Chapter 7
Total Economic Value of Wheat Landraces

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7.1 Introduction

Ecosystem, biodiversity, food and nutrition, economy, development, and the most important part of this integrity human are the basic rings of an inseparable chain. Each ring is an indispensable guarantee of the sustainability of another. Therefore, for the continuation of life, human beings have to make maximum use of biological diversity in a sustainable manner. Wheat, which has wider biological diversity, is the main food source of many societies. Wheat has not only a nutritional and economic value but also a cultural and social value. Approximately 10,000–11,000 years ago, it was cultivated in the Fertile Crescent and played a leading role in the transition to settled life. Thus, wheat has been seen as a product with a sacred value in all areas of human life such as history, culture, health, food, and economy from the depths of history to the present day. It is a strategic product that is seen as a source of power and guarantee of the future for many countries in the world. It can be said that food safety, which is a part of food security, gains importance on the basis of healthy and balanced nutrition in developing countries as well as in developed countries. People tend to benefit more from biodiversity and tend to local and natural products. This situation has begun to add increasing value to wild forms and local landraces. Wheat landraces are also an important source of gene and one of the rural mainstays. Stuck in local areas, identified with that region, and some are lost, the rest are at risk of

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disappearance. For the protection and sustainability of these populations, the benefit it provides to people must be made visible and maintained at an increasing level. From all these aspects, it is better understood the necessity of revealing its relationship with people and society in order to be able to recognize wheat landraces and provide sustainable maximum benefit. In order to examine a product, it is necessary to know very well the total economic value it provides to people in its journey from its historical past to today and the sociocultural value that brings the phenomenon of social objects to wheat landraces. In the process from the depths of history to the present, the journey that human and wheat landraces have carried out together with a social, cultural, and historical connection is very difficult to measure financially, although it is an economic value.

Landraces are produced, named, and preserved by manufacturers with traditional understanding to meet their social, economic, cultural, and environmental needs. In addition, they are referred to as landraces, farmer varieties, or people's village varieties (Jaradat 2011) in order to highlight the innovative role of these producer communities in their development and livelihoods. Due to the fact that the producers of wheat landraces are mostly subsistence family businesses living in rural areas, they have played an important but invisible role in rural development. They are a potential source of income in terms of both ecotourism, gastronomic tourism, and the evaluation of marginal areas. Local products have become an important tool for rural development, especially with the increasing popularity of the geographical indication system in recent years. The fact that the developed modern varieties (improved varieties) are on the market and the producers prefer higher productive products and landraces caused the local landraces to get stuck in local areas where they are compatible with the cultural structure. Rural development strategies must be determined by considering the socioeconomic and sociocultural structures of the producers living in these regions and producing local landraces and the social bond they establish with local landraces, because the policies to be carried out without knowing the human resources that carry out the activity and knowing the values will not be successful. Many socioeconomic, ethnobotanical, and archeobotanical researches have been carried out on wheat and wheat landraces. Combining these studies with the economic botanical concept in order to make an economic evaluation will guide us in determining the importance of these species and sustaining their production. There are different approaches and classifications on goods and services, which are the components of the "total economic value" provided by the species in the ecosystem. However, each class is known as the research subject of a different discipline. Although the economy gives the impression of a mathematical appearance, it is still a social science. Therefore, it requires a multidisciplinary understanding. There are very fine lines between the total economic value components, and they need to be analyzed with a multidisciplinary integrated approach that takes into account the differences between the components. Analysis of biodiversity and local landraces that have an important place in biodiversity concerns environmental and social sciences. Defining goods and services related to landraces requires examining ecosystem dynamics, human factor, economic activities, and the relationships between them. In the study, considering the relationship between

wheat and society, socioeconomic, ethnobotanical, and archeobotanical studies were examined, and the economic, social, cultural, and historical values of wheat landraces were discussed. All these values are indicators of the total economic value of wheat landraces. In terms of this value, the importance of the use of landraces as a rural development tool was emphasized. In this study, the direct use value, which is one of the total economic value components, was examined in detail.

7.2 Total Economic Value Approach for Valuation of Wheat Landraces

The concept of value in terms of economy is used as a measure to determine the necessity, importance, and value of something (Genç Yılmaz and Çağlayan 2017) and is one of the basic concepts of microeconomic analysis (Aydın and Aydınlar 2011). There are three value theories in economic discipline. It is the theory of labor-value, benefit-value, and cost of production. The labor-value theory argues that the value of an object depends only on the amount of labor spent on its production. The utility-value theory takes into account the marginal utility of the object. Production cost theory explains the value by considering the production factors used in the production of the product. Some economists use the value of market-oriented change. These theories often fail to explain the value of biodiversity. Alternative suggestions are given on the methods used in many of the conducted researches. The most important reason for this is the difficulties experienced in evaluating many services in monetary terms and the search for solutions. One of these difficulties in monetary value estimates is that current economic valuation procedures and methods are insufficient in measuring passive or unknown values (Nunes and van den Bergh 2001; Gowdy 1998; Gowdy and Salman 2010). Another is that the cost of loss cannot be adequately measured, and in addition there are benefits that are not noticed or yet unknown. A number of new methods have been developed to determine the monetary value of biodiversity, and this is mostly done at the cost of loss. It is also used frequently today. Monetary economic estimates provide us only a perspective. It may not reflect the true value of the product. Therefore, it is necessary to accept that it is much higher than the estimated value. It is possible to explain the production value, exchange value, or preference value of wheat landraces in monetary terms. However, it is difficult to determine the total economic value and express it in monetary terms, because wheat landraces have many social values such as relative, objective, abstract, concrete, religious, philosophical, historical, traditional, environmental belief. Social values: the object itself, which is a value, should be considered as the object's capacity to meet social needs, and the appreciation of people for its ability to satisfy (Fichter 1990). Although it is not possible to express all of these with money, it is not accepted as a correct approach. To what extent life-supporting functions of biodiversity can be subjected to economic valuation is an important ethical issue, but it is argued that it may not

be appropriate to subject spiritual values to economic valuation. It is more important to create a little idea and awareness by examining the quantitative and physical indicators of these values (Çelik 2010). Knowing the components that make up the economic value of all limited resources is also important for sustainable development (Karabak 2017). Wheat landraces are not just commodities that are subject to an economic activity. Although they are considered abstract, they are a social object and part of the ecosystem with their existence. In order to study economically, it is necessary to know the benefits it has achieved since the first day it was used for economic purposes and today. This brings together multiple research disciplines and interactions. While some usage value that constitutes the total economic value of wheat is common, some differences are seen when it is divided into local and commercial landraces. However, it is not always possible to explain these differences with very clear separations. It is possible to divide the total economic value into two as direct use and indirect use value (De Groot et al. 2002). These values are tried to be explained with examples below.

7.2.1 Direct Use Value (Directly Consumed or Available on the Market)

The direct use value is based on the fact that the goods are placed directly in the markets in line with supply and demand for a certain value. Benefits arising from the marketed goods, medicinal drugs that are produced or effective in their production, their contribution to the historical and cultural process, use as genetic resources, food and raw materials, production as agricultural products, benefits for tourism, and use for activities such as recreation can be shown as example for direct use value (Atasoy et al. 2014). This value of landraces should be examined under two subtitles "Production Function Value" and "Information Function Value."

7.2.1.1 Production Function Value

Commercial use value Although wheat landraces were widely cultivated in ancient times, some of these local landraces continue to be traditionally grown in marginal areas, generally mountain villages, rugged and barren lands, and small areas in Europe and Asia (Tan 2018; Cooper 2015; Kan et al. 2017). Since the production amounts are low, consumption primarily at home needs is aimed. After the producers meet their own needs as processed products or seeds, they trade the remaining amount. The producers use the seed they put aside and keep from the previous harvested crop. Seed change is mostly done by exchanging with other producers around. The sale of seeds started with the increase of market value of these landraces as processed products. Among the wheat landraces, emmer and einkorn, which are hulled wheat, are the most subject to trade. They are offered for sale

after making bread, bulgur, flour, and noodles, processed in general. However, the amount sold is quite low commercially. In studies conducted in Turkey, it has been determined that the wheat landraces producers still continue to produce them because they are suitable for their own taste, they are used in the production of local products, and also the straw and chaff of them are high and they are suitable for animal feed. The wheat landrace producers generally do not seek a market to sell them because they are producing generally for their home consumption (Özdemir et al. 2018; Yaman et al. 2019).

The increase in the interest in local landraces in recent years has created a demand for wheat landraces, but it is not possible to meet this demand in the current situation due to the limited production. The most important disadvantage of wheat landraces is that they are insufficient to meet the market demand compared to modern wheat varieties that are more subject to trade (Karabak et al. 2019). This also triggers the rise in product prices. The increase in demand and the fact that they started to get more shares in the trade causes increase in the number of actors and product prices in the value chain. The increase in product prices will have an advantage in terms of actors such as producers, processors, wholesalers/traders, retailers, and big market operators in the value chain of wheat landraces and will also have negative consequences for the consumer. The fact that there is more subject to trade may affect the amount of consumption even if it increases the usage value, but it may cause the low-income producer to be unable to purchase the product. Wheat landraces find more value than other commercial modern varieties processed in the market. Therefore, it is also an important source of income for the actors who trade in production and processed products and operate in the countryside. Considering the supply and demand situations, it can be said that their commercial use is lower compared to other modern commercial varieties.

Use value in human and animal nutrition as a food source Cereals have high levels of antioxidants (flavonoids, phenolic acid, phytic acid, tocopherols, and carotenoid) and nutritional fibers (Mpofu et al. 2006; Serpen et al. 2008; Zengin 2015). An important part of 4.5 billion people's protein needs and 20 percent of their energy needs in 94 developing countries in the world are met by wheat products. The main foodstuff of approximately 40 countries, which constitute 35% of the world's population, is wheat (Şanal 2018).).

Although the purpose of use of wheat landraces varies depending on the cultural differences, they are used in both human and animal nutrition. Businesses that produce these landraces prefer it as a cheap source of feed in the livestock feeding. The long stems of emmer and einkorn are also one of the reasons they are used as animal feed. Grains are also used in the feeding of poultry. The increased interest in organic products in human nutrition, functional food searches, and health concerns have increased the tendency to wheat landraces, which is rich in vitamins, minerals, and dietary fiber. Understanding the health benefits of high nutritional products has increased the demand for consumption of products made from whole grain and whole-wheat flour. The source of increased demand for wheat landraces is thought

to be findings that they have high protein, low allergic properties, and high antioxidant content (Şanal 2018). Many studies show that wheat landraces have higher protein content than other modern wheat varieties under the same growing technique conditions (Konvalina et al. 2013).

Considering the increasing demand for today's conditions and natural products, it has the feature of being a healthy and economical alternative in daily nutrition with its nourishment and naturalness (Yaman and Zencirci 2018).

Raw material value Wheat landraces are widely used in traditional bread making. At the same time, while bulgur, biscuits, flour, noodles, and beer are made from local landraces, their stems are also used for making reeds as baskets, hats, roofing materials, filling mattresses, mattresses, saddles, and harnesses (Peña-Chocarro et al. 2009a; Cooper 2015; Mann 2018; Karabak et al. 2019). Hulled wheats (Emmer, eincorn and spelt) can be named differently in different countries. Just as eincorn and emmer wheat are called "siyez" in Turkey. In Italy, it is known as "farro" (Karagöz 1996; Ertuğ 2004; Giuliani et al. 2009; Troccoli and Codianni 2005).

Today, bread making still continues in Switzerland, Italy, and Turkey. The bread called "pane di farro" in Italy is produced in some bakeries in local regions. The Siyez wheat in Turkey is used for making bulgur. Bulgur and flour are made by forging in traditional stone mills. It is planted especially in Kastamonu province in Turkey, İhsangazi district. There is also a bulgur factory in Seydiler district in Kastamonu. Different products such as flour and noodles are also produced in the factory (Karabak et al. 2019). Emmer is the raw material of Emmerbier at the Riedenburger ecological brewery in Bavaria, Germany (Cooper 2015).

Wheat landraces are considered as raw materials not only in food but also in different areas other than food in low-income areas. It was used as a cushion in Morocco (Peña-Chocarro et al. 2009b). It was also used in the construction of the roof of the houses in Morocco. It has been determined that the reason for the continuation of einkorn production in limited areas in the Chefchaouen region is still due to the low-income families continuing this practice in this region. It is preferred for roof construction because einkorn stalks are long, hard, and resistant to rain, and thatched roofs are hot in winter, cool in summer, and easily separable in case of fire. It has been documented that its stem and straw are also used to fill mattresses, cushions, saddles, and harnesses (Mann 2018). It was noted that einkorn was used in Hungary to make hats and tie vine branches and cornstalks (Gunda 1983) and also used in vine gardens in Romania.

Emmer is used to make "panchón" specific to the Aller region (Asturias) in Spain. Panchón is a pastry that is cooked slowly on the stove and consumed with milk and sugar (Peña-Chocarro and Zapata 1998; Borza 1945). Emmer flour is also used to produce a kind of porridge, pancakes, and pancake-like pastries that are traditionally consumed with milk (Peña-Chocarro 1996).

The disadvantage of other wheat landraces is that they are winnowed from their husks in the use of wheat landraces, which have mostly a husky structure. When wet, it easily separates from its husks. However, performing this process in modern facilities may reduce the use of labor.

Use value in traditional medicine The oldest information about the medicinal uses of plants in history comes from the history of China, Egypt, and Greece. Use value in traditional medicine: It is known that some drugs were produced and exported in Anatolia during the Hittites period (Sarı et al. 2006). People who live in rural areas and have difficulties in accessing modern medicine use the landraces that exist in their environment in the treatment of simple diseases. This tradition, which has been going on for centuries, continues in many countries of the world. Hittite tablets show that wheat was used for the treatment of diseases, medicine and magic. Ertuğ (2014) stated that in a pharmacological text, among the 33 plants that are understood to be prepared as porridge in a container with many types of bread and wine with red wheat as well. Today, no specific ethnobotanical study for the use of wheat landraces in traditional medicine has been encountered. In some publications, ıt was indicated that they were used for the treatment of a number of diseases, e.g., sore throat, boils, hemorrhoids, inflammations, digestive system diseases, ulcers, diarrhea, hoarseness, itching, hardness, callus, and cough. They are also used as wheat grain, stalk, wheat oil, and wheatgrass (Özdemir and Alpınar 2015; Korkmaz and Karakurt 2015).

Medical resource value Whole-wheat products are very rich in many important components such as dietary fiber, starch, fat, minerals, vitamins, and phytochemicals (Johnson and Gary 2003; Sidhu et al. 2007; Mpofu et al. 2006; Serpen et al. 2008; Lachman et al. 2011). It is known that cereals have cholesterol-lowering effect, reduce the effect caused by obesity because of their low glycemic index and satiety, and significantly reduce the effect caused by some types of cancer, cardiovascular diseases, diabetes, Alzheimer's disease, and cataracts when consumed together with fruits and vegetables (Slavin 2004; Mpofu et al. 2006; Serpen et al. 2008; Brouns et al. 2013; Yaman and Zencirci 2018). Natural antioxidants replace the radicals in oxidation reactions and prevent chain oxidation reactions that may occur by being oxidized themselves (Velioglu et al. 1998; Sidhu et al. 2007). It is seen that the wheat landraces have more nutritional value as a medical resource because they have richer components than other modern varieties. In a study conducted in Catalonia region of Spain, it was mentioned that the bread wheat is used as an antiseptic and infection reliever in animals (Bonet and Vallès 2007).

Use value in biotechnology Plant biotechnology enables further evaluation of genetic resources with molecular studies.

- Freezing and storing DNA in laboratory conditions in order to protect genetic resources and maintain their continuity.
- Molecular-assisted studies in addition to classical methods to identify genetic resources through modernized biotechnological methods (molecular marker-assisted selection (MAS), use of marker techniques, tissue culture studies, gene cloning and gene transfer techniques, and provision of transgenic lines).
- Creation of clone lines and their cultivation and development in order to increase the genetic resources.

- It can be expressed as developing the local and wild genetic resources with new in vitro studies as well as classical breeding methods due to their high allelic richness (İlhan 2017).

Using plant gene resources and gene pools is of critical importance for sustaining genetic diversity in plants for generations. For this purpose, they should be identified and put under protection in their geographies. Wild, local, and modern forms that are cultivated in terms of various features of the plant genetic resources developed to adapt to different climatic conditions are known as very valuable gene resources in order to sustain the rich genetic heritage (Jarvis and Hodgkin 1998; Maxted et al. 2000). Therefore, it is very important to preserve the gene structures of these genetic resources by protecting them through various new methods.

New clones and generations are created by using many new biotechnological methods such as tissue and cell culture, gene transfer, molecular marker-assisted selection (MAS), quantitative character locus (QTL) mapping, etc. in increasing yield and quality, obtaining lines that are resistant to various diseases or environmental pathogens, and providing the desired characters (İlhan 2017).

The local landraces have, until recently, been a dynamic and essential component of general agricultural biological landraces, which can be used almost exclusively in scientific breeding programs, and are considered to be the source of features that can increase the productivity of new crops (Jaradat 2013). It is mentioned that the genetic diversity has reduced in culture landraces of wheat, and this is mainly the result of selection processes in modern breeding programs (Cavanagh et al. 2013; Demir 2015). Although some of the desired features of selection processes come to the fore, it is thought that wheat, which is the focus of these breeding studies, increases its susceptibility to new diseases, pests, and adverse environmental conditions (Karcıcıo 2006; Demir 2015). Also, it is not possible to determine biotic and abiotic stress conditions by classical breeding methods since resistance to them is controlled by more than one gene. Therefore, use of the modern biotechnological methods in breeding comes to the fore. Among these, genetic engineering is a method with the highest level of hope and debate. However, genetic engineering techniques will only provide great convenience to plant breeders for the development of high-quality and productive new landraces resistant to environmental conditions, such as diseases and pests, drought, and salinity, with improved plant nutrient contents when used in conjunction with other molecular breeding methods (Çetiner 2005).

Local landraces are arguably seen as a key component in sustaining a safer food supply as they can increase productivity and make a much larger contribution in agricultural biodiversity (Jaradat 2013).

Determination of genetic diversity and population genetic structures in plants is very important for their more efficient use. The molecular markers are widely used for both breeding studies and identification and preservation of endangered species. However, plants are affected by environmental conditions and can show variations in both hereditary and non-hereditary forms even if molecular markers are not affected by environmental conditions. Therefore, knowing how much of the genetic

diversity shown by populations is in the genotype of the plant and how much due to environmental factors will be effective in conducting correct studies (Demir 2015).

Genetic resources value The genetic resources of plants can be classified as wild species, close relative species, local landraces and improved materials, and commercial or modern varieties (improved varieties). Local landraces have a broad genetic basis (Özberk et al. 2016) and are locally acquired populations that people have bred themselves by natural selection before the development of modern varieties (improved varieties). Local landraces, which are seen as an important source of gene, are only present in some farms and gene banks in limited areas. The characteristic features that clearly reveal the importance of local landraces as genetic resources are that they have characteristics of different geographies, reflect the characteristics of different ecological environments, have a high level of allelic richness, enable development of new landraces with agricultural activities, and most importantly, preserve the rich genetic features that they have since the past (İlhan 2017).

They play a key role in combating major challenges such as use of plant genetic resources in agriculture, food safety, climate change, limited use of water, and periodic long-term drought, salinity, and desertification (Tan 2010).

In the evolutionary development process, many local landraces, which have different genetic structures and are especially suitable for arid and semiarid conditions, have emerged. The local landraces that continued to be produced until the 1950s were replaced by the cultivated landraces developed by breeding. As of the last century, 75% of genetic diversity, including the Fertile Crescent, has been lost (Harlan 1975; Jaradat 1992; Brown 2000; Jaradat 2013; Özberk 2018).

Genes that show allelic variation against the global warming threat can be transferred from local landraces back to modern varieties. In breeding, wheat landraces have the opportunity to be used more in development of drought resistance, tolerance to diseases, adaptation to low input environments, and cultivation of modern varieties (improved varieties) through hybridization (Srivastava and Damania 1989; Kyzeridis et al. 1995; Zaharieva et al. 2010; Talas et al. 2011; Özberk 2018).

7.2.1.2 Information Function Value (Values Without Direct Consumption)

Scientific and educational use value Wheat is a subject of very wide and diverse disciplines. It is extensively used in natural, social, and applied sciences both in scientific research and educational applications. We can see that there is a subject of scientific work in biology, physics, chemistry, mathematics, statistics, medicine, sociology, history, archeology, economics, geography, psychology, and anthropology, and even political sciences and sub-disciplines in these disciplines. In this respect, it can be said that wheat has a common scientific value without classifying it as wild, local landraces, and modern varieties. However, wheat landraces are the subject of study for more branches than the modern varieties. They are evaluated in a much wider range for historical, social, and biodiversity.

Cultural and historical value Sociocultural relations can be defined as beliefs, ceremonies, traditions, habits, and rules, which are formed by the interaction of people in a community, and the relations that arise with the effect of this structure on people's life. We can see the effects of traditional sociocultural values in our personal values and behavior, because the values that we learn, internalize and give various meanings, affect the behaviors of people.

People determine, produce, and meet their needs according to their economic status in line with their psychological, social, traditional, and cultural thoughts. When analyzing the history of local landraces, we seek answers to questions such as "what stages has it passed from past to present," "what are its social and economic contributions," "what is its cultural value and how can it be sustained in the future," and "can it be used as a tool for rural development?".

Wheat landraces constitute the history of agriculture and have a very old history. They appear as traditions in the areas where they are grown, and these traditions characterize the rural life in areas where wheat landraces are grown.

In order to understand the cultural value of wheat landraces, it would be a correct approach to firstly examine its historical past. Archaeological, archeobotanical, ethnobotanical, and ethnographic researches on wheat can give us this information. The information provided also allows us to generate ideas about the transition from hunting and gathering to settled life, the start of food production in line with the needs, and determining how it has been shaped up to now and what can be done next. Some research results on this subject have been used in order to give an idea about cultural and historical value.

Wheat and human have 10,500 years of history and culture cooperation. In the researches, it is reported that the Neolithic age is important for humanity, and agriculture was initiated by people living in the Mediterranean settlement called Fertile Crescent (Vavilov 1926; Braidwood and Braidwood 1950; Heun et al. 1997; Diamond 2002). Genetic studies show that these wheat landraces are found in Turkey's southeastern part, Karacadağ (Kimber and Sears 1983), and they have spread to the world from here. Einkorn (*Triticum monococcum* ssp. *monococcum*) and emmer (*Triticum dicoccon*) are wheat landraces that have been cultivated in the early period and einkorn cultivated form of wild wheat species from *Triticum boeoticum*. The journey of bread wheat, which started from Anatolia to Greece 8000 years ago, has reached the Central Europe (mainly Italy and France), Scandinavia, England, Central Asia, China, Iran, Egypt, Africa, Mexico, Spain, and Australia (Keser 2018).

While the wild landraces were collected from the nature and consumed as food in ancient times, they were later cultivated and produced. It is thought that the first criterion for wheat cultivation is to be suitable for making bread (Hammer and Perrino 1984; Salamini et al. 2002). Communities engaged in hunting and gathering have been replaced by communities that settle and produce. It is said that the first villages in which the people were engaged in agriculture were in Southeast Anatolia and Northern Syria, and (Nesbitt and Samuel 1996) Abu Hurairah in Syria, and

archaeological sites such as Cafer Höyük, Çayönü, and Nevali Çöri in Turkey are among the first agricultural villages.

The beginning of agriculture is considered as a key to the human history, and this historical journey of local landraces also sheds light on the journey of human history. Human history is a sociological process. This process has turned into a socioeconomic process with the introduction of the economy over time and has become our current values by integrating with the sociocultural structure.

The first foundations of food supply have been laid in the process that has survived with the start of agriculture, and the adventure of plants has now been linked to the adventure of people who have started to apply their own laws (Pelt et al. 2002). Transition to food production in 8500 BC and effective use of scarce resources, which constitute the main subject of economic science, against unlimited needs, have constituted the first behaviors. When we examine the historical process of wheat landraces, we can say that no consumption behavior is independent from each other and the factors that shape the point of view of today's consumption arise from the behavioral patterns that have emerged in the past (Özüşen and Yıldız 2012).

Grain stocks, pots, and wheat forging containers found in the excavations in Çatalhöyük provide very important information from that period. In particular, it is stated that the grain stocks provide cultural data as the largest, richest, and best stored among those discovered (Özüşen and Yıldız 2012). Wheat residues found have shown that contain hexaploid wheat that is similar to the contemporary hexaploid wheat landraces including both hulled (*T. aestivum*) and unhulled (*T. spelta*) wheat. Unlike the grain-based Neolithic food systems in some parts of the world, bread is claimed to be a feature of the cultural traditions of the Neolithic people in the Near East (Haaland 2007; Fuller and Rowlands 2011). The social importance of bread as a cultural food item has contributed to the importance of grain consumption and is thought to be one of the factors that supports cultivation.

Different disciplined researches show us that cereals and the products produced from these, especially bread, have an important place in Anatolian, Hittite, Ancient Greek, Roman, and Egyptian nutrition culture. One of the cultural elements is the eating habits. Social, economic, and health are the factors that determine eating habits. These habits have continued as a traditional process for many years but have entered into an important change process due to sociocultural environment and economic reasons. The consumption habits of wheat landraces are also tucked in local areas. But the desire to eat healthy has begun to increase the popularity of wheat landraces.

Many products that have an important economic value in the world have actually reached this level due to their traditional sociocultural importance, and it is their social and cultural values that brought them the economic power. The fact that many wheat landraces are limited in certain areas, depending on not only the needs but also the traditional sociocultural environment, and that, although the consumption patterns differ, it is called with traditional names proves this. Traditional sociocultural factors have a determining feature in the process from the production of local landraces to their consumption. Although the demand for local landraces has

increased today, we can also see that the planting areas have not spread far beyond the areas where they have been grown for many years.

Aesthetic value All living things in nature have a physical appeal and beauty. Aesthetic values refer to the value every person gives this beauty through his/her eyes. Wheat ear is an indicator of elegance not only for people living in rural areas but also for everybody. This is evidenced by the aesthetic value turned into art.

Artistic and spiritual value Ears of wheat symbolize flexibility and harmony in the symbol language. The common feature of wheat in societies with different beliefs and cultural structures is that it is considered sacred. This meaning that people place on wheat has turned into rituals and reflected on art.

With the symbolizing ability of humans, they unconsciously transform objects and forms into symbols. They place psychological significance on these symbols and expose them both within belief and visual arts (Jung 2009). Wheat has also become a universal symbol and it represents fertility, productivity, seed, and rebirth in many cultures. For example, it is said that the blonde girl who holds a wheat spike in her right hand and a torch in her left hand is the goddess of harvest and fertility in Greek mythology (Çakır 2019). Since wheat has a dominant role in the Roman Empire, the nation was then called the "Wheat Empire." It is mentioned that one of the three products that are important for Pharaoh in Egypt is emmer (*Triticum dicoccon*) and bread made from it (Mayerson 2002).

In Hattuşaş, the capital of the Hittites, who established the oldest and first empire in Anatolia, near Çorum, wheat silos with a capacity of 4200–5900 tons dating to the thirteenth century BC were found (Seeher 2001). Ivriz Rock Relief near the Hittites, Konya, indicates the social and religious importance of wheat. The grain silos and the wheat remains (Balkan 1964) found near the Urartu temple and palace dating back to the 800–700s show that similar traditions have continued in Anatolia for thousands of years (Zengin 2015). It is the symbol of fertility in Mesopotamia.

Art is the expression of aesthetic and spiritual feelings with different tools. This can be exampled as using wheat motifs in traditional arts, handicrafts and embroidery, stone and metalwork, and ceramics (Tan 2018; Sezgin Ceyhun and Bülbül 2017) and its being an inspiration for folklore, poetry, literature, idioms, proverbs, and folk songs.

Recreation and tourism (ecotourism and gastronomy tourism) value Wheat landraces, such as emmer and einkorn, which are considered as cultural heritages today, are still produced by traditional methods. Products such as bread, flour, bulgur, noodles, tarhana, beer, biscuits, basket, hat, and saddle produced from these wheats are important opportunities for tourism.

In our developing world, the consumption of traditional and cultural values along with consumption habits has created a trigger force for gastronomy tourism. Sociocultural interaction and orientation to the natural products and the fact that wheat landraces have a unique taste increases the interest in local products and dishes produced from the wheat. It is known that wheat landraces have touristic

attraction with its historical and traditional aspects. Only these elements are needed to be enriched with art and food, to increase the product range for demand and to be used as a tool for developing regional tourism. Wheat landraces are of a great potential for tourism policies aiming to protect the cultural heritage and values of local people. Thus, they can be used as tools for local development (Kan et al. 2016a, b).

7.2.2 Indirect Use Value

7.2.2.1 The Value of Service in Functioning, Order, and Protection of the Ecosystem

Since the wheat landraces adapt to harsh conditions by cultivation areas, their production can be grown as close to natural, naturally or organically. Use of weed, pesticides, and fertilizer is very low. Therefore, habitat and regulatory service value can be increased more than the modern wheat varieties. There are two methods in biodiversity and conservation. These are in gene banks (ex situ) and in the hands of the producers (in situ). Producers are considered more important in the preservation of wheat landraces, because they have brought them together with the traditional structure until today. Their indirect use values with their assets and services to the habitat and the environment are given below:

- Habitat value: Shelter function value
- Biodiversity value
- Protection value

- Regulatory service value: Contributions to the regulation of atmospheric gases
- Contribution to the climate regulation
- Contribution to the food chain
- Contribution to water supply and conservation of resources
- Contribution to soil formation
- Contribution to erosion prevention
- Contribution to biological control
- Contribution to pollination

Preference usage value It expresses the value that it gave up as a result of preferring wheat landraces. Choosing wheat landraces means giving up a modern variety with the same usage value. The value we lose turns into opportunity cost.

7.3 Out-of-Use Value

Heritage value It is the value of payment willingness to protect for future generations to use. Producers show great sacrifice in protecting wheat landraces. There is also a willingness to protect behind this behavior. The value here is how much more

you can sacrifice to continue your protection. The losses it will experience and the extra expenses it will make constitute the inheritance value.

Existence value Every creature has a value from its existence. Even if they do not offer any service or benefit, all living things have value with their own existence. It is a difficult value to explain in monetary terms.

In order to ensure the sustainable use of wheat landraces, it is necessary to create awareness in order to transfer these values not only to people who research, produce, and consume but to all people. It should not be forgotten that awareness is the most important solution to maintain some habits in humans or to give up some behavior. Sustainable use of biodiversity depends on the benefits that people receive from it and the value it generates from its perspective. Economic value is not just a commercial value. It contains the benefits of all services and benefits in it. Although wheat landraces are evaluated with their price, it should be considered that they are a social object and add more economic value to them. Awareness is a key to be included in all plans and policies. The appropriateness of the economic plans to be made at local, national, and global levels to the social and economic structure is the trigger of awareness. Awareness can be raised if wheat landraces are included in health, education, and local development plans and in all environmental policies.

7.4 Use of Wheat Landraces as a Rural Development Tool

The aim of rural development is to provide sustainable, economic, social, cultural, and political development of rural residents. Rural areas could not achieve the targeted development as a result of supporting economic development approaches and developments in modernization in agriculture (Ellis and Biggs 2001) and experienced significant economic, social, and physical changes (Kan et al. 2020). It has shown itself especially in developing countries. Political revenue-oriented policies have caused rural people to lose their cultural values after a while and try to survive. The orientation has started from the producing societies and continued in consuming societies, while the agricultural production sector was predominantly in rural areas, the service sector came to the fore. With this change, besides rural areas, agriculture, and forestry, other economic activities such as tourism, small-scale industry, and handicrafts have started to develop. Thus, the need for different sectors and the need for physical change in rural areas have been opened to discussion (Davoudi and Stead 2003; Costis 2003; Noronha Vaz et al. 2006; OECD 2006; Yenigül 2017; Kan et al. 2020).

As the world changes, people and their needs change, and people's behaviors change to reach these needs. Communities living and producing in rural areas should also meet their needs arising from this change. Shifting agriculture-based industry to these areas instead of moving away from agriculture will surely create a pressure on nature. On the other hand, the most important issue to be emphasized is

to prepare a living space where the sector that produces it can be developed on-site, where they can meet their needs in their fields and ensure sustainability in production.

Rural areas have begun to lose these features with changes and orientations. The terms of rural area and rural communities need to be renegotiated. Who should be the target audience in development? Are the people living in rural areas and continuing their agricultural production activities? Do they live in the countryside and continue to work in the service sector? Do they live in the city and continue production in rural areas? In fact, a new definition is needed to answer all these questions. Development plans need multidisciplinary, extensive, and rigorous research. First of all, identification and selection of target audience must be made correctly.

Worldwide, policies focusing on local areas and local issues have begun to be developed. Approaches aimed at improving the agricultural structure and eliminating the negativities have been replaced by the approaches aiming to spread the service offered to the local people with an understanding that respects social and cultural values and protects nature. Especially in rural development programs, sociocultural structures of rural people are taken into consideration as well as socioeconomic status. The target audience we consider becomes more important in this respect.

As result of the changes in rural areas, policy approaches, and all areas, a stronger interaction started between rural and urban areas. This interaction triggered the change of the sociocultural structure and revealed the interest of the people living in the rural areas to the cities, the desire or longing of the people living in the urban area to natural life.

The negativity of technology age, diseases, epidemics, and people's desire for the nature gradually increases. Local landraces are capable of bringing together the bilateral demands of the people living in rural and urban areas. From a cultural approach perspective in rural areas identified with agriculture, local landraces should be considered as a good alternative for development. However, there should be an approach in which other sectors such as processing industry can be included for wheat landraces.

Although more income requests, nature conservation practices, and sociological factors create a harmony and balance today, they are also seen as elements that destroy each other in rural areas. It is important that the policies developed are sustainable as well as include measures to eliminate this risk. At this point, the historical process and socioeconomic and sociocultural structure of the rural people come into play. As a matter of fact, considering the history of humanity as a sociological process, it becomes more important. It is the common meeting point of agriculture, economics, sociology, and psychology. The survival of wheat landraces to this date is the best example of this.

Wheat landraces are produced mostly in small areas and family businesses. They are an important source of income for the people living in the regions where they are produced. The areas where these farms are located are often called rural areas. Since the lands of these family farms, which are mostly low-income and small, have low productivity, the number of alternative products is very low. The landraces they prefer are suitable for hard conditions and unproductive soil. In addition, it is seen

that the average age of landrace producers is over 50 in most countries (Negri 2003; Tsegaye and Berg 2007; Hajnalová and Dreslerová 2010; Montesano et al. 2012; Baboev et al. 2015; Husenov et al. 2015; Kan et al. 2016a, b, 2019a, b; Karabak et al. 2019). It makes it compulsory to use the product that does not require much workforce and meets the consumption and the financial needs of the family. They do not prefer to take risks. Producers compromise some social values, produce local landraces in line with their needs, and continue to protect according to their needs. However, the proportion of these self-sacrificing producers is also decreasing.

While wheat landraces are mostly used as animal feed, they also serve different purposes in many countries, and these areas of use have played an important role in maintaining their production. Unfortunately, local landraces have begun to disappear as their use also disappeared. Food need and health factor created an opportunity to revive local landraces. After many years, direct use value of wheat landraces has created a change value in line with the quality features suitable for consumption demands.

Two important issues should be carefully considered for the sustainability of wheat landraces. The first is to ensure that they are protected in the areas where they are grown, and the second is to ensure that those who produce these landraces earn more. It is known by the name of the region where many products are produced in the world. Wheat landraces are known as local products produced by traditional methods. Local products are economic values resulting from an economic activity at the end of a production process. Their special features are based on natural conditions specific to the region or the knowledge, skills, methods, and techniques developed by the producers for a very long time. It should not be forgotten that people living and producing in that region reflect their traditions and cultures with their local products besides defining local products as economic values (Çandır 2010; Altuntaş and Gülçubuk 2014; Kan et al. 2016a, b).

The issue of using local dynamics from rural development as a means of development comes to the forefront all over the world. Local economic development envisages a participatory approach that supports private and public cooperation by using local resources on-site and using these resources for the economic and social well-being of the local community and supporting competitive advantage (Altuntaş and Gülçubuk 2014; Çetin 2007). Among the local sources, especially the local products come to the forefront and make an important contribution to tourism (Kan et al. 2012), because today, it is seen that touristic preferences are directed toward countries and regions that protect their local values (Babcock and Clemens 2004; Yenipınar et al. 2014; Kan et al. 2016a, b). In order to improve tourism in local governments, they have attempted to get geographical indicators for local products in their regions. Usage of wheat landraces in geographical indication system will contribute to the development of local people with its contributions to ecotourism and gastronomy tourism.

Nature-friendly, human-oriented economic planning should help preserve cultural heritage, traditional knowledge, and biodiversity. Planning should be made to ensure vertical and horizontal integration among all stakeholders serving development with local, regional, national, and global cooperation. Wheat landraces will be

very valuable in human nutrition in the future as in the past. The main target should be to increase the diversity in nutrition for social, economic, environmental, and health and to ensure their sustainable use, by considering the local people first and then the country and the whole humanity at the global level.

7.5 Use of Wheat Landraces in Geographical Indication System

Although it is not a definitive description, the limits of the local products are tried to be determined with the perception that it differs from its peers in terms of quality, taste, flavor, and aroma on the producer's side, and with the thought that traditions, skills, and human and environmental factors are brought together with the product on the consumer's side. Because of the negative effects of the results of R&D and innovation studies regarding the environmental pollution that started with the industrialization process in the world and the increase in the use of technology in the industry, biotechnological products, mass production, and long-lasting foodstuffs, people have begun to return to the past especially in terms of healthy life. Organic product, additive-free product, natural product, local/traditional product, and local landraces/populations emerge as terminologies with increasing popularity in this process. People's interest and demand for such products are increasing day by day. Accordingly, a new sector has begun to emerge in the economy of many countries. This new sector is described as an alternative food economy, and quality and healthy food criteria come to the fore rather than price within this structure (Marsden et al. 2000; Holt 2005).

Local food, local landraces/populations, and handcrafts, especially food, are important elements describing the traditions, customs, cultures, past, people, geography, and climate of a region. Therefore, such elements are important tools for development and can be described as local development dynamics. If we take the Industrial Revolution as a beginning, the failure of the classical development theories that continued until the 1970s showed that the concept of development cannot be addressed with holistic approaches (Stamer 2003; Başkaya 2005). The existence of different structures in a country or even a region brought up the issue that local dynamics should be mobilized in development, and local/regional development models begun to come to the fore especially after the 1980s. For this reason, it is recommended to define local dynamics in the development rhetoric instead of gravitational regions and to develop area-specific development strategies and plans accordingly (Doğan 2011; Kan et al. 2016a, b). Among these local dynamics, genetic resources and production of value-added products based on these resources are an important starting point for the economic pillar of development.

Turkey is home to the genetic resources of many plants and animals with its geography, climate, and natural resources (Şehirali et al. 2005). This natural treasure has evolved into culture with the unification of the human element, and this

culture has been sustained for generations to become a world heritage site. Even today, the role of plant and animal genetic resources is great for Turkey to come to this point in terms of local knowledge, particularly in gastronomy. Many European countries that are aware of this situation have protected their existing resources by legal means in terms of protecting these resources and ensuring their sustainability and have succeeded in turning this into a commercial advantage. Although the homeland of grape is the field called Asia Minor covering Anatolia and Caucasus, France is famous with its wines; although the homeland of wheat is shown as the area known as the Fertile Crescent which covers Turkey too, Italy has become the center of pasta and bread landraces; the Mediterranean basin is the homeland of olives and it has made Greece, Spain, Italy, and Turkey important brands in olives and olive oil; and although Turkey has over 160 types of cheese, France, Italy, and the Netherlands have become brands. As it can be understood from here, the local resources (including genetic resources) are only understood and owned locally, gaining value when legal, economic, and even social measures are taken to ensure their sustainability. This treasure, combined with other natural and human resources, disappears and is forgotten day by day.

Turkey is the homeland of many plant species and wheat, which is one of humanity's most important foods, is among these (Van-Slageren 1994; Harlan 1998; Şehirali et al. 2005; Blood et al. 2015). Turkey is the homeland of 23 species of wild wheat and more than 400 breeding wheat landraces (WWF-Turkey 2016). The Fertile Crescent, which is shown as the homeland of wheat, is known as the region where the Western and Near East/Middle East/Pre-Asian civilizations were born. The first agriculture, domestication of animals, and the first villages have emerged in this region. This region covers Turkey, Syria, Lebanon, Israel, Iran, and Iraq today. The Fertile Crescent is the natural homeland of eight products (wheat (emmer), einkorn wheat (Siyez), barley, flax, chickpea, lentil, pea, and Burçak), which are the founding products of Neolithic culture (Lev-Yadun et al. 2000; Kahyaoğlu 2018).

Being located in the region of such an important product in human history and human development is an important reason for this product to be the local development dynamics. It can be said that wheat and wheat products have an important place both in the culture and trade of our geography. But the most important question to be asked is "How important is such an important gene source in the development of its homeland?" Local development dynamics have an important place in the new development theory, and these dynamics need to be determined. For this purpose, the Geographical Indication System, which was firstly developed in France and then spread across all EU countries, is an important initiative. The geographically indicated products, called as the new food chain, include quality, food safety, and commitment to origin, culture reflection, and all of the human contribution. Geographical Indication System, which has four different registration structures as PDO (Protected Designation of Origin), PGI (Protected Geographical Indication), Geographical Indication (GI), and TSG (Traditional Speciality Guaranteed), serves important purposes such as protecting the region-specific products, preventing unfair competition, preventing the use of names unfairly, making connections with

its origin, knowing the production standards, and having the right information about the product. It is stated that these products contribute to local economic development with effects such as bringing extra revenue, contributing to tourism (especially gastronomic tourism), and providing additional employment (Kan 2011; Kan and Kan 2020).

When the Geographical Indication System's development in Turkey and the EU is monitored, it is seen that 493 products are registered, in which 185 of them have origin indicators and 304 have geographical indicators as of June 30, 2020, in Turkey (TURKPATENT 2020). In the European Union geographical indicators registration system, 1836 of the 3336 registered geographical indications are PDO, 1211 are PGI, 247 are GI, and 63 are TSG (eAmbrosia 2020). The most important one is the group that is based on wheat and wheat products, and a total of 70 products in two groups are registered in the system of Turkey (14.20%). In the EU, 504 products (13.65%) are registered in five groups (Class 1.6-2.24-2.26-2.3-2.5).

As can be seen, the group of wheat-based products is important in Turkey. However, we have one registered geographical indicator (Kastamonu Siyez Bulgur-PDO) and three geographical indicators (Kastamonu Siyez Wheat-PDO, Kastamonu Siyez Flour-PDO, Bolu Seben Iza Wheat-PDO) in which the products are directly related to the wheat landraces. The reason why Turkey has very few registered geographical indicators based on local populations although it is the homeland of wheat is that its local populations have been lost or not given enough importance.

There are countries in the world that use the geographical indicators and register and turn them into an economic activity. For example, Spain and Italy are the leaders of these countries. Pa de Pagès Català in Spain and Pane Di Altamura and Pagnotta del Dittaino in Italy are examples of traditional bread with geographical indicators (eAmbrosia 2020). Especially Pane Di Altamura and Pagnotta del Dittaino in Italy are products of origin indicators and are produced and marketed only in certain regions. In addition, Farro della Garfagnana in Italy can be given as an example for PGI and Farro di Monteleone di Spoleto for emmer (*Triticum dicoccum*) wheat with PDO (Buerli 2006). Turkey is an important country for einkorn (*Triticum monococcum ssp. monococcum*) and emmer (*Triticum Dicoccum Schrank*.) wheat landraces. There are important attempts especially for registering einkorn wheat and the products made of it, and Siyez and Iza wheat are among these products.

An example of a local economic development initiative for wheat can be given in India. There is one local wheat with a geographical indication in India. The name of this local wheat is registered as "Bhalia Wheat," and it is produced in Bhal region of Gujarat state of India. It is stated that it has a wheat origin indicator, and it takes its unique feature from the region where it is registered. It is known as "Daudkhani Wheat," and it has high carotene, low water absorption, and high protein content, and approximately 5000 farmers grow it in the region. The producers of this wheat landrace in Bhal region sold of 25% more price than the other commercial wheat landraces and 40–50% more than the other bread wheat landraces (The Hindu Businessline 2011; Chaudhary et al. 2017).

As a result, the ability of wheat and wheat products to create local development model based on the geographical indication system can be seen in different examples. The fact that Turkey is the homeland of wheat, which is in the most front row in the food consumption of humans that there is a culture based on wheat and wheat products, makes it necessary for us to protect our genetic resources as well as to use it economically too. Economic factors are closely related to the protection of genetic resources (Kan et al. 2015; Kan 2018; Kan et al. 2019a, b; Kan 2019), and we need to support protection policies and economic use policies to combat genetic erosion.

7.6 General Evaluation and Conclusion

Wheat landraces, which have important social and economic values, also illuminate the common past of many countries. Although they have been forgotten in many regions in terms of culture in the modern world, they have begun to be remembered again with nutrition and health concerns brought by modern life. Conservation of these landraces mostly depends on the societies that produce it. However, the strategies and policies to be determined by the states will also guide the productive behaviors. With this study, the social and economic relationship between human and wheat landraces has been tried to be explained by researches in different disciplines. The results show that social and economic factors were effective in wheat landraces in the past, and the effects of environmental and nutritional and health factors are increasing. The diseases seen in the recent years, especially chronic diseases and global epidemics, have highlighted food safety, reliability, and self-sufficiency issues of the states. The priority has been nutrition and health. Especially, the Covid-19 pandemic has once again showed the importance of agriculture and biodiversity.

The main purpose of the economy is to ensure the highest sustainable use of scarce resources. Environmental, social, and economic criteria are considered as three separate criteria in sustainability. Both research results and current needs reveal that economic and social factors are intertwined, and the nutrition and health factors should be considered as sustainability criteria. The governments should take measures to ensure sustainability in terms of "environment," "society," and "economy" and "nutrition and health" in determining policies and strategies for sustainable use of these valuable landraces that provide nutrition to the people. The Green Deal recently announced by the European Commission and the "Farm to Fork Strategy" and "EU Biodiversity Strategy for 2030" declared on May 20, 2020, exactly show how important this issue will be in the future (European Commission (EC) (2020). Wheat landraces are products that have the potential to be used as development tools in local economic development with their nutritional content and social and economic value for these purposes. A sustainable use should be gained with the measures to be taken without destroying its traditional features and transforming it into a commercial commodity. Turkey is one of the most fortunate countries having this potential. Although the issues of biological diversity, conservation,

and sustainable use of natural resources come to the forefront in both agricultural policies and rural development strategy documents, it is necessary to perform the act faster.

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