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Is There a Food Security Risk for Turkey in Near Future? Findings from a Survey of Ninety Villages and Some Policy Implications*

Yakın Bir Zamanda Türkiye İçin Bir Gıda Güvenliği Sorunu Olur mu? 90 Köyden Anket Verilerinden Bulgular ve Bazı Siyasal Çıkarımları

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Abstract: In this study, I present the results of the analysis of partial data collected in a research project supported by TUBITAK, along with some socio-economic statistics collected by institutions such as the World Bank, United Nations and TurkStat. The primary data come from a questionnaire carried out through face-to-face interviews with 1424 household heads, who were randomly selected in 90 villages within the administrative borders of 10 provinces accross Turkey in 2009 as part of a research project. The findings indicate that most of the small-sized family farms in Turkey can best be described as a way of employing oneself for their owners, as the families' members could work on their lands rather than migrating into large cities and looking for already scarce jobs. Indeed, most of these family farms were generally earning very low monthly incomes, in debt, and only able to continue farming activities by financial transfers from their other income resources. Indeed, when the alternative costs of labor of family's members were taking into account, it did not make any economic sense to keep up farming. It was also found that the size of agricultural land was positively associated with both annual farms incomes and adapted agricultural innovations. Finally, the findings also show that there was ongoing depopulation of young people and an increasingly aging population in rural areas accross Turkey. When these findings are considered together with recent dramatic increases in prices of agricultural inputs, including fuel and fertilizers, as well as some other socio-econpmic indicators, they suggest that Turkey is quite likely to face serious food security problems in the near future.

Structured Abstract: Despites some improvement in production capabilities and economic conditions worldwide, hunger is still an issue in every country. Today, high costs, persistence of high-level poverty, and income inequality continue to keep healthy diets out of reach around 3 billion people.

The categorical dimension of food security is defined by four pillars: availability, access, utilization, and stability. The food security exists, when all pillars are satisfied simultaneously without sacrificing one for another. It is possible for a nation or region to be considered as food-secured, while its households may still experience food insecurity. A person's own food production depends on means of production such as land, financial resources, workforce, knowledge, and skills.

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Sen (1983)'s argument that food insecurity is much more about demand affecting access to food and more significant than supply led to a paradigm shift in analysis of food security. As the supply vs demand side of food security is still debated, there are some empirical evidences showing supply-side factors can be more significant. Besides, natural, social, economic, and political environments can constrain the ability to produce, distribute, or access to food.

Despite the claims that large geographic area and diverse microclimatic conditions of Turkey could satisfies its growing population's food needs for a long time, increasing number of evidences suggest that this may be far from being true. Agriculture inputs prices such as fertilizers and fuels in Turkey have increased between 2012 and 2021. These rising input costs and agricultural landholdings structural features, can directly affect food availability, households' livelihoods, and quality of life in rural areas. Besides, an increasingly aging population and depopulation of rural areas are likely to have negative impacts on production capabilities such as adoption of new ideas and technologies as well as on the overall supply of food at national level.

Purpose: The aim of this research was to investigate whether there was any risk of food insecurity in Turkey in the near future from a supply or availability perspective of food. While Sen's (1983) accessibility perspective remain crucial to understand many social and political aspects of food security and human security in general, understanding the availability pillar of the food security and factors that may have impacts on this aspect are at least as significant as other dimensions. Indeed, any analysis of food security has to start with food supply in order to discuss access, utilization or sustainability of food security. Therefore, this paper attempts to contribute a better understanding of social, economic and demographic factors, which characterize agricultural landholdings and how they are related to availability of food security in Turkey.

Method: The primary data for this study are from a questionnaire. The sample contained 1424 farming households' heads from 90 different villages located within administrative boundaries of 10 provinces in different regions of Turkey. The sampling was a combination of cluster and stratified random sampling that was drawn at four stages. In the second stage, the research team drew randomly 3 districts from all districts laying within the administrative boundaries of each province, which was determined in the previous stage. At its final stage, the sampling ended by a random selection of households' heads from residents within each village.

Findings: Finding show that overall farming household heads were older with average age of 51 years. Besides, the average number of children per household head for the entire participants were 4.2. In general, provinces with highly urbanized areas and mountainous topography had the highest average numbers of pieces of land per household head, an indication of more fragmented agricultural land.

On average, the monthly expenditures per households were quite higher when compared to their monthly incomes. Without support from other income sources, most households could barely get by. On average more than half of all participants in the study were in debt. Some of the structural characteristics of farmlands put constraints on their further development as to supply adequate and quality food needs of whole society. Of these, increasing fragmentation of agricultural land over time has led to both inefficiency in farming activities as well as to inability of farmers to take advantages that deriven from economies of scales and adoption of new technologies. Indeed, the overall average size of largest farmland for all provinces was just over 23 decares.

Furthermore, the farm landholding that had an annual income of more than 333,000 TL in 2009 were only 1,7% of total agricultural landholdings. Small farms with lower earnings dominated the agriculture production in Turkey. Monthly average farming income was positively associated with number of breed cows, sheep, and goats as well as with numbers of pieces of land and size of the largest farmlands.

Increases in prices of fertilizers, fuels, and seeds can have major impacts on income, livelihood, and in general quality of rural life. The recent increases in inflation and prices of fuel and fertilizers, are expected to negatively influence food supply and in general the quality of rural life in Turkey. Indeed, the Global Food Security index for Turkey, has worsened in the last 10 years between 2012 and 2021. Turkey has moved down 10 place and ranked 48th in 2022 among 113 countries.

This paper also focuses on factors that have negatively contributed to overall Global Food Security in Turkey. Turkey could not keep average food cost down. Especially in the last two years, the supply of food adequacy has been declining. Besides, people have suffered from sudden fluctuations in agricultural

production. Also, food import dependency rate has increased throughout years. By contrast, public expenditures on agricultural research and development have been in decline since 2019. Finally, volatility in agricultural production was another reason for increasing food insecurity.

Originality/Value: the findings from this study are based on data from a random sample of farming households' heads across Turkey. Therefore, findings can be generalized to rural areas in Turkey. This study also focuses mainly on factors that directly or indirectly influence availability of food. Besides, findings show that Turkish govenments need to address some of the urgent supply issues of the food security in the short time by making changes in some of agricultural and rural policies. But, it has to develop better and consistent policies of food security in the long time.

Keywords: Regional development, food security, Turkey, poverty, agriculture

Öz: Bu çalışmada, Dünya Bankası, Birleşmiş Milletler ve TÜİK gibi kurumlar tarafından toplanan bazı sosyo-ekonomik istatistiklerle birlikte TÜBİTAK tarafından da desteklenen bir araştırma projesinde toplanan kısmi verilerin analizinin sonuçlarını sunuyorum. Birincil veriler, 2009 yılında bir araştırma projesi kapsamında Türkiye genelinde 10 ilin idari sınırları içindeki 90 köyden rastgele seçilen 1424 hane reisi ile yüz yüze görüşülerek gerçekleştirilen bir anketten elde edilmiştir. Bulgular, Türkiye'deki küçük ölçekli aile çiftliklerinin çoğunun, aile üyelerinin büyük şehirlere göç etmek ve oralarda zaten kıt olan işleri aramak yerine kendi arazilerinde çalışabilecekleri için, kendi kendilerini istihdam etmenin bir yolu olarak tanımlanabileceğini göstermektedir. Gerçekten de bu aile çiftliklerinin çoğu, genellikle çok düşük aylık gelirler elde etmekte, borç içinde bulunmakta ve diğer gelir kaynaklarından aktardıkları finansal kaynaklarla çiftçilik faaliyetlerine devam edebilmektedir. Nitekim aile fertlerinin alternatif işgücü maliyetleri de hesaba katıldığında, çiftçiliği sürdürmek ekonomik anlamda bir anlam ifade etmemektedir. Ayrıca, tarım arazilerinin büyüklüklerinin, hem yıllık işletme gelirleri hem de kabul edilen tarımsal yeniliklerle pozitif yönlü ilişkileri olduğu bulunmuştur. Son olarak, bulgular aynı zamanda Türkiye genelinde kırsal alanlarda genç nüfusta süregelen bir azalma ve giderek yaşlanan bir nüfus olduğunu da göstermektedir. Bu bulgular, tarımsal üretimin önemli girdi maliyetlerini teşkil eden akaryayakıt ve gübre fiyatlarındaki son dönemdeki çarpıcı artışlar ve diğer bazı sosyo-ekonomik göstergelerdeki değişimlerle birlikte değerlendirildiğinde, Türkiye'nin yakın gelecekte ciddi gıda güvenliği sorunlarıyla karşı karşıya kalma olasılığının oldukça yüksek olduğunu göstermektedir.

Anahtar Kelimeler: Bölgesel kalkınma, gıda güvenliği, Türkiye, yoksulluk, tarım

Introduction

Food has been a concern for every government. The governments, whether it is a king, dictator or parliament, that have not been able to satisfy food needs of their population have often failed. (Godfray & Garnett, 2014, p. 1). Hence, hunger, malnutrition and thus food security have been a major issue in many countries around the world. Currently, 780 million people across the World live in extreme poverty on less than $1.90 per person per day, an amount that obviously cannot support a healthy livelihood in any part of the world (Action Against Hunger, 2022). As the poverty is one of the main reasons for food security and malnutrition, so, these poor people who make up 8,9% of the total world population are at the same time facing sever hunger, malnutrition, and related diseases. There have been major improvements in the production capabilities and economic conditions around the globe. But hunger still remains an issue in every country. "Even the greatest countries like the United States face the harsh consequences of acute hunger" (PLANETHICS, 2022). UNICEF (2021) estimated that there were between 720 and 811 million people facing hunger worldwide in 2020. The report also shows that in 2020, nearly 2,37 billion people did not have access to adequate food and there was an increase of 320 million people compared to those in previous year. Besides, it indicates that people facing hunger were distributed across all regions of the World (p. xv). The report states that high costs, persistence of high-level poverty, and income inequality continue to keep healthy diets out of reach around 3 billion people in every region of the world.

Finally, it directs attentions to the strong link between the unaffordability of healthy diets and moderate and even severe food insecurity (UNICEF, 2021, p. vi).

Turkey, ranked as the 17th largest economy in the world, has experienced hunger and malnutrition. Tukey, an upper-income country with a gross national income of US $9,127 per head, had approximately 83 million of population in 2019. Of this population 24,8% was rural (IFAD, 2022). In 2021, 2.5% of Turkish population was malnourished. Just one year later, these numbers grow further alongside a 3.5% increase in poverty (PLANETHICS, 2022). The recent increases in the number of people facing hunger may be due to the refugees, who came for various reasons such as the war in Syria as well as poverty and sever life conditions in other countries. Hence, Turkey with almost 3.1 million Syrian refugees is currently one of the most refugee-hosting countries. This means that the government has to allocate more money to meet needs of refugees in addition to its own citizens. Indeed, so far, Turkey has spent over $10 billion for refugees alone. The second major reason for increase in hunger was COVID-19 pandemic. The covid pandemic has led many to lose their jobs, fall into poverty and face hunger. Currently, 4,236,000 people cannot earn enough money to support themselves and their families, and thus an adequate nutrition (PLANETHICS, 2022).

Like many countries, Turkey is already faced with food security, which may become more severe, as the supply of food production has been in a decline mainly due to increasing productions costs and declining prices. Turkey is 8th largest agriculture economy in the world. The country's 38,9 million hectares, which contains 50,6% of the total land of the country, is in agricultural use. Of this, %54,9% was arable and 45,1% was permanent in 2012. Agricultural production was worth of 41 billion dollars in the same year. Turkey "is a major producer of wheat, sugar, beet, milk, whole fresh cow, tomatoes, barely, potatoes, grapes, maize, watermelons and apple. Apricots, cherries, hazelnuts with shell, figs, quinces and poppy seed are the most produced agricultural commodities by Turkey in the World" (Aytop, Çukadar & Şahin, 2014, p. 688.).

This study focuses on one aspect of supply side of food security, especially agricultural input costs, aging rural population and depopulation of rural areas across Turkey. The primary data set for this study was actually a part of larger research project carried out by researcher between 2009 and 2010. Besides, in this study, in addition to these data collected by the researcher, I also employ statistics on agriculture, poverty and hunger from national and international institutions.

Conceptual Development of Food Security

As much as the agriculture is the basic source of substance for human life, it is also major sources of many current environmental problems, ranging from biodiversity losses to climate change. As Ehrlich, Ehrlich and Daily (1993) point out, "whether the expansion of food production can keep pace with population growth over the long term remains the crux of the sustainability debate precipitated by Malthus almost two centuries ago" (p. 1).

As large as 15% of population in many developing countries experience malnutrition and related diseases. According to one estimate, micronutrient deficiencies affect 2 billion people around the world. There are millions of underweighted children with less than 5 years old. Besides, each year 2.5 million children die due to malnutrition. More alarming is the fact that those countries with higher rates of malnutrition will also experience very rapid high population growth in the future. Hence, future food demand is expected to be higher than now, especially in countries with current smaller populations, including those in Asia and Latin America. According to one estimate, the World's population will reach to 9 billion people by 2050 and its food demand is expected to increase by 59 to 98% (Alfieri, 2916, p. 1). Especially, feeding 9-10 billion people will be daunting a task for humanity, as we also need to protect productive land, lower carbon emission, and protect ecosystems (Smith et. al., 2013, p. 2286)

Food, is an eatable or drinkable substance that produce energy and material for body development and movements. There is both a production and consumption side, which are affected by many factors. Simelane and Worth (2020: 168), and Maxwell (1996) points out that food security goes beyond simple food production and accessibility. This concept is multi-layer or multi-dimesional and in time "has become a cornicopia of ideas" (Maxwel, 1996, p. 155). One may find as many as two hundred definitions of food security in the literature (Maxwell, 1996, p. 155). While the concept of food security has been defined over time and redefined in various ways, from different perspectives, most of these definitions commonly refer to "availability of food and people's ability to access it" (Gürsoy, 2020, p. 128; Mcdonald, 2010: 15). Besides, the concept can be applied at individual, household, regional, and national leveles (Maxwell, 1996, p. 155; Gürsoy, p. 128-130).

The first definition of the food security was introduced durring 2nd Wold War when malnutrition was a serious issue. Following the war, "right to food and an obligation to help all states" was affirmed by many international initaitatives (Gürsoy, 2020, p. 129). The UN's the Universal Declaration of Human Rights states that **"**Everyone has the right to a standard of living adeqaute for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to secure in the event of uneployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstance beyond his control" (Gürsoy, 2020, p. 129). Similarly, the International Covenant on Economic, Social and Cultural Rights in 1966 explicitly recognizes "the fundamental right of everyone to be free from hunger" and "the right of everyone to an adequate standard of living for himself and his family, including adequate food" (UN, 1966, cited in Gürsoy, 2020: 129).

According to Anderson and Cook (1999), the concept of food security was first appeared in international development work in the 1960s and 1970s and was defined "as the ability to meet aggregate food needs in a consistent way" (p. 142). Within a policy context, the concept was first used at the World Food Congress (WFC) in 1974. It is appeared more freqeuntly in discussions during mid-1970s, when at the time rapid rising food prices and the global food systems seemed to be out of control (Maxwell, 1996, p. 156; Gürsoy, 2020, p. 128-129). The WFC emphasized the significance of increasing food output both to eliminate shortages and to maintain a reliable food supply free from sudden price flactuations. In these early years, the disparity between total food supply and people's access to food was quite obvious, especially in developing countries. Indeed, these concerns were soon translated into creation of new institutions, including International Fund for Agricultural Development (IFAD) and Compensatory Financing Faclility, which sought to improve national food self-sufficiency and mechanisms that stabilize prices, (Maxwell, 1996, p. 156). The appropriate measures to realize food security were conceived to be global or national food stocks and control of prices, and elimination of discrepancy between aggregate supply and demand (Anderson& Cook, 1999, p. 142; Maxwell, 1996, p. 156)**.** But,during these years, the food security evolved as a movement to cope with hunger at individual level (Huish, 2008, p. 1387). Hence, the individual or household were regarded to be the appropriate unit of food security (Anderson& Cook, 1999, p. 14; Feleke, Kilmer & Galdwin, 2005: 351). Thus, the food secuirty was then generally measured by food-intake or through proxies, including such rates of real wages to relative food prices, poverty, employment or "demand on the emergency -food supply system". But, despite this individualistc interpretation, there was a recognition that links between indivduals or households and the community, the nation, or the international economy contribute to food security (Maxwell, 1996, p. 157; Anderson & Cook, 1999, p. 142)**.** The later introduction of green revolution and encompaying technologies made large improvement in production, but did little to improve poor people's access to food. In fact, there were still large numbers of people who niether had enough food nor a little propects to meet needed food (Anderson & Cook, 1999, p. 142).

As the discussions of food security evloved in academic and policy circles, its focus has moved from individuals' assurance of food to improving communities's access to food (Huish, 2008,

p. 1387). This marked the shift to a second stage with a new paradigm, which can be contributed to the influence of Sen's 1980s work on entitlement. His work helped to link issues of food security to accessibility and push access to food to the center stage of analysis. Following this paradigm change, analysis of food security began to consider ensurance of food access in addition to traditional concern for adequate aggregate supplies (Maxwell, 1996, p. 156-157). For Sen, food insecurity, "is not a problem of food prodcution or avalaiblity but of people's limited ability to mobilize resources and rules to access food" (Sen, 1983; cited in Gürsoy, 2020: 129). He argued that "individuals need entitelments to food and this will depend, amongst other things, on their income and assets. His analysis shows that it is not just the supply side of food that is important in ensuring individual food security but also demand side factors" (Sen, 1983; cited in Gürsoy, 2020: 129). Following Sen, the FAO has redefined the food security as "ensurring that all people at all times have both phsical and economic access to the basic food that they need" (FAO, 1983, cited in Gürsoy, 2020: 129). Of course, assurance to food requires a strong political commitment whereby no individual goes without food at any time. However, the reality is different and indeed, the complexity of the global food economy just makes these kind of wishes at best "ambitious" or an "idealistic proposal", which can easily be dismissed by politicians under circumstances (Huish, 2008, p. 1387).

In conceptual development of food security, Gürsoy (2020) also directs our attention to the World Bank's 1986 Report on Poverty and Hunger, which specifically underlined significance role played by temporal dynacmics of food security. The report for the first time made what is now genereally a recognized as "distinction between chronic and transitory food insecurity". The chronic food insecurity is related to problems of continuing or structural poverty and low incomes. By contrast, the transitory food insecurity generally occurs during intensive periods of crisis such as natural disasters,economic collapse or social conlfilicts (Gürsoy, 2020, p. 129). In 1994, UNDP has addopted a even more broader perspective in its Human Development Report, whereby food security is regared as one aspects of human security (UNDP, 1994). In 1996 at the World Food Summit, the most widely used defintion of food security was developed at the individual, household, national, regional, and global level: "when all people at all times have both physical and economic access to sufficient, safe and nutrious food that meets their dietary needs and food preferences for an active and healthy life" (Gürsoy, 2020 p. 130). Finally, in 2001 at The State of Food Insecurity, FAO redefined this definition again by stating that "food security exists when all people, at all time, have physical, social and economic access to sufficient, sea and nutrious food that meets heir dietary needs and food preferences for an active and healthy life" (FAO, 2002: 8; cited in Gürsoy, 2020: 130).

Maxwell (1996) notices two more paradigm shifts that have taken place in the conceptualization of food security during these years. The first was the change from a "food first" emphasis, in which assuring the short-term nutritional intake was the main objective in the period 1975-1985, to a livelihood perspective that emphasized resilience and sustainable livelihoods. These were seen to be a necessary conditions for relazing food security (Maxwell, 1996, p. 157). As Anderson and Cook (1999) point out this shift involved two important changes in how food security was viewed. First, food security depends on individuals and households having a reliable resource of livelihood, and second it requires a longer-time frame of planning horizon than "immediate". Rome Declaration on World Food Security at the World Food Summit in 1996 stressed the significance of the long-term process of food security and described its multidimensional aspects. It diverted attentions to sustainable manegement of natural resources, abatement of unsustaibale consumption and production as well as "need to ensure eqaulity between men and women and retivalization of rural areas" (Anderson& Cook, 1999, p. 142). The third shift, as it is identified by Maxwell (1996), was a shift from reliance on objective measure of food security (such as target consumption levels or access to required daily caloric intakes) to more subjective dimensions emphasizing quality of available food or people's anxiety about food avalaibility. Maxwell (1996) argues that this change of focus reflects different aspects of experince and perception of food quite

similar to post-modern interpretations in other fields (p. 159). So, the focus of food security adgenda has shifted from concerns related to national food supply and prices, to discussions involving complexity of livelihood strategies in difficult and uncertain environments, and to understanding how people themselves respond to percieved risks and uncertainties over time (Anderson & Cook, 1999, p. 143).

1. Four Pillars of Food Security

Notice that food security as a concept emphasizes both structural factors and the distress people feel of not having assurance to access to food. Thus, it implies an ongoing state entailing availability of food as well as some multiple dimension (Scanlan, 2003, p. 89). Thus, food security seems to be a quite complex issue (Simelane & Worth, 2020, p.368; Gürsoy, 2020, p. 128) involving four dimensions: "categorical, socio-organizational, managerial, and situation- related" (Simelane & Worth, 2020, p.368). Gürsoy (2020, p.13) and Simelane and Worth (2020) suggest that the categorical dimension of food security can be defined by four pillars, including availability, access, utilization, and stability. The authors argues that the food security exists, when these four pillars are satisfied at the same time without sacrificing one for another. Each of these pillars can be viewed from an individual, household, national or a regional perspective. The distinction of these perspectives is important in that it is entirely possible for a nation or region to be considered as food-secured, while at the same time households or individuals living experience food insecurity. Conversely, it is also possible that individuals or households to be food-secured whereas their nation or region is not. This last situation has been observed often time in highly inequitable economies (Simelane & Worth, 2020, p.368).

Figure 1 below shows Simelane and Worth (2020, p. 369)'s appraoch to food and nutrition security based on comonly shared ideas by many researhers in food security's literature. First, I summarize what is called the four pillars of food securty and then I discuss their interrelations as interpreted by Simelane and Worth (2020).

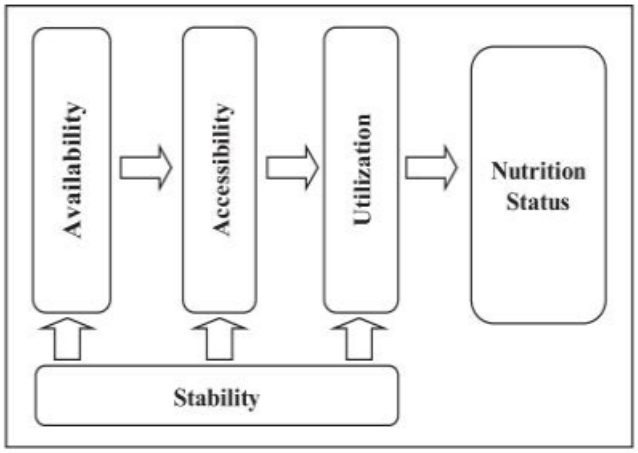


Figure 1: Four Pillars of Food Security and Their Relations
Source: Simelane & Worth, 2020, p. 369

Food availability, simply refers to physical existence and potentially obtainable food, whether food available to people in suficient quantities and qualities that are free from significant flactuations. These food may come from one's own farm or off-farm supplied by domestic production, imported commerically from other countries or provided as food aid (Gürsoy, 2020, p. 130; Simelane & Worth, 2020, p.368). It is clear that those food that come from one's own production depends on means of production such as land, financial resources, workforce, knowledge, and skills. Hence, the means of production should also influence food availability. Food availability is most

commonly measured at national, regional and household level, but rarely at individual level. Food available at national level is consists of domestic food stocks and household production as well as commercial production, food imports and international donations. This availability of food at national level, in return can greatly influence availability at other levels of individual, household and regional (Simelane & Worth, 2020, p.368).

On the other hand, *food access* is state of households or individuals who have sufficient means and resources to get the food they need for a complete nutritious diet (Simelane & Worth, 2020, p.369). It refers to accessibilty of adequate, appropriate and nutrious food resources by individuals, households, people, community or state. In food security, accessbility is the key concept (Gürsoy, 2020, , p. 130). Accessibility may be physical or financial. Hence, accessibility is determined by both physical, such as mobility, and financial means, such as money to pay for food. Access to food cannot only be determined by a household or an individual's ability to produce food. Their ability to move, to get or to buy food from markets also determine their access to food. Indeed, a household may be able to produce its own food, but it may not still earn enough income to access to nutritious food (Simelane & Worth, 2020, p.369).

Food utilization involves quality and nutritional content of food and thus is strongly related to health, access to clean water, and energy reources (Gürsoy, 2020, p. 130). Utilization is simly the ability of a human's body to assimilate nutrients content of consumed food. Optimum calorie and nutrient intake by a person are "an outcome of good care and dietary habits, food preparation, variety of the diet, and distribution of food among household's members" (Gürsoy, 2020, p. 130). Besides, socioeconomic aspects such as knowledge, skills, education, habits, and decision-making about food affect the utilization. Together with a good biological utilization, these all factors affect nutritional status of individuals. Clearly, these factors are closely associated with culture and education (Simelane & Worth, 2020, p.369; Gürsoy, 2020, p. 130).

Finally,the last pillar *food stability* means stability of available food supply over a long time. This implies taking into accout the consequences of sudden shocks in food security. In other words, food security is not a "sitution" that has to occur for only a moment, a day or a season, rather should last on a permanent or sustainable base (Gürsoy, 2020, p. 130). As food security can be gained or lost at any time, coping with stresses and shocks, resulting from such as climatic conditions, social and political conflicts, and economic fluctuations as in increasing unemployment or rising food prices become important. These shocks and sudden changes need to be managed and stabilized as to reduce direct or indirect negative impact and help to ensure sustainable of food security (Simelane & Worth, 2020, p.369).

2.1. Food Availability or Supply

Sen (1981)'s arguement that food insecurity is much more about demand side affecting access to food and more significant than availability or supply for food security at national level led to a paradigm shift in food security. Significance of the supply vs. demand side of food security is still an ongoing debate in political and academic circles (War, 2014; Stringer, 2016; Feleke, Kilmer & Gladwin, 2005: 351; Westengen & Banik, 2016). During 1970s, the conventioanl perspective was that decline or failure of aggregate food availability (supply) etiher at local, regional, national or global level was the primary reason for food insecurity. On the other hand, despite the favorable supply conditions and lower food prices after the mid-1970s, there were still ample insidences of food insecurity in many developing countries. These apparent anomality led to inverstigations of reason behinde food insecurity. In 1980s Sen's work on entitlement led to new perspective that defined food insecurity as being primarily a problem of access to food. Hence, now food security is generally regarded to be a function of entitlement, "which include a set of all alternative bundles of commodities that a person can obtain legally, by using his or her endowments" (Feleke, Kilmer & Galdwin, 2005: 351). Indeed, an individual may suffer from food insecurity due to a lack of

entitelement or access to food. In other word, this perspective suggests that food insecurity must be analyzed with respect to decline or failure of entitelements of different socioeconomic groups. Thus, the food insecurity can exists even without any decline of food availability, as there can be various other reasons, including such as loss of endowements, a loss of employment, a fall in wages or unfavarable terms of trade in food exchang (Feleke, Kilmer & Galdwin, 2005, p. 351). Sen (1983) rightly argues that "no famine in history has been the product of an absolute lack of food, but only that socio-political conditionalities have prevented vulnerable populations from receiving adequate amounts of food" (Sen, 1983; cited in Huish, 2008, p. 1393). So, in Sen's view vulnerability should be included within understanding of food security and thus hunger is political by its nature, as we are still dealing with these issues in a time of plenty (Huish, 2008, p. 1393).

On the other hand, there are some studies showing supply side factors to be more important than those in demand-side in food insecurity (eg., Feleke, Kilmer & Gladwin, 2005). For example, Feleke, Kilmer & Gladwin (2005) found that food-secured households in Etophia tended to have large larger lands, lower number of children and high numbers of livestocks as well as were high adopters of innovations and were cerial-based systems. By contrast, those who were not food-secured had smaller lands, were non-adopters of innovations and were non-cerial- based farming systems . (Feleke, Kilmer & Glawin, 2005, p. 356-357). They conclude that the suply-side factor had much more significant impact on households food security (Feleke, Kilmer & Glawin, 2005, p. 357-358).

Each pillar of food security is a function of natural, social, and policy environment. They all influence food security at all levels, particularly at household level. Factors such as extreme weather (e.g., floods and droughts), inadequate physical infrastructure including roads and transport, social conflict between various segments of society, war between nations, and bad government policies can constrain the ability to produce, distribute, and/ or access to and thus also influence stability of food security. These natural, social and political conditions do not only affect current production and availability but can also lead to "the loss of productive assets such as land, livestock, equipment, and infrastructure, affecting individual households, regions, and even whole nations". Once a community's productive capacity is lost, it may need a long time and more hard work to gain it back (Simelane & Worth, 2020, p.368).

While these all factors are important with respect to food security, here I mainly focuss on supply side or availability pillar and how changes in socioeconomic environment have influenced food secuirty in Turkey. The availability or supply of food in terms of quantity and quality play a major role in food security for several reasons. First of all, as the Figure 1 shows, food security has to start necessarily with availability of adequate food whether it is produced domestically, obtained through international trade or supplied by others as food aid. Without the availability of food, neither its accessibility nor its utilization will make sense to discuss. Secondly, I specifically focus on costs and revenues from perspective of farming households. Costs and revenues of farming in Turkish rural areas do not only influence the availability and security of food, but also determine families livelihoods. Indeed, small and mid-sized family farmholdings in Turkey produce a major proportion of national agricultural production and make up a very significant part of rural households' income resources. So, both the structural features of family farming and their natural, social, economic and political environments that influence these structures should also have major impacts on well-beings and food security of households.

Method

The data used in this study consists of both primary and secondary data. Secondary data consists of statistics collected by national and international institutions or organizations on socioeconomic, poverty and food security. Primary data, on the other hand, is subset of the data collected during another research project, which was also supported by TÜBİTAK.

The primary data is actually a subset of a larger dataset collected through a questionnaire during a research project. The questionnaire was carried out through face-to-face interviews with a randomly selected households heads living within the admisnistartive borders of 10 provinces charectereized by five distinctive socio-economic development levels across Turkey.

The sampling in the study was a random sample of 1424 farmer household heads, based on a combination of proportional stratified and cluster sampling techniques drawn at different geographic scales in four stages. This samping technique was utilized to ranomly select farming household heads that were living in 90 villages located within the borders of 10 provinces that included Adana, Ankara, Gaziantep, Gümüşhane, İstanbul, Kahramanmaraş, Malatya, Şanlıurfa, Trabzon and Yozgat (See Table 1)

Table 1: Sample of 10 Proviences with Five Different Socioeconomic Development Levels

1st degree Developed Province	2nd degree Developed Province	3rd degree Developed Province	4th degree Developed Province	5th degree Developed Province
ISTANBUL (4,81) ANKARA (3,31)	ADANA (0,95) GAZİANTEP (0,46)	MALATYA (-0,23) TRABZON (-0,19)	K. MARAŞ (-0,35) YOZGAT (-0,72)	SANLIURFA (-0,83) GÜMÜŞHANE (-0,93)

As the generalization of finding from sample was importan for the research project, a combination of cluster and proportional stratified random sampling was considered to best represent all households from whole villages, which had different socioeconomic development levels and access to urban markets. In the first stage of sampling, all 81 provinces were divided into five distinctive groups based on their socioeconomic development levels and degrees of access to urban markets and then two provinces were randomly selected from each group. As a result, at this stage in total 10 provinces were randomly selected. In a similar manner to the previous stage, one district town was randomly selected among small and mid-sized towns for each of three distinctive groups that were formed by urban settlements of similar level of socioeconomic development and access to urban markets. Hence, at this stage, the researcher determined 3 for each group and 30 small or mid-sized towns or districts in total within administrative boundaries of provinces determined in previous stage. In the third stage of the sampling, first of all, the research team divided all village settlements within the administrative boundaries of each of the 30 districts into three distinctive groups of high, medium, and low access villages based on their access to urban market. In next step, the team drew a random sample of three villages among all rural settlments within each group to represent low, medium and high access village groups. At the end of this stage, 30 villages representing each of the low, medium and high access village groups and 90 villages in total were randomly selected within 30 districts. Hence, this procedure ultimately provided research team with a total of 90 villages where they could randomly select a final sample of households heads coming from rural areas with different socioeconomic levels and degree of access to urban markets. In this last stage, the numbers of participants were determined for each of 90 villages based on their population shares within the group of market accessibility and then these were randomly selected among all household heads within each village.

In the statge, the number of households heads to be included in the sampling was calculated based the following formula (Yamane 2001: 188):

$$n = \frac{N\sum N_h P_h Q_h}{N^2 D^2 + \sum N_h P_h Q_h} \qquad D^2 = \left(\frac{d}{z}\right)^2 \qquad (3)$$

Were,
n= number of household heads to be selected for the sample,
N= the population of household heads,

N_h= numbers of household heads within each stratum,
P_h = share of household heads within each stratum,
Q_h=value of 1-$P_{h,}$
D^2= Desired variance,
d= Allowable amount of error from the population mean, and finally
z= Value of permissible margin of safety in the t distribution table.

For our research purpose, a 5% margin of error (d) and 95% confidence interval (e.g. z=2) was used to calculate the sample size of final household heads. The resuting sample size was 1690.12. As Henry (1990: 99-101) points out the sampling rate (fraction) of each layer is the same in such sampling. However, the number of subjects entering the sample within each strata is different. Sampling according to the strata in this way reduces the standard error, improve representation of strata or groups with different characteristics and increases the reliability of the analysis. Subsequently, these household heads were allocated to each strata according to Nh/N. In the last stage, researchers, using lists provided by village headmens and random number tables, determined the household heads to be interviewed with. Thanks to village headmens, they provided researchers with the lists that contained names of all farming resident in each villages .

Table 2: Numbers and Percentages of Household Head by Provinces

Province	Number of Participants	Percentage of Total Participants
ADANA	118,00	8,30
YOZGAT	110,00	7,70
ANKARA	101,00	7,10
G. ANTEP	155,00	10,90
GÜMÜŞHANE	158,00	11,10
ISTANBUL	172,00	12,10
K. MARAŞ	145,00	10,20
MALATYA	158,00	11,10
Ş. URFA	117,00	8,20
TRABZON	190,00	13,30
TOTAL	1424,00	100,00

Table 2 shows number and percentages of participants from each provinence. With 13.3% of participants Trabzon was the largest province, followed by İstanbul (12.1%), Gümüşhane and Malatya (11.1%) and Gaziantep (10.9%). By contrast, Ankara (7.1), Yozgat (7.7%) and Şanlıurfa (8.2) have the smaller number of participants. Overall, there were 1424 paticipant household head in the study.

The questionnaire form contained more than 200 questions and covered such issues as rural households living conditions, their economic activities, types of landholdings, costs of and incomes from agricultural production as well as their sociodemogarphic characteristics including such as ages, education, and marital status. The questionnaire form was filled through face-to-face interviews with 1424 farming household heads between 13 March 2009 and 15 July 2009.

In this research, I basically employ some graphs, descriptive statistics such as means and Pearsons' correlations to analyze relations between socioeconomic variables involving such as costs, revenues, farmland size, numbers of breed cattle and so on.

2. Discussion

In the following, I first I provide some descriptive statistics for socioeconomic and demografik charecteristics of the participants and some other statistics complined from secondary

resources, including World Bank, Turksih Statistical Institute. Table 3 shows some characteristics of participants from 10 provinences. The first column of the table clearly indicates that overall

Table 3: Socioeconomik and Demographic Features of Participants

Province	Mean Age	% Men	Number of Children	Pieces of Land	Monthly Income (TL)	Monthly Expenditure (TL)	% Participants with Debt	Monthly Debt Pay (TL)
ADANA	48.05	0.97	3.14	4.58	1466.79	764.79	0.54	539.96
	10.80	16	1.72	4.34	1593.92	831.34	0.50	1178.68
YOZGAT	54.15	1.00	4.23	8.63	1103.28	598.27	0.55	381.86
	13.53	.00	2.03	6.42	1087.46	332.29	0.50	595.14
ANKARA	56.37	0.97	4.14	8.82	1669.94	777.72	0.57	718.98
	12.76	0.17	2.04	7.15	1759.08	1039.94	0.50	1183.65
G.ANTEP	48.73	0.98	5.22	3.67	1482.84	698.56	0.70	832.24
	14.71	0.14	3.32	3.26	1785.14	1260.25	0.47	2242.86
GÜMÜŞHANE	60.20	0.87	3.78	6.15	915.12	621.56	0.50	270.98
	157.46	0.33	2.28	4.46	891.27	402.77	0.50	530.35
İSTANBUL	51.84	0.97	2.55	9.59	2381.19	1058.66	0.58	735.97
	11.74	0.17	1.29	14.98	2473.76	1153.46	0.50	1636.06
K. MARAŞ	50.72	0.96	4.36	6.10	1815.60	628.62	0.59	559.91
	26.00	0.20	2.36	6.66	3536.64	793.86	0.49	913.03
MALATYA	50.75	0.99	4.61	4.93	1013.24	503.86	0.66	371.43
	15.21	0.11	2.72	6.00	1957.01	379.34	0.47	530.43
Ş. URFA	43.27	0.98	7.17	2.61	2377.09	989.30	0.58	912.46
	11.51	0.13	4.43	1.96	2682.40	1477.15	0.51	1749.22
TRABZON	47.59	0.86	3.97	5.39	3285.98	917.83	0.52	521.24
	14.85	0.35	2.69	4.49	10182.21	828.48	0.50	1091.25
TOTAL	51.12	0.95	4.24	6.05	1817.70	761.04	0.58	577.39
	54.32	0.22	2.82	7.30	4631.65	932.39	0.50	1304.83

farming household heads were older, with the youngest average were from Şanliurfa (43, 27 years) and the oldest were in Gümüşhane (60.20 years) in 2009. The rest of mean ages of household head ranged between two extremes and overall average age was just over 51 years. When compared with findings from previous similar studies, these statistics were clear indication of aging rural population over time. Assuming that this trend of increasing age will keep going, it will have negatif impact on both livelihood of rural population and availability of national food stocks. Besides, during field works, we observed many deserted villages to be returned only in seasons of sowing and harvesting as well as the absence of young people in villages. We were able to meet and interview with few of them. Those young people who were still staying in their villages due to their parents, lack of jobs in nearby towns or other reasons such as social and cultural pressures were ready to leave their home in the next opportunity that may come out. Indeed, the lack of opportunity seems to be the major reason that keep these young people from leaving their villages.

Table 3 also show percentages of men in total participants for each provience, the average number of children, average number of pieces of land holdings, average monthly income and expenditures per household head within each provience as well as the percentages of participants with debts and monthly mean debt payment per household heads in each provience. I should remind that monetary values, including income, expenditure and debt, represent TL values in 2009. But, as all these values date back to the same year, they should not prevent us making some interpretations and predictions for the future. Turning back to Table 3 in column three, the average number of children per household head for the entire participants in the sudy was 4.2. Şanlıurfa being the highest in this respect had an average of 7.17 children, whereas İstanbul being the lowest had on average 2.52 children per household head. The table also shows the fact that on average, agricultural land in Turkey is quite fragmented as shown in “Total” raw. Putting aside Yozgat, in general, provience with large metropoliten cities such İstanbul and Ankara and those with a mounthanous geograph such as

Gümüşhane and Trabzon had the highest average numbers of pieces of land per household, an indication of more fragmented agricultural land compared to those in other proviences.

Measures such as monthly income from agriculture activities and expenditures and debt payments are good indicators of livelihood or standards of living in rural areas (See Table 3). Average monthly income of household heads were highest in Trabzon (3285,98 TL), İstanbul (2381,19 TL) and Şanlıurfa (2377.09 TL). Gümüşhane with 915.12 TL monthly income per household head was the lowest. On the other hand, monthly average expenditures were quite higher when compared to incomes. The highest average expenditures were in İstanbul (1058.66 TL), Şanlıurfa (989.30 TL) and Trabzon (917.83 TL). Malatya, Yozgat and Gümüşhane had the lowest average expenditures per household respectively. Both monthly incomes and debts are subjective at most as they were clearly based on statements from participatants rather than evidence based objective measures such as bank accounts or payment statements. But, they suggest that without support by some other sources of incomes most households in the study could barely get by when we substract monthly debt payments from incomes. Furthermore, on average more than half of all participants (exactly 58%) in the study were in debt. With a 70% of all its households in debt, Gaziantep was leading

Table 4: The Size of First Three Largest and Tenure Structure of Landholdings

Province	Largest (m2)	2nd Largest Land (m2)	3rd Largest Land (m2)	Owned Land (Yes/ No)	Rented Land (Yes/No)
ADANA	29.2128	16.5000	10.4151	.90	.20
	28.65436	15.23892	8.51116	.296	.404
YOZGAT	27.9143	18.1837	15.0215	.97	.10
	26.42628	18.94231	19.25232	.167	.308
ANKARA	40.0927	24.7961	17.5845	.92	.40
	36.26330	21.09157	14.75320	.280	.492
G.ANTEP	40.6397	25.5638	18.0203	.90	.24
	95.81359	45.52822	29.66415	.305	.426
GÜMÜŞHANE	9.5618	5.7015	3.6332	.89	.15
	8.17054	4.86728	3.62834	.315	.361
İSTANBUL	16.4158	9.9467	7.2248	.82	.53
	16.25317	10.68553	6.79598	.385	.501
K.MARAŞ	22.0682	13.7750	9.6066	.84	.20
	24.38166	12.69998	10.03577	.372	.402
MALATYA	20.4173	19.0000	14.5122	.93	.17
	20.90598	51.41137	55.64742	.259	.379
Ş.URFA	49.3038	32.7647	25.2500	.99	.12
	45.85466	31.12143	28.61874	.111	.331
TRABZON	4.4963	2.4420	1.7510	.96	.06
	4.21680	2.03460	1.50781	.207	.241
TOTAL	23.3094	14.3978	10.1335	.91	.21
	41.28722	26.36552	22.64648	.289	.409

provience in this respect.

These descriptive statistics imply that availabilty as one of the four pillars of food security is not in good shape in our rural areas as much as one may expect. Some of the structural charecteristics of traditional farms in our society may still enable rural households to meet their food needs, but also put constraints on their further development as to supply adequate and quality food needs of whole society at national level. Increasing fragmentation of agricultural land over time due traditions and inheritance rules has led to inefficient farming activities that can not benefit from economies of scales or take advantages of new technologies. Indeed, as Table 4 above show, the overall average size of

largest farmland for all proviences was little bit over 23 decares. The largest average farmlands were in Şanlıurfa (49.3038 decares), Gaziantep (40.6397 decares) and Ankara (40.0927 decares) respectively. By contrast, the smallest farmland were in Trabzon (4.4963 decares), Gümüşhane (9.5618 decares) and İstanbul (16.4158 decares). In terms of average famland size, the second and third pieces of the largest farmland for these proviences also show similar tendicies. In general, then, agricultural land is quite fragmented and smaller, especially in proviences with highly urbanized areas, such as İstanbul and Ankara, where large metropoliten centers dominate as well as in those proviences with mountanous topographical features.

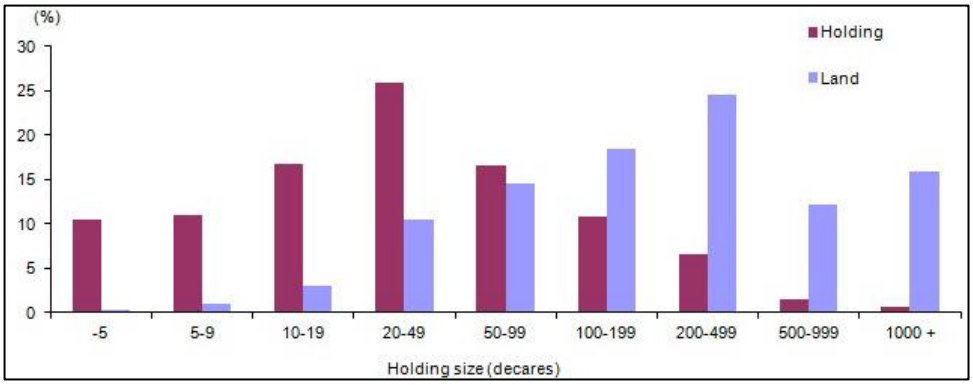


Figure 2: Agricultural Farmland Holdings by Size
Source: Turkish Statistical Institute, 2018, p. 3

Figure 2 shows shares of farmland holdings according their size groups. In Turkey, most of the farming holdings (%80.7) are smaller than 100 decares or 100,000 m^2. The share of the total land operated by this size group is just about 29.1%. On the other hand, with the share of %25.9 the total land holdings, farm holding are mainly concentrated in 20-49 decares-size groups. Those with a size between 200 and 499 only makes up %24.4 of the total holdings.

Table 5: The Distribution of Farm Holdings by Economic Size in Turkey, 2016

Economic size group (TL.)	Share (%)
<6,660	21,7
6,660 - 26,640	36,3
26,640 - 83,250	27,5
83,250 - 333,000	12,7
333,000 - 832,500	1,4
832,500 >	0,3
Total	**100,0**

Source*:* TurkStat, Agricultural Farm Structure Survey, 2016.

Besides, as Table 5 shows, in 2016, more than half of the farm holdings (more preicisly 58%) earned an annual income of less than 26,640 TL and just 27,5% between between 26,640 and 83,350 TL. Those with an annual income of more than 333,000 TL only makes up 1,7% of total share of farm holdings.

These statistics clearly suggest that small farm holdings with lower earnings still dominated agriculture sector in Turkey in 2016. I argue that the progressive fragmentation of agricultural land over time into smaller pieces has prevented majority of landholders to take the advantages of

economies of scales and adoptation of new tehcnologies in production, resulting in inefficiency in the agricultrual sector.

Table 6 show some Pearson's bivariate correletation between monthly averaga households income and several variables related to adaption of new technologies, pieces of tilled land, and largest agricultural land. The table suggests that monthly average farming income is both positively

Table 6: Bivariate Correlations Between Variables of Farming Structure

	Monthly farming income	Domestic Breed Cows (Heads)	Hybrid Breed Cows (Heads)	Culture Breed Cows (Heads)	Hybrid Sheep & Goats (Heads)	Culture Breed Sheep & Goat (Heads)	Cultivated Pieces of Land (number)	The size of largest piece of land (m2)
Monthly family's farming income	1	.000	.043	.164**	.049	.124**	.162**	.133**
N	1424	1220	1200	1216	986	987	1202	1206
Pieces of Land	.162**	.063*	.117**	.161**	.058	.134**	1	.083**
N	1202	1016	1006	1021	809	810	1202	1202
Size of the Largest Land (m2)	.133**	-.017	.009	.063*	-.003	.006	.083**	1
N	1206	1020	1010	1025	813	814	1202	1206

associated with number of breed cows and sheep and goats as well as with cultivated numbers of pieces of land and size of the largest farmland sown. In another termes, increase in number of adopted breed animals, land size and pieces of agricultural land is positively associated with monthly average income per household. While these statistically significant positive relations alone do not indicate a certainty whatsoever without taking into accounts other factors, they are in confirmation with my argument. Besides, number of pieces of land and land size are also positively associated with numbers of breed animals. Clearly, these corelations suggest that farmers' adoption to new agricultural technologies, in this study breed animals, are related to size of landholding. The agricultural lands in rural areas have over time become more fragmented due inheritance or urbanization pressure, leading to further subdivision of nearby agricultural lands. In return, fragmentation and further subdivision of land create economic and technological challenges for famers involving use of some undivisible factors of production or inputs or adaptation of new cropts, production techniques or new approaches to marketing. Hence, as these factors prevent and discrorage improvement in efficiency in production, movement, and marketing of produce, they can lead to reduction in supply or availability of food produced by a society.

Türk çiftliklerinin bu yapısal özellikleri, aynı zamanda tarım sektörünün yanı sıra kırsal kesimdeki insanların geçim kaynakları ve gıda güvenliğinin yerel veya uluslararası koşullardaki ani değişikliklere karşı kırılganlığını da artırmaktadır. Bu nedenle, sel, kıvılcım, iklim değişikliği veya sosyal çatışmalar, yanlış politikalar ve ekonomik krizler gibi doğal afetler, Türkiye'de gıda güvenliği üzerinde diğer ülkelere göre daha büyük etkilere sahip olabilir.

Indeed, the recent economic and social changes over the world clearly show how vulnearable our food security is. Turkey, with a rate of 11% economic growth, was the fastest developing economy amaong G20 countries in 2020. During 2021, COVID-19 measures have gradually been

relaxed around the world and in Turkey. However, in September 2022, the government made a cut in interest rates to stimulate demand. But, later monetray policy and spilovers from Ukrainian-Russian War also amplified macro-financial instability and led to deterioratin of economic conditions. Nowadys, rising inflation, energy, and food prices are hurting poor the most. As a result, the Turkish Lira has depreciated dramatically, whereas inflation reached to highest level. The value of the US dollar reached its highest value, rising to 18 Turkish Liras on December 20, 2021. Inflation rate rose to 61.1 percent in March 2022. "External and fiscal buffers deteriorated as the Central Bank dipped into foreign reserves to support the lira and the government deployed tax rate reductions and fuel subsidies to dampen the impact of inflation" (World Bank, 2022). According to latest data from Turkey Statistics Intuition, on May 2022 the inflation rate reached to 73,50%, a historical record within the latest 24 years. But, an independent academic community of economists who formed Inflation Research Group (ENAG) dispute the validity of such official statistics from the Turkey Statistical Institute (Turkstat) and insists that in May the inflation was actually 160%. Besides, Lived Map of United Nation Food Program show that in 2022 only between March and May number of malnutritional people has increased has by 410, 000 (BM verileri: Türkiye'de 14,8 milyon kişi yeterli beslenemiyor, 2022).

In rural Turkey, increases in prices of agricultural inputs such as fertilizers, energy and seeds have major impacts on income, livelihood, and generally on quality of life of rural households. Besides, these factors generally influence production and thus supply of food. The recent dramatic increases in inflation and inputs prices, including oil and fertilizers, are expected to negatively influence food supply and quality of life in rural areas.

Huish (2008) direct our attention to relation of food security to food justice. There has been a debate concerning vulnerability versus risk in the literature on food security. Supporting a vulnerability view Amartya Sen (1983) emphasize significance of socio-economic and political factors rather than a risk view as in environmental accidents, which also put people hungry (Huish, 2008, p. 1389). *Lexico Dictionaries* defines vulnerability as "the quality of being exposed to the possibility of being attacked or harmed, either physically or emotionally", while risk as "a situation involving exposure to danger" (Lexico Dictionaries, 2022). According to the author, "it seems that vulnerability still has to prevent outcomes of food insecurity, or even famine, rather than focus on the conditions that must put people at risk of going hungry in the first place" (Huish, 2008, p. 1389-1390). Thus, focusing on vulnerability towards famine does little to identify and cope with the macro and micro factor that put people at risk". "Putting the concept of risk, rather than vulnerability at the center of food security focuses attention on factors ranging from climate change to regional conflicts that can lead to poor food security. For example, studies show how local knowledge can help in coping with risk, whereas liberalized market environments lead to increasing risk (Huish, 2008, p. 1389-1390).

In Turkey, small farmholdings are very vulnerable to sudden changes and fluctuations in currency and inflation rates as well as to increases in prices of energy and fertilizers, which disproportionally account for the largest share in total production costs of agricultural produce. Unfotunately, as a steady increases in prices of these two inputs have been ongoing for a long time, recent sharp increase in these prices and rapid devaluation of Turkish Lira are expected to have far reaching consequences for food security. Indeed, as Figure 3 shows fuel prices increased by %27 between 2002 and 2003, 170% between 2002 and 2010 and 454% between 2002 and 2020. The oil price was 1,10 TL/ lt in 2002, increased to 2,33 in 2007 (TCTOB, 2020). In May 2022, the average price of 1 lt oil was over 26 TL (see Figure).

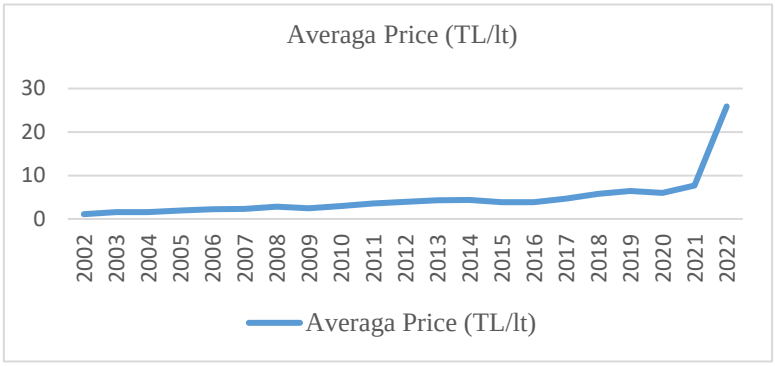


Figure 3: Changes in Average Prices of Fuel from 2002 to 2022
Source: TCTOB, 2020

Similarly, prices of fertilizers have skyrocked within last two years. Figure 4 show changes in prices of several types of fertilizers most commonly used by the farmers in Turkey. It clearly show a constant increase from 2002 to 2019 and then a sharp rise within last two years. Even long before these recent abnormal price increases, farmers frequently complained about high cost of agricultural inputs. Hence, these changes will have major deterioraring impacts on food security in Turkey.

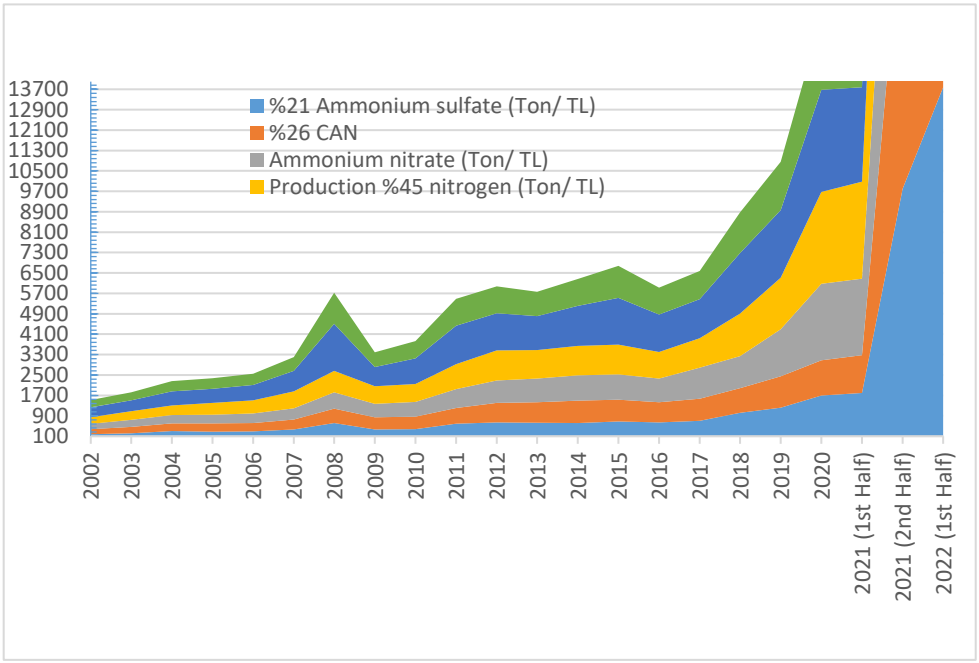


Figure 4: Changes in Prices of Various Fertilizers, 2002-2022

Currently, in Turkey, food insecurity may not seem to be a major issue when compared to malnutrition that has long been persistent. On the other hand, some recent statistics from the World Bank and United Naton Food Program show that Turkey may face with serious food insecurity issues in near future, as economic, social and environmental condition in Turkey and around the world are rapidly getting worse. For example, Live Hunger Map from UN World Food Program (UNWFP) shows that in 2022, Turkey has a population of 82,3 million, of which 14,8 million cannot sufficiently meet their food needs. Unfortunately, these numbers have grown rapidly within the last three months.

Also, there are large numbers of acute and chronic malnutrition among children under age 5. Of these, 1.7% are acute and 6% are chronic (UNWFP, 2022)

Table 7 shows changes in Global Food Security status of Turkey in comparasion to those of some other selected countries between 2012 and 2021. According to Impact Economist com, "The

Table 7: Changes in the Global Food Security of Turkey and Some Other Countries, 2001-2021

Rank	Δ	Country	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change
1	▲1	*Ireland*	80,0	80,6	80,4	80,9	82,6	83,7	84,8	84,7	84,5	84,0	+4,0
2	▲1	*Austria*	79,6	79,0	79,0	79,9	79,6	79,2	78,7	79,2	80,1	81,3	+1,7
3	▲14	*United Kingdom*	74,9	76,7	77,3	80,2	79,7	80,1	79,3	80,6	80,6	81,0	+6,1
4	▼3	*Finland*	80,6	79,6	80,2	81,9	84,1	84,1	83,9	84,5	85,2	80,9	+0,3
5	▲1	*Switzerland*	78,9	78,9	78,5	77,7	78,8	78,3	81,1	79,7	80,2	80,4	+1,5
=9	▼4	*France*	79,1	78,7	79,0	79,7	78,6	80,7	79,6	78,5	78,4	79,1	0
=9	▼2	*United States*	77,8	77,9	80,0	77,7	79,8	80,0	79,5	79,3	80,0	79,1	+1,3
11	▼3	*Germany*	77,6	77,6	77,1	78,6	80,1	80,4	79,4	79,7	79,6	78,7	+1,1
12	▲9	*Israel*	72,6	73,5	73,4	76,4	77,5	76,3	78,6	78,2	78,1	78,0	+5,4
21	▼9	*Portugal*	76,7	75,7	74,8	76,1	76,9	76,2	77,4	76,6	76,5	75,2	-1,5
23	▲12	*Russia*	65,4	66,5	65,9	65,6	63,5	69,8	72,6	73,4	73,9	74,8	+9,4
=24	▼5	*Spain*	73,8	74,7	74,2	74,9	75,2	74,1	74,8	74,3	74,8	73,6	-0,2
27	▼4	*Greece*	71,0	72,0	75,1	76,6	75,4	75,9	75,5	74,6	74,1	73,3	+2,3
29	▲3	*Romania*	66,2	67,3	69,2	70,3	71,2	71,3	69,9	71,9	73,8	72,4	+6,2
41	▲8	*Kazakhstan*	61,5	60,4	63,2	63,1	64,4	63,6	65,1	69,9	71,9	69,2	+7,7
42	▼12	*Slovakia*	67,5	69,0	68,5	71,1	71,7	71,4	68,5	68,6	68,1	68,7	+1,2
48	▼10	*Turkey*	64,0	63,5	65,0	64,0	64,5	65,9	64,0	63,5	61,2	65,1	+1,1
56	▲3	*Azerbaijan*	57,5	61,2	62,8	64,5	61,6	58,9	58,8	61,9	61,5	62,6	+5,1
58	▼1	*Ukraine*	57,8	56,1	58,2	54,9	50,7	54,1	53,2	56,3	58,8	62,0	+4,2
60	↔	*Serbia*	56,8	57,9	61,1	63,9	60,6	62,2	60,6	61,3	61,2	61,4	+4,6
71	▼7	*India*	54,5	54,7	53,3	56,0	58,4	58,9	59,9	59,8	58,6	57,2	+2,7
78	▼9	*Uzbekistan*	53,3	54,7	53,1	55,5	58,6	60,2	55,0	54,5	54,1	53,8	+0,5
83	▲1	*Tajikistan*	44,2	48,0	47,4	46,0	48,3	50,3	50,2	54,8	52,5	51,6	+7,4
96	▲11	*Guinea*	34,7	36,0	39,8	41,6	38,5	40,0	40,4	40,6	42,8	43,0	+8,3
=106	▼15	*Syria*	41,2	38,1	43,0	42,8	42,5	39,3	40,3	45,4	39,5	37,8	-3,4
113	▼15	*Burundi*	39,2	38,7	38,8	41,4	42,7	41,5	31,1	37,2	38,0	34,7	-4,5

Source: The Economist Intelligence Unit, 2021.
https://impact.economist.com/sustainability/project/food-security-index/

Global Food Security Index (GFSI) considers the issues of food affordability, availability, quality and safety, and natural resources and resilience across a set of 113 countries. The index is a dynamic quantitative and qualitative benchmarking model constructed from 58 unique indicators that measure the drivers of food security across both developing and developed countries" (The Economist Intelligence Unit, 2022).

For example, we see that food security for Ireland and Austria have improved over time. During this period, United Kingdom has moved up 14 places to become 3rd best food-secured conuntry in the world. The Economist Intelligence Unit (2022) states that "the countries that are models for food security are those that score highly on all four pillars of food security". Therefore, considering ranking of all 113 countries, "top-scorer Ireland scores above 92 points for Affordability, and Quality and Safety of food, and above 74 points for the Availability and resilience pillars". In contrast Portugal has moved down 9 places and in 2021 became 21st country in this respect.

Turkey's index skore was 64 in 2012 and 65.1 point in 2021. Probably, the index for 2022 will be lower than that of previous year, as there is a serious inflation and generally worsening economic conditions right now. The table shows that this index for Turkey reached to its lowest levet at 61.2 in 2019. But, what is interesting about food security in Turkey is the fact that it has moved down 10 place and in 2021 ranked 48th among all these countries, implying an overall increasing food insecurity.

Data from Table 1 in Appendix A show all indicators used in calculation of global food security for Turkey. These are various quantitative and qualitative measures, which covers availability, access, utilization, nutritional status as well as environmental, social and political envoronmental factors that may have direct or indirect influence on all the pillars of food security. From these measures, one can see how food security in Turkey has changed between 2012 and 2021. First, there are some improvement in several qualitative and quantitative measures, but also deterorations. Second, deterotation in these measures, especially, have accelerated within last three years. Here, I will only focus on factors that have negatively contributed to overall food security in Turkey. One reason for poor performance was that Turkey has not been able to keep average food cost down. Indeed, as we discussed previously, these costs have been increasing over time and with the current high inflation rates and worsening economic conditions since 2020, they have raised to unbearable levels. The table also indicates that from 2012 to 2020, the number of people under global poverty line have declined, but since the end of this period, they began to rise again. A similar trend also characterizes food supply. Especially in the last two years, the supply of food adequacy has been declining. Besides, people have suffered from sudden fluctuations in agricultural production. We should also notice that the food import dependency rate for Turkey has increased throughout these years. By contrast, public expenditures on agricultural research and development have been in decline since 2019.

Table 1 in Appendix A defines access to agricultural technology, education and resources as the discrepeancy between percenatge growth of agricultural output minus percentage growth in agricultural input. This value was negative in 2012, but, since then it has taken positive values ranging from 0,02 to 0,06. The positive, yet small values suggest that during this period there has been some small gains in agricultural efficiecy. Indeed, national agricultural land surveys, which took place several times between 1990 and 2020 confirm this, as the total land in agriculture had declined in this period. In 1990, 27, 856 thousand hectares were in agricultural use. But, in 2002 it reduced to 26, 579, in 2017 to 23, 375, and in 2020 to 23.136 thousand hectares. Despite decline of agricultural land use, quantities of various agricultural produce had increased in general (TCTOB, 2020). But, livestock produce in Turkey shows a constant decline. Beside, there have been a dramatic decline in the total land in pasture use. Pasture land was 1,027,900 ha in Egean region in 1970. This has declined to 440,166 in 2020. But, the most dramatic losses took place in Eastern Anatolian Region. While there was 9,162,100 hectares of pasture land in this region in 1970, it declined to 4,976, 736 ha in 2020. In summary, the total land areas in pasture show a dramatic decline over time throughout all regions in Turkey (TCTOB, 2020).

Another reason for decrease in Turkey's overall food security index seems to be volatility of agricultural production, which has varied between 0,052-0,089. Besides, political environment measuered by political stability risk and corruption index have deteriorated between 2012 and 2021. For example, during this period, while only within the last two years the political stability risk in Turkey has increased from 50 to 80, the corruption index stayed higher at 3 (0 being the lowest and 4 highest). gender inequality, which is qualitative measure ranging from 0 to 4 (4 being highest in equality), has stayed 3 during this period. The final point, albeit not the last, to make is that many environmental indicators used to measure such as risk, resilience or sensitivity of natural resources under droughts, floodings, and sea level rise have not performed well. Also, quantitative and qualitative measures associated with water availability, land degradation, marine biodiversity loss,

and commitment to risk management have skored lower. Despite the claimes that Turkey is one of the a major agricultural economy in the world and that it should not have to cope with issues of food security in the near future, what we have reviewed and discussed so far and especially the more recent developments suggest that perhaps we are ignoring the seriousness of this problem or overly optimistic.

Conclusion

This study began with the question of whether there may be a risk of food insecurity in near future in Turkey. For some politicians and academicians, the issues of food insecurity seems to be quite far from becoming an immediate adgenda in Turkey, which both has diverse climatic conditions suitable to grow various types of crops and is a major agricultural economies in the world. But this assumption can be described at best as an unrealistic wish, when we analyze it in the light of various statistics, concerning structural charecteristics of agricultural farmholdings as well as historical developments in demographic features of rural areas and more recent developments in economic conditions in Turkey. First, statistics clearly show an aging population and depopulation in our rural areas. These are important as older people tend to be close to new ideas and are reluctant to adopt new agricultural technologies or innovations. Besides, young people in rural areas seem to look for any chance to leave their homes for the city, where they hope to find better-paid jobs and social opportunities. Therefore, as long as these two trends continue, we can expect to find an even more older people in our rural areas. Impact of these trends will clearly be negative for individuals livelihoods, and well-beings of rural people, rural development, and ultimately national food supply. Ineed, foundings from this study clearly show that average monthly income from farming per households were positively associated with landholdins size, breed husbandary or adaption to new technologies. Unfortunately, most of the agricultural landholdings in Turkey are quite small in size to get any advavantage associated with economies of scale or adoption of new agricultural technologies or inovations. We also show that these same small farmland holdings were also responsible for the production of the largest share of domestic agricultural produce. This implies that largest share of agricultural production, and thus those of food supply at both local and national levels has been produced by family farms that are lacks of major efficincies and making gains from further improvments.

Flactuations in agricultural production may result from sudden changes in seasonal weather or economic and policy factors. Fertilizer and fuel prices account relatively a large share in total costs of agricultural production in Turkey. Historical statistics for prices of these two factors show that they have increased steadily overtime and in the last two years they have scyroceketted and reached to their highest recors. As the agricultural landholdings are disproportionally made up by small family farms, they can not bear rising costs and hence need to borrow or transfer other financial resources somewhere else in order to continue farming. On the other hand, once a farming household get into debt, it has to pay this money back by its earnings from sales of crops for a long time. In fact, this study shows that more than half of the households were in debt in 2009. Of course, debt burden further increases the costs of production. These factors which are either structural charecteristics of farmlands or features of natural, social, economic and political environments where farming take place have considerable impacts on production costs, quantity and quality of agrcicultural production, food supply and thus on overall households well-being in rural areas in Turkey. This study demonstrated, many of these factors have contributed to decline of Global Food Security of Turkey between 2012 and 2021. What we need, then, is to first reduce the cost of production, to stabilize flactuations in crops and inpus' prices, especially those of fuel and fertilizers, and to provide financial resources with much lower interest rates. Then, as was discussed in the last section of this paper, there is also a need to improve several qualitative and quantitative measures involving natural, social and political environments.

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Appendix A

Table 1: Global Food Security Index for Turkey, 2012-2021

Overall Food Security Environment	**Unit**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
1) Affordability											
1.1) Change in average food costs	Annual change in Consumer Prices, Food Indices (2015 = 100)	6,3	8,5	9,1	12,6	11,2	5,8	12,7	17,9	20,2	13,8
1.2) Proportion of population under global poverty line	% of population living under $3.20/day 2011 PPP	4,3	4	3,1	2,7	2,1	2,4	1,6	1,5	1,4	2,2
1.3) Inequality-adjusted income index	Index 0-1; 1=highest inequality adjusted income	0,588	0,6	0,6	0,65	0,65	0,66	0,66	0,66	0,66	0,65
1.4) Agricultural import tariffs	%	41,2	41,2	42,4	42,2	42,7	43,2	43,1	41,8	42,3	42,3
1.5) Food safety net programmes											
1.5.1) Presence of food safety net programmes	Qualitative rating 0-1	1	1	1	1	1	1	1	1	1	1
1.5.2) Funding for food safety net programmes	Qualitative rating 0-1	1	1	1	1	1	1	1	1	1	1
1.5.3) Coverage of food safety net programmes	Qualitative rating 0-1	1	1	1	1	1	1	1	1	1	1
1.5.4) Operation of food safety net program	Qualitative rating 0-1	1	1	1	1	1	1	1	1	0	1
1.6) Market access and agricultural financial services											
1.6.1) Access to finance and financial products for farmers	Qualitative rating 0-2	2	2	2	2	2	2	2	2	2	2
1.6.2) Access to diversified financial products	Qualitative rating 0-2	2	2	2	2	2	2	2	2	2	2
1.6.3) Access to market data and mobile banking	Mobile subscribers per 100 inhabitants	85,4	88,9	90,7	91,7	93,1	93,8	94	95,9	97,3	96,8
2) Availability											
2.1) Sufficiency of supply											
2.1.1) Food supply adequacy	Dietary Energy Supply (DES) as a percentage of the Average Dietary Energy Requirement (ADER)	153	154	154	154	153	154	154	155	155	149
2.1.2) Dependency on chronic food aid	Qualitative rating 0-1	0	0	0	0	0	0	0	0	0	0
2.2) Agricultural research and development											
2.2.1) Public expenditure on agricultural research and development	Ratio: Agriculture share of government expenditure (%) / Agriculture value added share of GDP (%)	0,33	0,4	0,44	0,45	0,47	0,45	0,46	0,5	0,46	0,43
2.2.2) Access to agricultural technology, education and resources	Annual growth in agricultural output (%) minus annual growth in agricultural inputs (%)	-9E-04	0,03	0,05	0,03	-0,01	-0,02	0,04	0	0	0,06

Table 1: Global Food Security Index for Turkey, 2012-2021 (Continues)

2.3) Agricultural infrastructure		**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
2.3.1) Crop storage facilities											
2.3.2) Road infrastructure	Qualitative rating 0-1	0	0	0	0	1	1	1	1	1	1
2.3.3) Air, port and rail infrastructure	Qualitative rating 0-4	2	2	2	2	2	2	2	2	2	2
2.3.4) Irrigation infrastructure	Qualitative rating 0-4	2,3	2,3	2,3	2,7	2,7	2,7	2,7	2,7	2,7	2,7
2.4) Volatility of agricultural production	Land area equipped for irrigation, %	13,37	13,6	13,6	13,6	13,5	13,5	13,6	13,7	13,8	13,8
2.5) Political and social barriers to access	Standard deviation of production growth rates	0,068	0,07	0,05	0,06	0,07	0,09	0,09	0,09	0,08	0,07
2.5.1) Armed conflict											
2.5.2) Political stability risk	Risk rating 0-4; 4=highest risk	2	2	2	2	2	2	2	2	2	2
2.5.3) Corruption	Risk rating 0-100; 100=highest risk	50	55	55	70	65	65	75	75	80	80
2.5.4) Gender inequality	Risk rating 0-4; 4=highest risk	3	3	3	3	3	3	3	3	3	3
2.6) Food loss	Index score 0-1, where 0=most equal	0,427	0,39	0,38	0,36	0,36	0,34	0,33	0,33	0,31	0,31
2.7) Food security and access policy commitments	Total waste as a percentage of total domestic supply	9,08	8,75	9,06	9,19	9,24	8,1	8,45	8,26	8,34	8,34
2.7.1) Food security strategy											
2.7.2) Food security agency	Qualitative rating 0-1	1	1	1	1	1	1	0	1	1	1
3) Quality and Safety	Qualitative rating 0-1	0	0	0	0	0	0	0	0	0	0
3.1) Dietary diversity											
3.2) Nutritional standards	% non-starchy foods in dietary consumption	52	53	54	55	56	57	57	58	58	58
3.2.1) National dietary guidelines											
3.2.2) National nutrition plan or strategy	Qualitative rating 0-1	0	0	1	1	1	0	0	0	0	0
3.2.3) Nutrition labeling	Qualitative rating 0-1	0	0	1	1	1	1	1	1	1	1
3.2.4) Nutrition monitoring and surveillance	Qualitative rating 0-1	1	1	1	1	1	1	1	1	1	1
3.3) Micronutrient availability	Qualitative rating 0-1	1	1	1	1	0	0	0	0	0	0
3.3.1) Dietary availability of vitamin A											
3.3.2) Dietary availability of iron	Qualitative rating 0-2	2	2	2	2	2	2	2	2	2	2
3.3.3) Dietary availability of zinc	mg/person/day	28,68	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7
3.4) Protein quality	mg/person/day	11,06	11,3	11,3	11,3	11,3	11,3	11,3	11,3	11,3	11,3
3.5) Food safety	grams of high-quality protein in diet	74,2	74,2	74,2	74,2	74,2	74,2	75,2	75,2	75,2	75,2

Table 1: Global Food Security Index for Turkey, 2012-2021 (continues)

3.5.1) Food safety mechanisms		**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
3.5.2) Access to drinking water	Score 0-100, 100 = best	76	80	80	80	80	80	93	60	60	80
3.5.3) Ability to store food safely	% of population with access to at least basic drinking water services	97,5	97,7	97,9	98,1	98,3	98,5	98,7	98,9	98,9	98,9
4) Natural Resources & Resilience	% of population with access to electricity in all areas	100	100	100	100	100	100	100	100	100	100
4.1) Exposure											
4.1.1) Temperature rise											
4.1.2) Drought	Index score, 0=least vulnerable	55,1	55,1	55,1	55,1	55,1	55,1	55,1	55,1	55,1	55,1
4.1.3) Flooding	Risk rating 0-4, where 4=highest risk	3	3	3	3	3	3	3	3	3	3
4.1.4) Sea level rise	% change in flood hazard	3,92	3,92	3,92	3,92	3,92	3,92	3,92	3,92	3,92	3,92
4.2) Water	Index score 0-1, where 0=least vulnerable	0,0054	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
4.2.1) Agricultural water risk – quantity											
4.2.2) Agricultural water risk – quality	Risk rating 0-4, where 4=highest risk	4	4	4	4	4	4	4	4	4	4
4.3) Land	Risk rating 1-5, where 5=highest risk	3	3	3	3	3	3	3	3	3	3
4.3.1) Land degradation											
4.3.2) Grassland	Proportion of land that is degraded over total land area (%)	9	9	9	9	9	9	9	9	9	9
4.3.3) Forest change	Net emissions/removals (CO_2), gigagrams	0	0	0	0	0	0	0	0	0	0
4.4) Oceans, rivers and lakes	Change in forest area as % of total land area	1,1	1,2	1,2	1,3	1,3	1,3	1,3	1,2	1,2	1,3
4.4.1) Eutrophication											
4.4.2) Marine biodiversity	Qualitative rating 0-2	0	0	0	0	0	0	0	0	0	0
4.5) Sensitivity	Index score 0-100, 100=most sustainable	8,3	3,9	2,4	2,4	2,4	2,4	2,4	2,4	2,4	2,4
4.5.1) Food import dependency											
4.5.2) Dependence on natural capital	%, cereal imports as a share of total cereal production	-2,9	6,5	4,6	6,5	12,1	5,4	0,1	7	10,2	22
4.6) Political commitment to adaptation	Total natural resources rents as % of GDP	0,4	0,5	0,7	0,6	0,5	0,4	0,3	0,3	0,4	0,5
4.6.1) Early-warning measures / climate-smart Agriculture											
4.6.2) Commitment to managing exposure	Qualitative rating 0-2	0	0	0	0	0	0	0	0	0	0

Table 1: Global Food Security Index for Turkey, 2012-2021 (continues)

		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
4.6.3) National agricultural adaptation policy	Qualitative rating 0-13, where 0 = No commitments to 13 = Full commitment	2	2	2	2	2	2	2	2	2	2
4.6.4) Disaster risk management	Qualitative rating 0-2	2	2	2	2	2	2	2	2	2	2
4.7) Demographic stress	% local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies	0	0	0	0	0	0	100	100	100	100
4.7.1) Projected population growth											
4.7.2) Urban absorption capacity	% growth in population (5-year forecasted)	6,9	6,8	6,6	6,2	5,7	4,8	3,9	3	2,3	2
	%, forecasted 5-year growth in GDP per capita minus 5-year forecasted urban population growth	1,428	1,95	1,02	0,34	-0,27	0,16	-0,13	0,34	1,24	1,88

Source: The Economist Intelligence Unit, 2022