Eastern Anatolian Region	7,79	67,53	20,13	2,60	1,95		100.00
North Eastern Anatolian Region	37,80	42,28	16,67	2,03	0,41	0,81	100.00
South Eastern Anatolian Region	12,30	50,27	23,53	9,63	3,74	0,53	100.00
Western Anatolia Region	46,20	43,27	8,19	1,17	0,58	0,58	100.00
Western Black Sea Region	43,00	50,24	6,28	0,48			100.00
Western Marmara Region	92,16	5,88	1,96				100.00
Total (Average)	41,75	35,60	12,83	5,98	3,14	0,70	100.00

The other variable examined after sowing and maintenance practices was harvesting and threshing applications. The first variable studied in applications related to harvesting is harvesting time. In this study, the harvesting time is examined in comparison with commercial varieties grown in the region. When examined the Figure 4.18, it was stated that the harvesting time of wheat landraces was at the same time with commercial wheat varieties (35.49%). Especially, 23.12% of wheat landrace producers who do not know what wheat varieties grown around the farms or in whose region no body grow commercial wheat varieties couldn't make comparison on the harvesting time. The proportion of wheat landrace producers indicated that the harvesting time of wheat landraces were the late when compared with the harvesting time of commercial varieties was 35.09%. Here, it can be said the local wheat landrace populations are more likely having the character of lateness. One of the most important factors affecting the having lateness character of wheat landraces could be more resistant to abiotic stress conditions.

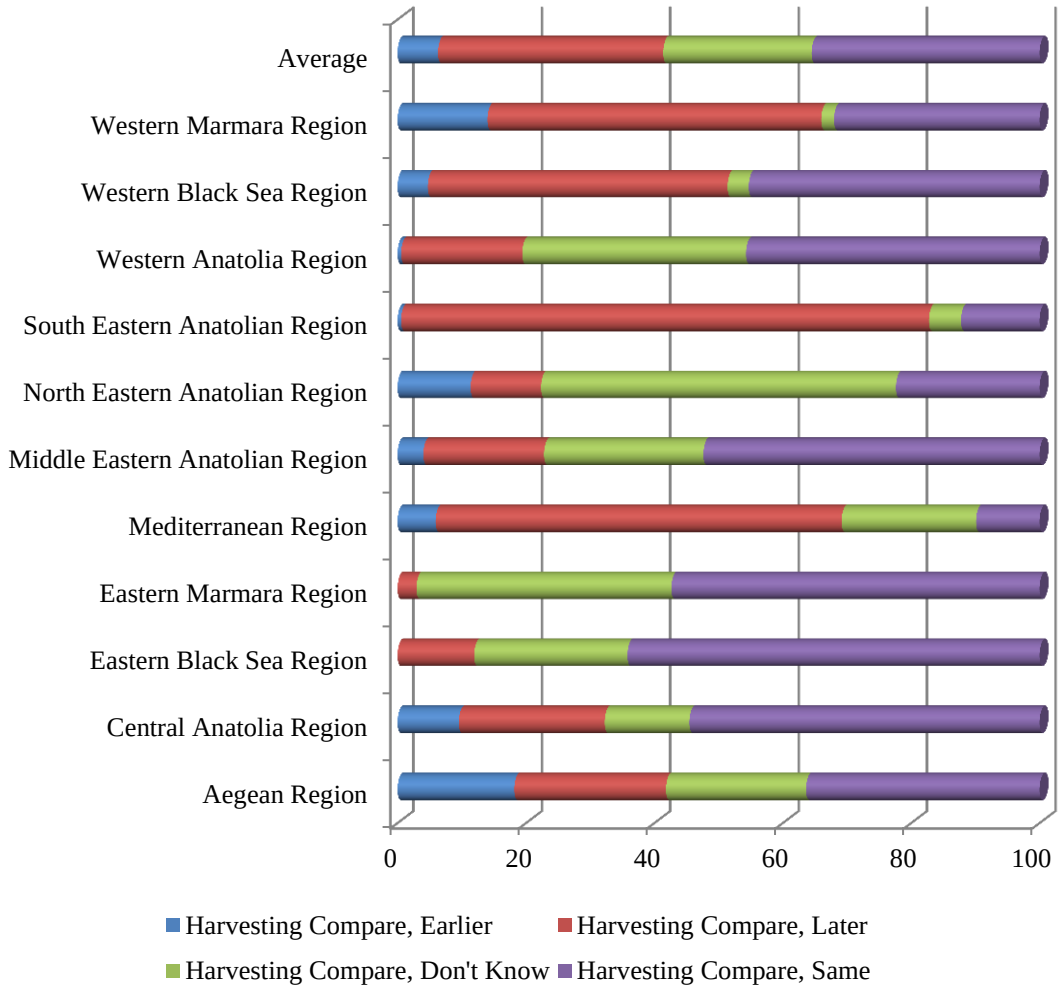


Figure 4.18 Distribution of Farmers' Opinion on Harvesting Time of Wheat Landraces with Respect to Improved Wheat Varieties

In the study, it was determined that which methods were used in the harvesting of wheat landraces and the results were presented in Figure 4.19, different harvesting machines were used in the harvesting in the research area. The first one is sickle and/or swath (by hand) (36.74%), the second one is combine harvester (33.09%), and the third one is towed machine (30.17%). Harvesting is one of the most important steps that require use of technology in the wheat cultivation. The factors of harsh geographical conditions where the wheat landraces were grown not made enough wheat cultivation in the research area and small and more fragmental land size can affect technology usage in the harvesting negatively. When examined the Figure 4.19, the proportions of farmers used three different harvesting machines were similar each other's and about 30%. Harvesting technology varies between regions in a statistically significant at 99% confidence interval (Chi-square:417.97, p:0.00, φ:0.49). As results of the analyses, while combine harvester were used in the Aegean, Eastern Marmara, Central Aantolian, Middle Eastern and South Eastern Anatolian Regions, sickle/swath (by hand) was used intensively in Western Anatolian, Western Marmara, Middle Eastern Anatolian and Eastern Black Sea Regions where the topographic and geographical structure are rough and use of technology is difficult. Towed machine was the most used harvesting machine in the North Eastern Anatolian Region.

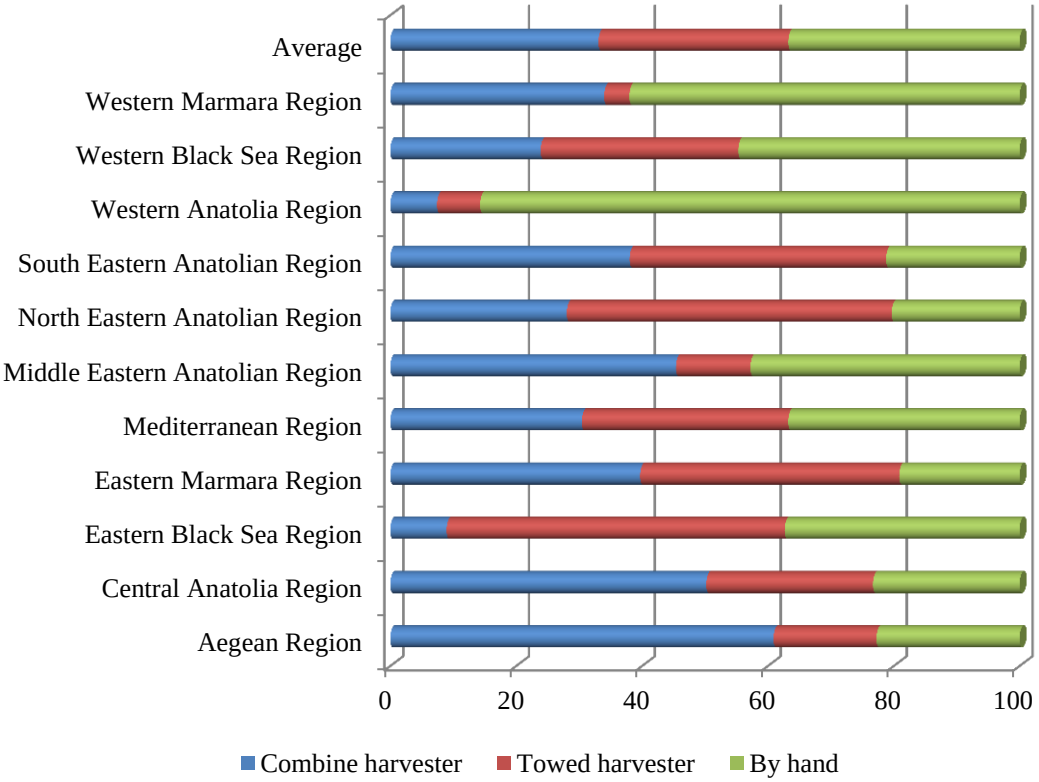


Figure 4.19 Distributions of Farmers' Harvesting Methods by Regions (%)

Towed Harvester

Combine Harvester

Scythe

Harrowed Harvest

Sickle

Transporting Crop

After the sowing, maintenance and harvesting practices, crop evaluation was examined as the next stage for wheat landraces. In this stage, either the product was sold as raw material or finished product, or stored for consuming. In this case, two different type farming system ensue. First of them is commercial farming system and the other is subsistence farming system. Evaluation methods of wheat landrace producers for wheat landrace populations were presented in Figure 4.20, by regions. As results of the study, 71.68% of wheat landrace producers were engaged with subsistence farming system and didn't sell their wheat landraces, 12.99% of them sold less, 12.59% of them sold more and 2.75% of them sold all of wheat landrace production. Product sell situatiof of the farmers varies between regions in a statistically significant at 99% confidence interval (Chi-square:259.42, p:0.00, φ:0.39). Tan (2002) determined that 84.44% of the wheat landrace producers were producing wheat landraces for self-consumption in her study carried out in Western Transitional Zone.

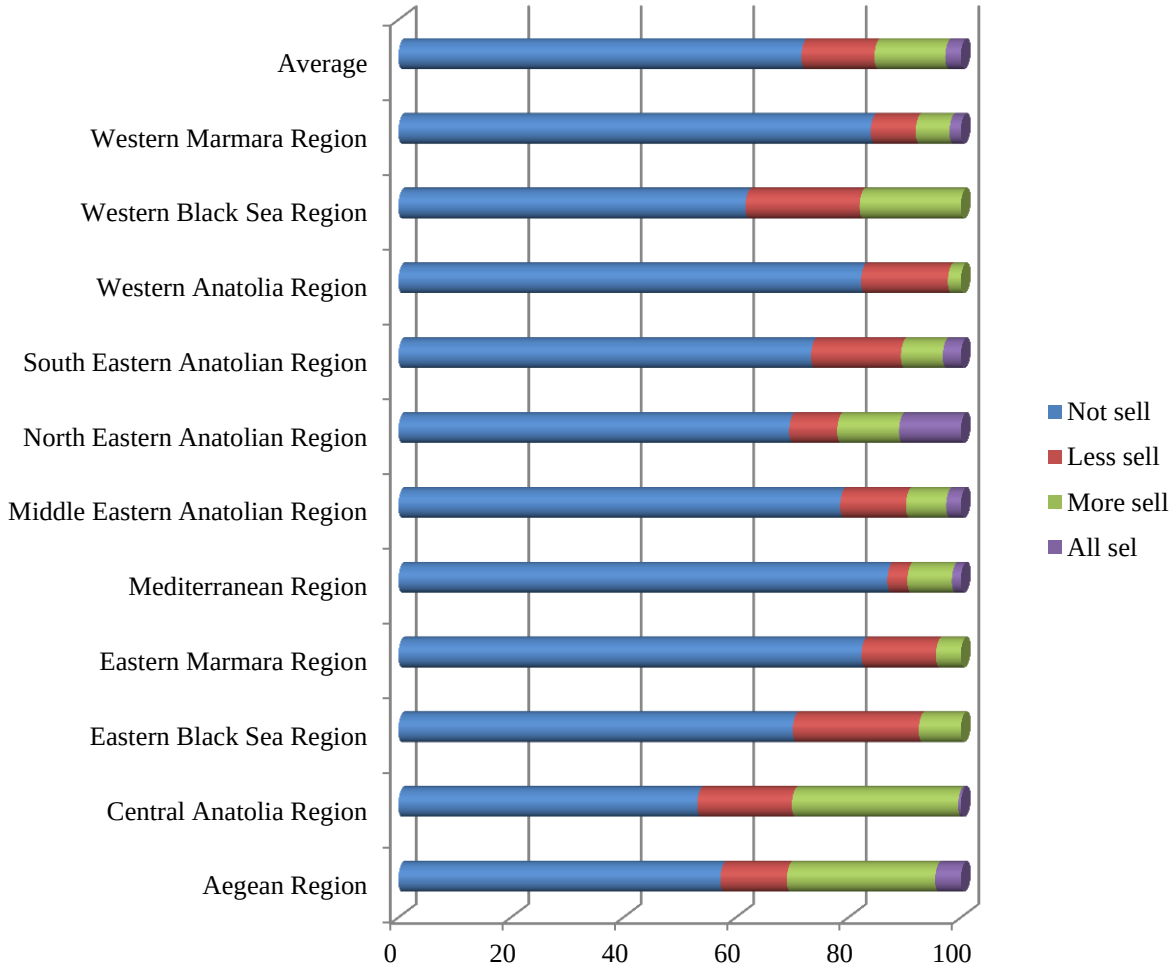


Figure 4.20 Distribution of Farmers' Product Evaluation by Regions (%)

Access to markets appears to play an especially important role in the decision to cultivate wheat landraces. Table 4.13 showed that selected characteristics for households broken down by percentage of household wheat sales. Households with the smallest percentages of wheat market sales face the greatest distances to markets. These households are also among the lowest with respect to information transmitted through extension programs from outside the village. Finally, households with fewer market sales are characterized by the smallest amount of total land owned as well as a relatively small percentage of available irrigated land. The farmers selling more wheat landraces have the more wheat landrace production area. These variables affecting the wheat evaluation strategies of the households are also statistically significant factors at 99% confidence level.

Table 4.13 Some Characteristics of the Households in Side of Wheat Evaluation

Wheat Evaluation	Market Distance (Km)	Altitude (m)	Total Cultivated Area (Ha)	Total Cultivated Area (Irrigated) (Ha)	Total Wheat Area (Ha)	Total Wheat Landrace Area (Ha)
Not sell	19.08	1134.94	5.11	0.70	2.18	1.57
Less sell	19.59	1145.20	10.37	0.65	5.23	3.10
More sell	15.85	1209.51	12.50	1.58	6.18	4.67
All sel	14.03	1103.50	22.15	6.88	10.24	6.18
Total	18.60	1144.56	7.21	0.98	3.31	2.29
F Value	8.06	2.23	75.55	64.66	73.30	68.12
	***	*	***	***	***	***

N.S: Non significant

The information on marketing places of wheat landrace producers was presented in Figure 4.21. While 21.51% of producers selling their wheat landrace production sold their wheat landrace production outside of the village, the rest of them sold their wheat landrace production inside of the village. The proportion of farmers selling their wheat landrace production inside and outside of the village varied according to the regions as statistically significant at 99% confidence interval (Chi-square:164.20, p:0.00, φ:0.31). Especially producers in the Eastern Black Sea Region (17.02%) preferred the market places as inside of the village (geographical condition, transportation problem, far away from the main centers and main market places etc.), the producers, especially in the Estern Marmara Region (58.82%) preferred the market places as outside of the village.

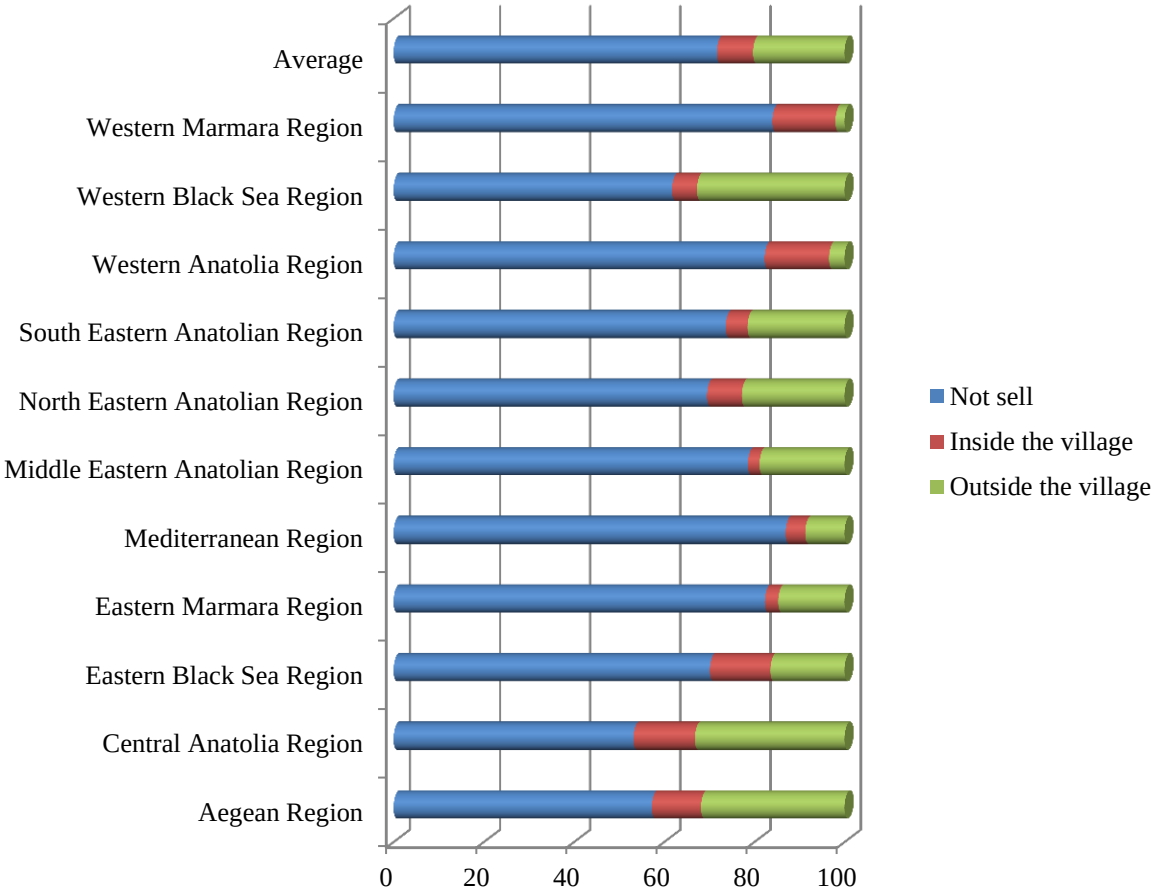


Figure 4.21 Distributions of Farmers' Preferences on Marketing Place by Regions (%)

One of the most important features of the wheat landrace populations collected in the scope of study is high height. To have high heightness some times can be disadvantageous as it is sometimes an advantage. The study showed that the producer mostly produced the wheat landraces for two aims when considered the producers mainly engaged with the subsistence farming. First one is to meet their food needs and second one is to meet their animal needs considered the producers also engaged with the animal production. At this point, straw is the essential source and in this case high heightness becomes the advantageous and it means high yield. The average height of wheat landrace population was presented by regions in Figure 4.22. When examined the Figure 4.22, the average height of wheat landrace population was about 1 m. in normal time. This value is able to reach to average 1.36 m by regions. Heightness in Western and Eastern Marmara Regions are higher than the other regions (136.10 cm and 134.72 cm). In the Fig. 4.22., it can be seen that the wheat landrace population is having high heightness in the research area.

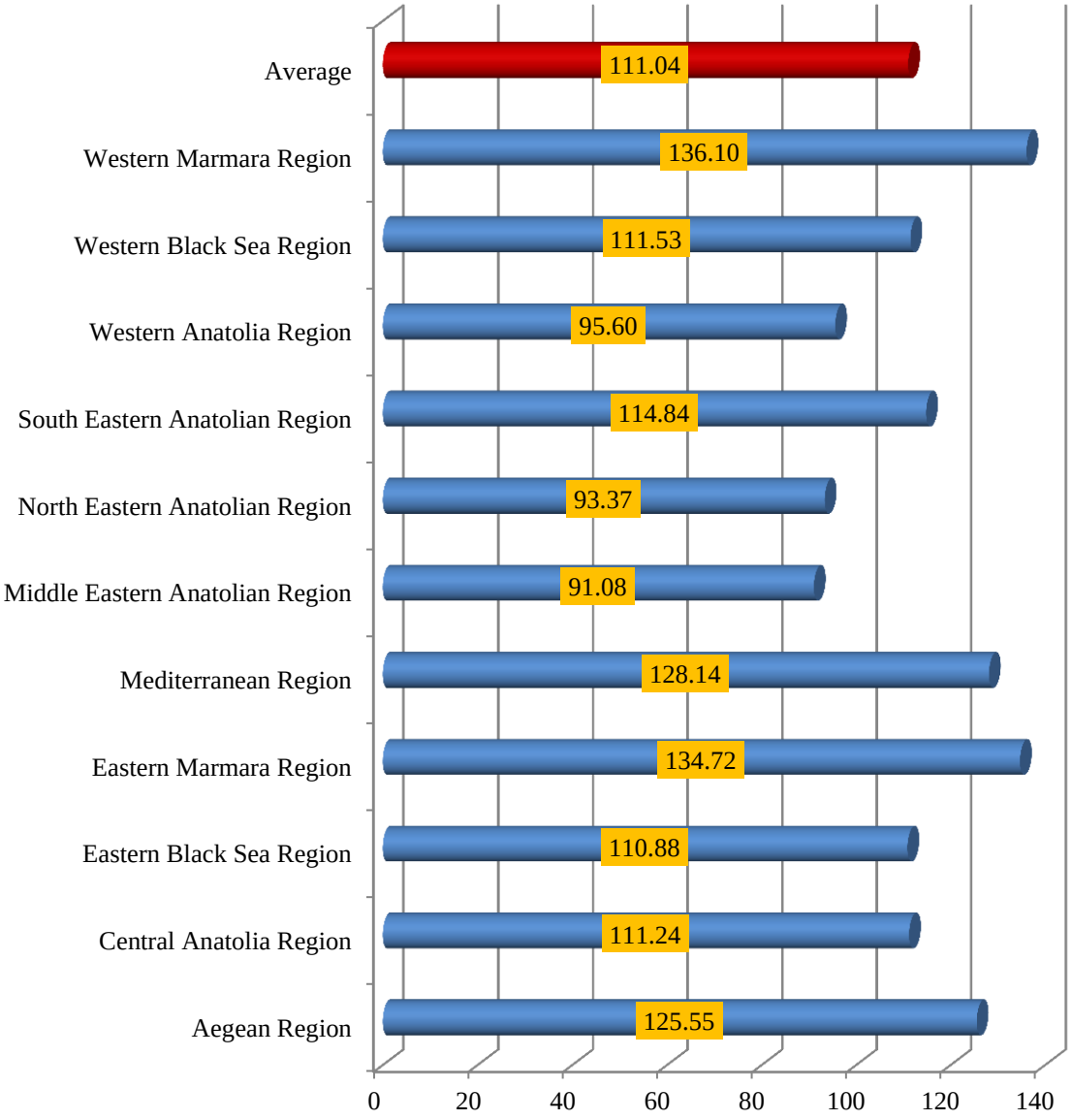


Figure 4.22 The Height of Wheat Landrace Population in the Research Area (Cm)

Product evaluation forms of wheat landrace producers were presented in Figure 4.23. While more than 90% of wheat landrace producers didn't sell their own wheat as processed products, 85.52% of them didn't sell their own straw production. It means that the one of the farmers' aim to produce wheat lanndraces is to get straw for animal feed.

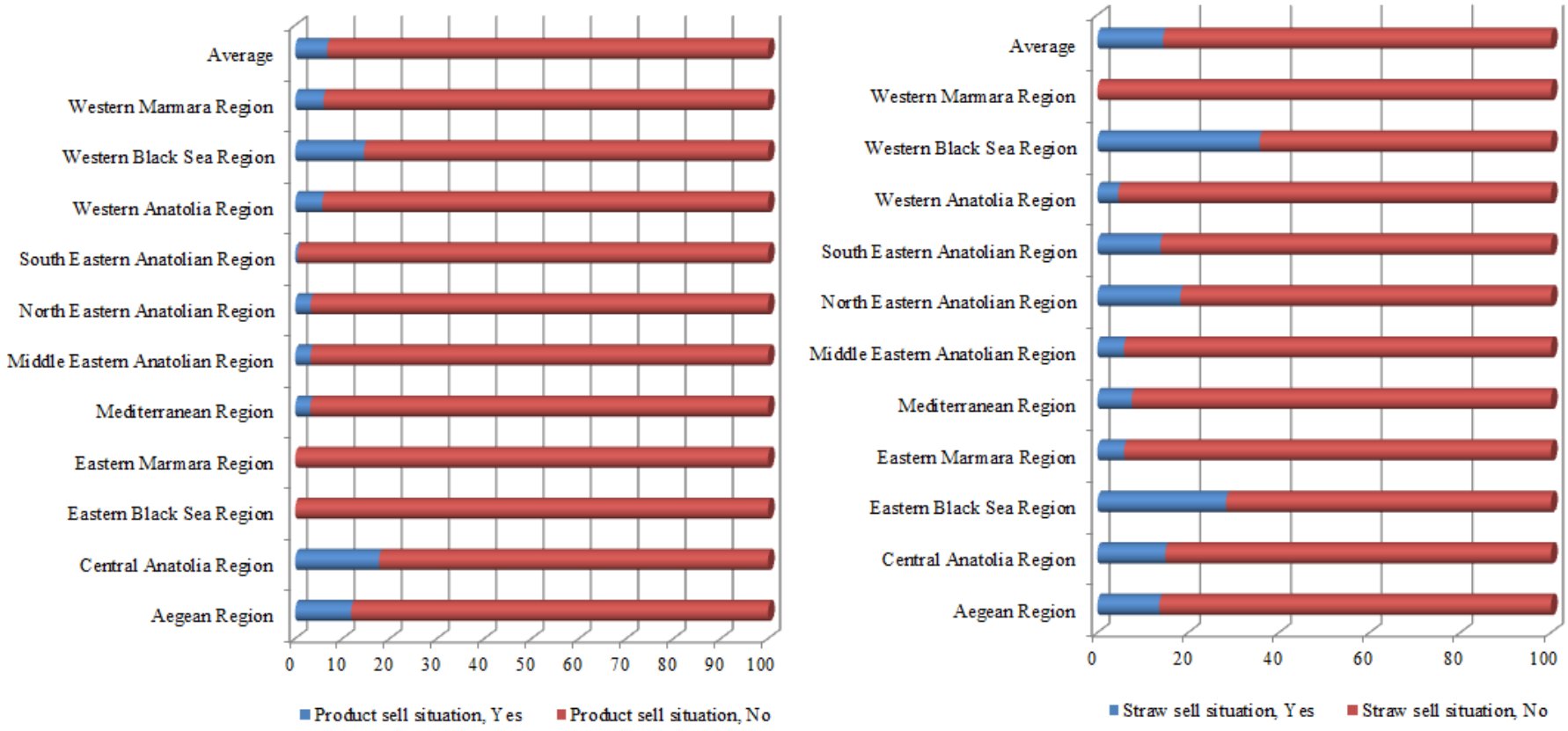


Figure 4.23 Distribution of Product and Straw Sell Situations of the Farmers by Regions (%)

Another feature of the wheat landrace populations compared to current commercial wheat varieties is to have low yield potential (Ehdaie et al., 1988; Blum et al., 1989). Wheat landraces have been largely displaced by high-yielding cultivars in many developing countries and are rarely cultivated in developed countries because of their low yield potential when compared with high-yielding cultivars under high external input farming systems (Jaradat, 2012). The collected wheat landrace population yield performances in bad, normal and good conditions by irrigated, rainfed conditions and wheat species (bread, durum and feed) were presented in Figure 4.24, Figure 4.25, and Table 4.14. When examined the Figure 4.24, the average yield according to the regions was calculated as 1254.43 kg/ha in bad conditions, 1982.97 kg/ha in normal conditions and 2761.97 kg/ha in good conditions The yield differences was found as statistically significant at 99% confidence interval in bad, normal and good conditions (F $value_{bad}$:48.11, p_{bad}:0.00; F $value_{normal}$: 24.99, p_{normal}:0.00: F $value_{good}$:12.28, p_{good}:0.00). While the highest yields in normal time were calculated as 2346.44 kg/ha and 2255.05 kg/ha in Mediterranean and South Eastern Anatolian Regions respectively, the worst yield was calculated as 1684 kg/ha in Western Anatolian Region (Duncan test) (Figure 4.24)

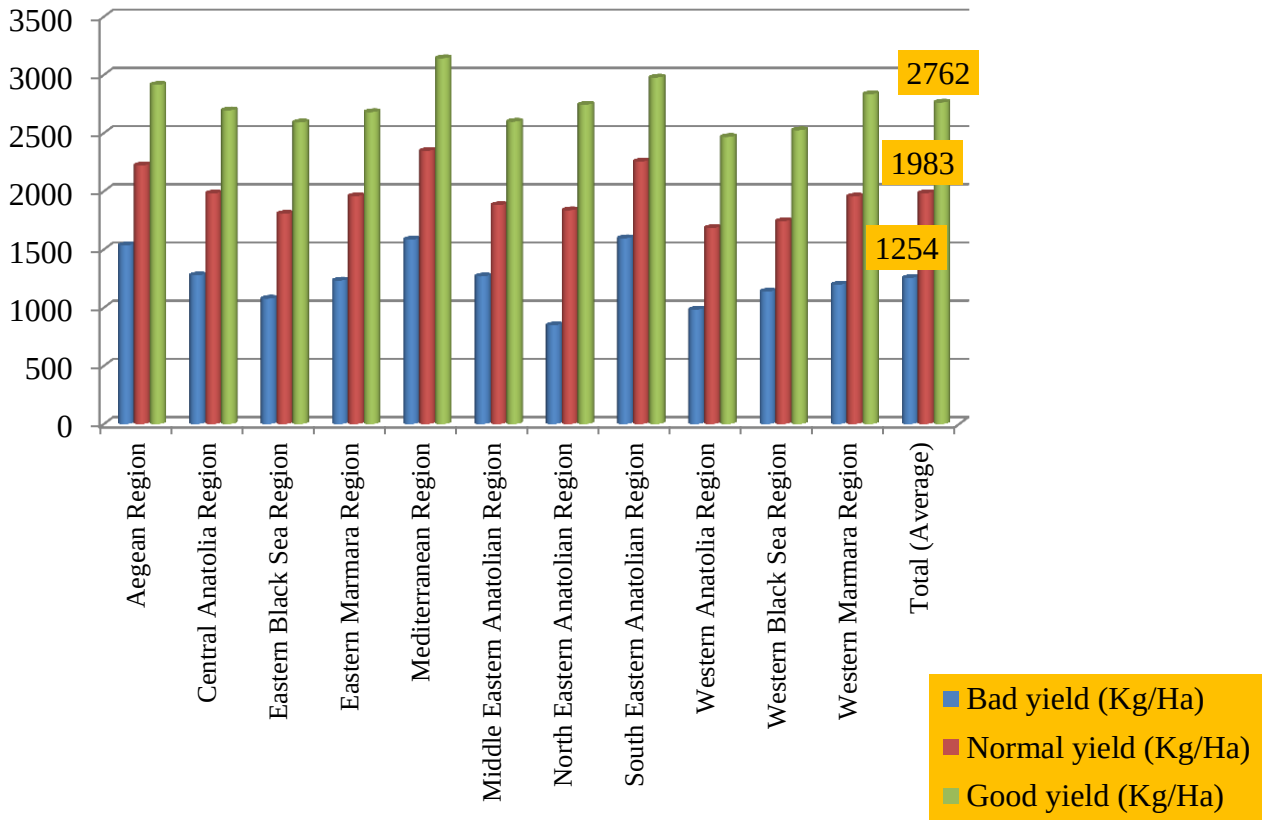


Figure 4.24 The Amount of Wheat Landraces Yield Potentials in Bad, Normal and Good Conditions (Kg/Ha)

The yield performances of wheat landraces with respect to wheat variety species (bread, durum and feed) was shown in Figure 4.25. The yield differences according to wheat species amongs to the regions in bad, normal and good conditions were analysed with the variance analyses. The yield differences was found as statistically significant at 99% confidence interval in bad, normal and good conditions (F $value_{bad}$:21.94, p_{bad}:0.00; F $value_{normal}$: 6.86, p_{normal}:0.00: F $value_{good}$:3.20, p_{good}:0.00). In the research area, the yields of bread and feed wheats were similar to each others, the yield of durum wheat was determined as the highest. In bad conditions, the worst yield potential was ascertained in bread wheats and feed and durum wheats followed it. In good conditions, the yield values of bread, durum and feed wheats were similar to each others.

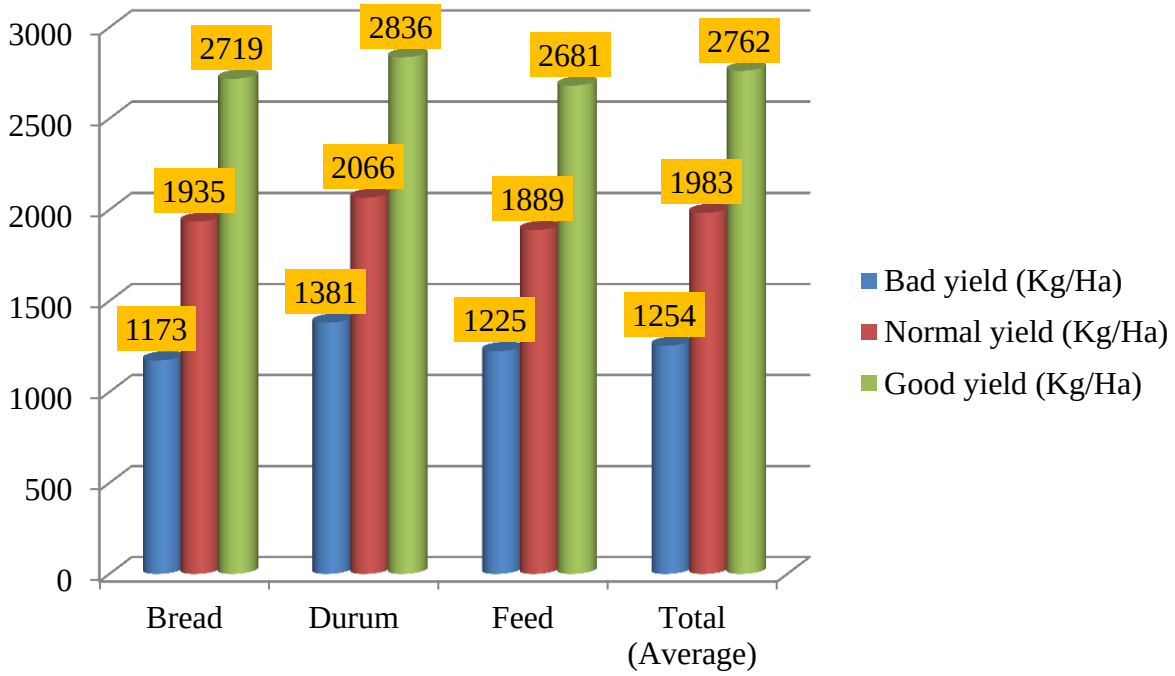


Figure 4.25 The Amount of Wheat Landraces Yield Potentials in Bad, Normal and Good Conditions With respect To Wheat Variety Specifies (Kg/Ha)

The yield performances of wheat landraces with respect to irrigated and rainfed conditions were shown in Table 4.14. When compared of the yield performances of wheat landraces population in irrigated conditions with the yield performances of them in rainfed conditions, in bad conditions with 13.68% more, in normal conditions with 20.58% more and in good conditions with 22.97% more yield were acquired.

Table 4.14 The Amount of Wheat Landraces Yield Potentials in Bad, Normal and Good Conditions With Respect To Irrigation Situation (Kg/Ha)

Regions	Irrigation	Bad yield (Kg/ha)	Normal yield (Kg/ha)	Good yield (Kg/ha)
Aegean Region	Irrigated	1400.00	1800.00	2000.00
	Rainfed	1535.60	2225.50	2922.75
	Mean	1534.36	2221.64	2914.36
Central Anatolia Region	Irrigated	1508.38	2460.48	3502.60
	Rainfed	1266.13	1957.02	2654.71
	Mean	1277.55	1980.77	2694.90
Eastern Black Sea Region	Irrigated	1440.00	2240.00	3200.00
	Rainfed	1071.36	1799.07	2581.03
	Mean	1077.12	1806.07	2590.85
Eastern Marmara Region	Rainfed	1232.35	1957.35	2679.71
	Mean	1232.35	1957.35	2679.71
Mediterranean Region	Irrigated	1721.88	2621.88	3593.75
	Rainfed	1575.11	2327.85	3111.81
	Mean	1584.39	2346.44	3142.29
Middle Eastern Anatolian Region	Irrigated	1633.45	2210.34	3043.97
	Rainfed	1048.44	1681.77	2327.60
	Mean	1268.77	1880.84	2597.40
North Eastern Anatolian Region	Irrigated	1076.98	2344.48	3521.56
	Rainfed	702.34	1511.15	2245.03
	Mean	848.54	1836.35	2743.19
South Eastern Anatolian Region	Irrigated	2277.78	3447.22	4463.89
	Rainfed	1523.53	2128.82	2819.41
	Mean	1595.74	2255.05	2976.86
Western Anatolia Region	Irrigated	1451.82	2433.09	3552.14
	Rainfed	913.78	1573.39	2305.52
	Mean	983.00	1684.00	2465.91
Western Black Sea Region	Irrigated	1343.75	1962.50	2750.00
	Rainfed	1129.15	1734.09	2513.49
	Mean	1137.65	1742.59	2523.35
Western Marmara Region	Rainfed	1197.40	1954.80	2833.10
	Mean	1197.40	1954.80	2833.10
Total (Average)	Irrigated	1423.02	2413.66	3447.14
	Rainfed	1228.37	1916.93	2655.21
	Mean	1254.43	1982.97	2761.97

4.4. References

Aresvik, O., (1975). The Agricultural Development of Turkey. Greenwood Publishing Group

Aydın, Z., (1986). Underdevelopment and Rural Structures in Southeastern Turkey: the Household Economy in Gisgis and Kalhana. Ithaca Press, London.

Bardsley, D. and Thomas, I., (2005). Valuing local wheat landraces for agrobiodiversity conservation in Northeast Turkey Agriculture, Ecosystems and Environment 106 (2005) 407–412

Bellon, M.R, (1996). The dynamics of crop infraspecific diversity: A conceptual framework at the farmer level. *Economic Botany* 50: 26-39.

Bellon, M.R., and Smale, M., (1998). A Conceptual Framework for Valuing On-farm Genetic Resources. CIMMYT Economics Working Paper 98-05. CIMMYT, Mexico

Blum, A., G. Golan, J. Mayer, B. Sinmena, L. Shpiler and J. Burra. (1989). The drought response of landraces of wheat from the northern Negev desert in Israel. Euphytica, 43: 87-96.

Breth, S.A., (1977). CIMMYT Today: Turkey's Wheat Research and Training Project. CIMMYT, Mexico.

Brush, S.B., Carney, H.J. and Huaman. Z. (1981). Dynamics of Andean potato agriculture. *Economic Botany* 35: 70-88.

Brush, S. B.,. Taylor, J. E and Bellon. M. R. (1992). Technology Adoption and Biological Diversity in Andean Potato Agriculture. Journal of Development Economics 39, no. 2: 365-387.

Brush, S.B., (1995). In situ conservation of landraces in centers of crop diversity. Crop Sci. 35, 346–354.

Brush, S.B., and Meng, E., (1998). Farmers' valuation and conservation of crop genetic resources. Genet. Resour. Crop Evol. 45, 139–150.

Büyüköztürk, Ş., (2010). Sosyal Bilimler İçin Veri Analizi El Kitabı. Ankara: PegemA Yayınları.

Demir, N., (1976). The Adoption of New Bread Wheat Technology in Selected Regions of Turkey. CIMMYT, Mexico.

Dennis, JV., (1987). Farmer management of rice variety diversity in northern Thailand. Ph.D. thesis, Cornell University, Ithaca, New York.

Düzgüneş, O,, Kesici, T. and Gürbüz, F., (1983). İstatistik Metodları I, Ankara Üniversitesi Ziraat Fakültesi Yayın No: 861, Ankara.

Ehdaie, B., Waines J.G., and Hall. A.E., (1988). Differential responses of landrace and improved spring wheat genotypes to stress environments. Crop Sci., 28: 838-842.

Ergüder, Ü ., (1991). Agriculture: the forgotten sector. In: Heper, M. (Ed.), Strong State and Economic Interest Groups: the Post-1980 Turkish Experience. Walter de Gruyter & Co., Berlin, pp.71–78.

Ergün, M., (1995). Bilimsel Araştırmalarda Bilgisayarla İstatistik Uygulamaları. SPSS For Windows. Ankara: Ocak Yayınları.

Erkuş, A., (1979). Ankara İli Yenimahalle İlçesinde Kontrollü Kredi Uygulaması Yapılan Tarım İşletmelerin Planlanması Üzerine Bir Araştırma, Ankara Üniversitesi Ziraat Fakültesi Yayınları No. 709, ANKARA

Feder, G., Just, R. E. and Zilberman, D. (1985). "Adoption of Agrucultural Innovations in Developing Countries: A Survey." Economic Development and Cultural Change 33: 255-298.

Kan, M., (2012). Usage Of Geographical Indication In Local Economical Development And Its Impact: A Case Study On Aksehir Cherry. Ph.D. Thesis, Ankara University, Graduate School of Natural and Applied Sciences, Department of Agricultural Economics, Ankara, Turkey.

Kaya, Z., Kün, E., Güner, A., (1997). National Plan for In situ Conservation of Plant Genetic Diversity in Turkey. Milli Egitim Basimevi, Istanbul.

Kesici, T., and Kocabaş, Z., (1997). Biyoistatistik. Ankara Üniversitesi Eczacılık Fakültesi Biyoistatistik Yayin No: 94, Ankara

Kronstad, W.E., (1981). The Turkish experience in increasing food production in arid and semiarid lands. In: Manassah, J.T., Briskey, E.J. (Eds.), Advances in Food Producing Systems for Arid and Semi-Arid Lands. Academic Press, NY, pp. 69–83.

Kruzich, T., (2006). Why do households cultivate landraces? Wheat variety selection and in-situ conservation in Turkey. MSc. Thesis. Montana State University, Bozeman, Montana.

Kruzich, T. and Meng, E., (2006). Wheat Landrace Cultivation in Turkey: Household Land-use Determinants and Implications for On-Farm Conservation of Crop Genetic Resources. Contributed paper. Annual Meeting, August 12-18, 2006, Queensland, Australia.

Meng, E., (1997). Land allocation decisions and In-situ conservations of crop genetic diversity resources. The case of wheat land races in Turkey, PhD Thesis, Department of Agricultural and Resource Economics, University of California, Davis.

Olgun, H., (1989). Some aspects and consequences of the agricultural price interventions in Turkey. Eur. Rev. Agricult. Econ. 16, 391–410.

Perrin, R., and Winkelmann. D. (1976). "Impediments to technological Progress on Small Versus Large Farms." American Journal of Agricultural Economics 58: 888-894.

Richards, P., (1986). *Coping with Hunger: Hazard and Experiment* in *an African Rice-Farming System.* London, UK: Allen and Unwin.

Şahin, K. ve Yılmaz, İ.H. (2008). Van ili Gürpınar ilçesinde yem bitkileri üretimi ve sorunları üzerine bir araştırma. Tarım Bilimleri Dergisi, sayı: 14 (1), s. 16-21.

Tan, A., (1998). Current status of plant genetic resources conservation in Turkey. In: Zencirci, N., Kaya, Z., Anikster, Y., Adams, W.T. (Eds.), Proceedings of the International Symposium on In situ Conservation of Plant Genetic Diversity, CRIFC, Ankara, pp. 5–16.

Tan, A., (2002). In Situ (On Farm) Conservation of Landraces From Transitional Zone in Turkey, Project No: TOGTAG-2347, TUBİTAK, İzmir.

Tansey, G., (1984). Turkey's Green Revolution: a Dryland First-An Account of the Turkish Wheat Research and Training Project, 1969–82. Rockefeller Foundation, NY.

Smale, M., Meng, E., Brennan, J.P., and Hu, R., (2003). Determinants of spatial diversity in modern wheat: examples from Australia and China. Agricultural Economics 28: 13-26.

Van Dusen, M.E., (2000). In Situ Conservation of Crop Genetic Resources in the Mexican Milpa System, B.A. (University of California, Berkeley), Doctor of Phılosophy Dissertation in Agricultural and Resource Economics, The USA.

CHAPTER 5

VALUING OF LOCAL WHEAT LANDRACES

5.1. Introduction

Crop genetic resources are key inputs used in agricultural research to develop and produce new plant varieties with desired charecteristics and to respond to unexpected environmental changes, including the onslaught of pest and disease. Maintaining an adequate pool of genetic materials with a range of traits is necessary given uncertainty over the types of problems that will arise in the future (Plucnett and Smith, 1983; Hawkes, 1983; Meng and et al., 1995). Maintainance of the local varieties depends on the farmers' valuation to them. Information about specific variety characteristics that the farmer finds important will provide insight on household preferences and behavior. If continued cultivation of landraces appears uncertain and if on farm maintenance of some target level of diversity is a stated objective, then the accurate valuation of these genetic resources from the viewpoint of the farm household could provide crucial information for the development of policies to guarantee their existence in the future. One of the approaches described in the literature is economic analyses of farmer's variety choice on valuation of landraces and crop genetic resources (Brush and Meng, 1998).

Farm households allocate resources for production of favorite or preferred landraces, expecting benefits to accrue from their subsequent consumption or sale in local markets. Farmers continue to grow a wheat species or landrace and maintain it if it meets their production and consumption needs. Therefore, direct use values, particularly the quality traits that farmers consider as valuable for consumption are indicators of private value. Socio-cultural values motivate farmers to retain some preferred landraces on the farm, and they appreciate the special organoleptic qualities and multiple uses of these landraces, despite the availability of improved wheat varieties in their locality. Landraces, especially those having multiple home uses, are more likely to be maintained for the foreseeable future. Therefore, home use values can serve as a strong incentive to encourage continued cultivation and utilization of wheat landrace by farm households (Jaradat, 2012).

The paper focuses specifically on the cultivation and farmer assessment of wheat landraces in the research area in Turkey. In examining the components of the private value of landraces, we consider variables suggested by economic theory to influence farmer's choices on whether they want to produce wheat landraces or both modern and wheat landraces together in their farm.

5.2. Materials and Methods

Economists have developed several theories to explain the variety choice of farm households. The desire to diversify and shield against risk (Swanson 1997; Fafchamps 1992; Finkelshtain and Chalfant 1991; Just and Zilberman 1983), transactions costs restricting household access to markets (Fafchamps 1992; Goetz 1992; de Janvry et al. 1991; Strauss 1986), and the presence of environmental constraints (Bellon and Taylor 1993; Jansen et al. 1990) have all been advanced and tested as important influences in the land use decisions of farm households. Risk aversion, transaction costs, and environmental constraints can each explain to some extent the occurrence of the partial adoption of improved crop varieties by farmers in developing countries (Meng, Taylor and Brush 1995, Brush and Meng, 1998).

Farmers continue to grow and maintain a wheat landrace if it meets their production and consumption needs. The total cost and benefit of landraces to farmer households are central to their on-farm conservation and continued utilization. Farmers maintain crop landraces if these are valued either for economic, cultural, social, or even ecological reasons (Jaradat, 2012). Social and cultural contexts also shape the roles of different individuals or groups within a household or community, for example, based on gender, age or social status. These socially determined roles affect farmers' knowledge, actions and access to resources regarding the maintenance of crop diversity. Studying the relevance of these social roles to on-farm crop diversity will help us to understand who is involved in maintaining this diversity (Jarvis et all., 2000).

To determine the farmer's decisions on landrace cultivation (only wheat landrace cultivation or both wheat landrace and improved wheat varieties cultivation) was analyzed. To analyse the influence of each explanatory variable on the dependent variable, which is a dichotomous variable, the binary logistic regression was used as a method (Maddala 1983; Grene 2000). Two different binary logistic regressions were applied for dependent variables such as only wheat landraces cultivated (y=1), or both wheat landraces and improved wheat varieties cultivated (y=2). Dependent variables were assumed as socioeconomic and

geographical location facts, because we thought that currently the change of these facts is to reaction the farmers' decisions. The logit model is written:

$$\Pr ob(y=1) = \frac{e^{x\beta}}{1}$$

where;

Prob (y=1) is the probability pof 1,

E is the base of natural logarithm,

F(xβ) is the standart logistic distribution function, and

X is the explanatory variable vector, which include the selected factors.

In this study, 4-point Likert Scale (Bad-Normal-Good-Don't Know) was used to measure the farmers' valuation on the wheat landrace populations (Köklü, 1995). Likert scales are a non comparative scaling technique and are unidimensional (only measure a single trait) in nature. A Likert item is simply a statement which the respondent is asked to evaluate according to any kind of subjective or objective criteria; generally the level of agreement or disagreement is measured. It is considered symmetric or "balanced" because there are equal amounts of positive and negative positions (Burns and Burns 2008).

5.3. Results and Discussion

The definitions, descriptions and summary statistics of independent variables included in the binary logistic regression analyse were given in Table 5.1. The independent variables considered in this analysis can be broadly classified as: household head characteristics, farm characteristics, geographical characteristics and regional dummy variables. In similar studies carried out in Turkey by Kruzich and Meng (2006), they classified these factors, which are effected to farmers' variety choice, in 6 parts. They were socioeconomic characteristics, plot-level characteristics, market access, variety characteristics, province and agroecozone and analyzed. Negassa and et al. (2012), classified their independent variables as: household head characteristics, farm characteristics, market access and institutions, agro ecotypes and provincial dummy variables in their household decision model.

The household head was characterized based on education, age and improved wheat farming experience. Educational attainment of household heads was measured as dummy varieble. The varieable divided to 2 parts; 1 represents the household heads having literate and/or illiterate educational level, 2 reprensents the other situation. Very similar level of

household heads' educational attainment was observed across wheat variety choices. Experience of household heads on improved wheat farming was showed with dummy variable. If the number is 1, it means that the household heads have tried the improved wheat varieties in their life. The 2 number represents the other situation.

Two variables were selected to characterize the farms for the sample households. These were percentage of wheat landrace area in total area (%) and the amaount of Man Labour Unit (MLU) in the household. In general, the proportion of wheat landrace area in total area was calculated as 62.11%. The amaount of Man Labour Unit (MLU) in the household represents also the household size. The average value of it was calculated as 3.76. This value is changing according to the variety choice of household heads as 3.71 and 3.93 respectively.

Geographical charactersitics are giving details in the research area. 2 variables were considered in the model. These were altitude and market distance of the farms to the main centers. Both of them were shown with continuos variebles. When examined the table 5.1, the farmers growing only wheat landraces settled in the further area than the farmers growing both wheat landraces and improved wheat varieties. These places' altitudes were generally above 1.200 m and are generally mountainous areas.

Table 5.1 Summary Statistics on The Factors Including The Empiric Model

1”	Variable Description	Summary Statistics		All Sample (N:1612)
		Landrace Varieties Only (n:1189)	Both Modern and Landrace Varieties (n:423)	
Household Head Characteristics				
BIMPV	Has the household head tried improved varieties in his farm? (Dummy)	1.85 (0.01)	1.04 (0.01)	1.65 (0.01)
AGE (Dummy)	**1:** 0-44 age years old **2:** 45-+ years old	1.77 (0.01)	1.73(0.02)	1.76 (0.01)
EDUC (Dummy)	1: Illiterate 2:Literate 3: Primary School 4:Secondary School 5: University	2.79 (0.02)	2.83 (0.03)	2.80 (0.02)
Farm Characteristics				
LSHARE	Percentage of wheat landrace area in total area (%)	47.79 (0.86)	22.26 (0.86)	41.09 (0.72)
HHH	The amount of land per household member (ha)	13.22 (0.61)	22.44 (1.45)	15.58 (0.60)
Geographical Characteristics				
MDIST (Dummy)	1: 0-39 km 2:40-+ km	1.03 (0.01)	1.03 (0.01)	1.03 (0.00)
ALTITUDE	The altitude of land grown wheat landraces (m)	1199.92 (11.45)	966.85 (14.62)	1139.45 (9.60)

Note: Figures in parenthesis represent standart deviations.

The results of binomial logit regression coefficients are presented in Table 5.2 The household characteristics such as age, education, and experience of household on growing improved wheat varieties appear to have significant effect on the household's choice of wheat varieties (wheat landraces or both wheat landraces and improved varieties). Similarly, the effects of farm and geographical characteristics were statistically significant, except market distance. As result of binary logistic regression, the farmers experience on modern wheat varieties production is affecting the decision of farmers. Producers trying the modern wheat varieties before tended not to leave the modern wheat production. They usually continue their production system with both modern and wheat landrace varieties. As known, modern wheat varieties have better yield potential and have ability to easily salability in markets than wheat landraces. The probality of this variable is also high. The occurance probability of the farmers triying modern wheat varieties in their farming sytem to continue both modern and wheat landraces together is 330 times higher that the other possibility (Table 5.2).

The other household head charecteristic was the age of house hold head. Indigenous Knowledge (IK), including knowledge of crop diversity, is often held by the older members of a community. This link can be a precarious one, as knowledge can be lost if elders do not pass IK down to younger generations (Jarvis et all., 2000). In the model, the variety was represented by dummy variable as older than 44 years old and younger than it. When looked the result, the age was found as a significant variable at 90% confidence level. Elder people tended not to leave the traditional wheat production system with only wheat landrace production (Table 5.2).

Education was the other significant factor affecting farmer's decision on the model. The more educated farmers wanted to prefer to produce wheat landraces with improved wheat varieties together in their farming system. Kruzich and Meng (2006) and Meng (1997) stated that a household decision maker with more years of farming experience was more likely to cultivate traditional varieties, while more education resulted in a significantly lower probability of landrace cultivation. Negassa and et al. (2012) found that the household characteristics such as the education, age and farming experiences of household heads appear to have no significant effect on the household's choice of wheat varieties. Similarly, the effects of farm household characteristics like dependency ratio and number of car ownership on farm household's wheat variety choice was not statistically significant. However, variables which appeared to significantly influencing farm household's wheat variety choice were: household size, number of cattle owned, number of buildings on farm, farm size, farm

fragmentation, percentage of irrigable farm plots, and the regional dummy variables (Table 5.2).

The average farm size was 7.16 ha for the whole sample and farm size showed large variability across wheat variety choices. For example, the average farm size for the wheat landraces only was about 6.01 ha, which is about double for the both modern and wheat landrace variety. Thus, households with landrace wheat variety only tend to have small farm size as compared to those with modern wheat variety only and those households simultaneously adopting both modern and landrace wheat verities. In the model the variable farm size was shown with the variable representing the share of wheat landrace area in total area. This variable was found as a significant variable at 99% confidence level. The proportion of wheat landrce area in total area was found more in the farms where only wheat landraces were grown. When consider that the farms, in which the proportion of wheat landrace area in total area is higher than 50%, are smaller farms, because of that it can be said that this variable is representing the farm size of the farmers. Farm size has been empirically shown to be positively related to the adoption of modern varieties (Perrin and Winkelmann 1976; Feder and et all., 1985; Brush and et all., 1992). Larger farmers may benefit from economies of scale, be willing to dedicate a smaller proportion of land to experimenting with modern varieties, or may have lower information costs relative to small farmers (Table 5.2).

The variable explaining the relation between the household size and farm size is HHH (The amount of land per household member). The value of HHH gives an idea both the wealth status of the farms in terms of income and the amount of manageable land. In that time of bidgger value of HHH, the farm generally heads towards commercial activities more. In the model it was found that if the amount of land per household member had more, in their farms, they tended to produce both wheat landraces and improved wheat varieties together.

The other factor examined in the model was the altitude of the place where the wheat landraces were grown. In extreme, heterogeneous and highland growing environments, traditional farmers' varieties are still more likely to be grown than modern varieties since the germplasm developed by centralized breeding programmes may not be well adapted to these marginal areas and their microclimates (Jarvis et all., 2000). As results of the empiric model, as expected, altitude is an important factor affecting the farmers' decision. When altitude is increasing, generally settlements steer away from the market centers. These locations are generally mountain and remote areas. This situation is effecting the farmers' decision on side of producing only traditional varieties (wheat landraces) (Table 5.2).

The other geographical factor is market distance factor. The previous studies were done in Turkey by Meng (1997) uses market access to empirically explain landuse decisions. Distance to market and road quality both influence the variety choices of households. Omamo (1998) empirically finds that high transport costs directly influence households and result in the decision to plant low-return food crops. Hintze (2002) also empirically tests road quality as an indicator of transactions costs and finds it to be positive and significant for modern maize variety adoption. Distance to market, road quality, and access to input and output markets havebeen shown to affect households' land-use decisions and their production strategies. In the study, the result showed that the market distance is not significan't factor for decision of the farmers as only wheat landrace production or both wheat landrace and modern wheat varieties production. The reason why we got the different result when we compare the other studies on this subject can be that we couldn't focus the farmers producing only modern wheat varieties. But when we look at the altitude of the farms producing only wheat landraces located in mountainous agroecological zones (Table 5.2).

Table 5.2 The Estimation of Binomial Logistic Regression Coefficients for Wheat variety Choice Model

Explanatory Variables	B	S.E.	Wald	df	Sig.	Exp(B)
BIMPV	-5.117	0.282	330.097	1	0.000	0.006
MDIST	0.553	0.464	1.422	1	0.233	1.739
LSHARE	-0.039	0.004	82.957	1	0.000	0.962
AGE	-0.394	0.239	2.728	1	0.099	0.674
EDUC	-0.281	0.148	3.627	1	0.057	0.755
ALTITUDE	-0.002	0.000	56.603	1	0.000	0.998
HHH	0.008	0.004	4.036	1	0.045	1.008
Constant	10.572	1.041	103.150	1	0.000	39041.708
Number of observation	1612					
Log-Likelihood value	681.94					
Cox & Snell R Square	0.52					
Nagelkerke R Square	0.76					
Percent correctly predicted						
LV Only	93.78					
Both MV and LR	87.94					
Overall correct prediction	92.25					
Hosmer and Lemeshow Test	15.97	p:0.04				

*** Significant at 99%level
** Significant at 95%level
* Significant at 90%level

In the other part of the study, yield, disease resistance, pest resistance, cold resistance, drought resistance, suitability to family consumption, market price, lodging resistance, straw yield and straw quality characetristics of wheat landraces were evaluated by the wheat landrace producers in the research area (Table 5.3). Except market price and lodging resistance charecterisitics of wheat landraces, the other ones were notified in normal or good levels. The evaluations of wheat landrace farmes on wheat landraces vary according the regions It seems that the wheat landraces are more tolerated to the abiotic (Cold and Drought) and biotic (Disease and Pest) stress conditions. This is a reson why the wheat landraces are grown in harsh conditions. The main disadvatageous of wheat landraces are market price and lodging problem. The lankiness of the wheat landraces brings along the lodging problem.

The market price of wheat landraces is one of the variables showing the most variation. In some regions, especially, the durum wheats (including Emmer Wheats) are sold in high price because bulgur was derived these durum wheats and they have good flovour and taste and also they are found the less in the market. Siyez, Kavlıca, Sarı Buğday and Üveyik Buğday can be shown as examples. This situation was sourced from that these wheat product are sold mostly in niche markets as local products. Especially in recent years, the rise in the demand for local and organic products, it allows the sale of these types of products mostly in niche, sometimes in luxury stores with high price. The best example in Turkey is the “Siyez Bulguru” obtained from Siyez Wheat.

Some of important factors were straw quality, straw yield and suitability to family consumption affecting the preference of wheat landraces by the farmers. The 3 factors were the most important factors on which the farmers focused in the research area.

Table 5.3 Distribution of Farmers' Opinion on Wheat Landraces By Regions (%)

		Regions											
		Aegean Region	Central Anatolia Region	Eastern Black Sea Region	Eastern Marmara Region	Mediterranean Region	Middle Eastern Anatolian Region	North Eastern Anatolian Region	South Eastern Anatolian Region	Western Anatolia Region	Western Black Sea Region	Western Marmara Region	Total
Yield	Good	23.64	30.28	47.76	22.95	18.18	38.56	14.63	25.40	22.67	30.09	30.00	25.68
	Normal	60.91	38.07	46.27	42.62	63.64	54.90	55.69	53.97	51.16	46.30	30.00	51.65
	Bad	14.55	27.52	2.99	34.43	18.18	6.54	20.73	20.63	8.14	22.69	40.00	18.78
	Don't Know	0.91	4.13	2.99	0.00	0.00	0.00	8.94	0.00	18.02	0.93	0.00	3.88
Disease resistance	Good	43.64	36.24	52.24	9.84	64.03	80.39	9.76	91.53	12.21	47.22	10.00	45.04
	Normal	30.00	35.32	31.34	16.39	16.21	14.38	52.44	5.29	39.53	37.50	75.00	30.26
	Bad	3.64	7.80	5.97	0.00	4.74	4.58	16.67	0.53	9.88	1.85	0.00	6.20
	Don't Know	22.73	20.64	10.45	73.77	15.02	0.65	21.14	2.65	38.37	13.43	15.00	18.49
Pest resistance	Good	37.27	27.06	10.45	9.84	71.54	77.12	6.10	91.01	9.88	37.04	42.50	41.33
	Normal	30.00	31.65	10.45	14.75	10.28	14.38	53.25	4.23	40.70	33.80	45.00	27.01
	Bad	2.73	11.01	0.00	0.00	2.77	6.54	17.07	0.00	4.07	1.39	0.00	5.57
	Don't Know	30.00	30.28	79.10	75.41	15.42	1.96	23.58	4.76	45.35	27.78	12.50	26.09
Cold resistance	Good	63.64	76.61	79.10	86.89	86.96	79.74	21.54	98.41	49.42	62.04	60.00	67.65
	Normal	22.73	15.60	16.42	13.11	9.88	11.76	39.02	1.59	31.98	36.57	40.00	21.45
	Bad	2.73	5.50	4.48	0.00	3.16	8.50	20.73	0.00	5.81	0.46	0.00	5.86
	Don't Know	10.91	2.29	0.00	0.00	0.00	0.00	18.70	0.00	12.79	0.93	0.00	5.04
Drought resistance	Good	44.55	62.84	79.10	91.80	91.30	62.75	20.73	98.41	34.88	68.06	67.50	63.36
	Normal	18.18	26.15	14.93	8.20	6.72	33.33	43.09	1.59	35.47	30.56	32.50	23.71
	Bad	12.73	8.26	2.99	0.00	1.98	3.27	21.95	0.00	13.95	0.93	0.00	7.19
	Don't Know	24.55	2.75	2.99	0.00	0.00	0.65	14.23	0.00	15.70	0.46	0.00	5.74

Table 5.3 (Cont.) Distribution of Farmers' Opinion on Wheat Landraces By Regions (%)

		Regions											
		Aegean Region	Central Anatolia Region	Eastern Black Sea Region	Eastern Marmara Region	Mediterranean Region	Middle Eastern Anatolian Region	North Eastern Anatolian Region	South Eastern Anatolian Region	Western Anatolia Region	Western Black Sea Region	Western Marmara Region	Total
Suitable family consumption	Good	67.27	78.90	91.04	81.97	89.72	89.54	84.96	96.83	89.53	62.50	92.50	83.42
	Normal	20.00	17.43	5.97	18.03	6.72	9.15	13.01	3.17	3.49	28.24	7.50	12.41
	Bad	5.45	0.92	0.00	0.00	1.58	1.31	2.03	0.00	0.00	6.94	0.00	1.97
	Don't Know	7.27	2.75	2.99	0.00	1.98	0.00	0.00	0.00	6.98	2.31	0.00	2.20
Market price	Good	20.00	31.65	17.91	9.84	65.61	45.10	15.45	69.84	11.05	12.96	2.50	32.58
	Normal	18.18	41.74	32.84	40.98	10.28	39.87	36.59	16.40	40.70	32.87	50.00	30.55
	Bad	17.27	9.63	10.45	11.48	6.72	11.76	31.30	13.76	8.14	34.72	2.50	16.35
	Don't Know	44.55	16.97	38.81	37.70	17.39	3.27	16.67	0.00	40.12	19.44	45.00	20.52
Lodging resistance	Good	31.19	24.77	2.99	4.92	38.34	43.79	17.89	24.34	12.21	11.57	0.00	22.80
	Normal	15.60	21.56	19.40	6.56	43.08	39.87	45.93	30.69	39.53	44.91	17.50	34.45
	Bad	51.38	48.62	76.12	88.52	18.58	15.69	30.89	44.44	32.56	43.06	82.50	39.44
	Don't Know	1.83	5.05	1.49	0.00	0.00	0.65	5.28	0.53	15.70	0.46	0.00	3.31
Straw quality	Good	75.45	64.22	73.13	44.26	88.14	87.58	42.68	94.18	43.60	48.15	47.50	65.91
	Normal	18.18	29.82	22.39	47.54	10.28	10.46	35.77	5.29	34.88	43.06	52.50	25.68
	Bad	0.91	2.29	4.48	8.20	1.58	1.96	8.13	0.00	5.81	8.33	0.00	4.00
	Don't Know	5.45	3.67	0.00	0.00	0.00	0.00	13.41	0.53	15.70	0.46	0.00	4.41
Straw yield	Good	78.18	67.89	80.60	75.41	92.09	79.74	32.93	93.65	37.21	64.81	60.00	68.12
	Normal	14.55	24.31	17.91	16.39	6.72	17.65	39.84	6.35	34.88	33.80	37.50	22.78
	Bad	6.36	2.29	1.49	8.20	1.19	2.61	8.94	0.00	5.23	0.93	2.50	3.42
	Don't Know	0.91	5.50	0.00	0.00	0.00	0.00	18.29	0.00	22.67	0.46	0.00	5.68

5.3. Conclusion

The results are consistent with the previous studies done by different researchers in Turkey. Firstly understanding and knowing the farmers who cultivate landraces is necessary for in situ conservation of the wheat landraces. The analysis was based on cross-sectional survey data collected between 2009 and 2014 years on 1873 sample households in 65 provinces of Turkey. The results show that not only agronomic characters are affecting on decision of production process. The other factors like socio-economic, geographical and farm charactersitics are effecting the household decision on maintaining the wheat landrace production. Landraces are more resistance biotic and abitotic stress and better adapting the environmental conditions. Sustainable of the landraces are not only possible with ex situ conservation, in situ conservation is necessary and these landraces should be assessed in breeding programs.

The inhabitants of Turkish villages are industrious and willing to produce crops which are suitable for the agro-climatic conditions of the region, in order to meet family needs and to offer the surplus produce at the local market. This has maintained great diversity in the landraces of many crops. The fact that these varieties, with excellent taste qualities, created many decades ago in the respective micro-areas with characteristic agro-climatic peculiarities, are grown by an aged population makes our activity in collection and preservation of this wealth priceless, as the desire to cultivate landrace diversity is not being handed on to the younger generations. The study showed also that the age of farmers growing wheat landrace above the 50 years-old (Figure 5.1)

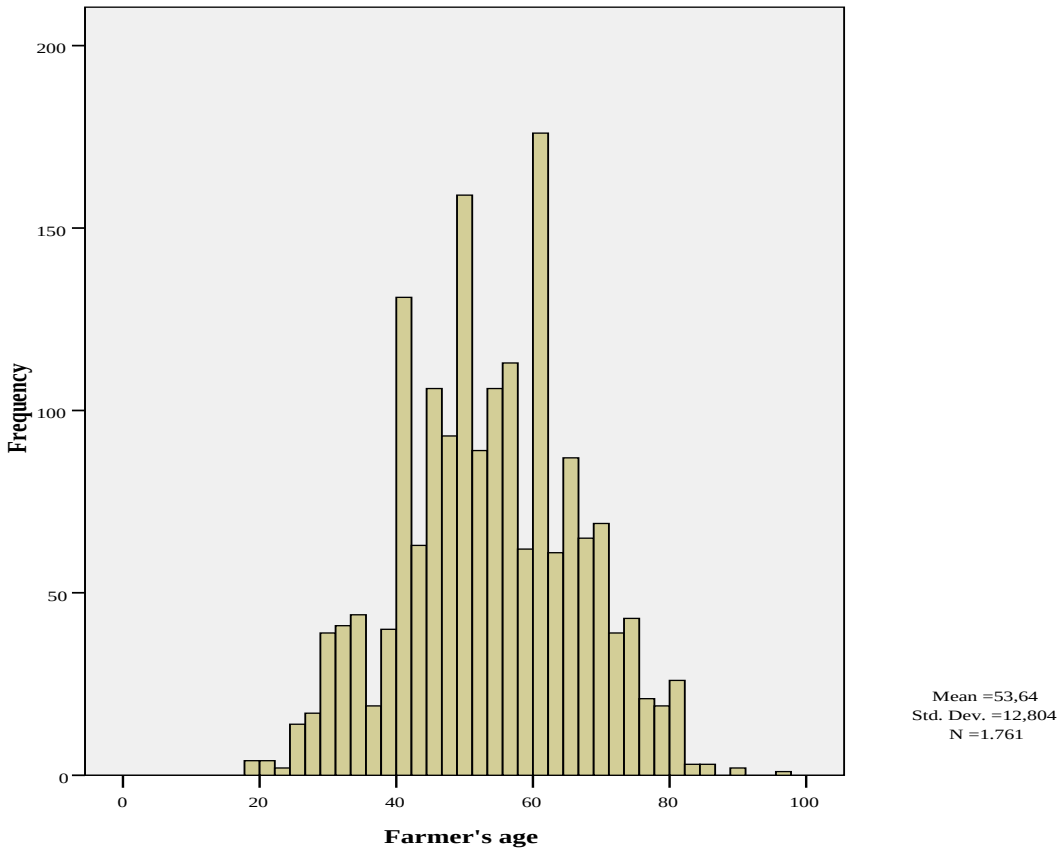


Figure 5.1. The Histogram of Farmers Age Producing Wheat Landraces

The farmers producing wheat landraces are maintaining this farming system in hard conditions. Because of that, while policy makers are establishing policy in rural area, they should establish different policies for specific areas, as well as general policies. As an example, The EU Agriculture Development Policy for people living mountainous area can be shown. Mountainous rural areas face particular challenges and have specific needs in respect to other rural areas. In the current EU agricultural policy context they are included in the designation of ”Less Favoured Areas (LFAs)” because they are generally characterised by a short growing season (because of a high altitude), or by steep slopes at a lower altitude, or by a combination of the two. Such conditions pose challenges for agriculture and the rural economy in these areas Specific support instruments have been developed by the EU which are targeted at mountain rural areas, and these include rural development policy measures (Anonymous 2012). If the wheat landraces were grown in such areas, constituting such a policy in Turkey will help to conservation of genetic resources (CGR) and also biodiversity.

5.4. References

Anonymous, (2012). Mountain Farming. http://enrd.ec.europa.eu/themes/agriculture/mountain-farming/en/mountain-farming_en.cfm

Bellon, M. R. and Taylor, J. E. (1993). Farmer soil taxonomy and technology adoption. Economic Development and Cultural Change 41: 764–786.

Brush, S. B., J. E. Taylor, and M. R. Bellon. (1992). "Technology Adoption and Biological Diversity in Andean Potato Agriculture." *Journal of Development Economics* 39: 365-387.

Brush, S.B., and Meng, E., (1998). Farmers' valuation and conservation of crop genetic resources. Genet. Resour. Crop Evol. 45, 139–150.

Burns, A. and Burns, R. (2008).Basic Marketing Research(Second ed.). New Jersey: Pearson Education. pp.250.ISBN978-0-13-205958-9.

de Janvry, A., Fefchamps, M. and Sadoulet, E. (1991). Peasant household behavior with missing markets – Some Paradoxes Explained. Economic Journal 101: 1400–1417.

Fafchamps, M., (1992). Cash crop production, food price volatility, and rural market integration in the third world. American Journal of Agricultural Economics 74: 90–99.

Feder, G., R. E. Just, and D. Zilberman. (1985). "Adoption of Agrucultural Innovations in Developing Countries: A Survey." Economic Development and Cultural Change 33:255-298.

Finkelshtain, I. and Chalfant, J. (1991). Marketed surplus under risk: do peasants agree with sandmo? American Journal of Agricultural Economics 73: 557–567.

Goetz, S., (1992). A selectivity model of household food marketing behavior in sub-Saharan Africa. American Journal of Agricultural Economics 74: 444–452.

Grene W.H., (2000). Econometric Analysis 4th edition. Prentice Hall.

Hawkes, J. G., (1983). The Diversity of Crop Plants. Harvard University Press, Cambridge, MA.

Jansen, H. G. P., Walker, T. S. and Barker, R. (1990). Adoption ceilings and modern coarse cereal cultivars in India, American Journal of Agricultural Economics 72: 653–663.

Jaradat, A.A., (2012). Wheat Landraces: Genetic Resources for Sustenance and Sustainability. USDA-ARS, 803 Iowa Ave., Morris, MN 56267 USA. http://www.ars.usda.gov/SP2UserFiles/Place/36450000/products-wheat/AAJ-Wheat%20Landraces.pdf

Jarvis, D.I., L. Myer, H. Klemick, L. Guarino, M. Smale, A.H.D. Brown, M. Sadiki, B. Sthapit and T. Hodgkin. (2000). A Training Guide for In Situ Conservation On-farm. Version 1. International Plant Genetic Resources Institute, Rome, Italy

Just, R. and Zilberman, D. (1983). Stochastic structure, farm size, and technology adoption in developing agriculture. Oxford Economic Papers 35: 307–328.

Hintze, L. H. (2002). "Characteristics, Transaction Costs, and Adoption of Modern Varieties in Honduras." Ph.D. Dissertation, North Carolina State University, North Carolina.

Köklü, N. (1995). Tutumların Ölçülmesi ve Likert Tipi Ölçeklerde Kullanılan Seçenekler. Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi, cilt:28, sayı:2, s:89-90, Ankara. http://dergiler.ankara.edu.tr/dergiler/40/486/5698.pdf, Erişim Tarihi:26.08.2011.

Kruzich, T. and Meng, E., (2006). Wheat Landrace Cultivation in Turkey: Household Land-use Determinants and Implications for On-Farm Conservation of Crop Genetic Resources. Contributed paper. Annual Meeting, August 12-18, 2006, Queensland, Australia.

Kurosaki, T. (1996). "Risk, Crop Choices, and Consumption Preferences in the Pakistani Punjab." Unpublished

Maddala G.S., (1983). Limited-Dependent and Qualitative Variables in Econometrics. Cambridge University Pres.

Meng, E., Taylor, J. E. and Brush, S. (1995). Land allocation decisions and in situ conservation of genetic resources: The case of wheat landraces in Turkey. Paper presented at the 1995 American Agricultural Economics Association Annual Meetings, Indianapolis, IN. (Unpublished).

Meng, E. C. H. (1997). "Land Allocation Decisions and *In Situ* Conservation of Crop Genetic Resources: The Case of Wheat Landraces in Turkey." Ph.D. dissertation, University of California, Davis, California.

Negassa, A., Hellin, J., and Shiferaw, B., (2012). Determinants of Adoption and Spatial Diversity of Wheat Varieties on Household Farms in Turkey. International Maize

and Wheat Improvement Center (CIMMYT) Socio-Economics Working Paper 2. Mexico, D.F.: CIMMYT.

Omamo, S. W. (1998). "Transport Costs and Smallholder Cropping Choices: An Application to Slaya District, Kenya." *American Journal of Agricultural Economics* 80:116-123.

Perrin, R., and Winkelmann, D. (1976). "Impediments to technological Progress on Small Versus Large Farms." American Journal of Agricultural Economics 58: 888-894.

Plucknett, D. L., and Smith, N. H.,(1983) "Sustaining Agricultural Yields," Bioscience 36:40-45.

Strauss, J., (1986). The theory and comparative statics of agricultural householdmodels: A general approach. In I. Singh, L. Squire, and J. Strauss (eds.), Agricultural Household Models: Extensions, Applications and Policy. pp. 71–91 Johns Hopkins University Press, Baltimore.

Swanson, T., (1997). The management of genetic resources for agriculture: ecology and information, externalities and policies. Paper presented at the XXIIImeeting of the International Association of Agricultural Economists, Sacramento California, August 1997.

Tan, A., (2002). In Situ (On Farm) Conservation of Landraces From Transitional Zone in Turkey, Project No: TOGTAG-2347, TUBİTAK, İzmir.

CHAPTER 6

THE SUSTAINABILITY OF WHEAT LANDRACES-NGO's

6.1. Introduction

Turkey is the country of Europe and Middle East which has the richest biological diversity and it is on the ninth rank in the continent of Europe in terms of biological diversity. Each one of the seven regions of the country shows the features of different climate, flora and fauna and it has the most important three ecological regions of the world. One another diversity which is the shareholder of biological and cultural diversity is agricultural biodiversity –the diversity of the plants used in agriculture. Agricultural biological diversity involves all the components of biological diversity about food and agriculture. Types of cropes, farm animals, genetic resources of types of fish and all resources not tamed within field, forest, meadow and water ecosystems are included in the scope of agricultural biological diversity. The importance of biological diversity in terms of agriculture will be understood better when its features enabling the ecological services like nutrient cycle, pest control, protection of local wild life, protection of water basins, control of erosion, arrangement of climate.

Agricultural biodiversity of all food types is an indispensable part of general biodiversity and it is the first chain of food chain developed and protected by farmers, breeders and fishermen all over the world. In our day, it is known that agricultural biodiversity encounters many dangers caused by globalization of food market, intellectual property systems and unsustainable industrial food production applications. Our agricultural genetic resources either disappear seriously or diminish because of the processes of both changing market conditions and agricultural mono acculturation processes accordingly and decrease in rural population and their leaving from their traditions as well as change in nature (like climatic changes). Difficulties encountered during the living on of the small-scaled farmers which are the roots of production styles carried out by taking natural cycles into consideration, user preferences, the demands in the market being conventional and supportive of excessive consumption and irreversible destruction of natural areas affect peasant types and wild gene resources to a large extent.

Protection of biodiversity is possible by the coordinated and integrated work of various shareholders with each other more than being a case dependent only on legislations, laws and government policies. Because, the method of biodiversity is a complex phenomenon requiring the participation of many different units from public institutions to private companies and from non-governmental organizations to volunteer workers. NGOs are one of the important shareholders in this phenomenon. Non-governmental organizations working on the protection of biological diversity in Turkey have specializations well accepted in the international arena. For this reason, partnerships to be made with NGOs in the studies to be carried out in the protection of biological diversity will increase the common effect of operation results. In Turkey, it is possible to see various examples on the issues like introduction of local products, marketing attempts based on local products, protection of local multiplication materials notably the seed and enabling sustainability. These activities showed up with the attempts of local communities and both financial and organizational supports of various institutions notably the public and private sector. And they are important examples for the country in terms of protecting biological diversity locally and enabling sustainability. Thus, in this section, some examples of various attempts related to the protection of biological diversity in Turkey were presented and advices were given about the issue that what kind of works to increase the effectiveness of these examples should be carried out in terms of enabling sustainability and protection of biological diversity nation-wide.

6.2. The Role of Local Initiatives and NGO's

In Turkey, both the government and non-governmental organizations have carried out various programs to protect the biological diversity for a long time. These activities have been made real with in-situ protection programs like National Parks, Protected Wildlife Reserves, Natural Parks, Wildlife Protection Areas, Specially Protected Environment Areas, Natural Sites, Natural Assets, Gene Protection and Management Areas and with ex-situ protection programs like Seed and Orchards, Arboretums, Botanical Gardens and Gen banks (Anonymous, 2001).

Until today, education of environment protection has been carried out via indirect ways and protection of forest fires has been the initial purpose. In recent years, private sector, with the support of NGOs, has started to carry out supportive activities for raising awareness of public about the environment. In Turkey, the concepts of "environment" and "biological diversity" were presented by the government, but as happens everywhere, it has gained higher

popularity as a result of the activities of NGOs. There are not explicit provisions for NGOs in Turkish laws and this situation prevents the potential contributions which these organizations will make to the activities to be carried out to protect the environment in general and especially the biological diversity. Main problems on this issue are the legal hindrances related to the financial mechanisms of which the NGOs will take advantage and their fundraising as well as the hindrances about the cooperation of these organizations with international NGOs.

Despite all these problems the NGOs encounter, types of flora and fauna having an international importance and their habitats have been put under protection as a result of joint efforts of NGOs with international institutions or many activities likely to affect these kinds and areas have been stopped. For example, Society for The Protection of Nature- a national NGO- is a member of WWF and Turkish partner of Bird Life International. Society for The Protection of Nature has taken on tasks like, including even the evaluation of the effects of fish farms, putting projects for breeding sites of marine turtles into practice, putting projects of important bird and plant areas into practice, carrying out biological diversity protection projects for some deltas and lakes and integration of the plan of management of wetland in Delta Goksu. Society of Volunteers from Bodrum which has connections with Greenpeace and A SEED has also contributed to putting the project of Mediterranean Seal near Bodrum into practice. Environment Society of Turkey has a lot of publications on the protection of environment. Other international NGOs have contributed to the activities for protection of biological diversity in Turkey at different scales. Society of Underwater Researches has carried out studies on Mediterranean seal and coastal areas (Anonymous, 2001).

In this section, it was tried to give a place to activities and works made by some NGOs making some important activities in terms of protecting the biological diversity in Turkey and enabling the sustainability. The examples dealt with are the ones directly or indirectly related to the topic of wheat landrace which constitutes the main theme of the work. These works are especially the ones for the protection of agricultural biodiversity and the main base of all is to stimulate the protection and use of *in situ* on the place of the available material and to enable the financial and economical sustainability of this by using rural tourism potential

Bugday Association movement has been in operation since 1990 and decided to institutionalize its activities under the roof of the Bugday Association for Supporting Ecological Living. on 12 August 2002, in harmony with the other lives and feeding its dream of a society respecting the ecological entirety.

The Wheat, first seeds of which were sown in 1990s for the first time in Bodrum in the BugdayVegetative Products Restaurant and Natural Living Center works in order to achieve this dream by;

- establishing examples
- supporting the existent ones
- ensuring the circulation of the information

and executes its activities in line with these three purposes

One of the NGOs carrying out works to protect and use the biological diversity in Turkey is Wheat Association For Supporting Ecological Living. The association which was formed by assembling together of the Wheat movement founded in 1990s under the roof of a corporate in 2002 states its establishment reasons as follows;

- Protection and maintenance of productions in the traditional processes
- Redefining human requirements in harmony with the ecosystem cycles
- Generalizing sustainable agricultural methods not harming environment and human health
- Informing the public to let them live in harmony with nature and environment and creating fields of activity in order to let them develop their abilities

The association is an important example in terms of in situ protection of genetic resources in Turkey together with the works of it carried out on the topics of creating a market based on local products in Turkey and protecting local materials and making the manufacturing in local places. One of the most important works of the association is the project of "Network of Seed For The Protection of Turkey's Agricultural Biodiversity". The project of "Network of Seed" one of the important works carried out by Wheat Association For Supporting Ecological Living within the scopes of protecting agricultural biological diversity and maintaining rural life, emerged by drawing a road map intended to protect the local seed types by coming together of individuals, NGOs, related Ministry units and universities carrying out works to protect the local seed types from local to national in 2007. The work developed later on by the association is named "Exchange Network of Seed" and via this, festivals of seed exchange are organized and thus both the maintenance and sustainability of the production in the fields producing the local materials are enabled and it is tried to prevent the loss of local diversities. With the donations raised up to now within the campaign of Exchange Network of Seed, planting of 155 local varieties from 42 different stocks being grown in various regions are

enabled and 4,715 acres of lands in 27 farms in total from different regions of Turkey are involved in the project (Anonymous, 2012a).

Besides, Tatuta which is for stimulating the production of ecological products by the association and which is supported by UNDP, GEF and SGP; the project of "Agricultural Tourism in Ecological Farms and Exchange of Volunteer Information, Experience", the project of "100% Ecological Market", the project of "Nature-friendly Agriculture Policies" and "Camtepe Education, Application and Research Center of Ecological Life" which is made real by the association with its equity capitals for the applied demonstration of ecological life in its place and information exchange are some of the important work examples (Anonymous, 2012a).

Bogatepe Association of Environment and Life which is in service in Kars created a model of local economy in which women are featured for the purpose of supporting village life and making the local varieties survive and increase as cooperated with 27 villages. Within the works carried out; seeds belonging to 8 local varieties among which the wheat types "Kavlıca" and "Caucasian Red" about to distinct were regained and their usage was popularized. By creating living gardens for subsistence, vegetable growing for self consumption is being made. Moreover, training studies are being carried out for the presentation, multiplication, collection and drying of ethno botanical and medical plants. In the villages, visits of cultural sharers from abroad are enabled via rural tourism works. Foreign language education and communication trainings are carried out in order to communicate with incoming foreigners. The importance and statue of women have increased in villages and in one of the villages, a grocery the administration of which is made by women was founded. As a result of the works carried out, incomes of the villagers have increased and local economy has grown stronger (Koculu, 2012).

The seed association founded by the farmers in the village of Karaot in the Torbalı district of Izmir has carried out works since 2004 in terms of finding, protecting and popularizing the local seeds. As a result of the works carried out, an increase in the production with the local seeds has enabled and the production and sale of products attained from local seeds to various cities of Turkey has started to be made via the informal organization composed of women in the village. A common greenhouse was built to produce seedling and sale of seedling has been made. Common movement and self-sufficiency among the men in the village notably women have developed (Celik, 2012).

In 2005, Association of Ecology and Life was founded in Kirazlı village of Kusadası and it started its activities with the purposes of protecting peasantry, looking after local values and

enabling rural improvement. In this context; a project has been started by using fund resources of BM/GEF in order to develop ecological production from local varieties in fruit and vegetable, build an ecological vegetable seedbed, to present the local fruit types to the market as quality, branded, processed and packaged. At the end of the two-year project, the brand of "Kupluce" the old name of the village was formed, the production of types of local fruit and vegetable was started to be made ecologically, sale of the produced products was made real in Kusadası market and a market was formed to sell the products in the village. In the works carried out, traditional information and varieties correspondingly diversity and development in the income are enabled by enhancing the efficiency and creativeness of women (Celik, 2012).

Bayramic Yenikoy Kaz Mountains Ecologic Life and Seed Association which started its activities in Canakkale Bayramic region almost 8 years ago and has been continuing its activities as formal since 2010, has carrying on the activities like producing via local seeds and traditional methods, involving the peasants especially the women in the surrounding villages into this process and sale and gaining value of attained products. In this context, a local variety called "Saz Çavdarı" was multiplied by saving from extinction. Proliferation of planting of types of wheat landrace notably the wheat of "Yellow wheat, Kavlıca, Kızılca, Akkunduz and Karakılcık" was enabled. Sale of the products, via community supported agriculture methods, like flour, cracked wheat, bread, noodle, vegetables and food attained from them which were gained from the productions of locals via local seeds with the works of developing traditional information has been made real (Celik, 2012).

The other movement in Turkey is the Slow Food Organisation. Slow Food is a global, grassroots organization with supporters in 150 countries around the world who are linking the pleasure of good food with a commitment to their community and the environment. A non-profit member-supported association, Slow Food was founded in 1989 to counter the rise of fast food and fast life, the disappearance of local food traditions and people's dwindling interest in the food they eat, where it comes from, how it tastes and how our food choices affect the rest of the world. Today, the organisation has over 100,000 members joined in 1,300 convivia worldwide, as well as a network of 2,000 food communities who practice small-scale and sustainable production of quality foods.

One of the projects of the organisation is "Slow Food Presidia". The Presidia project is one of the most effective tools for putting into practice and exemplifying Slow Food's policy on agriculture and biodiversity. The Presidia sustain quality production at risk of extinction, protect unique regions and ecosystems, recover traditional processing methods, safeguard

native breeds and local plant varieties. The general objectives of the presidia are numerous, complex and multifaceted, but can be boiled down to four areas. The economic aspect is obviously vital (presidium products were disappearing because they were no longer profitable and in order to continue their activity, producers have to have economic assurance about the future), but another three factors are also crucial: environmental, social and cultural aspects (Anonymous, 2012b). The Presidia support traditional small-scale products at risk of disappearing, promote local areas, recover ancient crafts and production techniques and save native breeds and fruit and vegetable varieties from extinction. Currently there are almost 400 Presidia in over 50 countries (Anonoymous 2012c). In the Presidia, there is 1 presidium in Turkey and it's name is Siyez Wheat Bulgur. Many farms in the forested northern Turkish province of Kastamonu continue to cultivate the oldest type of wheat still in existence, *Triticum monococcum*, known as Siyez in Turkey. Compared to common wheat, it is low in gluten (and its non-toxic gluten can be tolerated by celiacs) and has a high protein content, around 20 percent. It has single grain spikes, a very long growing cycle and low yields. But it also flourishes in poor soil where modern hybrids would struggle, surviving harsh climates with at least three months of snow cover. Slow Food Organisation promotes these types of products indicated on the Slow Food Presida Guide Lines (Anonymous, 2012b).

The other project carried out by Slow Food Organisation is "The Earth Market" Project. Earth Markets are farmers' markets that have been established according to guidelines that follow the Slow Food philosophy. These community-run markets are important social meeting points, where local producers offer healthy, quality food directly to consumers at fair prices and guarantee environmentally sustainable methods. In addition, they preserve the food culture of the local community and contribute to defending biodiversity. In the world, there are 22 earth markets and one of them is in Turkey (Foça). Launched by Slow Food Convivium Foça Zeytindali in April 2011, the market takes place every Sunday from 8:30 to 18:30, in the market square or Yerel Pazar. All producers attending the market came form an area of 40 km of radius. The convivium carried out a considerable work by mapping local products and producers; bread, fresh fruits and vegetables, preserves, fresh herbs, mushrooms, chees, milk, yogurt, flower-related products so that it promote local producers and preserve local culture and biodiversity (Anonymous, 2012d).

As well as the NGOs, producer unions also play an important role in the protection of local products. It was identified that Presidency of Chamber of Agriculture in Meram in Konya province, which is one of these, made the production of Dinkel wheat a hexaploid wheat type from the family of Triticumspelta, Poaceae in the province of Konya in order to

prevent the extinction of it. Besides, it is stated that it is possible to market it among diet products while indicating that products attained from this wheat have a different aroma and taste.

6.3. Conclusion

Both the protection of biodiversity and the provision of sustainability are not only a public service but also a social responsibility. This social responsibility is not a task to be administered or overcome via applications by only a single institution or foundation; it is an issue to be performed with the coordinated and integrated work of all related shareholders. Especially the usage and protection of biodiversity, environment, local heritage and available richness are the topics regarding the future of mankind directly and everyone is responsible for their protection. At this point, NGOs play an important role. Especially in recent years, it can be seen that NGOs have intensively struggled to create awareness on these topics in Turkey. The works carried out by NGOs, based on the principal of willingness, have contributed a lot to the protection of local culture notably the local products in Turkey and to especially create awareness. It can be said that in situ conservation programs can reach the success only all stakeholders work together and with perfect coordination. In the interviews made with NGOs (Especially thanks to Mert Altıntaş), the roles of NGOs in the protection of biodiversity were summarized as follows;

Introduction; Shares the importance of local varieties in the axis of ecology, nutrition and sustainable agriculture and rural development in a wide communication network. In this way, it stimulates the use of these varieties and products produced from these varieties. It creates awareness in this way in the general society.

Information Transfer and Communication Network; It enables the free circulation of information about local varieties among the works carried out in local, national and international platforms. It adopts the facilitating task of sharing technical and scientific information among the parties and use of it in a way focused to the topic.

Defensiveness and Policy Making; Develops advices to overcome the political, legal and legislation related obstacles for the production, multiplication, sharing, inventory and protection of local varieties without spoiling, makes defensiveness, tries to form the defenders of ideas in this direction in the decision-maker and executive institutions,

R-D; Enables the works of research and development about the products to be produced from the local varieties or starts these works in person.

Formation of Marketing Channels; Brings the related parties together in order to form the marketing channels for increasing the use/consumption of local varieties, acts as the facilitator of the processes. The projects of Wheat Association named as 100% Ecologic Markets, TaTuTa, Wheat Points are important ground works formed in this direction.

Multiplication of Seeds; Gets in touch with small producers who will multiply local varieties and stimulates the production in person by creating a social network. The project of Network of Wheat Exchange of Wheat Association serves for this purpose but it also involves the titles above.

Technical Education; They can operate on the topics of education, informing, guidance and of producers producing and/or wishing to produce local varieties, and the work of providing technical support in all processes.

6.4. References

Anonymous, (2001). Türkiye Ulusal Biyolojik Çeşitlilik Stratejisi Eylem Planı. www.cbd.gov.tr

Anonymous, (2012)a. Wheat Association, www.bugday.org.tr.

Anonymous, (2012)b. Slow food Presidia. www.slowfoodfoundation.com

Anonymous, (2012)c. Social Report 2011.Slow Food Foundation for Biodiversity. http://slowfoodfoundation.com/pagine/eng/presidi/pagina.lasso?-id_pg=84

Anonymous, (2012)d. Slow food Earth Market Project. http://www.earthmarkets.net/

Çelik, Z., (2012). Yerel Tohumlar ve Tohum Ağlarının Kırsal Kalkınmadaki Yansıması. X. Ulusal Tarım Ekonomisi Kongresi, 5-7 Eylül 2012, Konya.

Koculu, İ, (2012). Boğatepe Köyü Bitkilerle Yaşam ve Sürdürülebilirlik Projesi, BoğaTepe Çevre ve Yaşam Derneği

CHAPTER 7

CONCLUSION AND RECOMMENDATION

All societies depend on biodiversity and genetic resources, and policy-makers are increasingly aware that development pressures are today generating unprecedented rates of biodiversity loss. For this reason, strategies are being developed on the topic of protecting both the genetic resources and biological diversity at national and international levels and courses of action are being prepared. In Turkey, the public institutions responsible for the application of laws and legislations towards the protection and sustainable use of natural resources are Ministry of Forestry and Water Affairs as well as Ministry of Food, Agriculture and Livestock. The protection of plant genetic resources (both ex situ and in situ, in place and on farmer conditions) is made by Ministry of Food, Agriculture and Livestock. The national program of Ministry of Food, Agriculture and Livestock for the Protection of Genetic Resources of Plants involves many research areas related to the protection of available plant diversity and habitats and agricultural ecosystems of these plants. Within the frame of this program, research institutes of Ministry of Food, Agriculture and Livestock builds national cooperation with institutions like formal universities including NGOs. With this program, Turkey has become member of various plant and region networks.

Turkey has also international responsibilities for the protection of biological diversity and genetic resources. Turkey has also signed many agreements, contracts and protocols about the protection, alteration and commerce of natural and biological resources. Plant genetic resources which are the most important ones of biological diversity elements are mainly protected with ex situ and in situ strategies. The seed samples collected in gene banks of seed which are placed inside the ex situ methods are protected as main (long term) and active (short and middle term) collections while vegetative material is protected in field gene banks formed in various institute lands. In recent years, infrastructure is being constructed to start the works of protection under ultra cold conditions in our country. 3.749.673 hectares of land in total is under protection via *In situ* methods (Karagoz et al, 2010).

Researches and programs are being implemented in order to implement *in situ* and *ex situ* protection methods in the protection of available gene resources. The works carried out in the topic of *in situ* have started in Turkey in recent times which has sufficient infrastructure about *Ex situ* protection. The project of "In Situ Protection of Genetic Diversity" which is one of the

most important works about *In situ* protection started in 1993 and lasted for 5 years. At the end of the project, 6 areas for 5 wild relatives of wheat were selected as "Area of Gene Protection and Management" in the fields of Ceylanpınar Agricultural Enterprise (Karagoz, 1998).

Wheat is a staple food crop all over the world and is the most widely grown crop in the world and Turkey. Wheat is produced in almost every part of the Turkey. During the last 35 years wheat production in Turkey steadily increased, reaching about 21 million tons/year out of 9 million ha (the seventh largest area in the world). Unfortunately, the production area of wheat landraces is decreasing day by day. Wheat landraces have been largely displaced by high-yielding cultivars in Turkey as like many developing countries. Jaradat (2012) stated that wheat landraces are rarely cultivated in developed countries because of their low yield potential and susceptibility to diseases when compared with high-yielding cultivars under high external input farming systems. However, landraces and old cultivars out-yield, and have better quality attributes than, high-yielding cultivars under organic and low-input farming systems. Agronomic and socio-economic studies indicated that farmers' selection for desirable agronomic and quality traits is a major force shaping the dynamics of wheat landrace populations; therefore, sustained on-farm conservation and sustainable utilization of these landraces will ensure their continued evolution and contribution to sustainable local food systems (Jaradat, 2012).

The numbers and working areas of NGOs related to the protection of live natural resources in Turkey have been increasing day by day. But, the point where the works have reached is well below the desired level because of especially insufficiency of fiscal resource. The following associations and foundations help about the issues of participation of the public to the works of protection of nature, arrange education works and even create income generating activities by changing their works into rural tourism activities: Association For Protection of Turkey's Nature, Association For Protecting Natural Life, The Turkish Foundation For Combating Erosion and Reforestation, Research Association For Rural Environment and Forestation Problems, Wheat Association, World Wildlife Fund, Slow Food and other NGOs. At the moment, the NGOs have also big share on increasing of public awareness about the importance of genetic resources and they are encouraging the farmers on providing their mainteinace of landraces (traditional varieties) in their own farms (*in situ* conservation).

Works related to in situ protection of local varieties are new in our country and not much advancement has been had. A leading work about this topic was conducted with the purpose

of determining precautions related to the situation of important local varieties in the north passage region of our country and protection of these varieties. As a result of this work, in summary, the mattes below are stated to be provided via in situ protection works of local varieties under farmer conditions (Tan, 2002):

a. Determining the local varieties grown by farmers and understanding their ecological, socio-economic situations;
b. Determining the main factors effecting the decision of still planting the local varieties by the farmers and therefore their storage;
c. Detecting the direction and dimension of effectiveness of farmer decisions effecting the variation in local variety populations in time;
d. Looking for the ways to help the use of local varieties or village varieties, by this way, market opportunities for farmers are created and new varieties are developed in the direction of the wishes of farmers by use of local varieties, thus, the opportunity to enter the locale via these varieties can be created.

The importance of interdisciplinary research on biodiversity in both traditional and modern agro-ecosystems should be recognized as a prerequisite for the development of more effective agro-biodiversity conservation regimes (Bawa et al. 2004; Jackson et al, 2005). The necessity that the protection cannot stay only as realization of legislation and project and the integration of it with all national policies and sectoral approaches is a known phenomenon. It is essential to understand that the protection of biological diversity is synonymous with the protection of vital resources of the country.

The farmers, who play an important role in the protection of traditional varieties, even though they cannot trade for local varieties, can share these varieties via informal seed exchange. Legal arrangements related to "The Record of Plant Genetic Resources" are being made based on the 5553 numbered law and the "Regulation of Record of Plant Varieties". These arrangements will even entitle the farmers to record their local varieties (Tan, 2010). Under the new law, farmers will be able to continue to save seeds for their own use and to exchange with other farmers without having to register them. But the trade of not registered varieties as a seed has been forbidden. Against this regulation, the big reaction, especially by the NGOs has been occured. The new regulation must be introduced and explained to public on why we need like this arrangement in Turkey. It must be know that this regulation don't hinder and limit the production and trade of traditional varieties. Moreover, the new law prevents the uncontrolled movement of plant seeds. Uncontrolled, undefined and unrecorded seeds (the landraces aren't uniform seeds, they may consist of one more varieties) can't be

merchandised as a seed. But if the landraces are defined and recorded by especially MFAL and if the new regulations are done for traditional varieties and farmer's right, the concern of the NGO's and farmers will have been reassured.

In the protection of traditional varieties and enabling sustainability, prior to making a policy, descriptive researches are important about the issues of in which enterprises and where are the local varieties produced. The socio-economic structure of the farmers is an important factor in the protection and production of local varieties involved in *In situ* conservation works under farmer conditions. If it is thought that these varieties are, in our day, grown by the producers, dealing with subsistence agriculture, rather far from the main centers, in a tough geography, it is apparent that the policies to be made should be the ones towards specific areas rather than general policies.

Some of the most genetically diverse plant populations of potentially great value to global society are grown by some of the poorest human populations in the world. As long as farmers themselves find it in their own best interests to grow these populations, both farmers and society will benefit at no extra cost to anyone. But to what extent do farmers have an "incentive" to keep growing them? When we refer to farmers' "incentives" to grow crop populations, we mean the extent to which these populations provide the traits that satisfy farmers' objectives, as they define them. Since most small farmers produce food crops for their own consumption, these traits often include not only agronomic characteristics such as tolerance of biotic and abiotic stress, but also some consumption characteristics – such as their suitability for the preparation of special dishes that are "valued" in local communities. When markets are not well developed, the value of varieties is directly related to the extent to which they meet the needs of farm households. Even when markets develop, there may still be a number of attributes over which farmers define their needs that cannot be obtained through the market. In many areas of the world, markets are imperfect (Jarvis et al., 2000). In that situation, to conserve genetic resources and provide the maintainance of them, we firstly create "market (niche markets can be an example)" for them and after that encourage the wheat landrace farmers to market access. The situation of not fully completion of financial potential of these varieties has effects on the staying of local varieties on a condition of subsistence production. According to the Millennium Ecosystem Assesment (2005), encouraging market based mechanisms is necessary to conserve biodiversity. The idea is that market creation can help increase the opportunity cost to local land users of agricultural practices that negatively affect agro-biodiversity. Markets can take different forms. Firms and NGOs can already purchase land use rights, such as logging in forested regions, and then

decide not to extract wood but to conserve the land for its biodiversity. (Pascual and Perrings, 2005). Besides, the creation of local product markets the examples of which are available in some regions of Turkey, supporting these markets, supporting the productions in the relation of local product – organic product, enlivening and supporting gastronomy tourism and rural tourism based on local products will be effective means in creating market for local products. Moreover, local products having specific features arising from a specific region in Turkey, or in some situations from the country, as well as geographical indication (GI) can be put under protection. This system can be used as an important media in the protection of both biological diversity and the genetic resources. Regarding sustainability, GI may promote biodiversity conservation directly through the use of a specific genetic resource, or indirectly through production and management practices that include landscape and ecosystem considerations. Globalization of food trade impacts the everyday decisions of farmers worldwide because agroindustrial generic products have increasing access to local and regional markets. Attempts by farmers, usually supported by public policies, to compete with generic products may change local agricultural practices and genetic resource use. If market success is a key component of the sustainability of small farmer livelihoods and the conservation of the diverse genetic resources they use, then GIs and informative labeling offer the possibility of commercializing production with a differentiated identity, avoiding the type of competition that is based on volume, low prices and marketing (Kan, 2012; Guerra, 2010).

To conserve local wheat types in the natural environment and to leave them as heritage for future generations, Ministry of Food, Agriculture and Livestock should support the farmers planting local wheat for the protection of genetic resources as well as for livestock farmers. In the study by Küçükçongar & et. all. (2004) in the province of Aksaray, it was determined that local wheat (Akbuğday) planting farmers were earning 659.20 TL ($467.50) less revenue per hectare compared to commercial wheat growing farmers. Local wheat farmers are needed to be subsidized $ 500 per hectare when considered this situation.

As a result of the work of wheat landrace carried out in Turkey in the years of 2009-2014, it was tried to be put forward that why the producers continue the production of types of wheat landrace, what kind of factors may be effective in the production of these types in the future and what kind of precautions should be taken for in situ protection of these types. As a result of the work, SWOT analysis related to the types of wheat landrace was presented in Table7.1.

Table 7.1 SWOT Analysis of Wheat Landraces in Turkey.

Strenghts	**Weakness**
➢ High adaption ability to extreme conditions (Drough, Cold, etc.) (Meng et all., 1998; Williams 1989; Jarvis et all. 2000; Bardsley and Thomas, 2005, Jaradat, 2012) ➢ Greater adaptabilityto a range of soil types (Bellon and Taylor 1993) ➢ High bulgur quality for durum wheat landraces (Aktan and Zencirci, 1995), high flour yield for bread wheat landraces (USDA-ARS, 2013) ➢ Distinctive flavor (Bardsley and Thomas, 2005 ➢ High straw yield (Bardsley and Thomas, 2005; USDA-ARS, 2013) ➢ High straw quality (Bardsley and Thomas, 2005; USDA-ARS, 2013) ➢ Almost all documentation is available in wheat landraces. ➢ They have intrinsic charecters and special genes (Williams1989, Masood et all, 2005)	➢ Low yield feature (Ehdaie et all. 1988; Blum et all. 1989) ➢ Wheat landraces are generally sustain to logging because of high height of them ➢ Wheat landraces are generally sold in market at low price ➢ Local products do not have a regular market (Jarvis and et all., 2000) ➢ Not because the farmers want to produce wheat landraces but they produce wheat landraces because of habitats coming from the old or the lack of something else to do. ➢ Lack of information on wheat landraces and their products ➢ Lack of coordination between NGO, public and private sector
Oppurtinities	**Threatens**
➢ The growing interest in national and international level to the local varieties ➢ Increase in the number of local markets ➢ Response to the growing of GMO products ➢ The presence of consumers linking local products with organic and healthy products, ➢ The Government's promotions and supports to conserve genetic resources ➢ Increase in the number of NGO's involved in promotion and conservation of local products ➢ They have intrinsic charecters and special genes. They are giving oppurtinity for breeding studies (Cecceralli, 1994; Harlan,1995)The existence of the necessary legal basis ➢ Local products can be a tool for alleviating poverty in underdeveloped areas, if its income generation side is made out.	➢ Improved varieties getting infused to farming system every passing day. These leads to genetic erosion and extinction of local varieties by replaced with local varieties ➢ Farmers are forced to comply with capitalist marketsystems to continue their existence and make living by agriculture. ➢ It is hard to support the all farmers in side of financial by the goverment to conserve genetic resources within *in situ* concept.

Wheat landraces are better adapted than modern cultivars to changing climate conditions and to stress environments due to their population genetic structure, buffering capacity, and a combination of morpho-physiological traits conferring adaptability to stress environments (Jaradat, 2012). Their specific features should be evaluated in every area, especially as breeding material to get better varieties. But it doesn't mean that we should replace them with modern varieties. The oppurtinities (Table 7.1) can be used as valuation tools and they can be leverage in terms of economic development for rural remote areas.

6.4. References

Aktan B., Zencirci N. (1995). A report on durum wheat quality in Turkey. In : Di Fonzo N. (ed.), Kaan F. (ed.), Nachit M. (ed.). Durum wheat quality in the Mediterranean region . Zaragoza : CIHEAM, 1995. p.123-125 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 22

Bardsley, D. and Thomas, I., (2005). Valuing local wheat landraces for agrobiodiversity conservation in Northeast Turkey Agriculture, Ecosystems and Environment 106 (2005) 407–412

Bawa, K.S., Kress, W.J., Nadkarni, N.M., Lele, S., Raven, P.H., Janzen, D.H. et al., (2004). Tropical ecosystems into the 21st century. Science, 306, 227–228.

Bellon, M. R., and Taylor. J. E. (1993). "'Folk' Soil Taxonomy and the Partial Adoption of New Seed Varieties." Economic Development and Cultural Change 41: 764-786.

Blum, A., Golan, G., Mayer, J., Sinmena, B., Shpiler L., and Burra. J., (1989). The drought response of landraces of wheat from the northern Negev desert in Israel. Euphytica, 43: 87-96.

Ceccarelli, S., (1994). Specific adaptation and breeding for marginal conditions. Euphytica 77, 205–219.

Ehdaie, B., J.G. Waines and A.E. Hall. 1988. Differential responses of landrace and improved spring wheat genotypes to stress environments. Crop Sci., 28: 838-842.

Guerra, J.L., (2010). Geographical Indications, in Situ Conservation and Traditional Knowledge. ICTSD Project on Genetic Resources, ICTSD Policy Brief Number 3, November 2010.

Harlan, J.R., (1995). The Living Fields: Our Agricultural Heritage. Cambridge University Press, Cambridge

Jackson, L., Bawa, K., Pascual, U., and Perrings, C. (2005). AgroBIODIVERSITY: A new science agenda for biodiversity in support of sustainable agroecosystems. DIVERSITAS report. N. 4. 40 pp.

Jaradat, A.A., (2012). Wheat Landraces: Genetic Resources for Sustenance and Sustainability. USDA-ARS, 803 Iowa Ave., Morris, MN 56267 USA. http://www.ars.usda.gov/SP2UserFiles/Place/36450000/products-wheat/AAJ-Wheat%20Landraces.pdf

Jarvis, D.I., Myer, L., Klemick, H., Guarino, L., Smale, M., Brown, A.H.D., Sadiki, M., Sthapit B., and Hodgkin. T., (2000). A Training Guide for In Situ Conservation On-farm. Version 1. International Plant Genetic Resources Institute, Rome, Italy

Kan, M., (2012). Usage of Geographical Indication In Local Economical Development And Its Impact: A Case Study On Aksehir Cherry. Ph.D. Thesis, Ankara University, Graduate School of Natural and Applied Sciences, Department of Agricultural Economics, Ankara, Turkey.

Karagöz, A. (1998). In situ Conservation of Plant Genetic Resources in Ceylanpınar State Farm. in: International Symposium on In situ Conservation of Plant Genetic Diversity. Eds. N. Zencirci, Z. Kaya, Y. Anikster and W. T. Adams. Central Research Inst. for Field Crops. 87-91.

Karagöz, A., Zencirci, N., Tan, A., Taşkın, T., Köksel, H., Sürek, M., Toker, M. ve Özbek, K., (2010). Bitki Genetik Kaynaklarının Korunması ve Kullanımı. Türkiye Ziraat Mühendisligi VII. Teknik Kongresi, Ankara.

Küçükçongar, M., Cevher, C., Kan, M., Kan, A., Taner, S., Hekimhan, H., Arısoy, Z., Taner, A., Kaya, Y., Karabak, S., Atalay, A., Bolat, N., Çekiç, C., Atmaca, E., Avcıoğlu, R. (2006). Determination of Tecnologies on Wheat Production in Central Anatolia of Turkey, TAGEM Project, Project Number: TAGEM/TA/04/03/01/007, KONYA.

Masood, M.S., Javaid, A., Rabbani, M.A., and Anwar, R., (2005). Phenotypic Diversity and Trait Association in Bread Wheat (Triticum Aestıvum L.) Landraces from Baluchistan, Pakistan, Plant Genetic Resources Program, NARC, Islamabad, Pakistan, Pak. J. Bot., 37(4): 949-957, 2005.

Meng, E. C. H., Taylor, J. E. and Brush. S. B. (1998). "Implications for the Conservation of Wheat Landraces in Turkey from a Household Model of Varietal Choice." In M. Smale (ed.), Farmers, Gene Banks and Crop Breeding: Economics Analyses of

Diversity in Wheat, Maize, and Rice. Norwell, Massachusetts: Kluwer Academic Publishers, Inc., and CIMMYT.

Pascual, U., and Perrings, C., (2005). The Economics of Biodiversity Loss in Agricultural Landscapes

Tan, A., (2002). In Situ (On Farm) Conservation of Landraces From Transitional Zone in Turkey, Project No: TOGTAG-2347, TUBİTAK, İzmir.

Tan, A., (2010). Türkiye Gıda ve Tarim Bitki Genetik Kaynaklarinin Durumu, Gıda ve Tarım İçin Bitki Kaynaklarının Muhafazası ve Sürdürülebilir Kullanımına İlişkin Türkiye İkinci Ülke Raporu, Ege Tarımsal Araştırma Enstitüsü, Menemen, İzmir.

USDA-ARS, (2013). Landraces: Infra-specific Diversity & Adaptive Divergence, www.ars.usda.gov/...wheat/3-AAJ-WLR-1472011-Part3.pptx

Williams, P.H. (1989). Screeing for resistance to diseases. In: The use of Plant Genetic Resources. (Eds.): Brown, A.H.D., et al. Cambridge. U. K: Cambridge University Press.