Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü

Faculty of Economics and Administrative Sciences

Department of Economics

THE IMPACT OF AGRICULTURAL MECHANIZATION AND AGRICULTURAL PRODUCTIVITY ON AGRICULTURAL EMPLOYMENT

Muhammed Hasan YÜCEL

Master's Thesis

Ankara, 2019

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ACCEPTANCE AND APPROVAL

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The jury finds that Muhammed Hasan YÜCEL has on the date of 12 June 2019 successfully passed the defense examination and approves his Master's Thesis titled "The Impact Of Agriculture Mechanization and Agricultural Productivity on Agricultural Employment".

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ETİK BEYAN

Bu çalışmadaki bütün bilgi ve belgeleri akademik kurallar çerçevesinde elde ettiğimi, görsel, işitsel ve yazılı tüm bilgi ve sonuçları bilimsel ahlak kurallarına uygun olarak sunduğumu, kullandığım verilerde herhangi bir tahrifat yapmadığımı, yararlandığım kaynaklara bilimsel normlara uygun olarak atıfta bulunduğumu, tezimin kaynak gösterilen durumlar dışında özgün olduğunu, Tez Danışmanının **Prof. Dr. Zafer ÇALIŞKAN** danışmanlığında tarafımdan üretildiğini ve Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Yazım Yönergesine göre yazıldığını beyan ederim.

Araş. Gör. Muhammed Hasan YÜCEL

DEDICATION

To My Beloved Wife, Kadriye GÜL YÜCEL.

ACKNOWLEDGE

For his sincere and helpful attitude and guidance in all processes of my thesis, I would like to thank Prof. Dr. Zafer ÇALIŞKAN.

I would like to express my sincere thanks to Assoc. Prof. Dr. Özgür TEOMAN and Asst. Prof. Yusuf MURATOĞLU, who have guided me through constructive criticism and valuable suggestions in my jury.

I would like to thank my esteemed mentor, Prof. Dr. Taha Bahadır SARAÇ who is a role model for me with his academic identity and working discipline.

I would like to thank Dr. Asst. Mustafa Nal who inspired me on the subject of the thesis and Dr. Asst. Ferhat Çıtak who helped me in the analysis section.

I would like to thank my dear Asst. Fatih KAYA and Asst. L. Gizem EREN, who are always giving me morale and academic help with his smiling face and joy.

I have special thanks to my beloved wife, Kadriye GÜL YÜCEL, who was always with me during the writing phase of the thesis, who contributed during the writing and editing phase, whom I felt the love and support of.

I would like to thank my family, especially my mother, Sevim, for their endless understanding in this process.

ABSTRACT

YÜCEL, Muhammed Hasan. *THE IMPACT OF AGRICULTURAL MECHANIZATION AND AGRICULTURAL PRODUCTIVITY ON AGRICULTURAL EMPLOYMENT,* Master's Thesis, Ankara, 2019.

Agriculture and agricultural production play an important role on population in a country. With the development of agriculture, humanity can continue its progress. Cultivation, fertilization and fertilization methods, mechanization of agriculture and high-yield hybrid seeds have enabled agricultural production to meet the food needs of the population. Especially it was absolutely saving time and effort with mechanization. excess labour occurred in the agricultural sector has created the phenomenon of migration from rural to urban glides to other sectors.

In this study, the mechanization and productivİty in agricultural production is being investigated its impact on agricultural employment in Turkey. In this context, 2009Q3-2018Q2 period between the level of mechanization in Turkey, the number of employed in the agricultural sector, agricultural Gross Domestic Product values and the Autoregressive Distributed Lag (ARDL) model analysis was performed with statistical data on agricultural land in the same period. As a result of the analysis, it was found that mechanization level and average income per capita in agriculture had a negative effect on agricultural employment rate in the long run.

Keywords

Agricultural Employment, Mechanization in Agriculture, Agricultural Productivity, ARDL.

ÖZET

YÜCEL, Muhammed Hasan. *TARIMDA MEKANİZASYONUN VE TARIMSAL VERİMLİLİĞİN TARIM İSTIHDAMI ÜZERİNE ETKİSİ,* Yüksek Lisans Tezi, Ankara, 2019.

Tarım ve tarımsal üretim bir ülkede nüfusun beslenmesinde önemli rol oynamaktadır. Tarımın gelişimi ile beraber insanlık ilerlemesini devam ettirebilmektedir. Toprak verimliliğini arttırıcı ekim, ilaçlama ve gübreleme yöntemleri, tarımın mekanizasyonu ve yüksek verimli hibrit tohumlar tarımsal üretimin nüfusun gıda ihtiyacını karşılamada yeterli olmasını sağlamıştır. Özellikle mekanizasyon ile birlikte zamandan ve emekten büyük oranda tasarruf edilmiştir. Tarım sektöründe meydana gelen fazla işgücü diğer sektörlere kayarak kırdan kente göç olgusunu yaratmıştır.

Bu çalışmada, Türkiye'de tarımda makineleşmenin ve tarımsal üretimde verimliliğin, tarımsal istihdam üzerindeki etkisi araştırılmaktadır. Bu bağlamda Türkiye'deki 2009Q3-2018Q2 dönemleri arasındaki mekanizasyon düzeyi, tarım sektöründeki istihdam düzeyi, tarımsal Gayri Safi Yurtiçi Hasıla değerleri ve aynı dönemdeki tarım alanı istatistiki verileri ile ARDL analizi yapılmıştır. Yapılan analiz sonucunda, uzun dönemde, mekanizasyon ve tarımda kişi başı ortalama gelir düzeyinin, tarımsal istihdam oranını negatif yönde etkilediği saptanmıştır.

Anahtar Sözcükler

Tarımsal İstihdam, Tarımda Makineleşme, Tarımsal Verimlilik, ARDL.

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ABBREVIATIONS

ADF: Augmented Dickey Fuller Test

AIC: Akaike Information Criteria

ARDL: Autoregressive Distributed Lag Model

ARIP: The Agricultural Reform Implementation Project

BDDK: Banking Regulation and Supervision Agency

ÇSGB: Ministry of Labour and Social Security

DEA: Data Envelopment Analysis

DIE: Turkish Statistics Institute

DIS: Direct Income Support

ECT: Error Correction Term

EU: European Union

EVDS: Electronic Data Delivery System

FGLS: Feasible Generalized Least Squares

GDP: Gross Domestic Product

GUD: Gübre Üreticileri Derneği

NNTC: Non-neutral Technical Change

NUTS: Statistical Regional Units Classification

OLS: Ordinary Least Squares

PCSE: Panel Corrected Standard Error

PP: Phillips-Perron Test

TCMB: Central Bank of the Republic of Turkey

TEE: Technical Turkish Statistics Institute Efficiency Effect

TFP: Total Factor Productivity

TFPG: Total Factor Productivity Growth

TURKSTAT: Turkish Statistics Institute

TVE: the Time Varying Efficiency

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INTRODUCTION

It is still a mystery about how agriculture emerged in the different part of the world, almost at the same time. There are several theories on this subject, but they are far from absolute. One of these theories is that people suffer from food shortages in a certain period. A global drought has led people to seek more food sources than food gathering. Another theory is that the number of people increases in a certain period. Due to a sudden increase in the world's population, people have had to learn more difficult but more productive agriculture, leaving an easier job to collect food. However, it is difficult and even impossible to prove these theories. (Davis, 2011, p. 13).

About 10,000 years ago, a process began to change the way humanity lived. After a while, people who had been hunting and meeting their food needs began to meet their food needs by imprisoning their herd of animals in a certain area. People are on their way to tame wild animals. By this way, people started to stay in the same area for a long time. At this point, it is thought that people do not meet their food requirements by eating only meat. People gathering other foods, especially in the plains and in the marshes around the plains, have also collected grains such as barley, rice and wheat. In this way, people who find agricultural products have learned the transition to agriculture as a result of a process that is not sudden but long. (Davis, 2011, p. 11-12).

According to Adam Smith, capital is like a certain amount of labour that has been collected and stored for use at another time when necessary (Smith, 2004, p. 353). In the structure of the hunter-gatherer society, no one could store more than production. People have found the way to save time and energy needed to meet their urgent needs by saving their labour. The source of investments in new things has been this capital accumulation (Ridley, 2013, p. 135).

The importance of agricultural sector from past to present continues to increase. For the development of humanity and the continuity of the population,

agricultural production is required. The development of agricultural production and humanity has a different nature. Thomas Robert Malthus (1776-1834) who first made his point in 1798 in his essay on the Principles of Population'. Malthus emphasized that while the population increased geometrically, agricultural production increased arithmetically. In other words, the nutrients needed by the population increase by 5 times within a century and the population increases by 16 times. Feeding with 16 times increased population with 5 times increased nutrients is not possible after a period of time. According to Malthus, the world will inevitably face a starvation problem in the future (Malthus, 1798, p. 15).

However, this view of Malthus, which had a great repercussion in the 18th century, has lost its influence with the developments in agricultural production in the last century. In the last century, the rate of increase in population has decreased, while significant improvements have been experienced in increasing productivity in agriculture. The work, which took days and even weeks with human labour, was carried out in hours with improved machinery and techniques. In fact, innovation is not in inventions but in entrepreneurs' readiness to ponder the already existing and accessible science and technology (Hobsbawm, 1969, p. 56). In the 18th century, the Industrial Revolution accelerated as a result of a number of new techniques and innovations in production.Developments in different production techniques have led to the invalidity of Malthus ' famous theory. For example Dutch farmers realized they could produce without following land. In this direction, the amount of arable agricultural land increased by 33%. Instead of following land, farmers planted grain, turnip, grass and clover in each part of their fields by dividing them into 4 pieces. With this method, the amount of arable land increased by 33%, but also planted clover, nitrogen plants and the soil enriched as animal feed was used. These developments have been replaced by a vicious cycle of productive growth in agriculture. (Appleby, 2012, p. 72).

Developments in biology and chemistry have increased productivity in agriculture. Gregor Mendel, the father of the science of heredity, contributed to

the development of modern genetics. Genetically modified, in other words, with the help of hybrid seeds, agricultural productivity could be increased. Another scientist, Louis Pasteur, explores the method of pasteurization, which is known by his name, and ensures that foods are kept in a long life. At the same time, this process allows the food to be free of harmful bacteria without losing its nutritional value. With the developments in sea and railway transportation, food reaches to agricultural markets in a shorter time and in a cheaper way. After these and similar steps in technical progress, agricultural production minimizes the likelihood of future starvation by increasing rapidly beyond the rate of increase in population.

Today, developed countries used agricultural surplus as a capital accumulation in the transition from agricultural society to industrial society. The agriculture sector plays a primary role in development. During the progress, the industrial sector is growing by using agricultural production as inputs. The profit accumulated in the large agricultural enterprises is directed to the industrial sector production. Investments in the industrial sector increase the demand for the industrial sector by turning the terms of domestic trade in favor of the industry. As a result of the developments in agricultural production, the manpower out of employment is directed to other sectors. There is a flow of labour from the primary sector to the industrial sector.

In order to obtain more efficient production areas in the agricultural sector, there is increasing needs of other sectors support to agriculture sector. While the development of the industrial sector opens up a working area for the domestic labour force in the agricultural sector, it also forms an infrastructure for technological breakthroughs in agricultural production (Şahinöz, 2011, p. 59). *''A backward agriculture not only obstructs production increases-agricultural surplus, but also traps the labour force that other parts of the economy need.''* (Şahinöz, 2011, p. 51).

Historically societies have undergone similar processes on the road to development. The first people engaged in hunter-gatherer became a part of the agricultural society. The transition from hunting to agriculture is the first deep-

rooted socio-economic and technological change that humanity performs on earth (Şahinöz, 2011, p. 82). Rostow explains the path that societies have in their path towards development. He states that it is possible to classify societies. According to him, the transition period depends on the acceleration of the transfer of funds from agriculture to industry and land reform. Rostow emphasizes that there have been radical changes in the production methods used in the agricultural sector during the take-off stage (Kaynak, 2014, p. 190-191).

The agricultural sector represented by the traditional sector is described by Lewis as a labour store. In the Lewis Model, it is assumed that there is unlimited labour in the agricultural sector because the labour supply at the level of subsistence wages is above the labour demand. Lewis states that, the average product of labour does not decrease in the agricultural sector if there is no labour transfer from the agricultural sector to the capitalist sector (industry sector), assuming that there is hidden unemployment in the agricultural sector. Since the land is scarce, the agricultural sector has diminishing returns of scale. If the population rises rapidly and labour force has very few employment opportunities outside the land, then the employment capacity of the agricultural sector decreases. According to Lewis, in order to get rid of the diminishing returns in the agricultural sector, the excess labour should be absorbed by the industrial sector. Ensuring that productivity increases faster than population depends on increasing productivity in agriculture. One of the basic conditions for increasing productivity in agriculture is to increase capital accumulation. (Kaynak, 2014, p. 214-216).

There is no direct linkage between more efficient agriculture and the design of new machines that are ground-breaking in production. Agricultural revolution could not produce the vital inventions of industry. But if there hadn't been plenty of harvest due to these discoveries, these discoveries would have been limited to a small segment of society that was not responsible for producing food for everyone. Producing more food with less people created vital labour and capital

resources. The agricultural revolution paved the way for capitalism (Appleby, 2012, p. 84-85).

To sum up, this thesis investigates the impact of agriculture mechanization and agricultural productivity on agricultural employment in Turkey. Thesis is orginized as follows: The next section describes the structure of Agriculture and Employment in Turkey in two sub-headings. Chapter 3 consists of literature review. Chapter 4 demonstrates the methodology, data and empirical results of ARDL bounds testing approach model. Finally concluding remarks and policy implications are presented in the last section.

CHAPTER 1

THE RELATIONSHIP BETWEEN AGRICULTURE AND EMPLOYMENT

1.1 GENERAL FRAMEWORK OF AGRICULTURAL SECTOR IN TURKEY

1.1.1 Importance of Agriculture Sector

Agriculture is one of the sectors that significantly affects the growth of societies. The agricultural sector, which has an important place in meeting the food needs of the society, obtaining national income by exporting, and supporting the industrial sector in the use of inputs, has a strategic importance in the sustainable development of the countries and societies. The agricultural sector creates value added and contributes to the development of other sectors. Agriculture has been supported in different ways in every society due to its importance. Agricultural supports vary according to region, time and conditions. As agricultural production and input use varies according to climatic conditions and landforms, agricultural support methods should be used effectively.

Mercantilism occurred from approximately the 15th to 18th in Europe. Mercantilist thought emerged in central kingdoms, such as Britain and France, has generally developed in relation to macroeconomic issues such as foreign trade and money. Mercantilists accept the source of wealth as gold and silver from a profitable foreign trade. Mercantilist thought is measured by money from wealth originating from foreign trade (Gürkan, 2008, p. 635). Mercantilist tenets centered on relative power, the balance of trade and its relation to the balance of power and supply of precious metals, protectionism, trade promotion, and a zero-sum world economy, the circulation of Money, population and labour, and the places of manufacturing and agriculture in the order of economic priorities (Welch, 1998, p. 107).

“The King Law” in the form of population movements and relationship of agricultural production (decline of total agricultural income in periods of

agricultural production) was first introduced in Mercantilism period. According to the law of Gregor King, one of the mercantilist authors, he concluded that agricultural income decreased in the years when agricultural production increased. It is also called the “paradox of plenty”. According to this law, because the demand for agricultural products is not flexible, prices increase in the few years of the product and farmers' income is more. Farmers' incomes are falling because the prices are falling in the years when the product is more.

The physiocracy emerged as a reaction to mercantilism, which neglected agriculture. The founder and most important representative of the physiocracy is Francois Quesnay (1694-1774). The rule of the physiocracy of nature means that societies are governed by natural law.

In this view, which advocates the natural order, social and economic rules are formed by the power of natural law. F. Quesnay also emphasized that agriculture is a productive sector in his work called “Analysis of the Tableau Economique” and taxes should be taken from agriculture after showing the surplus value created by the soil in the economic table.

In Quesnay’s analysis, the nation is divided into the usual three socio-economic classes: the productive class (those engaged in agriculture, including both entrepreneurs and wage-earners); the class of proprietors (the landlords, sovereign, and clergy, who receive the net product in the form of rent, taxes, and tithes respectively); and the sterile class (those engaged in non-agricultural employments, including both entrepreneurs and wage-eamers) (Meek, 2013, p. 298). According to the economic table created by Quesnay, the distribution of income in these classes is as follows; farmers give the net income from the soil as rent to the land owners. Landowners take this net harvest, which is the cost of the operation of the land. The sterile class requires a manufacturing facility and worker to convert raw material to processed material. Therefore, the net income generated by this class has to return to the other two classes.

According to Physiocrats, agriculture is the only productive sector within the economy. Unlike the mercantilists, however, they identified the source of wealth

as lying in agriculture or production, not circulation. In contrast to mercantilist thinking, the physiocracy is an economic view of freedom and has brought the agricultural producer to the fore. It is more likely that in the conditions of that day France is an agricultural country and the heavy taxes on agriculture and agricultural production reduction (Güngör, 2006, p. 4).

According to Physiocratic thought, agriculture was almost the only activity which yielded an output that was in excess of its input. This excess they termed the net production (Gudeman, 1980, p. 245). They argue that exports should be based on agricultural products. According to Physiocrats interest is the profit of agricultural capital.

Smith emphasized the importance of capitalist development in agriculture in the Wealth of Nations. In this emphasis on agriculture, the relationship with the Physiocrat has a great share. Smith explained the problems of political economy on the basis of examples derived from agriculture and the problems of agriculture (Kaymak, 2005, p. 9). According to Smith, agriculture is not the only productive sector, but it is the most productive sector among other sectors. However, the trade and industry sectors, which the Physiocrats consider as inefficient sectors, are also productive areas.

Smith stated the importance of land in the fifth chapter of his first book entitled "Various Uses of Capital" as follows: "productive labour in most of the same capital of the same size can mobilize the capital of the farmer. They are not only a factor that reproduces their own consumption or capital, but also the capital owner's profit. From the capital of the farmer, other than all the profits of this capital, they are constantly conducive to the reproduction of the rent of the landowner (Smith, 2014, p. 393). The same amount of labour used in industry can never be a means of production of this size again. In industry, nature does nothing, but in agriculture, nature works with people. Although the labour of nature is free, the crop has value as much as the most expensive worker. Therefore, the capital used in agriculture mobilizes labour from any of the equal capital used in the industry and adds much greater value to the income of the country compared to the productive labour used. In summary, Smith's view is

that agriculture is the most beneficial to the community, in all the ways in which capital can be used.

Smith's analysis shows how beneficial rent reproduction is to society, but does not mention the cost of rent to society. Ricardo explains that there is no absolute benefit from the reproduction of the rent. Only one class can earn on the rent at the expense of the other. Since nature works with human labour during the cultivation process, it is a dream product of the concept that the agricultural sector provides products and as a result it brings rent. According to Ricardo, rent is not from the product, but from the price where the product is sold. This price is not the price of the nature to help production, but the price to adjust consumption (Günaydın, 2009, p. 355). Smith implicate the concept of rent with the interest and profit of capital. However, according to Ricardo, rent is the piece that is paid to the owner of the land from the product obtained by using the original and indestructible power of the land. In this context, the soil should be owned to produce rent.

David Ricardo's growth model is built on diminishing returns and functional income distribution. According to the theory, income is distributed between the factors of production as follows; wages in return for labour, rent in return for natural resources, profit in return for capitalist entrepreneurship. According to Ricardo, capitalists rent land from landowners and try to make more profit. The profit earned is added to the capital, creating the possibility of more production with more workers. However, in the growth period, it is necessary to open production in the new territory with the increase in population. However, the second quality land is not suitable for growing agricultural products. When the second quality soil of this type is opened to production, productivity decreases while the total rents amount increases and the total payment of wages increases. Ricardo explains this with the law of diminishing returns. As a result of this situation, the state of labour and output will not change.

According to Ricardo, when the population is raised and the same amount of land is planted, the share of the landowner's crop will reach its former level, but the value of this share will not be the same. So rent will be the same as before,

profits will be much higher. Because the price of food, therefore the wages have fallen much more. Labour demand is thus further increased, and landowners begin to see the benefit of increasing demand for their land (Ricardo, 2013, p. 297-298). According to Ricardo, the extraordinary profits resulting from the nature of the land cannot be permanent, because each more crop of crops yields to the landowner, after a reasonable amount has been deducted enough to promote accumulation. Ricardo claims that, with the price of labour falling due to the abundance of crops, not only will it be harvested more than the land already planted, but also the possibility of using more capital in the land, generating greater value. At the same time, infertile soils can be harvested with high profits, which will benefit both the landowner and the consumer class. Ricardo explains the relationship between land yields and the fall in labour prices as follows: “soil, the most important substance producing this machine, will gain superiority, will receive a price proportional to the services expected from the soil. At the first stage, the workers, the capitalists and the consumers will benefit from it, but with the rise of the population, this superiority will gradually be transferred to those who hold possession of the land (Ricardo, 2013, p. 298). Ricardo concludes from this process that the interests of the landlord and the interests of the consumer and the manufacturer are opposed.

According to Ricardo's conceptualization, rent is not the cause of wealth, but a symptom. The rise of rent indicates that wealth is increasing in the country and food supply for the growing population is becoming increasingly difficult (Günaydın, 2009, p. 357).

Marx stated that the distinction between capitalist agriculture and industry is not as precise as the classical economists claim. On the contrary, conditions of capitalist production influence all areas of the economy and affect it in the same way. In this context, there is no significant difference between the capitalist and the landowner. Both classes acquire plus value by exploiting labour.

Marx redefined the categories of distributive shares. No longer was the dividing line one which distinguished the roles of capitalist, landowner and labourer. For Marx, a twofold class schema was sufficient. What mattered was the separation

of those who had a recognized stage in the ownership of the means of production from those who did not. On this basis the distinction between agriculture and industry- to which the classical tradition had attached so much importance- largely evaporated (Barber, 2009, p. 143). Marx notes that although many of the detrimental physical effects of machine use on factory workers are not visible on agricultural workers, the increase in workers here is more intensive and unobstructed due to the use of machinery (Marx, 2015, p. 480). Marx states that the great industry has shown the most revolutionary effect on the agricultural field, destroying the old peasantry and transforming it into wage workers. Thus, he stated that the conflicts of interests between the classes increased in the countryside to the level in the city. It has been stated that the scientific and technological use of the old, non-rational, old-fashioned agricultural methods has been replaced by scientific and technological use. The capitalist mode of production has broken the old link between agriculture and manufacture, but it will also create the material conditions of a higher level of synthesis in the future. According to Marx, the wide spread of rural workers, they break their resistance forces, and their mass presence increases the tendency of urban workers to resist (Marx, 2015, p. 482). Marx claims that increasing the productivity and mobility of labour in modern agriculture is at the expense of waste of labour power and consuming. Every progress in capitalist agriculture is not only a progression of the worker, the art of exploitation, but also an advance in the art of exploiting the land. In summary, Marx summarizes, every progress in improving the fertility of the soil for a given period of time is also a progress in destroying the permanent resources of this productivity.

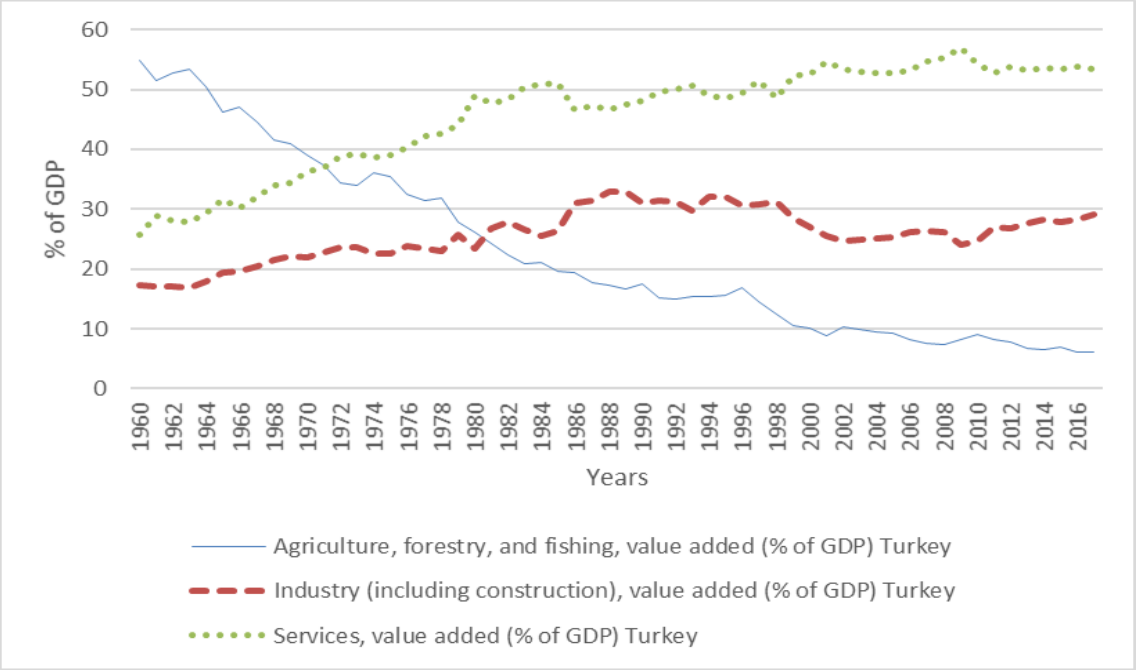
We do not have enough information about the economic structure of the Ottoman Empire due to the fact that the state archives covering the pre-republic period were not regular and not opened to the researchers (Tokgöz, 2007, p. 3). Inherited from the Ottoman Empire, the Republic of Turkey took over the remaining years of the establishment of a very primitive type of agricultural production. The developments implemented in the Republican Period in the sectoral progress of agriculture have a great effect. In 1925 the Tithe Tax (Aşar) was abolished, private property rights were adopted for the land and the

foundation lands were transferred to the treasury. 3.7 million decares of land was distributed to families without land. At the same time, pasture sand meadows were opened to agriculture. With these developments, agricultural sector grew by 29% in 1929 (Oğuz, 2014, p. 27).

The first census of the Republic Period was made in 1927 and continued to be carried out every 5 years. According to the census conducted in 1927, about 13.5 million people were living in Turkey. 75% of the population was living in rural areas and villages and the rest in the province and district centres. In those years, the share of the agricultural sector in the total population was up to 90%.

As can be seen from Figure 1, the share of agricultural sector in total national income in the 1960s was around 50%. This rate declined to 30 percent in the 1970s, while it was between 26 and 17 percent in the 1980s. The share of agriculture in the national income for the first time in 2001 fell below 10% to 8,85%. In 2017, this ratio was determined as 6%.

Figure 1: Share of Main Sectors in GDP in Turkey (1960-2016)



Source: World Bank, World Development Indicators Database (2019).

The agricultural sector supports other sectors with its production. It is possible to monitor the size of this support from the input-output tables.

The Table-1 shows ''How much of the percentage of the economically active population is income ''. According to this table, while 75% of the economically active population in 1960 was working in the agricultural sector, in 2017 this rate decreased to 20%. The economically active population in the agricultural sector, which was 63% in 1980, fell sharply in 1990 to 31%. The proportion of economically active population in the services sector has steadily increased over the decade between 1980 and 1990 and has experienced a sharp increase over the next decade. This rate increased by 77% over the next decade to 40%. In the industrial sector, there has been a reverse but parallel development with the agricultural sector, which is the same with the change in the agricultural sector. From this, it can be understood that there is a population change between the agricultural sector and the industrial sector. In the 1980s, the employment in the industrial sector was about 2 times.

Table 1: Distribution of Economically Active Population by Sectors (%)

Years	Sectors		
	Agriculture	**Industry**	**Service**
1960	*74,94*	*9,64*	*15,42*
1970	*66,06*	*12,60*	*21,34*
1980	*63,90*	*15,50*	*24,60*
1990	*31,90*	*45,60*	*22,50*
2000	*36,00*	*24,00*	*40,00*
2009	*24,60*	*25,30*	*50,10*
2010	*25,20*	*26,20*	*48,60*
2011	*24,80*	*26,80*	*48,40*
2012	*24,60*	*26,00*	*49,40*
2014	*19,5*	*27,8*	*52,8*
2015	*18,9*	*27,2*	*53,9*
2016	*21,00*	*26,4*	*52,6*
2017	*20,07*	*26,8*	*52,6*

Source: TURKSTAT, Labour Force Statistics, 2013, 2017.

In the 1980s, the sharp employment change in agriculture continued under the influence of neoliberal policies. The neoliberal strategy that was effective on small producers in agriculture has pushed a large rate of peasants out of

agriculture (Kaymak, 2011, p. 134). After 1980, the peasant was introduced into the process of poverty. With the abolition of input supports and raising interest rates on agricultural loans, the peasant has been compelled to accept the price determined by the merchant (Kaymak, 2011, p. 136). The terms of domestic trade developed against the agricultural products and contributed to the impoverishment of the farmers (Boratav, 2009, p. 17). As the rural population becomes poor, the rural connections of urban laborers are weakened. Institutionalization policies applied in agriculture and deepening capitalism in agricultural production reduce the prices of agricultural products in rural areas while increasing the prices of consumers in cities. In other words, the prices received by farmers is falling, the city consumes more expensive (Kaymak, 2011, p. 140).

In the process of capitalization, rural farmers have found themselves in the industrial sector. In the 1980s, this situation brought with it many problems in the cities and towns.

1.1.2. Agricultural Production and Sector

Width and structure of the agricultural sector in Turkey varies depending on terrain conditions. Area of farmland in Turkey has increased over time. The agricultural land area, which has been increasing since the 1960s, has started to decrease since 2006. As seen in Table 2, total cultivated agricultural area in Turkey is about 23 million hectares in 2018. Approximately 81% of this is cultivated land. Approximately 19% of the total agricultural area is used as a fallow land. Total cultivated agricultural areas have decreased by 12% in the last fourteen years. The increase in the amount of land in non-agricultural use has a significant impact. It is undeniable, as well as Turkey's arid and semi-arid climate in the region and the effect of that erosion prone.

Table 2: Agricultural Land in Use

Years	Fruits, Drinks And Spice Crops Field - Thousand Hectares	Fallow Land - Thousand Hectares	Vegetable Area - Thousand Hectares	Ornamental Plants Area - Thousand Hectares	Field of Cereals and Other Plant Products - Thousand Hectares	Total Area- Thousand Hectares
2004	*2780*	*4956*	*894*	*0*	*17961*	*26593*
2005	*2831*	*4876*	*893*	*0*	*18005*	*26606*
2006	*2895*	*4690*	*850*	*0*	*17439*	*25876*
2007	*2908*	*4218*	*814*	*0*	*16944*	*24887*
2008	*2949*	*4259*	*835*	*0*	*16460*	*24505*
2009	*2942*	*4322*	*811*	*0*	*16217*	*24294*
2010	*3010*	*4249*	*801*	*0*	*16333*	*24394*
2011	*3091*	*4017*	*809*	*4,21*	*15691*	*23613*
2012	*3200*	*4286*	*826*	*4,78*	*15463*	*23781*
2013	*3232*	*4147*	*808*	*4,5*	*15612*	*23805*
2014	*3242*	*4107*	*803*	*4,89*	*15781*	*23940*
2015	*3283*	*4113*	*808*	*4,59*	*15723*	*23933*
2016	*3329*	*3998*	*804*	*4,86*	*15574*	*23711*
2017	*3348*	*3697*	*798*	*4,99*	*15536*	*23385*
2018	*3462*	*3512*	*783*	*5,17*	*15435*	*23199*

Source: TURKSTAT, Agricultural Land, (2019).

1.1.3. The Size of Agricultural Enterprises

The size of the enterprise is defined in two different ways. The first definition of enterprise size is expressed by the size of the farmland owned by the enterprise. In other words, the size of the enterprise is measured by the scale of the land suitable for agriculture (Baş n.d. as cited Castle and Berker, p. 104). In the second definition, the size of the enterprise is defined in the structure of inputs used in the agricultural enterprise. The capital used in the production process is associated with the amount of land suitable for agriculture and the size of the labour enterprise (Aksöz, 1972, p. 175). Due to insufficient data, the measurement of the size of agricultural enterprises in Turkey cannot be made according to these definitions. The measurement of the size of agricultural enterprises is limited to the land width criterion (Baş, n. d., p. 162).

According to Table 3, in 1980, enterprises using more than 5.000 decares of agricultural land used approximately 2% of the total agricultural area. This rate fell below 2% in 2001. If enterprises using agricultural land below 100 decares are considered as small enterprises, the ratio of enterprises using agricultural land under 100 decares in total farms in 1980 was 85% in 1991 and 85% in 2001. This high rate shows that small enterprises are still highly dominant in the agricultural sector.

Table 3: Structure of Enterprises

Enterprises Size (Decares)	1980		1991		2001	
	Enterprises	Land	Enterprises	Land	Enterprises	Land
Less than 5	*7,23*	*0,20*	*6,34*	*0,28*	*5,89*	*0,26*
5-9	*6,70*	*0,69*	*9,61*	*1,07*	*9,61*	*1,06*
10-19	*14,13*	*2,96*	*18,96*	*4,28*	*17,86*	*4,00*
20-49	*32,56*	*15,69*	*32,13*	*16,49*	*31,46*	*16,02*
50-99	*21,07*	*21,42*	*17,98*	*19,94*	*18,53*	*20,68*
100-199	*11,99*	*23,98*	*9,66*	*20,99*	*10,83*	*23,81*
200-499	*5,46*	*22,73*	*4,38*	*19,82*	*5,09*	*22,82*
500-999	*0,77*	*8,04*	*0,61*	*6,39*	*0,58*	*6,09*
1000-2499	*0,007*	*1,59*	*0,26*	*5,91*	*0,14*	*2,97*
2500-4999	*0,01*	*0,55*	*0,05*	*2,79*	*0,01*	*0,36*
5000 +	*0,001*	*2,16*	*0,01*	*2,04*	*0,00*	*1,91*
Total	*100,0*	*100,0*	*100,0*	*100,0*	*100,0*	*100,0*
Quantity (Million Decares)	*3,43*	*199,0*	*4,07*	*234,51*	*3,02*	*184,35*

Source: DİE/TURKSTAT (1981,1991, 2001) General Agricultural Census, Ankara.

Due to the fragmented and small scale of agricultural enterprises, the use of new agricultural production technologies is limited, productivity in production and agricultural investments are insufficient (Özgüven et al., 2010, p. 91).

1.1.4. The Main Inputs of Agricultural Production

Machinery, labour, credit, diesel, seed, irrigation are some of the important inputs affecting the productivity in agriculture.

The use of qualified and high quality seeds is one of the factors affecting product efficiency. In agriculture, increasing production and productivity is possible through the use of certified seeds. Low quality seed use increases the cost of production. In plants such as cereals, the use of high quality seeds, 30% efficiency while affecting the efficiency of maize plants has been shown to affect over 100% (Tigem, 2017, p. 4).

In mechanization, mechanization increases productivity by saving time and labour. The tractor needs a diesel to increase efficiency as an input. With the increase in the level of mechanization, the use of diesel oil is also increasing.

Table 4: Total Cash Loan Amount Given to Agricultural Sector and Share in GDP (Million TL)

Years	Agriculture	GDP	%
2010	*15.258*	*1.160.014*	*1,32*
2011	*22.544*	*1.394.477*	*1,62*
2012	*30.187*	*1.569.672*	*1,92*
2013	*31.758*	*1.809.713*	*1,75*
2014	*36.014*	*2.044.466*	*1,76*
2015	*45.854*	*2.338.647*	*1,96*
2016	*60.004*	*2.608.526*	*2,30*
2017	*73.479*	*3.106.537*	*2,37*
2018	*89.192*	*3.700.989*	*2,37*

Source: BDDK, Agricultural Loans, (2019). TURKSTAT, Annual GDP, (2019). Note: Apart from official loan data, the level of informal loan is far above these values.

In case of insufficient agricultural sector support, the agriculture production is financed by the loan. As production increases in agriculture, farmers need more loans (Terin et al., 2014, p. 71). Table 4 shows the increase in the loan level between 2010-2017. The share of agricultural loans in GDP in 2010 was 1.32%. According to BDDK data for 2017, this ratio increased to 2.37%. There is an

increase in loans to the agricultural sector. However, considering that the share of the agricultural sector in total national income was 6% in 2017, it can be concluded that the agricultural sector did not have sufficient support in terms of financing.

Fertilizer is used to enrich the soil with mineral and to increase the productivity in the plant production. Erosion, over-processing of the soil and excessive watering over time make the soil poor. The use of chemical fertilizers leads to a productivity increase of fifty percent in the production of plant products (Yurtsever and Ülgen as cited Çelik, 2000, p. 32). Fertilizer use in Turkey, has increased the importance of farmers fertilizing with grip. The Table 5 shows the use of fertilizers.

Table 5: Fertilizer Consumption (Tons)

Years	Nitrogen (N)	Phosphorus (P)	Kalium (K)	Total (N+P+K)	Simple Index 2003=100	% Change
1965-69	*150.338*	*132.396*	*8.162*	*290.896*	*15*	*-*
1970-74	*343.597*	*200.251*	*16.294*	*560.142*	*28*	*193*
1975-79	*636.619*	*543.792*	*23.231*	*1.203.641*	*61*	*215*
1980-84	*850.188*	*548.089*	*34.291*	*1.432.568*	*73*	*119*
1985-89	*1.046.833*	*534.100*	*46.380*	*1.627.314*	*83*	*114*
1990-94	*1.170.290*	*626.479*	*63.104*	*1.859.873*	*94*	*114*
1995-99	*1.249.734*	*617.861*	*75.236*	*1.942.831*	*99*	*104*
2000	*1.378.532*	*628.776*	*82.095*	*2.089.403*	*106*	*108*
2001	*1.132.555*	*470.258*	*67.820*	*1.670.633*	*85*	*80*
2002	*1.199.130*	*474.418*	*73.567*	*1.747.115*	*89*	*105*
2003	*1.340.867*	*546.145*	*83.622*	*1.970.634*	*100*	*113*

Source: TKB, 1969; TKB,2004; Yılmaz, H. as cited in GÜD.

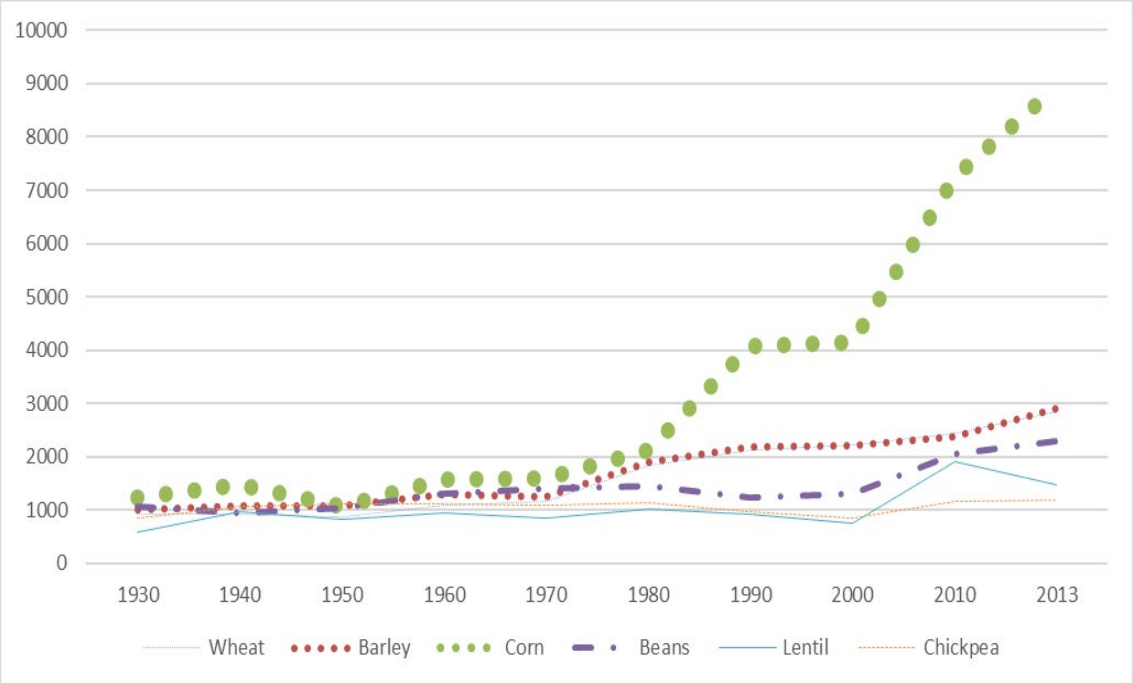
The use of water in agricultural production is not sufficient in arid regions. It located in arid and semi-arid climates in annual water potential of Turkey, 98 billion cubic meters of surface, including a total of 112 billion cubic meters to 14 billion cubic meters under the ground. Approximately 74% of this potential is used in the agricultural sector (Çakmak and Gökalp, 2013, p. 3). With the development of irrigation methods, it is possible to save water used. In an environment where the climatic conditions are more arid with the effective use

of water in agriculture, there will be no problem in agricultural production. Water management and effective use in terms of food safety is of strategic importance.

1.1.6. Agricultural Productivity

The productivity in agriculture is measured by the amount of product obtained from the soil unit used in a given year. According to TURKSTAT, the amount of production per hectare in selected products in the bulletin prepared for the years 1923-2013 is given in Figure 2 in kg. According to the Figure 2, the highest productivity increase emerged in corn production. Increasing productivity in maize was followed by barley and wheat production.

Figure 2: Products



Source: TURKSTAT, Statistics Indicators, 1923-2013.

There are many factors affecting productivity in agricultural production. Use of fertilizers, expansion of arable agricultural areas, mechanization, increase of irrigation facilities, labour, soil structure, social factors, storage, input prices,

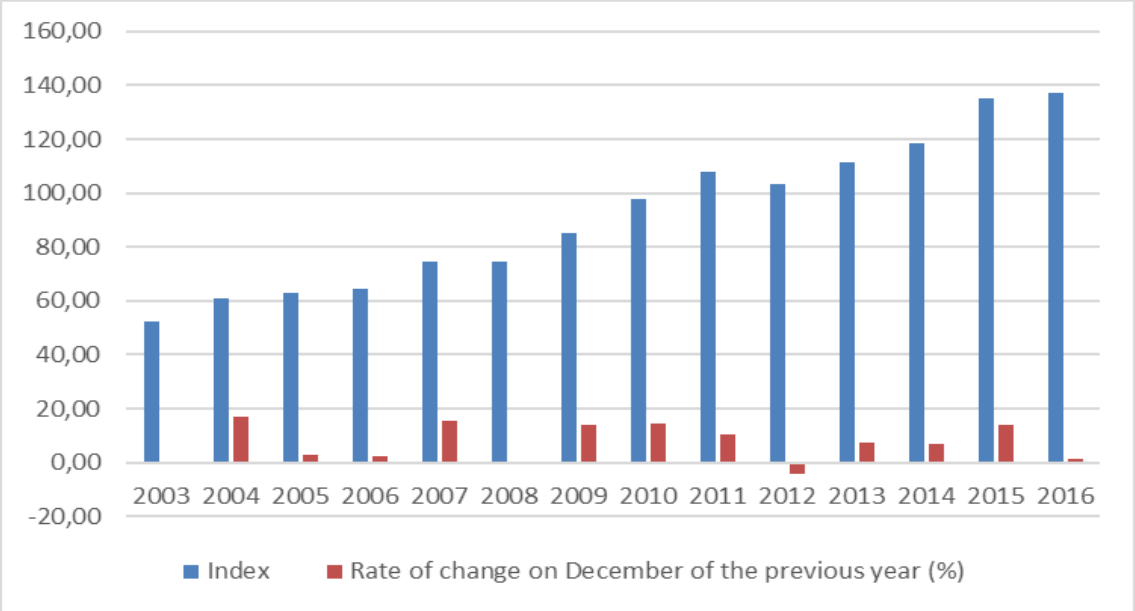
drug, seed, climate, producers' size, incentives, taxes are some of these factors (Çelik, 2000, p. 14).

1.1.7. The Price of Agricultural Products

Price formation of agricultural products is determined different factors. An important aspects that agricultural price formations are highly depend on seasonal fluctuations, the supply of product of the previous year, or the price intervention of the state. In order to keep stable the non-agricultural sectors input costs of, the state needs to intervene in agricultural prices. The stable agricultural prices will be guaranteed by other sectors with stable costs in the market.

Figure 3, between the years 2003 to 2016 it is possible to monitor the agricultural price index comprised in Turkey. Agricultural price index in Turkey, except for the year 2012, has increased between 2003 and 2016. The highest increase in the index occured in 2004 with 16,81%.

Figure 3: Producer Price, Price Index of Agricultural Products

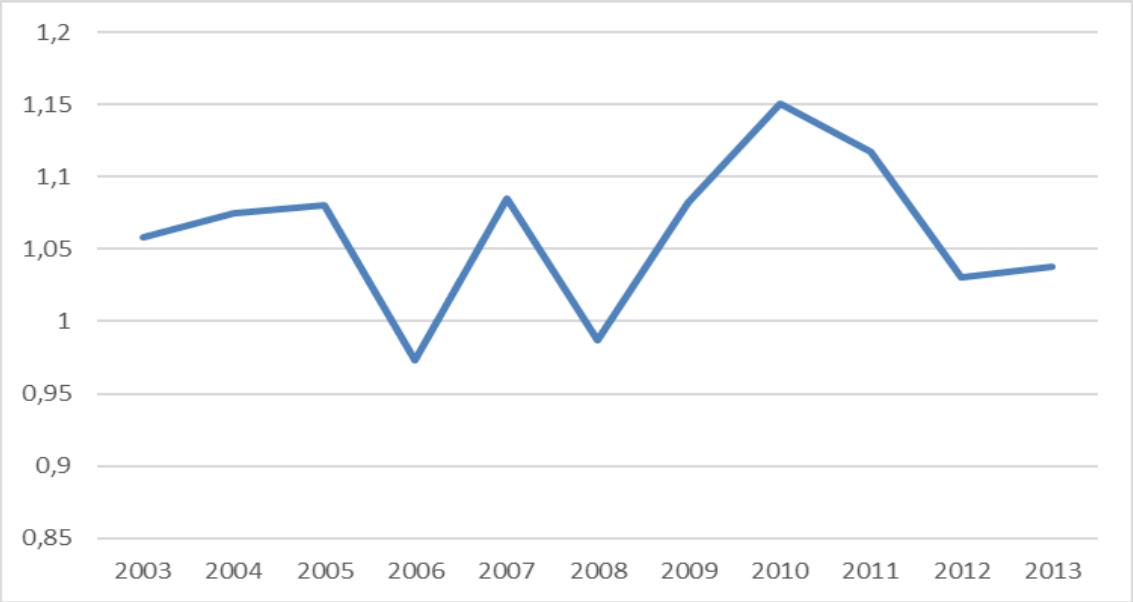


Source: TURKSTAT, Producer Price price index of agricultural products, (November 2017) (2010=100).

Domestic trade rates (in other words terms of domestic trade) are obtained by the ratio of the price index of agricultural products and non-agricultural sectors in a certain period of time. The increase in this ratio implies that the terms of trade have improved in favor of agricultural sector. The opposite situation, ie the decrease in the volume of trade, explains that the purchasing power of the industrialist has increased (Kepenek, 2014, p. 374).

Figure 4 shows the course of the domestic terms of trade in Turkey. From December 2003 to December 2013, the terms of internal trade were largely in favor of the agricultural sector. In the table of domestic trade figures calculated according to December price indices, the domestic trade rate for only in 2006 and 2008 improved in favor of agriculture.

Figure 4: Domestic Trade Rate in Agricultural Products



Source: TURKSTAT, Producer Price Index, (2003=100), (December, 2013).

1.1.8. The Mechanization in Agricultural Sector

The increase in crop production can only be achieved in two ways. The expansion of agricultural areas and the increase in the amount of products obtained from the unit area are two factors that will cause an increase in food production. According to agriculture statistics agricultural land areas are almost

reached the threshold level in Turkey. The achieving any increase in production can be possible by increasing the production per unit area. In other words, increasing productivity in production is the only way to produce enough food for society. Protection of soil and water resources, development of irrigation techniques, use of hybrid seeds and chemical fertilizers, application of advanced agricultural techniques such as mechanization will bring productivity to higher levels in agricultural production (Ergüneş, 2009, p. 2).

Since the first years of the Republic of Turkey, there have been developments in the development of the agricultural sector. According to the agricultural census conducted by the Ministry of Agriculture in 1927, the number of agricultural machinery available at this date is only 15.711. These machines consist of tractors, harvester and threshing machines, meadows, harrows, machinery and drills. 1. The committee collected in 1931 in Ankara in Turkey Agriculture Congress in that year reveals that there were about 2 thousand tractors in Turkey (Aktan, 1954, p. 39).

The agricultural sector has undergone a very rapid transformation. In the 1950s and 1980s, great importance was attached to the mechanization of agriculture. In this period, modern agricultural machinery has been used instead of karasaban and bullock (calf). Table 6 shows the amount of some agricultural machinery and tools.

Table 6: Quantities of Some Agricultural Machinery and Instruments

Quantities of Some Agricultural Machinery and Instruments (Thousand Pieces)			
Years	**Karasaban**	**Tractor**	**Harvester**
1952	*1981*	*31*	*3*
1960	*1991*	*42*	*5*
1970	*1994*	*105*	*8*
1980	*953*	*436*	*13*
1990	*500*	*692*	*11*
2000	*152*	*941*	*12*
2010	*58*	*1096*	*13*
2013	*45*	*1213*	*15*

Source: TURKSTAT, Statistics Indıcators, 1923-2013.

As a result of mechanization, the agricultural production area and the increase in the amount of production occurs. As can be seen from the Table 7, the increase in sugar beet production during the Democratic Party was over 400%. Sugar beet was followed by potatoes with 131% and wheat production by 118%. On the other hand mechanization has a certain limits. In 2017 the number of tractors in Turkey has exceeded 1.3 million. Given the limited agricultural areas in need of Turkey's saturation point it is made in the determination of the number of tractors that exceed about 5 times. Advanced technology in agriculture is not measurable by the dimension of the tractor park. Progress in agriculture is only possible with the use of advanced technology. (Bayaner, 2014, p. 14).

Table 7: Major Agricultural Products Production (Thousand Tons)

	1925	1940	1950	1960	1950-60 The Percentage of Increase
Wheat	*1075*	*4068*	*3872*	*8450*	*%118*
Barley	*1252*	*2249*	*2047*	*3700*	*%81*
Corn	*523*	*757*	*628*	*1090*	*%74*
Cotton	*76*	*77*	*118*	*176*	*%49*
Tobacco	*56*	*71*	*93*	*139*	*%49*
Sugar Beet	*6*	*553*	*855*	*4385*	*%413*
Potatoes	*73*	*319*	*605*	*1400*	*%131*

Source: TURKSTAT, Statistics Indicators, 1923-2013.

At this point, it should be stated that products quality is more important than its quantity. 43% of tractor parks in Turkey is composed of tractors have completed their economic life. These tractors, which have completed their economic life, consume 30% more fuel than the new ones. The extra cost of these tractors, which have completed the economic life of 1620 lt more fuel, is approximately 4 thousand TL per year. The additional cost to bear is not limited to this. The annual maintenance costs of 1400 TL, 150 hours of job loss, ten times more pollution of the air and at least 7 dba more noise are the extra costs to be incurred (Ozguven et al. as cited Evcim 2008, 2010, p. 99).

Table 8: Mechanization Level in Turkey (2004-18)

Years	Tractor Power Per Unit Area (kW/ha)	Tractor Density in Unit Agricultural Field (Tractor/1000 ha)	Per Tractor Area (ha/tractor)	Number of Tractors Per Enterprise (Tractor/1000Enterprises)
2004	*2,07*	*56,18*	*17,80*	*333,91*
2005	*2,10*	*56,78*	*17,61*	*338,31*
2006	*2,21*	*59,49*	*16,81*	*343,28*
2007	*2,32*	*62,33*	*16,04*	*349,48*
2008	*2,43*	*65,05*	*15,37*	*354,32*
2009	*2,48*	*66,20*	*15,11*	*355,24*
2010	*2,52*	*67,15*	*14,89*	*362,90*
2011	*2,68*	*71,70*	*13,95*	*372,27*
2012	*2,85*	*76,20*	*13,12*	*389,89*
2013	*2,92*	*77,73*	*12,86*	*401,58*
2014	*2,95*	*78,78*	*12,69*	*411,42*
2015	*3,02*	*80,16*	*12,48*	*417,06*
2016	*3,08*	*81,77*	*12,23*	*421,42*
2017	*3,19*	*84,11*	*11,89*	*432,41*
2018	*3,29*	*86,31*	*11,59*	*440,81*

Source: All units calculated using by TURKSTAT.

In the literatüre there are different criteria apply to measure the level of mechanization. Some of them the tractor power per unit area, the tractor density in the unit agricultural area, the number of tractors per unit area and the number of tractors per enterprise are used to measure the mechanization level. The Table 8 shows these indicators. 2018 tractor power per unit area in Turkey (3.29 kW / ha) is on.

Table 9: Mean Power Values Used in Tractor Power Calculation

Tractor Group	Average Power (HP)
Single Axle (1-5 Hp)	*3*
Single Axle (5+ Hp)	*7,5*
Two Axle (1-10 Hp)	*5,5*
Two Axle (11-24 Hp)	*17,5*
Two Axle (25-34 Hp)	*29,5*
Two Axle (35-50 Hp)	*42,5*
Two Axle (51-70 Hp)	*60,5*
Two Axle (70+ Hp)	*85*

In order to measure the level of mechanization, the above criteria were measured by using tractor statistics from TURKSTAT. The power of the tractor

is based on the median hp in the tractor group. The base values are shown in the Table 9. The tractor power (kW / ha) was calculated per unit area by converting to total hp kw.

1.1.9. Agricultural Subsidies

1.1.9.1. Forms of Agricultural Intervention

The agricultural sector differs from other sectors due to its characteristics. The balance of supply and demand in the agricultural sector is unstable. Some years of supply is much higher than demand, some years can not meet demand. Since the presence and severity of the parameters affecting the yield of agricultural products are unpredictable, this sector should be regulated and supported by intervention.

Natural factors such as flood, drought, erosion and human-induced factors besides fertilizer, seed, mechanization in agricultural production are among the most important factors affecting the yield. Due to these factors, agricultural production level a fluctuates between different years. There can be some solution to regulate not only the volume of product also the price fluctuation of product. For example unplanned production i.e. excess supply in production should usually store and this can affect the price of products. A product produced less than one year of demand should be put on the market and the price should be aprevented from rising.

Turkey in 2006 issued by the Agriculture Act 5488 Article 21: "The financing of agricultural support programs are provided from the budget resources and outsourcing. The source to be allocated from the budget cannot be less than one percent of the gross national product.'' However, as can be seen from the Table 10, these rates could not be achieved in any year. In 2018, a total agricultural support payment of 14.5 billion TRY was made by Government. The share of payments made in this year does not exceed 0.4% of GDP. This rate is less than half of the rate prescribed by law. In this sense, agricultural support payments remain insufficient. Considering that agriculture is the primary sector

that supports other sectors in the EU, it is vitally important to pay due attention to agriculture.

Table 10: Share of Agricultural Supports in GDP

Date	Agricultural Supports (Thousand TL)	GDP (Thousand TL)	%
2010	*5.817.012*	*1.160.014.000*	*0,50*
2011	*6.332.956*	*1.394.477.000*	*0,45*
2012	*7.553.045*	*1.569.672.000*	*0,48*
2013	*8.684.168*	*1.809.713.000*	*0,48*
2014	*9.147.584*	*2.044.466.000*	*0,45*
2015	*9.971.168*	*2.338.647.000*	*0,43*
2016	*11.488.898*	*2.608.526.000*	*0,44*
2017	*12.721.747*	*3.106.537.000*	*0,41*
2018	*14.552.454*	*3.700.989.000*	*0,39*

Source: TURKSTAT, Republic of Turkey Ministry of Treasury and Finance General Budget Balance and Financing.

Article 19 of the same law aims to improve agricultural production according to domestic and foreign demand, increase food security, increase productivity, strengthen producer organizations and agricultural markets, and improve rural welfare. According to this article, agricultural support instruments are determined as follows (5488 Agricultural Law, 2006).

- Direct Income Support
- Deficiency Payments
- Compensatory Payments
- Livestock Payments
- Agricultural Insurance Payments
- Rural Development Supports
- Other Supporting Payments

1.1.9.2. Direct Income Support (DIS)

Narin (2008) defines the Direct Income Support payments (DIS) as follows: ‘’It is an income payment system which is given to the production farmers directly through the unit of agricultural production’’ (Narin, 2008, p. 199). Babacan (1999) describes the DIS application as follows: ‘’DIS is a policy instrument implemented in the form of transfers made from public sources to influence the income level of target agricultural producers (Babacan, 1999, p. 3). The DID system has been implemented since the early 2000s in accordance with the EU Common Agricultural Policies within the framework of EU harmonization laws and with the suggestions of the International Monetary Fund and the World Bank.

Since payments are made in the DIS system based on the field, many farmers whose agricultural land is less than 1 hectare have not been able to benefit from this system. Minister of Agriculture and Rural Affairs at the end of 2006. The Minister of Agriculture and Rural Affairs stated that these payments were more useful to the wealthy farmers and that this system was not fair to the small farmers. The Minister of Agriculture and Rural Affairs said, *‘’While the proportion of landowners in Turkey over 100 hectare is 17 percent, the proportion of those under 100 decares is 83 percent, while the other half goes to 17 percent.’’* (Hürriyet, 2006). This system, which was implemented in 2000, was abolished in 2009 due to the lack of effective system of DIS (Narin and Oznazik, 2017, p. 39).

1.1.9.3. Deficiency Payments

The premium system given to products with a supply gap and strategic importance is defined as deficiency payment (Erdinç, 2018, p. 79). It is seen from the Table 11 that the share of deficiency payments in general payments in recent years tend to decrease gradually. The highest deficiency payment was realized as 3.9 billion TL in 2017.

Table 11: Deficiency Payments and Share in Total Payments

Date	Difference Payments (Thousand TL)	%
2008	*1.848.000*	*31,81*
2009	*2.006.790*	*44,65*
2010	*2.056.322*	*35,35*
2011	*2.502.000*	*35,94*
2012	*2.363.874*	*31,30*
2013	*2.607.000*	*30,02*
2014	*2.684.500*	*29,35*
2015	*2.728.002*	*27,36*
2016	*3.173.700*	*27,62*
2017	*3.887.905*	*30,56*
2018	*3.622.839*	*24,90*

Source: Central Bank of the Republic of Turkey (TCMB), EVDS.

1.1.9.4. Compensatory Payments

Compensatory payments are a another type of support that has been paid since 2008. The farmer is supported until the level of income determined in the product supported, provided that the pre-determined criteria are met in compensatory payments. In other words, it is defined as compensatory direct income support depending on income or production quantity (Bayraktar and Bulut, 2016, p. 47). The overpayment products are determined by the Compensatory Payments method and the incentives for the production of alternative products are given instead of producing those products. If the farmer harms the products produced, the damage is compensated. Table 12 shows the amount of compensatory payments and the share of total payments.

Table 12: Compensatory Payments and Share in Total Payments

Date	Compensatory Payments (Thousand TL)	%
2008	*80.000*	*1,38*
2009	*74.000*	*1,65*
2010	*80.946*	*1,39*
2011	*85.000*	*1,22*
2012	*100.000*	*1,32*
2013	*122.500*	*1,41*
2014	*125.000*	*1,37*
2015	*133.105*	*1,33*
2016	*185.800*	*1,62*
2017	*191.410*	*1,50*
2018	*200.572*	*1,38*

Source: TCMB, EVDS.

1.1.9.5. Livestock Subsidy

Livestock subsidy payments are subsidies paid directly to the farmers from the state budget. These incentives are paid for titles such as forage crops produced, artificial insemination, artificial insemination, breeder-certified animals, meat incentive bonus and milk incentive bonus. The share of these supports in total support has increased in the last 10 years. From the Table 13, The amount of livestock subsidy payments paid from 2006 to 2018 is approximately 5 times and the share of total subsidies in total subsidies has been doubled.

Table 13: Livestock Supports and Share in Total Payments

Date	Livestock Supports (Thousand TL)	%
2006	*660.975*	*13,92*
2007	*740.690*	*13,33*
2008	*1.095.465*	*18,86*
2009	*907.500*	*20,19*
2010	*1.157.608*	*19,90*
2011	*1.726.850*	*24,81*
2012	*2.195.240*	*29,06*
2013	*2.756.084*	*31,74*
2014	*2.664.683*	*29,13*
2015	*2.972.670*	*29,81*
2016	*3.030.666*	*26,38*
2017	*3.848.427*	*30,25*
2018	*3.831.997*	*26,33*

Source: TCMB, EVDS.

1.1.9.6. Agricultural Insurance Payments

Erdinç (2018) defines agricultural insurance payments as follows: ''Agricultural insurance payments are subsidies based on the assumption that some of the premiums are taken over by the state to encourage producers to insure their products or the tools they use in production'' (Erdinç, 2018, p. 80). It is observed from Table 14 that the insurance support payments have increased by 7 times in the last decade. In 2018, the share of these payments in total payments was realized as 7,29%, exceeding TL 1 billion.

Tablo 14: Agricultural Insurance Payments and Share in Total Payments

Date	Agricultural Insurance Payments (Thousand TL)	%
2006	*1.990*	*0,04*
2007	*40.000*	*0,72*
2008	*46.776*	*0,81*
2009	*61.000*	*1,36*
2010	*79.829*	*1,37*
2011	*239.006*	*3,43*
2012	*263.274*	*3,49*
2013	*299.000*	*3,44*
2014	*357.407*	*3,91*
2015	*528.718*	*5,30*
2016	*704.062*	*6,13*
2017	*860.317*	*6,76*
2018	*1.060.991*	*7,29*

Source: TCMB, EVDS.

1.1.9.7. Rural Development Supports

The Rural Development Investment Support Program has been implemented by the Ministry of Food, Agriculture and Livestock since 2006. This project aims to strengthen the linkages between agriculture and industry through the support of small enterprises and increase the income level in rural areas. With this project, it is aimed to make the most effective use of the rural development funds to be provided in the European Union harmonization process (Tan et al., 2016, p. 1).

It is observed from Table 15 that Rural Development Payments increased approximately 13 times from 2008 to 2018, and amounted to approximately 1.3 trillion TL. The share of these payments in total supports is 9.6%.

Table 15: Rural Development Supports and Rural Development Supports in Total Payments

Date	Rural Development Payments (Thousand TL)	%
2008	*109.377*	*1,88*
2009	*246.628*	*5,49*
2010	*304.264*	*5,23*
2011	*250.000*	*3,59*
2012	*240.525*	*3,18*
2013	*478.015*	*5,50*
2014	*613.494*	*6,71*
2015	*626.636*	*6,28*
2016	*1.168.989*	*10,17*
2017	*795.404*	*6,25*
2018	*1.397.442*	*9,60*

Source: TCMB, EVDS.

1.1.9.8. Other Support Payments

Other Support Payments are research, development and agricultural extension support, marketing incentives, special storage assistance, quality support, market regulations support, organic production support, destruction support, product processing support, some input supports and agricultural basin supports if necessary, and similar support tools (5488 Agricultural Law, Article 19, Article B). The Table 16 shows the progress of these support payments by years.

Table 16: Other Support Payments and Other Support Payments in Total Payments

Date	Other Support Payments (Thousand TL)	%
2007	*276.923*	*4,99*
2008	*56.513*	*0,97*
2009	*10.2080*	*2,27*
2010	*133.711*	*2,30*
2011	*153.300*	*2,20*
2012	*189.502*	*2,51*
2013	*222.569*	*2,56*
2014	*297.000*	*3,25*
2015	*372.037*	*3,73*
2016	*455.153*	*3,96*
2017	*503.406*	*3,96*
2018	*893.893*	*6,14*

Source: TCMB, EVDS.

1.2. LABOUR MARKET IN TURKEY

1.2.1. Employment and Types of Employment

Labour, is one of the most important elements of human life. Including human factor is the most important factor that separates labour from other production factors. It is impossible that this concept, which is directly affected by the human element, cannot be influenced by social and cultural changes (Orhan and Savuk, 2014, p. 10). Employment is the labour factor in the production process in general. In the economic sense, in order to realize production in a country or to obtain domestic output, the production factors are actively involved in the production process of goods and services (Ardıç, 2006, p. 175).

The level of employment in a country directly or indirectly affects many economic and social variables in the country. Basic economic indicators such as business life and labour legislation, population and technology, interest rate, inflation and investment are affected by the employment level in a country. Therefore, countries aim to employ all of the labour potential (Gül et al., 2009, p. 9). In this respect, types of employment, full employment, underemployment and over-employment, are explained.

Full Employment; the absence of unused production factor in the production process is called full employment. In other words, the fact that none of the factors of production is left behind is called full employment in the broad sense. The labour factor in the factors of production is a production factor that has its own characteristics, which are different from other factors. For example; labour does not accumulate strength for the days when it is not working and cannot keep it for the future. Therefore, the unemployment problem is one of the basic problems of developing economies. In the narrow sense, full employment refers to the employment of all adult individuals who want and want to work in an economy (Dinler, 2012, p. 489). In other words, it is the use of ready-to-work labour factor in production (Unay, 2000, p. 394).

Under Employment; in a broad sense, it means that some of the factors of production are kept idle in the production phase, in other words, not all production factors are used in production. Inadequate employment in the narrow sense is that there are those who cannot find a job in the economy (Dinler, 2012, p. 489). TurkStat categorizes its employees under 45 hours of work per week and under the heading of underemployment if it works in a different profession with a lower productivity and wages outside its own profession (Mehmet and Kılıç, 2009, p. 56).

Over Employment; refers to the work of the whole workforce in an economy. The individuals who are unemployed due to structural and temporary reasons are not included in the labour force (Ciftci, 2018, p. 45). Excessive employment is mentioned if more workforce is needed although all of the labour force is employed (Eyuboglu, 2003, p. 12).

1.2.2. Employment Theories

In this section, respectively; Classical, Neo-Classical, Marxist, Keynesian, Monetarist and Neo-Keynesian Employment Theories will be briefly explained.

1.2.2.1. Classic Employment Theory

Classical economists are the first economic school to claim that full employment is always provided in the economy. According to them, fluctations in economic balances may occur. The full balance of employment may also can not be provided. But thanks to the price and flexible wage mechanism, the economy will return to the full employment balance (Bilgili, 2012, p. 34).

Say's Law; is defined briefly as, ''every supply creates own demand''. According to Say, the crises arising from overproduction are not possible, and if the balance of the economy is disturbed, it will stabilize again. Say says, ''*that creates the demand for goods is the production.… When the supply of a commodity, from that moment creates demand for other goods full value the amount … Since the foundation of a commodity, the market for other goods will be opened.*'' (Kazgan, 2012, p. 102). According to this law, there will not be any unemployment problem arising from the lack of demand in the market (Uyar, 2005, p. 11).

Interest Theory; was explained by Classics as the money, which did not go into consumption and thus saved. This money spend again in the market as an investment (Uyar, 2005, p. 15). In the case of violation of the assumption that all of the income, which is the validity condition of Say Law, is spent, Say Law comes into play (Uyar, 2005, p. 14). According to classics, equilibrium interest rate is formed at the point where savings and investments are equal. Savings supply and demand are a function of interest. In other words, demand for savings and savings for investment are determined by interest rates. If the interest rate is higher than the equilibrium interest rate, a saving deficit will occur. Savings owners who want to save more than the high interest rate cause the interest rate to decrease. Otherwise, if the interest rate is lower than the market interest rate, the demand for investment increases. Investment deficit is formed in the economy. Interest rates increase with the increase of investments. After a while, the interest rate comes back to the market equilibrium (Pekin, 1996, p. 129).

Wage Theory; it explains how the economy comes to full employment equilibrium through wages. According to classics, equilibrium wage level occurs at the intersection of labour supply and demand in the labour market. Labour supply and demand are a function of real wages. In other words, labour supply and demand are determined by real wages. If the real wage is higher than the equilibrium price, there is an excess of labour supply in the labour market. Because this workforce will be willing to work at a lower cost, they pull the balance price down in the market. Otherwise, if the market equilibrium wage is low, the demand for the workforce rises and the supply of labour passes. In the market where there is a surplus of demand, wages tend to rise. After a while, the labour market is rebalanced (Aren, 2011, p. 56).

1.2.2.2. Neo-Classical Employment Theory

One of the basic assumptions of neoclassical economics is the full employment of production factors. According to neoclassical economic theory, real wages, which is the price of labour in the labour market, goods market analysis in the price of commodities with perform the same task. In other words, real wages occur at the intersection of labour supply and demand curves, and equilibrium is achieved in the market (Ardıç and Aydın, 2011, p. 31). But the labour market can not be evaluated in the same way as goods market because the commodity in the labour market is the labour force that differs from all other goods. In neoclassical economics, the level of employment is determined by the wage rate. Flexible wage rates make it possible for the economy to achieve balance at all times. Therefore, involuntary unemployment is not possible in the model.

In neoclassical theory, where labour markets are based on the relationship between supply and demand, workers and employers confront on the full competition market. The employer knows the contribution of the last unit employed to the production. According to the Law of Diminishing Returns, a theory of neoclassical economics, the marginal product of labour will decrease with the increase in the amount of labour employed. In this case, the employer will pay at the level corresponding to the value of the last worker he or she

hired. The wages of each worker will increase or decrease depending on the total number of workers (Çetin as cited Steward, 1980;, 2014, p. 11). The labour demand, represented by a negative curved curve, under the assumption of the Law of Diminishing Returns, reflects the efficiency of labour. While the individuals who supply labour are in line with the principle of maximization, firms are also in line with the motivation of profit maximization. It is accepted that there is full substitution between labour and capital, and it is considered that labour and capital are homogeneous, divisible and fluid (Ardıç and Aydın, 2011, p. 32).

In neoclassical economics theory, workers and employers are considered to have full knowledge. It is assumed that these actors know the working conditions, wages, the future course of wages. However, it is clear how these assumptions of neoclassical economics are valid in real life.

In neoclassical theory, unemployment is voluntary and temporary. Since labour supply and labour demand curves are shown as a function of real wages and there is an equilibrium wage level at the intersection of these curves, there is no unemployment in this wage level and employment situation (Çetin, 2014, p. 11). If there is an excess of labour in the labour market, the wages will decrease and unemployment will end. However, if individuals do not wish to work below the equilibrium wage level, unemployment will emerge (Lordoğlu and Özkaplan, 2007, p. 406).

1.2.2.3. Marxist Employment Theory

The Marxist theory claims that, in exceptional circumstances, the labour market is the market containing surplus supply and unemployment is a natural consequence of the capitalist economy. Labour surplus is defined as the ‘’reserve army of labour’’ in Marxian view. The reserve labour army can appear strikingly in the form of dismissal of workers who are currently working, although it can be seen in a more realistic way, as it is less common, the difficulty of the

mass of additional workers to be absorbed by the usual channels (Sweezy, 2007, p. 93).

Marx states that, if the organic composition of capital remains the same, the progression of capital accumulation will, once in a certain level, favor workers, because full employment will tend to occur. Capitalist development is the substitute for living labour. Because machines are replacing workers.

The value of the labour force is determined on the basis of the wage system, and the various types of labour force have different values, or because their production requires different labour quantities, they must be sold at different prices in the labour market.

Getting rid of the noise for equal or even fair wages on the basis of the system of wages is the same as making a noise for freedom on the basis of the slavery system (Marx, 2001, p. 56).

According to Marx (2015, p. 593), the growth of capital involves the growth of its own changing part or the part that is transformed into labour power. Some of the value that has become additional capital must always be transformed into additional labour funds. If all other conditions remain the same, assuming that the composition of capital remains the same, it is clear that the demand for labour will grow, and that the consumption funds of the workers will increase at the same rate as the capital, and that this increase will be rapid if capital grows. The reproduction of labour power as a means of valuation of capital is in fact a component of the reproduction of capital itself. In other words, the accumulation of capital means proliferation of the proletariat (Marx, 2015, p. 594). According to Marx , one of the signs of alienation is that everything is under the rule of an inhuman power. In this way, man becomes alienated to his labour, but man is also disintegrated from other people. After all these divisions, it is only a pile of flesh left by the individual; this is the smallest common denominator that has ever been achieved after all its characteristics, which constitute the basis for human recognition.

In Marxist theory, there are two types of unemployment associated with each other. The first is the technological unemployment that creates the reserve unemployed army, which is the result of capitalist production, and the second is the unemployment resulting from the decrease of the reserve unemployed army and the profits. Marx's wage theory is based on technological unemployment. With technological development and the replacement of the machinery workers, the growth of the reserve army of the unemployed causes the labour supply to rise steadily higher than the demand for labour, resulting in lower wages due to the competition between the workers. But this fall is not enough to threaten the power of labour, it will be enough to reproduce for a sufficient wage level.

Marx, as a result, expresses his rejection of the wage system in capitalist order as follows: “They (workers) should write the following revolutionary slogan on their flags, instead of a fair wage for a fair day's work, which is a conservative slogan: "the abolition of the wage system!”’ ". (Marx, 2001, p. 89). Marx lists his labour market propositions in Value, Price and Profit (Marx, 2001, p. 89-90) as follows; first, a general rise in the rate of wages results in a decrease in the overall rate of profit. However, this does not affect the prices of commodities. Second, he emphasizes that the general tendency of capitalist production is not to raise the average level of wages, but to lower them. Finally, he refers to unions. He states that the unions are useful as centers of resistance against the attacks of capital, but that they should spend on the definite salvation of the working class instead of the search for a palliative solution. This is possible with the abolition of the wage system.

1.2.2.4. Keynesian Employment Theory

The economic crisis that emerged in the US in 1929 is called the Great Depression. During this crisis, due to lack of demand or excess supply, there has been a large decline in production. As the purchasing power of the American people declined, the producers have reduced their production capacity to survive (Galbraith, 2009, p. 155). This phenomenon has brought with it high unemployment. The views, teachings and suggestions of Classical

Economics were insufficient to get out of the crisis. Instead, Keynes argued that the way out of the crisis would be possible only if the state intervened in the market. Keynes's marginal views for that period were later referred to as the Keynesian Revolution. At this point, Keynesian School of Economics emerged. Keynes introduced a number of new concepts in his 1936 work entitled, ‘’General Theory of Employment, Interest and Money’’. In this sense, it can be said that the greatest innovation is the concept of ‘’effective demand’’.

According to Keynes, the main reason for the crisis is the lack of demand and the way out of the crisis is to increase the effective demand. Keynes defines the concept of effective demand as the sum of consumption and investment goods that entrepreneurs think will be demanded by consumers at the current employment level (Ardıç and Aydin, 2011, p. 73).

Keynes argues that the economy is not a mechanism to automatically return to full employment. In order to increase the employment level, market intervention may be required by increasing the total investment level (Ersoy, 2008, p. 566). The decrease in the monetary wage reduces prices and increases the real money supply of the economy. This is the first time Keynes suggested and is known in the literature as *Keynesian Effect*. (Savaş, 2007, p. 780).

The Keynesian Effect is defined as the increase in investment in the commodity market if the demand for money decreases as a result of the decrease in nominal wages, which increases the demand for bonds and brings the result of the decrease in bond interest rates. Increasing investments lead to the increase in total demand and to the level of full employment (Küçükkalay, 2010, p. 306).

The Keynesian theory was generally accepted until the late 1980s, but in the 1980s it was unable to find a solution to the new economic problems leading to economies of developed countries. Therefore, new theories of economics emerged (Çetin, 2014, p. 11).

1.2.2.5. Monetarist Employment Theory

In developed countries, the Keynesian Policies implemented in the economy continued their gold years until the 1960s. After 1960, unemployment and inflation rates in these developed countries, especially the USA, started to increase rapidly. Monetarist theory, against Keynesian Employment Theory, After World War II, it was developed by Milton Friedman, one of the economists at the University of Chicago in the 1960s. Monetarists have focused on price stability. According to them, the lack of employment is due to the poor management of the government rather than to the private sector (Gül et al., 2009, p. 54-55).

According to the Monetarists, the main factor affecting the economy is monetary changes. Therefore, the total demand, production, employment and general price level are affected by the widening of the monetary base. According to them, it is the expansive fiscal and monetary policies pursued by governments and monetary authorities that destabilize the economy. (Savaş, 2013, p. 215).

Friedman criticized the argument that Keynesian approach labour supply depends on the nominal wage rate. In his view, the demand for labour is a function of the real wage expected. The demand for labour is a function of the real wage. The expected price level and the actual price level in the short term are different. Therefore, governments can change employment level in the short term with expansive policies but cannot change it in the long term (Gul et al. taken., 2009, p. 57).

Monetarists, contrary to Keynesians, say that people's expectations are under the effect of decisions about the future. Monetarists have suggested the concept of Adaptive Expectations Hypothesis. According to this hypothesis, economic units take their expectations by taking their past experiences into account and taking risks into account (Ardıç and Aydin, 2011, p. 127). Long-term economic units are expected to be adaptable. Friedman argues that there is a trade between inflation and unemployment in the short run, but that

expansionary policies will lose their effectiveness and cause inflation and unemployment in the long run (Küçükkalay, 2010, p. 399).

According to the Monetarists, if the natural unemployment level is desired to be decreased, the labour market regulates; Supply-side policies such as the reduction of income tax rates and the reduction of social security payments should be followed. In addition to this, it is necessary to facilitate the finding of jobs in different areas by training the labour force and to make it easier to find work in different geographical regions where the workforce cannot find a job in the geographical area (Ardıç and Aydın, 2011, p. 140).

1.2.2.6. New-Keynesian Employment Theory

New Keynesian economists conducted market analyses based on micro-foundations. Greenwald and Stiglitz state that the analysis on the labour market is inadequate. The New Keynesian theory provides detailed analyses on this subject (Ardıç and Aydin, 2011, p. 180). New Keynesian approaches, taking into account nominal and real rigidities in the late 1980s, can be used to achieve stability in the economy in the short term (Yıldırım et al., 2010, p. 1270).

Due to the fact that the prices are rigid in the short term, monetary policy is effective on production and employment in the short run. A contractionary monetary policy does not fall in the short run, as prices are rigid. Economic units reduce their spending as a result of decreasing money supply and total demand decreases. As a result of falling demand, firms reduce production and have to remove workers. The new Keynesians' workspace are works aimed at eliminating the lack of consistent theories of price rigidity (Ardıç and Aydın, 2011, p. 181).

The New Keynesian approach, Malinvaud (1983), states that the labour market is linked to the commodity market. In this respect, wages are not only a cost for firms, but also an indicator of the purchasing power for workers. In more detail, a decrease in wage level will not change the total demand since it will be considered as a reduction in the labour cost in terms of the firm, which means

that the purchasing power will fall for the consumer. So in fact, production will not increase (Ataman, 1998, p. 67).

New Keynesian economists argue that the state should intervene in the economy in a limited way. New Keynesians state that the economy should not be managed according to previously announced interventions. It is important to note that the views of these economists on labour markets are as efficieny Wave Models, Implicit Contract models and Insider Models (Sarıipek ve Kesici, 2010, p. 36).

The Implicit Contract Model tells us what the economic power is that is holding companies and workers together in the long run. Implicit labour contracts provide long-term advantages to companies. These invisible, unwritten contracts guarantee every worker. In this case, the wage rate not only represents the payment for the labour service, but also serves as an insurance against variable income shocks (Snowdon and Vane, 2005, p. 384). This wage structure is one of the reasons for wage rigidity (Sarıipek ve Kesici, 2010, p. 30). This model contains some problems. When the economic climate worsens, it is the main problems of this approach that companies should share their jobs instead of dismissals and that companies should not pay low wages to new workers. To solve these problems, New Keynesyans have suggested Efficiency Wage and Insider-outsider models (Snowdon and Vane, 2005, p. 384).

The Efficiency Wage Model assumes a linear relationship between wages and productivity. According to this relationship, it is emphasized that high wages will increase productivity and low wages will decrease productivity and increase costs (Sarıipek ve Kesici, 2010, s. 30). In other words, productivity and wages are positively related at a given interval. Alfred Marshall says that high-wage labour is usually productive (Snowdon and Vane, 2005, p. 388).

According to *Insider-Outsider Model*, workers are divided into two groups. Internal workers are experienced and their replacement brings high cost to the company. The workers outside are unemployed and it is costly for them to be trained and experienced as workers inside (Aydın, 2009, p. 106-107). The

trained workers inside and the untrained workers outside are not perfect substitutes. The workers in the inside react negatively to the training of the workers outside and to the replacement of them at a lower cost. Because internal workers are not afraid to charge more when they receive training, companies prefer cheap labour (Sarıipek ve Kesici, 2010, p. 33).

1.2.3. Employment, Unemployment and Labour Force Participation in Turkey

One of the main problems in some countries is high unemployment rates. Although it has reached the working age and wants to work for various reasons, those who do not take a job category show that the country's resources are not used effectively enough. At the same time, this problem affects not only the economy but also the different dynamics of society.

Unemployment rates is steadily increase in Turkey. The unemployment rate was realized as 14.1% in the 2008 crisis. The first month of the year 2019, the unemployment rate realized as 14.7% is a factor that strengthens the economic recession a little more.

The Table 17 shows the labour force and employment figures between 2007-2019. Between these years, an average of 786 thousand new people join the army of labour force, while the number of new employment is approximately 591 thousand each year. In the light of these figures, approximately 194 thousand people attend the army of the unemployed each year.

Table 17: Structure of Employment in Turkey

Date	Work Force	Employment	Unemployment Rate
2007-01	*21.605,00*	*19.467,00*	*9,90*
2008-01	*21.573,00*	*19.324,00*	*10,40*
2009-01	*22.539,00*	*19.351,00*	*14,10*
2010-01	*23.781,00*	*20.554,00*	*13,60*
2011-01	*24.516,00*	*21.798,00*	*11,10*
2012-01	*25.122,00*	*22.775,00*	*9,30*
2013-01	*26.256,00*	*23.704,00*	*9,70*
2014-01	*27.261,00*	*24.456,00*	*10,30*
2015-01	*28.713,00*	*25.454,00*	*11,30*
2016-01	*29.565,00*	*26.275,00*	*11,10*
2017-01	*30.658,00*	*26.672,00*	*13,00*
2018-01	*31.438,00*	*28.029,00*	*10,80*
2019-01	*31.825,00*	*27.157,00*	*14,70*

Source: TURKSTAT, Labour Force Statistics, (January, 2019).

1.2.4. Education Level of the Workforce

The high level of education of the labour force leads to increased productivity in production. Therefore, the income of highly educated and specialized individuals in the labour market is much higher (Alcan, 2018, p. 7). The existence of a well-trained labour force and the ratio of this workforce within the total labour force is very important in order for countries to continue their development (Taş and Bozkaya, 2012, p. 158).

The current workforce consists of people in Turkey at the elementary level of over 50%. In 2018, the labour force ratio in total labour force was 51%. The rate of labour force at the university and higher education level increased by 1% annually and became 24% in 2018.

Table 18: Labour Force Status By Educutional Level

Years	Illiterate	Less Than High School	High School	Higher Education
2014	*997 (%4)*	*15644 (%56)*	*5800 (%20)*	*5657 (%20)*
2015	*932 (%3)*	*15782 (%55)*	*5972 (%21)*	*6243 (%21)*
2016	*868 (%3)*	*15817 (%53)*	*6248 (%21)*	*6840 (%23)*
2017	*898 (%3)*	*16095 (%52)*	*6534 (%21)*	*7294 (%24)*
2018	*874 (%3)*	*16137 (%51)*	*6784 (%22)*	*7606 (%24)*

Source: TURKSTAT, Labour Force Statistics, 2018.

When we look at the unemployment figures, it is seen that the unemployment rate is mostly among the young population in the 15-24 age group. The unemployment rate of the young population was 26.7% in January 2019. According to education levels, the highest unemployment rate in unemployment rates was in January 2019 with 16.6% among high school graduates. The unemployment rate in the Higher Education group was 13.9% in January 2019 (TURKSTAT, Labour Force Statistics, 2019).

1.2.5. Sectoral Distribution of Employment

Table 19 shows the distribution of employment among sectors in Turkey. The sector with the highest employment is the services sector while the sector with the lowest employment is the agricultural sector. The decrease in employment in the agricultural sector and the increase in employment in the services sector are close to each other. In the light of this information, it can be interpreted that the labour force shifts from agriculture to service sector.

Table 19: Sectoral Distribution of Employment

	Sectors (Thousand People)				
Years	**Agriculture**	**Industry**	**Construction Industry**	**Service**	**Total**
2014	*5470 (%21)*	*5316 (%20)*	*1912 (%7)*	*13235 (%51)*	*25933*
2015	*5483 (%21)*	*5332 (%20)*	*1914 (%7)*	*13891 (%52)*	*26620*
2016	*5305 (%20)*	*5296 (%19)*	*1987 (%7)*	*14617 (%54)*	*27205*
2017	*5464 (%19)*	*5383 (%19)*	*2095 (%7)*	*15246 (%54)*	*28188*
2018	*5297 (%18)*	*5674 (%20)*	*1992 (%7)*	*15774 (%55)*	*28737*

Source: TURKSTAT, 2019.

The fact that the average income in the agricultural sector is below compared to other sectors the labour force transitions from agriculture sector to other sector can be a problem that affect urbanization. Between 2009 and 2017, average per capita income in the agricultural sector increased by only TL 333. This proves that the welfare level in the agricultural sector remains stable.

Table 20: Average Per Capita Income of Agricultural Sector

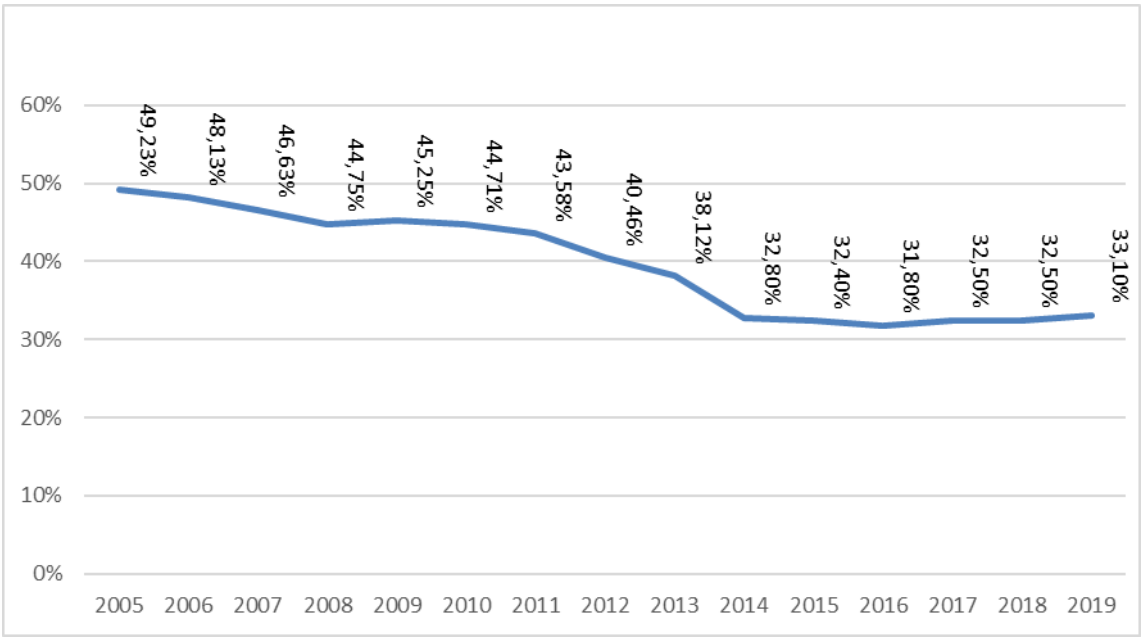
Years	Agricultural GDP (Thousand TL)	Agricultural Employment (Thousand People)	Per Capita Income
2009	*81234274*	*5035*	*16134*
2010	*87464906*	*5374*	*16276*
2011	*90473489*	*5325*	*16990*
2012	*92459743*	*5349*	*17285*
2013	*94603925*	*5053*	*18722*
2014	*95164941*	*5432*	*17519*
2015	*104084511*	*5410*	*19239*
2016	*101399804*	*5313*	*19085*
2017	*106347301*	*5557*	*19138*

Source: TURKSTAT, Agricultural Statistics, 2017.

1.2.6. Informal Employment

Unregistered employment is defined as the absence of all or part of the two elements of the Tax Office and Social Security Institution such as the day of employment and the wage paid to the employee (Mahiroğulları, 2017, p. 549). Figure 5 shows the informal employment rate in Turkey in the last 15 years. The unregistered employment rate has been steadily declining for the past 14 years. The informal employment rate, which was about 50% in 2005, fell to 33% in 2019. But as for the agricultural dimension of informality, a much more negative picture emerges. The unregistered employment rate in the agricultural sector was 81% annually in 2015, 83% in 2017 and 85% at the highest level in 2019. Economic factors play a major role in the dissemination of informal employment. The increase in input prices in the agricultural sector brought out the farmers in a difficult situation. For this reason, the agricultural worker was willing to work without Social Security rather than being unemployed.

Figure 5: Informal Employment Rate



Source: TURKSTAT, The Results of Household Labour Force Survey,Labour, Force Statistics, 2019.

CHAPTER 2

LITERATURE REVIEW

In the literature, a plenty of studies have been investigated the examining the effect of mechanization, productivity and income on agricultural employment with using econometric models. *Wang, Zhao and Fu, 2016; Ahmed and Goodwin, 2016;* are some of the studies examining the effect of mechanization level on agricultural employment. Some studies investigating the migration phenomenon towards rural cities which affect agricultural employment are as follows: *Şimşek ve Gürler, 1994; Sağlam, 2006; Günaydın, 2006; Güreşçi, 2009; Yalçın and Kara, 2016.*

A series of studies are conducted by Çakmak, Dudu and Öcal, 2008; Armağan, Özden and Bekçioğlu, 2010; Ayşe İmrohoroğlu, Selahattin İmrohoroğlu and Üngör, 2012; Atiyas and Bakış, 2013; Yıldız, 2014; Özden, 2014; Aldemir and Kara 2014; Dudu, Çakmak and Öcal, 2015; Eruygur, Kıymaz and Küçüker, 2016; based on the determinants of agricultural productivity. In addition, there are also studies that indirectly examine the impact of agricultural support policies on agricultural employment. *Scott and Cuecuecha, 2009; Cengiz and Baydur, 2010; Kandemir, 2011; Yılmaz, 2015; Sugözü and Hüseyni, 2017 have* investigated the effect of agricultural subsidies on agricultural employment.

Wang et al. (2016), studied the relationship between agricultural mechanization level and labour using a static mathematical equation. The model was estimated by regression analysis and Delphi methods. In the study, which includes future predictions, it was estimated that there will be 270 thousand demand for labour force at 93% mechanization level for 1.5 million hm^2 of land in 2024 in in northern of Heilongjiang Land Reclamation Area in Chine.

Ahmed and Goodwin (2016), in their study, used a survey data from 1988 to 2008 in Bangladesh. This study concludes that the level of mechanization in agricultural enterprise will create more labour supply to other sectors. In this study The Bivariate Probit model, the Endogenous Treatment and the

Endogenous Treatment Effects econometric models are used to analyze the impact of technological progress on the distribution of income and poverty in Bangladesh. For this purpose, survey data by the US Institute of Development Research (BDRI) are used. In the analysis, it has been determined that the use of modern technology in agriculture may cause labour force loss from agriculture to non-agricultural sectors.

Şimşek and Gürler (1994), in their study showed that the agricultural production structure is very primitive and production depend on the lack of production infrastructure, lack of modern tools between the years 1927-1950 in Turkey. Although the population growth in the rural areas is higher than the population growth rate in urban areas, the decrease in the share of the population in rural areas indicates a migration phenomenon out of agriculture sector. Especially after 1950, the most important reasons for the migration out of agriculture sector, agricultural machinery and machines produced by the phenomenon of hidden unemployment and agricultural productivity and per capita agricultural income is not enough to keep the farmer in the agricultural sector. It was emphasized that more use of new inputs affecting production would reduce the demand for agricultural employment. The number of tractors in Turkey between the years 1940-1990 has increased to 689343 units from 1065 units. This expansion of the tractor numbers expanded the agricultural area to its limits and then increased the hidden unemployment in the agricultural sector by substituting itself for the workforce. In one region of the country, while the average income is 7000 US dollars and another 500 US dollars in the region, it is not possible to prevent migration.

Sağlam (2006), examined the effect of migration from rural to urban areas on the cities. In Turkey, which is a developing country, there was a rapid urbanization after the 1950s. This transformation is not called a healthy changing, also it has brought serious problems both in rural areas and in cities. In this study, it was found that one of the reasons for the migration from rural to rural areas was mechanization in agriculture sector.

Günaydın (2006), in his study, Turkish agriculture is different from the Central countries in the production process is determined to depend on the nature conditions. Turkey meets the conditions under which broadly determine the nature, it reveals a similar structure to the neighboring countries. Agriculture in Turkey is hosting significant hidden unemployment. The inadequacy of producer organizations constitutes are seen as obstacle to the development of marketing channels. Therefore, the consumer can face major losses. In terms of agricultural employment structure, it is located in the countryside, with low level of education and high rate of women. Therefore, labour transfer from agriculture to other sectors should be carried out in a planned manner supported by educational activities. In addition, the phenomenon of immigration from rural to urban areas will trigger to new problems in social, economic and political life. It also states that it must realize an agricultural production process with increased productivity, reduced average costs, and set up an agricultural structure that operates the production process for the benefit of large citizens.

Güreşçi (2009) discusses rural migration within the framework of Agriculture Policy in his study. Rural migration is a phenomenon that occurs mostly in developing countries and is effective in solving agricultural employment. The basis of the economic transformation here is liberalization in the agricultural sector. Rural migration is the result of failure in agricultural policy. Therefore, the objectives, scope and tools of agricultural policy in rural areas need to be well identified in a short term.

Yalcin and Kara (2016) stated that the biggest cause of rural migration was economic reasons. The emergence of mechanization in agriculture with the Industrial Revolution causes a surplus of labour in rural areas. The idle labour accelerated the movement of migration to cities in search of new jobs. Another reason for the migration from the countryside to the city is that large landowners transfer their investment funds to outside of the agricultural area. This study, show that, small business structure of agriculture production, unbalanced formation of agricultural prices, increasing in input prices, the division of the

land doe to inheritance, agricultural loans of farmers and hidden unemployment phenomenon are seen main reasons migration from rural areas to urban areas.

Çakmak et al. (2008), analyzed the relationship between activity status and geographical, economic and social variables. In this way, policies related to the event can be developed. The data used in the study using the Time-Varying Efficiencies (TVE) (Batesse and Coelli 1992), Technical Efficiency Effects (TEE) (Batesse and Coelli 1995) and Non-neutral Technical Change (NNTC) (Battese and Broca, 1997) models were obtained from the surveys carried out within the scope of the Agricultural Reform Implementation Project (ARIP). Within the framework of the analyses, it was emphasized that the labour force was insufficient in increasing the income in agricultural production and that it negatively affect the factor that contributed positively to the other activity. The phenomenon of unpaid family labour, which constitutes an important part of employment in agriculture, should be reduced by increasing non-agricultural employment opportunities in rural areas. Agricultural employment policies aimed at shifting the labour surplus in the agricultural sector to other sectors will increase the effectiveness in the agricultural sector. It is also stated that mechanization significantly increases technical efficiency.

Armağan et al. (2010) analyse the technical efficiency and total factor productivity based on Nuts Regions (Statistical Regional Units Classification) in Turkey between 1994-2003. Data enveloping analysis (DEA) method and Malmquist productivity index method were used in the study, total factor productivity (TFP) and technical efficiency in the ten-year period of several advanced provinces, except for all other provinces decreased was found. In order to increase TFP and technical efficiency, large enterprises with high technology need to enter into production in agriculture. The study indicated that the real price level of inputs increased despite the economic decline in agricultural production and the difficulties in the adaptation of new production techniques to agricultural sector were listed as reasons for the decrease in TFP and technical efficiency.

Imrohoroğlu et al. (2012), investigated the growth of multi-sector experience using a model of Turkey for the period 1968-2005. The authors compared Turkey's growth experience with Greece, Portugal and Spain found that although these countries had the same level of GDP per capita as Turkey in the 1950s, GDP per capita in Turkey fell below the others in the 1960s. The authors state that the inter-sectoral labour force change is mainly due to the increase in agricultural productivity. From the 1960s to the interventionist policy of Turkey in the agricultural sector consists of the income difference between other countries and the policies that apply to non-agricultural sectors is emphasized that due to the negative repercussions for the agricultural sector. In this context, the decline in agricultural population is slowing and agricultural productivity decreases.

Atiyas and Bakış (2013), calculated total factor productivity (TFP) in Turkey for the 1970-2011 period on sectoral basis. It has been determined that the TFP, which was calculated with the growth accounting approach, has increased significantly over the last decade compared to international comparisons. Authors emphasized that total factor productivity in Turkey was fourth with in other countries and measured as 3,81 percent in the period 2002-2010. The agricultural sector TFPG (Total Factor Productivity Growth) reached its highest level with a ratio of 6.75 for the period 2002-2006. The development of agricultural employment has paved the way for this high rate.

Yıldız (2014), examined the impact of agricultural mechanization on agricultural unemployment. To measure effect of mechanization author compared the human power with the machine used in product cultivation Malatya Sultansuyu business Farm in 2013. As a result, it has been determined that the activity with human power costs about 14 times higher than the activity with the machine.

Özden (2014), has calculated total factor productivity using the DEA in Turkey (The Method Of Data Envelopment Analysis (DEA) and Malmquist Index (The-Input Oriented Model Of Malmquist Index) from 1992 to 2012. The output and production area of agricultural production, tractor, agricultural workforce, fertilizer and animal presence parameters were selected as inputs in production

under assumption constant of returns scale. The results indicated that this trend is caused by technological change rather than technical activity.

Aldemir and Kara (2014), in their study, found a direct bi-directional causality between agricultural employment and fiscal policy. In the analysis using Johansen Cointegration Analysis and Vector Error Correction Model estimation methods, PPI-weighted real exchange rate index (r) with monthly frequency covering 2005-2009 period, public expenditure (g), M1 defined money supply (m) and oil prices (p) were used as independent variables while agricultural employment (i) was used as a dependent variable in the model. The indirect causality relationship between agricultural employment and monetary policy was realized through fiscal policy.

Dudu et al. (2015), conducted an analysis on the productivity of agriculture using survey statistics conducted at the household level in 2002 and 2004. In the study of panel data method, it was determined that agricultural production was largely dependent on soil and that there was an excessive employment in agricultural areas. The need to develop effective incentive policies to shift this over-employment into other productive agricultural areas has been emphasized. It has been informed that the western regions are at the top in terms of agricultural productivity.

Eruygur et al. (2016), in their study, investigated total factor productivity (TFP) in agriculture at regional level. The authors set up a 'Cobb-Dougless Log-Linear Model' covering the years 2005-2011 with the panel data estimation method. In the study, 15 parameters that determine the change in total factor productivity in agriculture, agricultural gross value added, agricultural employment, agricultural capital stock, total agricultural area size, inflation rate, dollar rate, time trend, rural development supports, dollar exchange rate volatility, high-tech product export, human capital per labour force, dummy variable for arid climatic conditions between 2007-2008. Thornthwaite thermal efficiency index, use of fertilizers with high nitrate content per hectare and the share of irrigated areas in total agricultural area. TFV was determined with random effects, fixed effects, Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard

Error (PCSE) estimation methods for Turkish Regional Regions Classification (NUTS-2) regions. As a result of the study, technical advances, rural development supports and human capital have a positive effect on TFV. Economic uncertainty increases and exchange rate changes have negative effects on TFV. In addition, there was no significant effect of agricultural subsidies on TFP except for rural development supports. In the light of these results, more efficient determination of agricultural subsidies, increasing the education level of the labour force by increasing the general quality of agricultural human capital, supporting technological change with R & D and increasing the quality of the inputs used have been seen as the main policies.

Cuecuecha and Scott (2009), investigated how Procampo subsidies, the agricultural support program launched in Mexico in 1994, affected the migration phenomenon and agricultural employment dynamics in Mexico. According to the analysis, the subsidy peso per 1.23 hectares reduces migration flow by 0.02%. In addition, it was determined that subsidy expenditures have a direct or indirect effect on agricultural employment. According to results the individual receiving subsidy continues to work in the agricultural sector, while the fact that the sector supported by subsidies creates more demand for agricultural labour is a phenomenon that indirectly affects employment.

Cengiz and Baydur (2010), in their study, found that the mechanization and modernisation of agriculture and the traditional land ownership regime were changing as a result of the acceleration of the rural-urban migration movement between 1950 and 1960 in Turkey. It also concluded that the decline in rural real wages increased agricultural employment.

Kandemir (2011), in his study, examined the system of supporting Direct Income Support (DIS) implemented in Turkey in the early 2000s. This agricultural support policy pursued by Turkey in order to comply with EU agricultural policies negatively affected rural development. The DIS policy has increased poverty in rural areas. According to this study, while the DIS system slows development in rural areas, it has been concluded that it is a policy that increases migration from rural to urban areas.

Yılmaz (2015), studied the structure of rural population. For the period 1980-2012, the change of rural and urban population on the basis of provinces was analysed by tabling. In this study, it is suggested that agricultural and animal production should be supported effectively, increase household income in rural areas and revise existing support policies may reduce migration to urban areas. In addition, it has been stated that supporting policies should be produced in order to employ people who have migrated from rural to urban areas and who are unemployed in cities by returning back to rural areas (reverse migration).

Sugözü and Hüseyni (2017), in their study, analyzed the impact of agricultural support policies on rural-urban migration with a regression model. According to study results, a strict relationship was established between agricultural support and rural to urban migration. It is emphasized that agricultural support should be made to increase agricultural employment. In other words, the thesis suggested that policies aimed at increasing agricultural employment should be developed in order to prevent migration from rural to urban areas.

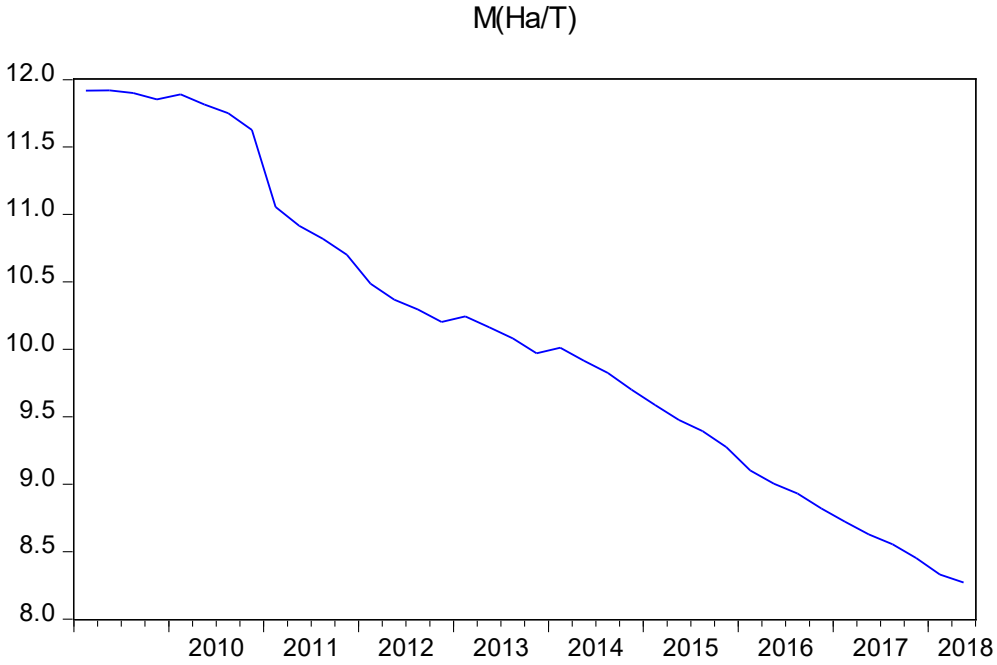
CHAPTER 3

DATA AND METHODOLOGY

3.1. DATA

This thesis analyzed a set of potential determinant variables on influence the agricultural employment rate in Turkish agricultural sector. Quarterly time-series data spanning the period from third quarter of 2009 to second quarter of 2018, for a total of 38 observations for each variable, was obtained from the TURKSTAT. We classify the explanatory variables into three categories including the Mechanization (Hectare/Tractor); productivity (Agricultural GDP/Hectare); agricultural average income (Agricultural GDP/Agricultural Employment).

Figure 6: Mechanization Level



The Figure 6 shows the agricultural area per tractor. At the beginning of 2009, the average agricultural area per tractor was approximately 12 hectares, while

in the second quarter of 2018 this rate decreased to 8 hectares. This changing indicates that the level of mechanization has increased during this period.

The Figure 7 and Figure 8 show us the revenue from the unit area (Ha) and the per capita income in the agricultural sector, respectively. This two charts show that there is a striking seasonality. In other words, while the average income per unit area and average per capita income are at the bottom level in the first quarter, in the third quarter, these rates rise to the highest level. While the revenue obtained from the unit area was 2361 TL in the 3rd quarter of 2009, it increased to 3496 TL in the 3rd quarter of 2017. While the average per capita income in the agricultural sector was 7865 TL in the 3rd quarter of 2009, it increased to 9834 TL in the 3rd quarter of 2017.

Figure 7: Productivity

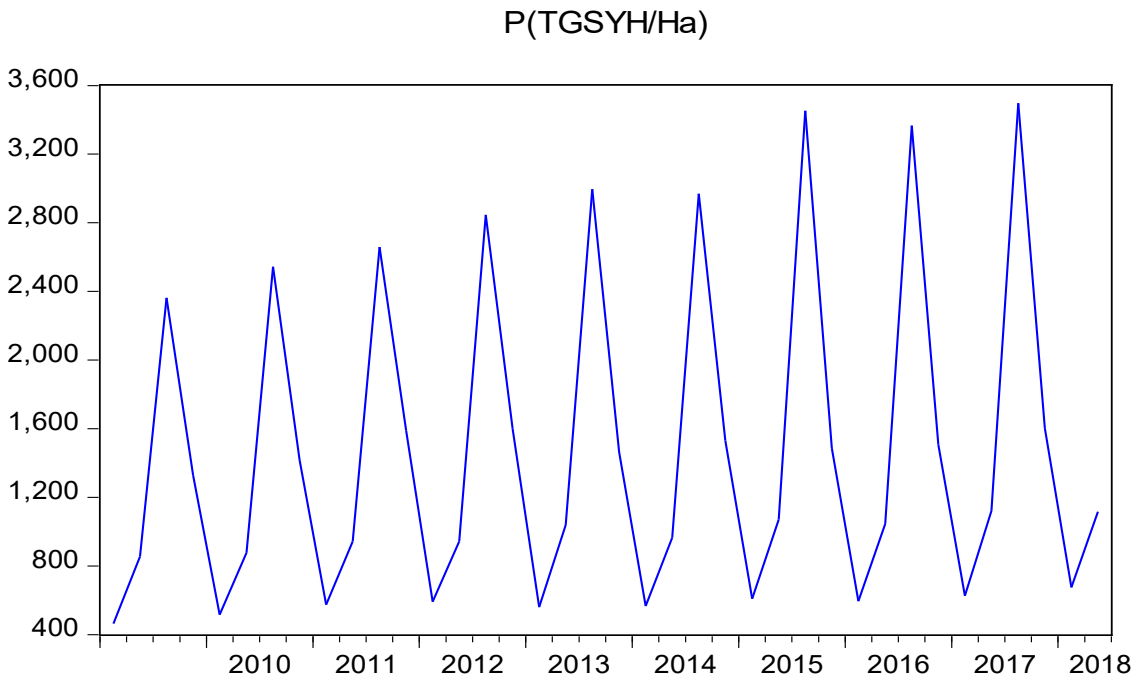
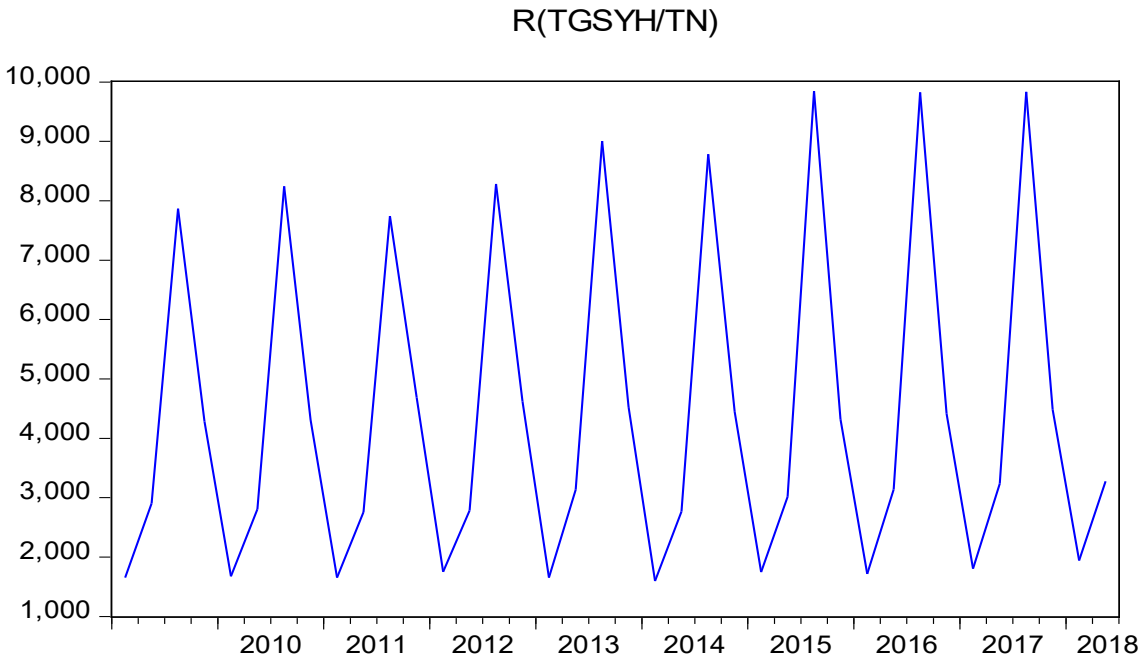


Figure 8: Average Revenue



3.2. DESCRIPTIVE STATISTIC

Before starting the analysis, it would be useful to see the general level of our variables from Table 21.

Table 21: Definitions and Descriptive Statistics of the Variables Used in the Empirical Analysis

Variable	Definition	Descriptive Statistics					
		Obs.	Mean	S.D.	Median	Min.	Max.
N	Agricultural Employment/Total Employment	*38*	*-1.550054*	*0.076813*	*-1.553626*	*-1.697409*	*-1.437748*
MQ	Hectare/Tractor	*38*	*2.306581*	*0.114810*	*2.307240*	*2.112710*	*2.478219*
P	Agricultural GDP/Hectare	*38*	*7.111855*	*0.610671*	*7.019413*	*6.138925*	*8.159437*
R	Agricultural GDP/Agricultural Employment	*38*	*8.205489*	*0.605396*	*8.087718*	*7.374559*	*9.194937*

Note: All variables are expressed in natural logarithm.

3.3. THE MODEL

To analyze the determinants of agricultural employment rate, we use the following reduced function in equation 1;

$$N_t = f(MQ_t, P_t, R_t, u_t) \quad (1)$$

where N_t is the Agriculturel Employment Rate (Agriculturel Employment/Total Employment) which is seasonally adjusted, MQ_t is the level of mechanization (Hectare/Tractor), P_t is the productivity which represent by the income from a unit of the agriculturel land, R_t is the agriculturel average income (Agriculturel GDP/Agriculturel Employment) and u_t is the error term.

All variables are expressed in logarithmic values. However, it is aimed to eliminate or reduce the effect of any heterogeneity problem in economic time series data. In light of these explanations, the regression equation used for this econometric analysis is:

$$ln(N_t) = \alpha_0 + \alpha_1 MQ_t + \alpha_2 P_t + \alpha_3 R_t + u_t \quad (2)$$

The parameters to be estimated are α_0, α_1, α_2 and α_3, which represent the long-term flexibility of Nt in terms of mechanization, productivity, agricultural average income, respectively. The term stochastic error represented by u_t is assumed to meet the normality requirements. The subscript t represents a three-month period. Hence, we have:

$$\Delta ln(N)_t = \beta_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta ln(N)_{(t-i)} + \sum_{i=0}^{m} \alpha_{2i} \Delta ln(MQ)_{(t-i)} + \sum_{i=0}^{m} \alpha_{3i} \Delta ln(P)_{(t-i)} + \sum_{i=0}^{m} \alpha_{4i} \Delta ln(R)_{(t-i)} + \theta_1 ln(N)_{(t-1)} + \theta_2 ln(MQ)_{(t-1)} + \theta_3 ln(P)_{(t-1)} + \theta_4 ln(R)_{(t-1)} + v_t \quad (3)$$

We have already defined all variables. Here Δ represents the first difference operator and m, the optimal delay length. The α_{1i}, α_{2i}, α_{3i} and α_{4i} coefficients show the short-term coefficients and the θ_1, θ_2, θ_3 and θ_4 coefficients show the long-term coefficients. Multipliers of the model; β_0 is the drift component and v_t is the white noise error.

After estimating the equation (3) using the Ordinary Least Squares (OLS) technique, the null hypothesis (H_0) of the absence of long-term relationship between the variables is tested against the alternative hypothesis (H_1). In other words, the hypotheses H_0: $\theta_1=\theta_2=\theta_3=\theta_4=0$ and H_1: $\theta_1\neq\theta_2\neq\theta_3\neq\theta_4\neq0$ are tested. There are 4 different critical value ranges for the F statistic. These ranges are critical value ranges for 1%, 2.5%, 5% and 10%. The resulting f-value is compared with these ranges. If f is greater than all of these values, there is a long-term relationship between the variables.

Once the long-run relationship has been determined, the 3rd equation is estimated by considering the Akaike's Information Criterion (AIC). In the next stage, a one-period lagged error correction version of the ARDL model, which is related with long-run coefficients, is formed and short-run dynamics are estimated. This is showed by:

$$\Delta ln(N)_t=\beta_0+\sum_{i=1}^{k}\alpha_{1i}\Delta ln(N)_{(t-i)}+\sum_{i=0}^{k}\alpha_{2i}\Delta ln(MQ)_{(t-i)}+\sum_{i=0}^{k}\alpha_{3i}\Delta ln(P)_{(t-i)}+\sum_{i=0}^{k}\alpha_{4i}\Delta ln(R)_{(t-i)}+\delta ECT_{t-1}+\varepsilon_t \quad (4)$$

Here, equation 4, α_{1i}, α_{2i}, α_{3i}, and α_{4i} show the short-run dynamic coefficients of the approximation of the model to equilibrium. δ is the speed of adjustment for long-run equilibrium for the described variable. And ECT is the error correction. The error correction term (ECT) is shown as follows:

$$ECT=lnN_t-(\gamma_1 lnMQ_t+\gamma_2 lnP_t+\gamma_3 lnR_t) \quad (5)$$

Equation 5 indicates to us that the coefficient of ECT is less than zero and statistically significant proves the existence of a co-integration relationship here.

3.3.1. Autoregressive Distributed Lag (ARDL) Bounds Testing Aproach

This thesis uses the Autoregressive Distributed Lag (ARDL) model, which was first proposed by Pesaran and Shin (1999). The ARDL approach is a suitable model if the parameters are completely static, I (0) or the first difference is I(1) or as a mixture of I (0) or I(1). But before we start the analysis, we need to

make sure that our variables are not stable I(2). Therefore, in the next section, we will investigate the static states of variables.

3.3.2. Unit Root Tests

To avoid the problem of spurious regression and biased results, it is necessary to stabilize the time series (Maddala, 2001, p. 582). Many unit root tests have been developed for this purpose. Two different unit root tests were performed in this article which are Augmented Dickey and Fuller (ADF, 1981) and Philips and Perron (PP, 1988) to check the order of integration of the variables under consideration by examining the Akaike Information Criteria (AIC) with maximum lag lengths. ADF Test can be formulated as follows.

$$\Delta y_t = \alpha + \delta y_{t-1} + \varepsilon_t$$

$$H_0 : \delta = 0$$

$$H_1 : \delta < 0$$

where H_0 shows non-stationarity and H_1 shows stationarity. PP (Phillips-Perron Test) unit root tests differ from the ADF (Augmented Dickey and Fuller) tests mainly in how they deal with serial correlation and heteroskedasticity in the errors.

ADF tests use parametric autoregression to approach the ARMA structure of errors in test regression, while PP test does not take into account any serial correlation in the test regression. The formulation for PP test is as follows.

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + u_t$$

$$H_0 : \pi = 0$$

$$H_1 : \pi < 0$$

With these two tests, the null hypothesis of static data is tested. Table 22 shows the results of the two different stationarity tests.

Table 22: Unit Root and Stationarity Tests

Variables	ADF		PP	
	ADF_c	ADF_{c+t}	PP_c	PP_{c+t}
N	*0.277495* *(0.9739)*	*-4.225614**** *(0.0100)*	*0.907197* *(0.9945)*	*-4.233505**** *(0.0098)*
MQ	*3.492694* *(1.0000)*	*-0.490522* *(0.9779)*	*0.382876* *(0.9795)*	*-2.518141* *(0.3181)*
P	*-1.672366* *(0.4345)*	*-3.113188* *(0.1215)*	*-8.901854**** *(0.0000)*	*-8.075083**** *(0.0000)*
R	*-0.175745* *(0.9323)*	*-3.210445** *(0.0998)*	*-8.200967**** *(0.0000)*	*-8.009112**** *(0.0000)*
dN	*-7.194578**** *(0.0000)*	*-7.265750**** *(0.0000)*	*-8.535500**** *(0.0000)*	*-9.276246**** *(0.0000)*
dMQ	*-6.339432**** *(0.0000)*	*-5.859836**** *(0.0003)*	*-4.919164**** *(0.0003)*	*-4.840132**** *(0.0021)*
dP	*-31.84914**** *(0.0001)*	*-31.96032**** *(0.0000)*	*-8.136667**** *(0.0000)*	*-7.914393**** *(0.0000)*
dR	*-31.23675**** *(0.0001)*	*-30.97293**** *(0.0000)*	*-8.153041**** *(0.0000)*	*-7.910550**** *(0.0000)*

Notes: All variables are in logs in the series. The values in parentheses give p-values. d represent differenced. *, **, *** indicates %10, %5 and %1 significance level, respectively.

In order to ADF test, the variables *MQ, P, R* are non-stationary in level form *I(0)* and *N* is in level form stationary only in constant and trend form. In order to PP test, the variables *N* and *MQ* are non-stationary in level form at intercept but only *N* is stationary at constant and trend level. Only MQ is non-stationary according to both tests. After differencing the data, the unit root test reveals that the series for *N, MQ, P, R* became stationary and integrated of order *I(1)* according to both tests and both form *c* and c+t.

3.4. THE RESULTS OF THE ARDL BOUNDS TESTING MODEL

The computed F-statistic is 7.70, which exceeds the upper critical bound values for 1 per cent level of significance (4.84), supporting the hypothesis of co-integration among agricultural employment rate, mechanization (Hectare/Tractor); productivity (Agriculturel GDP/Hectare); agricultural average income (Agriculturel GDP/Agriculturel Employment). In the model. The table 23 shows the f-values of the model.

Table 23: ARDL Bounds Test for Co-integration

Variables	F-statistics	Inference
F(N/MQ, P, R)	**7.701289***	Co-integration
Significance Value	**Lower Bound**	**Upper Bound**
1%	*3.42*	*4.84*
2.5%	*2.87*	*4.16*
5%	*2.45*	*3.63*
10%	*2.01*	*3.1*

Note: * % 1 significant.

Table 24 shows that the most appropriate ARDL model is 1 delay for the dependent variable and 4 for the independent variables based on the AIC, SCI and HQC criteria. (1,4,2,4) has the smallest AIC, SCI and HQC values and lowest ECT probability.

Table 24: ARDL Lag Length Order Selection Criteria Based on AIC, SCI and HQC

	Selected Models			
Lag Length	***(1,4)***	*(4,4)*	*(1,1)*	*(3,1)*
	(1,4,2,4)	*(3,4,4,1)*	*(1,1,1,1)*	*(3,1,1,1)*
AIC	***-8.100934***	*-8.145991*	*-7.530107*	*-7.706302*
SIC	***-7.472433***	*-7.472597*	*-7.225339*	*-7.306355*
HQC	***-7.886597***	*-7.916344*	*-7.422662*	*-7.568240*
Normality (prob.)	***0.739415***	*0.723290*	*0.435947*	*0.437381*
Serial Correlation	***0.1429***	*0.1218*	*0.4476*	*0.8695*
Heteroscedasticity	***0.6726***	*0.3070*	*0.7329*	*0.6874*
Bound-Test	***7.701289***	*5.486102*	*2.132948*	*1.174234*
ECT(-1)	***-0.348127***	*-0.322183*	*-0.015942*	*-0.008288*
Prob. of ECT	***(0.0000)***	*(0.0001)*	*(0.0046)*	*(0.0305)*

Note: The first value specified in parentheses in the second row of the table specifies the lag length of the dependent variable, while the second value indicates the delay length of the independent values.

The Table 25 shows the long-term coefficients of the variables. According to the ARDL model, the coefficients of mechanization level and average income

independent variables are significant at 1%. However the productivity does not affect the agricultural employment rate in the long run. In other words, the coefficients of productivity independent variable is not significant. According to these coefficients, a 1% increase in the level of mechanization leads to a 0.56% decrease in agricultural employment. In other words, the agricultural employment rate decreases as the average agricultural area per tractor decreases. As the average income per capita in agriculture increases by 1%, agricultural employment falls by 0.46%. The phenomenon of hidden unemployment in the agricultural sector is actually an element that reduces the average income per agricultural person. The elimination of this element increases the per capita income in the agricultural sector and decreases the rate of agricultural employment.

Table 25: Long-run Coefficients of ARDL (1,4,2,4) Model

Long-Run Coefficient (Total Effect)			
Variable	**Coefficient**	**Std. Error**	**Prob.**
MQ	*0.566349*	*0.035333*	*0.0000*
P	*0.137109*	*0.109755*	*0.2260*
R	*-0.468450*	*0.103523*	*0.0002*

Migration from rural to urban changes from the agricultural sector to other main sectors. The labour force leaving the agricultural sector has a decreasing effect on the rate of agricultural employment and actually creates an impact on the average per capita income in the agricultural sector. In today's world, where there is increasing depth and productivity through agriculturalization, secret unemployment is less common. These factors create an effect that naturally reduces the rate of agricultural employment. Another reason is that, with the immense landowners migrating and making their investments to other sectors, agricultural employment has decreased with the migration to cities. (Gürbüz and Karabulut as cited Ozbay, 2014, p. 41). In the light of this information, we can say that as agricultural income per capita increases, the rate of agricultural employment decreases.

Short term coefficients of the model are shown in Table 26. While the coefficient of productivity in the long term was insignificant, it was found to be significant in the short term. Accordingly, agricultural employment rate increased by 0.62% when agricultural production per hectare increased by 1%.

Table 26: Short-run Coefficients of ARDL (1,4,2,4) Model

Short-Run Coefficient			
Variable	**Coefficient**	**Std. Error**	**Prob.**
D(MQ)	*0.634930*	*0.072774*	*0.0000*
D(P)	*0.627689*	*0.025069*	*0.0000*
D(R)	*-0.629750*	*0.026687*	*0.0000*

In the Table 27, the accuracy of the model has been tested with some tests. According to Serial Correlation test, there is no correlation between the variables in the long term. For the Breusch-Godfrey Lagrange Multiplier (BG LM) Test, the probability value of Test statistics is 0.14. Since this value is greater than 0.05 at 5% significance level, the hypothesis of absence is accepted. So there is no first-line autocorrelation in the model. The probability value of the Jarque-Berra statistic (0.603791) was calculated as 0.74. Since this value is greater than 0.05, the hypothesis of absence is accepted. The interpretation of this is normally distributed at 5% significance level. With another test, it is tested whether residues have fixed variance. The Test statistics of the Heterocedasticity Test were 0.78. The probability value of the Test statistic is 0.67> 0.05 and H_0 is not rejected. And at 5% significance level residues have fixed variance.

Table 27: Diagnostic Tests for ARDL Regression

Test Statistics	**Test Applied**	**Test-statistics**	**Prob.**
Serial Correlation	*Lagrange multiplier test of residual serial Correlation.*	*2.172338*	*0.1429*
Normality	*Test of Skewness and Kurtosis*	*0.603791*	*0.7394*
Heterocedasticity	*Breusch-Pagan-Godfrey Test*	*0.786049*	*0.6726*

The cumulative total (CUSUM) and cumulative squares sum (CUSUMQ) stability tests were applied to determine whether the parameters were consistent. Figures 9 and 10 show that the parameters of the CUSUM and CUSUMQ statistics remain between the red lines and the parameters are stable at 5% significance for the time period.

Figure 9: Plot of the Cumulative Sum (CUSUM)

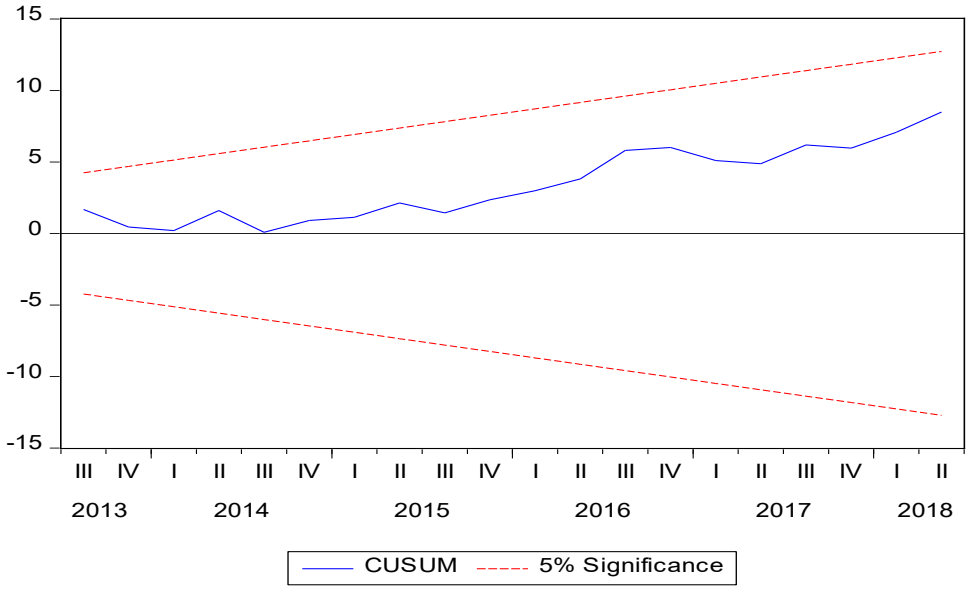
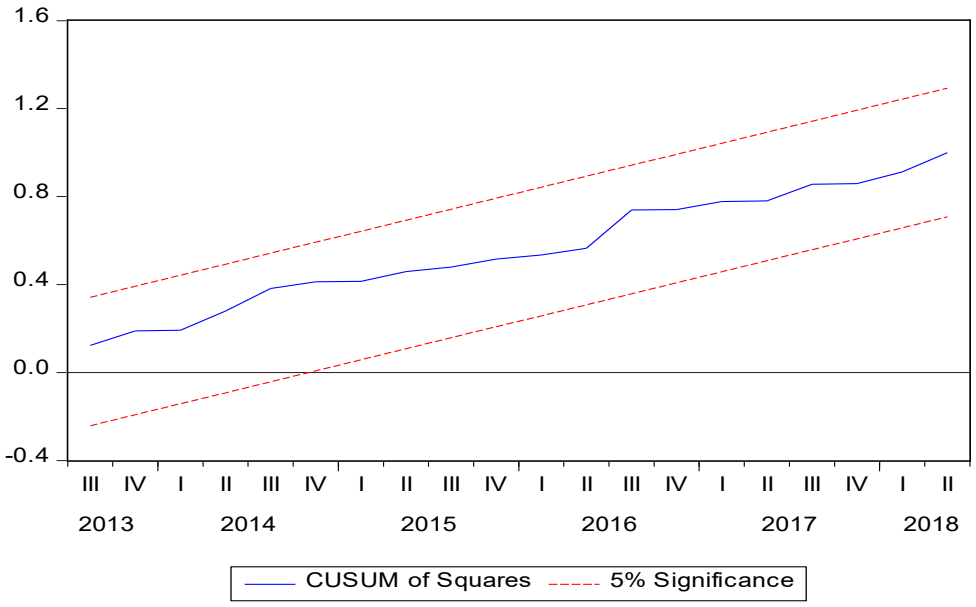


Figure 10: Plot of the CUSUM of Squares Test (CUSUMQ)



CONCLUSION

Agricultural production has been an activity that has to be done from past to present, which is of vital importance to all societies. In other words; Agriculture is an essential phenomenon for the continuation of humanity. Nowadays, the growing societies have to be done effectively and efficiently for their access to adequate food and adequate nutrition. It is observed that the level of mechanization, productivity and average income in agriculture provide important data to decision makers in the effective use of labour force among sectors.

This thesis has investigated a set of potential determinant variables that influence the agricultural employment rate spread of Turkey between 2009:Q3-2018:Q2 for a total of 38 observations for each variable, was obtained from the Central Bank of the Republic of Turkey and TURKSTAT, by employing ARDL Bounds Testing. The main purpose of this study is to determine how the rate of agricultural employment is affected by the level of agricultural mechanization, productivity and average income in agriculture sector.

As a result of the increase in agricultural mechanization in Turkey, changes in the structure of society have occurred. We found that he welfare level of the farmer has increased as a result of mechanization. The decrease in the need for labour used in agriculture has led to the production of more products at low costs. Productivity increased, agricultural areas expanded and facilitated the planting and production of a variety of plants (Merter, 1990, p. 89). In this context, it is thought that there was a relationship between mechanization and migration from rural areas to urban areas. Since the phenomenon of migration from rural to urban is a factor that reduces the rate of agricultural employment, a theoretical inverse relationship exists between mechanization and employment.

The findings of the thesis show that there is a significant relationship between the level of mechanization in agriculture and the rate of agricultural employment in the long run. As the mechanization level increases by 1% in the long run, the agricultural employment rate decreases by 0.56%. These results showed that the level of mechanization in agriculture causes a labour flow from agriculture to

other sectors in the long run. Therefore, the ratio of agricultural employment in total employment is gradually decreasing.

Another result is the effect of productivity on agricultural employment. According to findings, there was no long-run relationship between productivity and agricultural employment. However, productivity in the short run affects the rate of agricultural employment. Thus, a 1% increase in productivity in the short run increases the rate of agricultural employment by 0.62%. In the long run, the increase in income from the unit area may not be towards increasing labour force but may go to machinery and equipment to increase efficiency. Therefore, even if the income increases in the long run, the labour force does not increase. However, in order to increase the revenue obtained from the unit area in the short run, the producer increases the income in the short run by demanding more labour force. Another fact is that if there is to be a choice between machine and workforce in the short run, this is the labour force because in the short run the labour force brings less cost. In the long run, capital accumulation is already shifting to other sectors.

With economic development, per capita agricultural income is decreasing in the agricultural sector. The general impression is that the income of workers in the agricultural sector in developed and developing countries is less than the income of workers in non-agricultural sectors. As the level of development of countries increases, the share of agricultural employment in total employment decreases, while the income gap between agriculture and other sectors decreases. According to 2010 data, agricultural employment in 5 developed countries (USA, Germany, Italy, Denmark, Czechoslovakia) has reached half of the income of non-agricultural workers, while agricultural employment in 1 percent of total employment in England and agricultural employment in Sweden has 2 percent of total employment in 2 percent of the income of agricultural workers is equal to income of non-agricultural. In Turkey, the income of agricultural workers is lower than half of the income of non-agricultural workers. In 2010, the ratio of agricultural employment in Turkey to total employment was

24% and agricultural incomes were 41% of the income of non-agricultural sector (Dinler, 2014, p. 90-91).

It is observed that the average income affects the employment rate negatively in long run in agriculture sector in Turkey. The agricultural employment rate decreased by 0.46% as the average agricultural income per person increased by 1% in the long run. With the introduction of effective scale production methods in agricultural production through corporatization, the phenomenon of hidden unemployment has largely disappeared. Therefore, while the average income per capita in agriculture increases, the rate of agricultural employment decreases.

Finally, decision makers have a major role to move to more efficient scale production in agriculture. Currently, there is over 30% annual food inflation in Turkey. A few of the main reasons for this are the inability of the state to support the farmer sufficiently, the use of ineffective traditional production methods in agriculture and the lack of appropriate employment policies between sectors.

In the last century, the institutions and infrastructures that constitute the basis of economic growth emerged in developed countries. The wealth increases caused by technological development, which is the driving force of growth, show itself in the wealth of rich nations. Hope is that the same energy remains still in the poorest regions of the world (Jones, 2001, p. 165). The increase in specialization is the unique signature of prosperity. The unique signature of poverty is self-sufficient (Ridley, 2013, p.145).

REFERENCES

5488 Sayılı Tarım Kanunu. (2006). *T.C. Resmi Gazete, 26149,* 25 April 2006.

Ahmed, M. and Goodwin, B. (August 2016). *Agricultural Mechanization and Non-Farm Labor Supply of Farm Households: Evidence from Bangladesh* [Bildiri], 2016 Agricultural & Applied Economics Association Annual Meeting, Boston.

Aksöz, İ. (1972). *Zirai Ekonomiye Giriş.* Erzurum: Atatürk Üniversitesi Yayınları.

Aktan, R. (1954). Zirai İstihsalde Makine Kulanılması Hadisesinin Ekonomik Analizi. *Ankara Üniversitesi Siyasal Bilgiler Fakültesi Dergisi, 9*(1), 11-44.

Alcan, D. (2018). *Türkiye'de İşgücüne Katılımın Belirleyicileri ve İşgücüne Katılım Oranı Öngörüleri.* Uzmanlık Tezi, T.C. Kalkınma Bakanlığı, Ankara.

Aldemir, Ş. and Kara, M. (2014). Türkiye'de İstihdam Dinamiklerine İlişkin Nedensellik Analizi. *TISK Academy / TISK Akademi, 9*(17), 24–38.

Appleby, J. (2012). *Amansız Devrim Kapitalizm Tarihi.* (A. C. Akkoyunlu, Çev.). İstanbul: Alfa Basım Yayım. (2010).

Ardıç, K. and Aydın, Y. (2011). *İktisat Okulları ve Emek Piyasası*. İstanbul: Derin Yayınları.

Ardıç, O. (2006). *Mikro Ekonomi* (4. Baskı). Ankara: Seçkin Yayıncılık.

Aren, S. (2011). *İstihdam Para ve İktisadi Politika.* Ankara: İmge Kitabevi.

Armağan, G., Özden, A. and Bekçioğlu, S. (2010). Efficiency and Total Factor Productivity of Crop Production at NUTS1 Level in Turkey: Malmquist Index Approach. *Qual Quant, 44*(3), 573-581.

Ataman, B. C. (1998). İşsizlik Sorununa Yeni Yaklaşımlar. *Ankara Üniversitesi SBF Dergisi, 53*(1), 59-72.

Atiyas, I. and Bakis, O. (2014). Aggregate and Sectoral TFP Growth in Turkey: A Growth Accounting Exercise. *İktisat Işletme ve Finans, 29*(341), 9–36.

Aydın, Y. (2009). *Çağdaş İktisat Okullarının Emek Piyasalarına Yaklaşımı ve Türkiye'de Emek Piyasasının Yapısı.* Doktora Tezi, İstanbul Üniversitesi, İstanbul.

Babacan, A. (1999). *Genel Tarım Politikaları Çerçevesinde Doğrudan Gelir Ödemeleri Sistemi.* Ankara: Devlet Planlama Teşkilatı Yayını.

Bankacılık Düzenleme ve Denetleme Kurumu (BDDK), (2019). Tarımsal Krediler. İstanbul.

Barber, W. J. (2009). *A History of Economic Thought.* Connecticut: Wesleyan University Press Middletown.

Baş, S. (n. d.). Tarım İşletmelerinin Büyüklüğü, Türkiye'de Bölgeler İtibariyle Yeter Gelirli İşletme Büyüklüğünün Hesaplanması. Erişim: 4 March 2019, https://arastirmax.com/tr/system/files/dergiler/2057/makaleler/10/1/arastirmax-tarim-isletmelerinin-buyuklugu-turkiyede-bolgeler-itibariyle-yeter-gelirli-isletme-buyuklugunun-hesaplanmasi.pdf

Battese, G.E. and Coelli, T.J. (1992). Frontier Production Functions, Technical Efficiency and Panel Data: With Application to Paddy Farmers in India. *Journal of Productivity Analysis, 3*(1–2), 153–169.

Bayaner, A. (2014). *Türkiye Tarımı Gelişmeler ve Beklentiler.* Ankara: Nobel Akademik Yayıncılık

Bayraktar, Y. and Bulut, E. (2016). Tarımsal Desteklerin Değişen Yapısı ve Yüksek Tarımsal Desteklerin Nedenleri: Türkiye İçin Karşılaştırmalı Bir Analiz. *İstanbul Üniversitesi İktisat Fakültesi Mecmuası, 66*(2016/1), 45-66.

Bilgili, Y. (2012). *Karşılaştırmalı İktisat Okulları Ders Notları. (Makro İktisadın Teorik Esasları)*. İstanbul: İkinci Sayfa.

Boratav, K. (2009). Tarımsal Fiyatlar, İstihdam ve Köylülüğün Kaderi. *Mülkiye Dergisi, 33*(262), 9-19.

Castle, E. N. and Becker, M. H. (1964). *Farm Business Management-The Decision Making Process.* The Macmillan Company: USA.

Cengiz, S. and Baydur, C. M. (2010). Kırdan Kente Göç Ve Tarımsal Verimlilik: Türkiye Örneği. *Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 19*(2), 85-98.

Çakmak, B. and Gökalp, Z. (2013). Kuraklık ve Tarımsal Su Yönetimi. *Gaziosmanpaşa Bilimsel Araştırma Dergisi, 4*, 1-11.

Çakmak, E., Dudu H. and Öcal, N. (2008). *Türk Tarımında Etkinlik: Hanehalkı Düzeyinde Nicel Analiz.* Ankara: TEPAV Yayınları.

Çelik, N. (2000). *Tarımda Girdi Kullanımı ve Verimliliğe Etkileri.* Uzmanlık Tezi, Devlet Planlama Teşkilatı, Ankara.

Çetin, F. G. (2014). *Genç İstihdamı ve Türkiye'de Teşviklerin Genç İstihdamına Etkisi.* Yüksek Lisans Tezi, Gazi Üniversitesi, Ankara.

Çiftçi, S. (2018). *İstihdam Yaratmayan Büyümenin Dinamikleri: Türkiye Örneği.* Yüksek Lisans Tezi, Osmaniye Korkut Ata Üniversitesi, Osmaniye.

Davis, J. C. (2011). *İnsanın Hikayesi Taş Devrinden Bugüne Tarihimiz.* (B. Bıçakcı, Çev.). İstanbul: Türkiye İş Bankası Kültür Yayınları. (2004).

Dickey, D. A. and Fuller, W. A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series With a Unit Root. *Econometrica, 49*, 1057-1072.

Dinler, Z. (2012). *İktisada Giriş.* Bursa: Ekin Kitabevi.

Dinler, Z. (2014). *Tarım Ekonomisi*. Bursa: Ekin Kitabevi.

Dudu, H., Cakmak, E. H., and Ocal, N. (2015). Drivers of Farm Efficiency in Turkey: A Stochastic Frontier Analysis. *World Journal of Applied Economics, 1*(1), 45–63.

Erdinç, Z. and Erdinç, M. H. (2018). The Place of Turkey in Agricultural Economics and its Tracked Agricultural Policies. *Journal of Current Researches on Business and Economics, 8*(2), 69-84.

Ergüneş, G. (2009). *Tarım Makinaları.* Ankara: Nobel Yayın Dağıtım.

Ersoy, A. (2008). *İktisadi Teoriler ve Düşünceler Tarihi.* Ankara: Nobel Yayın Dağıtım.

Eruygur, O., Kıymaz, T. and Küçüker, M. C. (2016). Türk Tarımında Rekabet Edebilirlik ve Toplam Faktör Verimliliği. *Ekonomik Yaklaşım, 27*(100), 237–279.

Eyüboğlu, D. (2003). *2001 Krizi Sonrasında İşsizlik ve Çözüm Yolları.* Ankara: Milli Prodüktivite Merkezi Yayınları.

G. Udny Yule. (1926). Why Do We Sometimes Get Nonsense-Correlations Between Time-Series?--A Study in Sampling and the Nature of Time-Series. *Journal of the Royal Statistical Society, 89*(1), 1-63.

Galbraith, J. K. (2009). *Büyük Kriz 1929*. (E. N. Akbaş. Çev.). İstanbul: Pegasus Yayınları. (1955).

Gudeman, S. F. (1980). Physiocracy: A Natural Economics. *American Ethnologist.* 7(2), 240-258. Erişim: 11 April 2019, http://search.ebscohost.com/login.aspx?direct=true&db=edsjsr&AN=edsjsr.643590&lang=tr&site=eds-live

Gujaratı, D.N. (2012). Temel Ekonometri. (Ü. Şenesen, G.G. Şenesen. Çev.). İstanbul: Literatür Yayınları. (2009).

Gül, E., Ekinci, A. and Konya, S. (2009). *Türkiye'de İstihdam Politikaları: Yapısal Bir Analiz.* Bursa: Ekin Kitabevi.

Günaydın, G. (2006). Türkiye Tarım Sektörü. *Tarım ve Mühendislik,* 76-77, 12-27.

Günaydın, G. (2009). Smith, Ricardo ve Marx İktisadında Tarım. *Mülkiye Dergisi, 33*(262), 345-362.

Güngör, K. (2006). *İktisadın Tarihine Kısa Bir Bakış ve Merkantilizmden Günümüze İktisadi Düşünceler.* Erişim: 25 April 2019, https://www.researchgate.net/deref/https%3A%2F%2Fwww.researchgate.net%2Fpublication%2F266607898_iktisadin_tarihine_

Gürbüz, M. and Karabulut, M. (2008). Kırsal Göç ile Sosyo-Ekonomik Özellikler Arasındaki İlişkilerin Analizi. *Türk Coğrafya Dergisi, (50)*, 37-60.

Güreşçi, E. (2009). Kırsal Göç ve Tarım Politikası Arasındaki İlişki. *Muğla Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 22*, 51-67.

Gürkan, C. (2008). Kameralizm: Merkantilizm ve Fizyokrasi ile Bir Karşılaştırma. F. Başkaya and A. Ördek (Ed.). *Ekonomik Kurumlar ve Kavramlar Sözlüğü Eleştirel Bir Giriş* (p. 625-650). Ankara: Maki Basın Yayın.

Hobsbawm, E. J. (2008). *Sanayi ve İmparatorluk.* (A. Ersoy, Çev.). Ankara: Dost Kitabevi Yayınları. (1969).

Hürriyet. (2006). Erişim: 05.02.2019. http://www.hurriyet.com.tr/gundem/bakan-eker-dogrudan-gelir-destegi-adil-bir-sistem-degil-5687572

İmrohoroglu, A., İmrohoroglu, S. and Ungor, M. (2014). Agricultural Productivity and Growth in Turkey. *Macroeconomic Dynamics, 18*(5), 998–1017.

Jones, C. I. (2001). *İktisadi Büyümeye Giriş*. (Ş. Ateş and İ. Tuncer, Çev.). İstanbul: Literatür Yayıncılık. (1998).

Kandemir, O. (2011). Tarımsal Destekleme Politikalarının Kırsal Kalkınmaya Etkisi. *Ekonomi Bilimlerı Dergisi, 3*(1), 103-113.

Kaymak, M. (2005) Ulusların Tarımsal Zenginliği: Adam Smith ve Fizyokrasi. *Ekonomik Yaklaşım, 16*(54), 1-25.

Kaymak, M. (2011). 1980 Öncesinin Sorunsalından Hareketle 1980 Sonrası Türkiye Tarımı. E. Başer, N. Koçyiğit and M. Öziş (Ed.). Bugüne Bakmak: 1980 Sonrasında Türkiye'de Yaşanan Toplumsal Dönüşüm Süreçleri (s. 123-141). Ankara: Dipnot Yayınları.

Kaynak, M. (2014). *Kalkınma Ekonomisi.* Ankara: Gazi Kitabevi.

Kazgan, G. (2012). *İktisadi Düşünce veya Politik İktisadın Evrimi.* İstanbul: Remzi Kitabevi.

Kepenek, Y. (2014). *Türkiye Ekonomisi.* Ankara: Remzi Kitapevi.

Küçükkalay, A. M. (2010). *İktisadi Düşünce Tarihi.* İstanbul: Beta Yayınları.

Lordoğlu, K. and Özkaplan, N. (2007). *Çalışma İktisadı*. İstanbul: Der Yayınları.

Maddala, G.S. (2001). *Introduction to Econometrics*. (3rd Edition). Wiley, New York.

Mahiroğulları, A. (2017). Türkiye'de Kayıtdışı İstihdam ve Önlemeye Yönelik Stratejiler. *Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 22*(2), 547-565.

Malinvaud, E. (1983), *Marché du Travail: Limites Sociales des Nouvelles Théories.* Paris: Ed. Economica.

Malthus, T. R. (1798). *An Essay on the Principle of Population*. London: J. Johnson.

Marx, K. (2001). *Ücret, Fiyat ve Kar.* (S. Ege, Çev.) Ankara: Bilim ve Sosyalizm Yayınları. (1898).

Marx, K (2015). *Kapital: Ekonomi Politiğin Eleştirisi Cilt: 1.* (M. Selik, N. Satlıgan, Çev.), İstanbul: Yordam Kitap. (1867).

Meek, R. L. (2013). *Economics of Physiocracy*. London: Routledge. (1962).

Mehmet, Ö. and Kılıç, C. (2009). *Çalışma Ekonomisi Teorisi.* Ankara: Gazi Kitabevi.

Merter, F. (1990). *1950-1988 Yıllları Arasında Köy Ailesinde Meydana Gelen Değişmeler (Malatya Örneği).* Ankara: Aile Araştırma Kurumu Başkanlığı Yayınları.

Narin M. and Öznazik, A. (April 2017). *Tarımsal Desteklerde Son Değişmeler ve Tarım Sektörü Üzerine Olası Etkileri* [Bildiri], ICFAEC 2017 Uluslararası Gıda ve Tarım Ekonomisi Konferansı, Antalya.

Narin, M. (2008). Türkiye'de Uygulanan Tarımsal Destekleme Politikalarında Değişim. *Ekonomik Yaklaşım, 19*, 183-225.

Oğuz, C. and Bayramoğlu, Z. (2014). *Tarım Ekonomisi*. Konya: Atlas Akademi.

Ollman, B. (2015). *Yabancılaşma Marx'ın Kapitalist Toplumdaki İnsan Anlayışı* (A. Kars, Çev.). İstanbul: Yordam Yayınları. (1977).

Orhan, S. and Savuk, F. (2014). Emek-Teknoloji-İşsizlik İlişkisi. *ÇSGB Çalışma Dünyası Dergisi*, 2(2), 9-24.

Özden, A. (2014). Total Factor Productivity Growth in Turkish Agriculture: 1992-2012. *Bulgarian Journal of Agricultural Science*, 20(2), 469–473.

Özer, S. (2014). Demokrat Parti Dönemi Zirai Makineleşme Hareketi ve Sonuçları. *SDÜ Fen Edebiyat Fakültesi Sosyal Bilimler Dergisi, 31*, 61-80.

Özgüven, M. M., Türker, U. and Beyaz, A. (2010). Türkiye'nin Tarımsal Yapısı ve Mekanizasyon Durumu. *GOÜ Ziraat Fakültesi Dergisi, 28*(2), 89-100.

Pekin, T. (1996). *Makro Ekonomi.* İzmir: Bilgehan Basımevi.

Pesaran, M. H. and Shin, Y. (1999). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis. S. Strom (Ed.) *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium* (p. 371-413). Cambridge: Cambridge University Press.

Phillips, P. C. B. and Perron, P. (1988). Testing for a Unit Root in Time Series Regression. *Biometrika, 75*, 335-346.

Ricardo, D. (2013). *Siyasal İktisadın ve Vergilendirmenin İlkeleri.* (B. Zeren, Çev.). İstanbul: Türkiye İş Bankası Kültür Yayınları. (1817).

Ridley, M. (2013). *Akılcı İyimser.* (M. Doğan, Çev.). İstanbul: Boğaziçi Üniversitesi Yayınevi. (2010).

Sağlam, S. (2006). Türkiye'de İç Göç Olgusu ve Kentleşme. *Hacettepe Üniversitesi Türkiyat Araştırmaları (HÜTAD),* (5), 33-44.

Sarıipek, D. B. and Kesici, M. R. (2010). Yeni Keynesyen İktisat ve Emek Piyasaları. *Paradoks Ekonomi Sosyoloji ve Politika Dergisi, 6*(2), 17-38.

Savaş, V. F. (2007). *İktisatın Tarihi.* Ankara: Siyasal Kitabevi.

Savaş, V. F. (2013). *Politik İktisat*. İstanbul: Beta Yayıncılık.

Scott-Andretta, J. and Cuecuecha A. (2010). The Effect of Agricultural Subsidies on Migration and Agricultural Employment. División de Economía Working papers DTE No:474, CIDE.

Sevüktekin, M. and Çınar, M. (2017). *Ekonometrik Zaman Serileri Analizi, Eviews Uygulamalı.* Bursa: Dora Basım-Yayın Dağıtım.

Smith, A. (2004). *Ulusların Zenginliği*. (A. Yunus and M. Bakırcı, Çev.). İstanbul: Alan Yayıncılık. (1776).

Smith, A. (2014) *Ulusların Zenginliği.* (H. Derin, Çev.). İstanbul: Türkiye İş Bankası Kültür Yayınları. (1776).

Snowdon, B. and Vane, H. R. (2005). *Modern Macroeconomics Its Origins, Development and Current State*. Cheltenham: Edward Elgar Publishing.

Sugözü, İ. H. and Hüseyni, İ. (2017). Tarımsal Destekleme Politikaları ve Kırdan Kente Göç Üzerindeki Etkisi: 1986-2015 Dönemi Türkiye Örneği. *Turkish Studies International Periodical for the Languages, Literature and History of Turkish or Turkic, 12*(31), 379-396.

Sweezy, P. M. (2007). *Kapitalist Gelişme Teorisi*. (G. Akalın, Çev.). İstanbul: Kalkedon Yayınları. (1942).

Şahinöz, A. (2011). *Neolitikten Günümüze Tarım Ekonomi ve Poltikaları*. Ankara: Turhan Kitabevi.

Şimsek, E. and Gürler, A. Z. (1994). *Kırdan Kente Göç Olgusu ve Kırsal Sanayi*. İzmir: Türkiye 1. Tarım Ekonomisi Kongresi.

Republic of Turkey Ministry of Treasury and Finance (2019), General Budget Balance and Financing.

Tan, S., Ozen, A. and Everest, B. (2016). Kırsal Kalkınma Destekleri Kapsamında Tarıma Dayalı Yatırım ve Hibe Projelerinin Değerlendirilmesi: Aydın İli Örneği. *ÇOMÜ Ziraat Fakültesi Dergisi, 4*(2), 29-36.

Taş, S. and Bozkaya, G. (2012). Avrupa Birliğine Uyum Sürecinde Türkiye'de Uygulanan İstihdam Politikaları. *Kahramanmaraş Sütçü İmam Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 2*(1), 151-176.

Terin, M., Güler, İ. O. and Aksoy, A. (2014). Türkiye'de Tarımsal Üretim ile Tarımsal Kredi Kullanımı Arasındaki Nedensellik İlişkisi. *Journal of the Institute of Science & Technology / Fen Bilimleri Estitüsü Dergisi, 4*(1), 67–72.

The World Bank. (2019). World Development Indicators Database, Washington DC.

Tigem. (2017). *Tohumculuk Sektör Raporu*. Ankara: Tarım İşletmeleri Genel Müdürlüğü

Tokgöz, E. (2007). *Türkiye'nin İktisadi Gelişme Tarihi (1914-2007).* Ankara: İmaj Yayınevi.

Turkish Statistical Institute (DİE/TURKSTAT), (1981). Genel Tarım Sayımı, Ankara.

Turkish Statistical Institute (DİE/TURKSTAT), (1991). Genel Tarım Sayımı, Ankara.

Turkish Statistical Institute (DİE/TURKSTAT), (2001). Genel Tarım Sayımı, Ankara.

Turkish Statistical Institute (TURKSTAT), (2013). Producer Price Index, Ankara.

Turkish Statistical Institute (TURKSTAT), (2017). Producer Price Price Index Of Agricultural Products, Ankara.

Turkish Statistical Institute (TURKSTAT), (2019). Agricultural Land, Ankara.

Turkish Statistical Institute (TURKSTAT), (2019). Annual Gross Domestic Product, Ankara.

Turkish Statistical Institute (TURKSTAT), (2019). Statistics indicators, 1923-2013.

Turkish Statistical Institute (TURKSTAT), (2019). Labour Statistics, Ankara.

Unay, C. (2000). *Genel İktisat*. Bursa: Ekin Kitabevi.

Uyar, Y. E. (2005). *Türkiye'de Uygulanan İşsizlik ve İstihdam Politikalarının Avrupa Birliği Uyum Sürecine Etkileri (1980 Sonrası).* Yüksek Lisans Tezi, Adnan Menderes Üniversitesi, Aydın.

Wang, F. L., Zhao, S. X. and Fu, X. M. (2016). Improved Estimation Model And Empirical Analysis Of Relationship Between Agricultural Mechanization

Level And Labor Demand. *International Journal of Agricultural and Biological Engineering, 9*(2), 48—53.

Welch, P. (1998). Mercantilism and Fascism. *History of Economic Ideas, 6*(2), 97-122. Erişim: 23 April 2019, http://www.jstor.org/stable/23722517

Yalçın, E. G. and Kara, Ö. F. (2016). Kırsal Göç ve Tarımsal Üretime Etkileri. *Harran Tarım ve Gıda Bilimleri Dergisi, 20*(2), 154-158.

Yıldırım, E., Lopcu, K., Çakmaklı, S. and Özkan, Ö. (2010). Yeni Keynesyen Makroekonomik Bir Model: Türkiye Uygulaması. *Ege Akademik Bakış, 10*(4), 1269-1277.

Yıldız, A. (2014). *Tarım Alanında Makineleşmenin İstihdam Üzerindeki Etkileri*. Yüksek Lisans Tezi, Maltepe Üniversitesi, İstanbul.

Yılmaz, H. (2004). Türkiye'de Kimyasal Gübre Üretim, Tüketim ve Dış Ticaretindeki Gelişmeler. M. R. Karaman and A. R. Brohi (Ed.). *3.Ulusal Gübre Kongresi Tarım-Sanayi-Çevre Bildiri kitabı* (p. 35-46). Tokat: Nobel Yayıncılık.

Yılmaz, M. (2015). Türkiye'de Kirsal Nüfusun Değişimi ve İllere Göre Dağılımı, (1980-2012). *Eastern Geographical Review, 20*(33), 161–187.

APPENDIX.1.ETHICS COMMISSION FORM OR ETHICS' BOARD APPROVA

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GRADUATE SCHOOL OF SOCIAL SCIENCES
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Program:	Economics
Status:	☒ MA ☐ Ph.D. ☐ Combined MA/ Ph.D.

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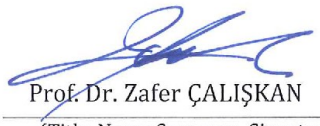

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APPENDIX.2.THESIS ORIGINALITY REPORT

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MASTER'S THESIS ORIGINALITY REPORT

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Department: Economics
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Prof. Dr. Zafer ÇALIŞKAN
(Title, Name Surname, Signature)