

INVESTIGATION OF FACTORS AFFECTING THE ORGANIC AGRICULTURAL PRODUCTION AMOUNT IN TURKEY: A PANEL DATA ANALYSIS

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Abstract. As a result of the fact that materials and practices used to increase productivity in agricultural production all over the world are harming the environment in different ways due to increasing concerns about the environment and health, organic agriculture has come to the forefront. These concerns lead to an increase in the demand for organic products by consumers, and lead to an increase in production. The purpose of this study, organic farming production which is expected to ensure the protection of the environment and human health is to examine the factors that influence. By using panel data analysis method, the relations between organic agriculture production amount and organic agriculture production area and number of farmers were examined. To this end, in Turkey the 2003-2018 period was included in a research conducted on the production of 43 provinces on a regular basis. There results indicated that in all panel data models, the total organic agricultural production across the country was between 66.01% and 67.79%, the number of farmers and the explanatory power of the production area and the organic agricultural production value between 34% and 35% depended on other factors. Panel data shows that the impact of the cultivation area is greater than the number of farmers.

Keywords: *organic production, organic farm field, number of organic farmers, Pooled OLS, fixed effects, random effects*

Introduction

Although there is an expansive consensus in literature on the topic of agricultural sustainability, sustainable agriculture is defined in different manners. But with its widest use, it can be defined as “the maintenance of agricultural operations in the future”. Just as Marsh (1997), Ambroise et al. (1998), Legg and Viatte (2001), and Gafsi et al. (2006) specified in their studies, the growing interest in sustainable agriculture is relevant because of the negative impacts of conventional agriculture on environmental quality and the wealth of resources, deterioration in human health, and the clear effects of the desertification of rural areas, especially in developed countries. In the focus of attention on sustainable agriculture is not just the avoidance of influences that are harmful to the environment and the health of living beings but also ensuring the ability of the maintenance of agricultural operations as they exist around the world by preserving the quality and wealth of soil and water. Sustainable agricultural operations carry economic value and are a driving force in the development of countries.

The growing phenomenon of agricultural sustainability can be descriptive of the improvements in the sustenance conditions for the rural segment, may provide for a relative decrease in food production, and may contribute to other important functions. Along with creating a significant impact over local and regional food security with mainstays for people in rural segments should these approaches be commonly adopted, the benefits that improvements that contribute to food security and natural, social, and

humane capital provide with open support through means of international, national, and local policy reforms can spread to numerous farmers and rural areas in the coming years (Pretty et al., 2003). Especially in recent years, the provision of the expansion of the sector has become an important topic in terms of sustainable agriculture by regaining for the sector people who ended their operations due to rising costs and falling profit margins and with people who will be newly added.

While there exist different approaches on the topic of ensuring and maintaining agricultural sustainability, sustainability must ensure an increase in yield as well as food security and must materialize in a manner cleansed of elements that threaten human and environmental health. This is because the phenomenon of sustainability is a comprehensive and important concept that increases in yield alone cannot explain.

Similar important emphasis is on taking the measures necessary to reduce the intensity of the use of inorganic fertilizers and insecticides, to control the deterioration of agricultural fields, and to increase the profit margins of farmers by reducing the costs of production. Farmers also must encourage the use of organic fertilizers and integrated insect-management technologies to control pests. These types of inputs produce the possibility of reducing the intensity of use and thus increasing the profit margin of farmers without sacrificing the yield of the goods. The effective implementation of these types of policies requires the repeated guidance of the sector, which has thus far focused on the promotion of traditional agriculture (Zulfiqar and Thapa, 2016, 2017). Along with sustainable agriculture and other natural resources, another important element that will execute agriculture are farmers. The people who will realize agricultural production operations must be made aware on the topic of sustainability and be included in the process. This is because farmers are the most important stake holder of sustainable agriculture.

Organic agriculture has come to the fore around the world due to the observance that materials used and practices performed to increase yield in agricultural production harm the environment in different ways and due to the increase in environmental concerns. Organic agriculture is among the systems of sustainable agriculture. Earth and water resources are not unlimited, and breakdowns that occur in the environment cannot be easily resolved. In this regard, the sustainability of agricultural capacity and the healthy use of natural resources are an important issue. In a system of sustainable agriculture, the deterioration of the environment is reduced, yield is attempted to be preserved, short- and long-term economic vibrancy is encouraged, and living standards are aimed to be increased by preventing migration in the rural segment (Turhan, 2005). Agricultural practices that may be environmentally harmful must be withdrawn and environmental and agricultural sustainability must be shown in an integrated manner in terms of ensuring the sustainability of environmental quality in relation to the problems that have been on the agenda in recent years especially. In this regard, organic agriculture carries importance on the topic of environmental sustainability.

Organic agriculture is a topic that came to the fore in the 1920s around the world based on the idea that it was necessary to turn to forms of natural production to prevent the harm caused to the environment by agricultural production. It has exhibited clear developments in different regions. However, especially in the 1970-80 period, societies' increased sensitivity to the environment and their shift toward foods and products not harmful to health in turn increased demand for organic agricultural products while also increasing the market volume. It is striking that developed countries began to reach the position of consumer while developing countries reached the position of producer

(Kızılaslan and Olgun, 2012). The national and international standards on the topic of organic agriculture were created after 1980. However, it does not appear possible to meet the food needs of the global population with products acquired from organic agriculture in small areas. Organic agricultural practices in Turkey began not to meet domestic need but to be implemented for exports upon the demand of countries purchasing agricultural products from us. The provision of the expansion of demand in domestic markets together with foreign markets causes an increase in the volume of organic agriculture and will provide benefit in terms of sustainable agriculture.

Although it is low, the people who demand organic products around the world comprise high-income people who want to pay in excess for these. Behind the higher payments for organic products are the roles of factors like environmentally friendly methods of production, low levels of pesticides in foods, products cultivated by small family farms, agricultural workers being subjected to fewer insecticides, and there existing greater flavor or nutritional content among the others (Thompson, 2000).

Demand for and production of organic food products is quickly rising today because of growing concerns for food security. Organic production also is an environmentally friendly system of agriculture that aims for high-quality products and agricultural practices that don't harm the environment or people. However, insufficient market supply, traceability, lack of consumer knowledge about market position, and the high price that emerges when compared with other traditional foods are the main factors that influence the purchase behaviors of people (Narmilan and Sugirtharan, 2015). Although there are various reasons in the tendencies toward organic products, the most important factors are income and price effect. By providing for an increase in production and a decrease in prices due to the spread of organic agriculture over a wide area, the consumption of organic products by more people and the spread of the benefits that arise in relation to this to all shareholders must be ensured.

The increase in demand leads to an increase in the volume of trade in organic agricultural products worldwide and countries are making efforts to increase the production of organic agricultural products in order to gain more shares from this market. The increase in agricultural production depends on the quantity and quality of the inputs (land, labor, seed, fertilizer, medicine, etc.) used in production. In addition, product prices in the market and subsidies provided by the government are among the factors that direct producers to produce more agricultural production. However, the effect of each factor on the amount of production is different. On the other hand, consensus has been reached on minimizing the amount of agricultural inputs such as pharmaceuticals and fertilizers which are thought to have a negative impact on the environment and health in organic agriculture. Therefore, it is thought that other factors will have more effect on the increase in organic production. It is necessary to investigate how the desired rate of increase can be achieved and to determine which factors influence the amount of production. When determined how rate of which factor is effective, the measures to be taken to increase the amount of organic production to the desired level can be determined more clearly.

In the literature, there are studies (Isin et al., 2007; Toma and Mathijs, 2007; Alexopoulos et al., 2010; Kafle, 2011; Lapple and Rensburg, 2011; Jierwiryapant et al., 2012; Rana et al., 2012; Asadollahpour et al., 2014; Shams, 2017; Bostan et al., 2019) investigating the factors affecting the adoption of organic agriculture. In addition, there are studies (Hepelwa et al., 2013; Brenes-Munoz et al., 2016; Gupta et al., 2019) investigating the factors affecting the expansion of the land, which is an important factor

in the increase of agricultural production. No studies investigating the factors affecting organic agricultural production and the effects of these factors on production have been evaluated.

The purpose of this study, organic farming production which is expected to ensure the protection of the environment and human health is to examine the factors that influence.

Organic Agriculture Around the World

Although organic agriculture has existed as a concept for about 100 years, it gained significant interest from consumers, environmentalists, farmers, and, finally, political structures around the world only since the 1980s. Growing concerns on the topic of the negative environmental impacts that the industrialization of the agricultural sector after this turning point, World War II, brought were influential (Varini and Andrighetto, 2019).

One of the topics that has come to the agenda in recent years with globalization is the concept of sustainability. Organic agriculture has assumed a key role when considering the tendencies in agriculture regarding globalization and sustainability. In recent years, organic agriculture has quickly spread both in Turkey and around the world and has captured the attention of consumers and producers. In this context, the organic food market is gradually growing in a global sense, and those who wish to receive a share of this market increase the levels of competition with the new tendencies (Deviren and Çelik, 2017). Growing economic and political instability in European countries (migration issues, Brexit, referendum in Catalan, etc.) contributed to the instability of currency exchange rates and to the general drop in the growth of the consumer market (including organic food markets) (Nechaev et al., 2018).

Along with the developments experienced in various countries in recent years, organic agriculture has actually been a popular and striking topic for years. To look at the primary indicators regarding organic agriculture in the report (2019) that the Research Institute of Organic Agriculture (FIBL) and the International Federation of Organic Agriculture Movements (IFOAM) prepared:

Organic agricultural operations have taken place in 181 countries around the world since 2017. However, there are nine countries that have organic regulations around the world. The total organic agriculture space comprises 69.8 million hectares, and the countries with the largest organic agricultural space are Australia (35.6 million hectares), Argentina (3.4 million hectares), and China (3 million hectares). In 1999, when organic agricultural operations began to become popular, the global organic agricultural space comprised a total 11 million hectares. The share within the total agricultural space for organic agricultural space was 1.4% in 2017.

The regions that have the largest organic agricultural spaces are Oceania (35.9 million hectares, half of the world's organic agricultural fields), Europe (14.6 million hectares, 21%), Latin America (8 million hectares, 11%), Asia (6.1 million hectares, 9%), and North America (3.2 million hectares, 5%). However, nearly one in four (16.8 million hectares) of organic agricultural space in the world and more than 87% (2.4 million) producers are found in developing countries and developing markets (Willer et al., 2019). Liechtenstein receives the greatest share of organic agriculture area within the total agricultural area by country (37.9%). Following this are Samoa (37.6%) and Austria (24%).

The wild collection spaces and other non-agricultural spaces around the world (e.g. apicultural operations) are 42.4 million hectares. These areas are the greatest in Finland (11.6 million hectares), Zambia (6 million hectares), and Tanzania (2.4 million hectares). The wild collection spaces and other non-agricultural spaces around the world were 4.1 million hectares in 1999.

The number of people who perform organic agricultural operations around the world is 2.9 million, considering the numbers of producers. The countries in which there are the most organic agricultural producers are India (835,000 people), Uganda (20,352), and Mexico (20,000). The total number of people who were performing organic agricultural operations around the world in 1999 was 200,000.

The global organic market was at a level of \$17.9 billion in 2000, but this figure reached \$97 billion (about €90 million) in 2017. The countries with the greatest share within the organic market are the United States (\$45.2 billion), Germany (\$11.3 billion), and France (\$8.9 billion). Switzerland ranks first in the world in the consumption of organic products per capita (\$325). Apart from this, Denmark (\$315) and Sweden (\$268) top the list in consumption of organic products per capita. The global average consumption of organic products per capita is \$12.8. To evaluate the organic market by region, North America is in a leading position (\$46.35 billion), and behind it are Europe (\$40.21 billion) and Asia (\$10.35 billion) (Lernoud and Willer, 2019). The ranking of the countries with the greatest share in the global organic market and the greatest consumption per capita show us the effect of income in the demand for organic products. This is because the national income per capita for the countries in the rankings materialize much higher than the global average.

The organic food market continues to develop, with global sales reaching \$97 billion in 2017. Organic products are produced in almost every country anymore, but demand is gradually increasing. North America and Europe acquire almost 90 percent of the global revenue in the organic market, but these two markets constitute just one-fourth of the organic area. No matter how much domestic markets develop, most organic products cultivated in Asia, Africa, and Latin America are targeted at export markets (Sahota, 2019). In addition to this, Asia has the third largest market for organic products. Historically, the most important consumer markets are Japan and South Korea, and increases in demand are experienced in especially the Chinese and Indian markets in Asia with the driving force of food scandals and health scares (Sahota, 2019).

Organic Agriculture Around Turkey

Although organic agriculture came to the fore in the 1920s around the world based on the idea that it was necessary to turn to forms of natural production to prevent the harm caused to the environment by agricultural production, it began not based on domestic demand in Turkey but based on exports in the 1980s, in line with the demand coming from European countries. Exports initially began with traditional products like dried grapes, apricots, and figs and continue with production of eight products from 1985-1986 up to the 1990s. The first serious attempt at organic agriculture took place with the opening of organic product stores by a civil society organization between the years of 1998-2000 (Merdan, 2018). In Turkey, just as around the world, organic agriculture markets are constantly expanding for reasons such as the propagation of environmental awareness, agricultural sustainability, and health concerns. The change of consumer preferences ensured an increase in the diversity of organic products.

According to 2017 data in IFOAM and FIBL (2019), Turkey ranks 17th in the world in terms of organic agricultural space. It is seventh in terms of the number of organic producers. It is eighth in terms of organic agricultural spaces in Europe and first in terms of number of producers with a 19% share.

Data related to the development of organic production in Turkey were collected from Ministry of Agriculture statistics about organic farming (2019). In 2002, approximately 12,428 producers produced 310,125 tons of organic products on 89,827 hectares of land, while as of 2018, 791,663 producers produced 2,371,612 tons of organic products on 626,885 hectares of land. Although the number of products and areas of organic production vary in years, the number of farmers engaged in organic production and production amounts generally tend to increase continuously. The average annual increase in organic agriculture in Turkey between the years 2002-2018 are as follows: the number of products 2.2%, number of producers 12.3%, production area 12.9%, produce amount 13.6%. Despite the continuous development of areas for organic agriculture in Turkey, the share in total agricultural land is only 1.4%, according to data from 2017. While 64% of the total production areas were farming areas in 2002, 86% of the total organic production areas were farming areas in 2018. In 2018, 86.7% of the total organic production (transition process excluded) was made up of farming products, while 13.3% is collected from nature. In 2018, 27.7% of the production and 27.1% of the production areas were made up of transition process production. Inclusion of organic agricultural production in support since 2005 also has an impact on the developments of organic agriculture sector in Turkey.

In addition to external demand, domestic demand has been continuously increasing in recent years due to health concerns and environmental awareness. In 2018 a total of 213 kinds of organic products are produced in Turkey. These products are not only products grown by manufacturers, but also include products such as blackberries, rosehip, thyme, centaury, hawthorn, a blend of powdered thyme grass and raspberries that grow spontaneously in nature. In addition, some cultivated products are grown wild in nature and are considered as organic products collected from nature. Turkey has an important potential at the point of collection and evaluation of these products as organic. 9.6% of the total production in Turkey is composed of organic wild collection products.

In 2018, with the maximum amount of production in organic agriculture in Turkey Aydın province (352 639 tonnes), Manisa (220 293 tonnes) and Van (166 784 tonnes). The provinces with the highest organic production area in terms of production area were Aydın (73933 hectares), Van (61293 hectares) and Kayseri (53889 hectares). The provinces with the highest number of organic farmers were Aydın (14388 people), Rize (10711 people) and Van (4595 people). The most produced organic products in 2018 were olives (213369 tons), wheat (195131 tons) and apples (98136 tons). The ratios of these products in total organic production were listed as olives (11.4%), wheat (10.8%) and apples (10.4%).

The development of organic animal products not increased like crop production in Turkey. All entries must be organic to organic farming, the plant must be suitable for the welfare of animals, organic reasons such as lack of meadows and pastures organic farming makes it difficult and costly in Turkey (Dalbeyler and Işın, 2017). The number of farmers engaged in organic animal farming was reached 5,177 in 2018. The number of farmers engaged in beekeeping increased from 256 to 455. In 2018, approximately 68% of the farmers engaged in organic farming produce broiler and ovary chickens, while 20% of them are bovine and about 12% of them are sheep.

Although red meat production varies each year. Total organic milk production was 12,884 tons in 2018. Production of organic cheese, yogurt, butter and cream is not produced regularly but in 2018, 15 tons of cheese, 1 ton of butter and 7 tons of cream were produced. There is no production of organic yogurt.

To increase organic agriculture, direct income support for crop production has started in 2005, in Turkey. Later, the scope was expanded to include livestock, aquaculture and beekeeping. Organic livestock subsidies started in 2011. Producers engaged in organic farming has to registered to the Farmer Registration System and Organic Agriculture Information System to get benefit from support payments in crop production. Government support given to organic farmers in Turkey area-based payments, contract manufacturing, leasing of organic farming for treasure land, low-interest investments and business loans, support for the protection of the environment for agricultural land, state can be listed as supports for the rustic arrangements.

Entrepreneurs who produce organic agricultural products and inputs have been given the opportunity to use operating and investment loans within the scope of the low interest agricultural loan application since 2004. In addition, the Ministry of Agriculture and Forestry signed a grant agreement to farmers who participated in the Environmental Protection of Agricultural Land (ÇATAK) Program in order to take necessary cultural measures to protect soil and water quality in agricultural lands, sustainability of renewable natural resources and mitigate the negative effects of intensive agricultural activities. support payments are made. Within this scope, 240.2\$ / ha (The average exchange rate of the relevant years has been taken into consideration in the conversion of the local currency into foreign currency) is paid for 3rd category environmentally friendly agricultural techniques and cultural practices (Ministry of Agriculture and Forestry, 2019).

In 2018, organic farming supports were organized into 4 categories. Scope of support; The first category (Fruit-Vegetable and Medicinal-Itri Plants) products found in 221.2\$ / ha (The average exchange rate of the relevant years has been taken into consideration in the conversion of the local currency into foreign currency), the second category products (Pistachio and Olives) 154.87\$ / ha, the third category (field crops with high economic value) 66.37\$ / ha products, the fourth category (Other products and fallow) products are 22.12\$ / ha. In addition, organic beekeeping support is provided as 2.21\$ per bee hive.

Materials and Methods

In the study, organic agricultural production data of 43 provinces in Turkey between 2003 and 2018 were used. According to data from the Ministry of Agriculture and Forestry in all provinces (81 provinces) have organic agricultural production. All provinces data were collected, and provinces having data not suitable for panel data analysis were excluded. Provinces without regular organic production in the period included in the analysis were excluded from the analysis. In other words, 43 provinces in total were subjected to the research between 2003 and 2018. Provinces (painted in yellow) used in the panel data analysis were given in the *Figure 1*.

The increase in agricultural production depends on the increase in the quantity and quality of the inputs to be used in production. However, in organic agriculture, it is aimed to protect the environment and human health by reducing the use of inputs such as drugs and fertilizers in order to ensure sustainability in agriculture rather than

increase productivity. For this reason, it is considered that the most important factor in order to increase the production in organic agriculture is to increase the agricultural areas. In the research, the variables of the amount of organic agricultural production of the provinces and the production area and number of farmers were used for the analysis of the factors affecting the amount of organic agricultural production.



Figure 1. Provinces included in panel data analysis

StataMP 14 (64 Bit) was used for data analysis. In this study, panel data analysis was used to examine the relationships between variables. There are some advantages of using panel data models: increasing the sample size; capturing the heterogeneity involved both in cross-section units and time dimensions; testing hypotheses about the presence of heteroscedasticity or autocorrelation, or both; and, finally, they are better suited to study the dynamics of change and complex behavioral models (Gil-Garcia and Puron-Cid, 2013). Panel data model is estimated by using one of the Pooled Least Squares (HEKK - Pooled OLS, Classic Model), Fixed Effects and Random Effects approaches (Onder, 2017). In the panel data analysis, total organic agriculture production values were examined separately for each Pooled OLS, Entity Fixed Effects Model, Random Effects Model and Entity and Time Fixed Effects Model. As with all time series analysis, in panel data analysis that performs both time and horizontal section analysis together, variables should be stationary in order not to cause false relationships between variables (Baytar, 2012). In study, Levin-Lin-Chu (2002) and Pesaran's (2006) CADF tests were used for unit root tests.

Results

General tendencies of the variables included in the analysis for the period 2003-2018 were shown in the *Figure 2*, *Figure 3* and *Figure 4*.

According to *Figure 2*, the change in production areas is generally constant trend and there is an irregular change in provinces 10, 12, 16, 21, 24, 25, 27 and 34. An increase was observed in 12 and 28 provinces by years.

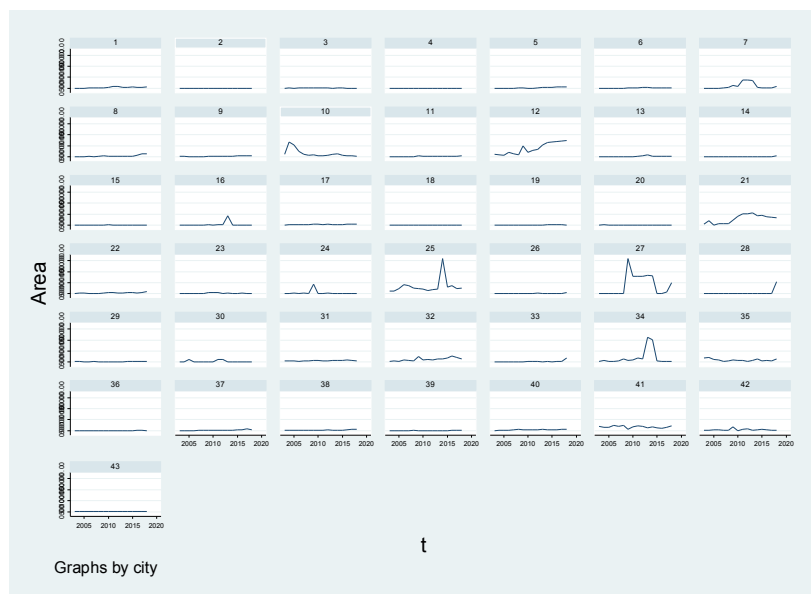


Figure 2. Distribution of area values for each province by years

According to *Figure 3*, although 8, 9, 12, 21, 25, 27, 29, 31, 32, 37 and 41 provinces have increased year by year, there is a very limited increase over the whole time period (2003-2018). The increase in provinces 12, 21 and 32 has a significant upward trend over the period of time.



Figure 3. Distribution of total production value for each province by years

In general, the number of farmers in the provinces has a stable series structure compared to the years and a significant increase trend has been observed in the 5 and 12 provinces over time (*Figure 4*).



Figure 4. Distribution of the number of farmers by year for each province

Descriptive statistics of the parameters used in the study are given in *Table 1*.

Table 1. Descriptive statistics of the parameters used in the research

	Mean	Std. Deviation	Range
Total organic production	19007.54	41463.68	0-360228.2
Total organic farm area	6795.354	15918.99	0.85-160273.5
Number of farmers	720.5029	1650.205	0-14388

In order for econometric analysis to yield reliable results, it is necessary to determine whether the variables have a unit root. Levin-Lin-Chu (LLC) and Pesaran's CADF analysis results for unit root test of the parameters used in the research are given in *Table 2*.

Table 2. Levin-Lin-Chu and Pesaran's CADF unit root tests for research parameters

LLC Unit Root Test						
	ADF regression lags average	Barlett kernel lags average	Unadjusted t	Adjusted t	p	
Total organic production	1.23	8.00	-8.2010	-1.2061	0.1139	
Total organic farm area	0.79	8.00	-10.3415	-3.7440	0.0001	
Number of farmers	1.28	8.00	-6.3889	1.1193	0.8685	
Pesaran's CADF Unit Root Test						
	t-bar	CV10	CV5	CV1	Z	p
Total organic production	-1.955	-2.540	-2.620	-2.760	2.176	0.985
Total organic farm area	-2.067	-2.540	-2.620	-2.760	1.449	0.926
Number of farmers	-1.325	-2.540	-2.620	-2.760	6.262	1.000

Since different panel data models (Pooled OLS, Entity Fixed Effects Model, Random Effects Model and Entity and Time Fixed Effects Model) will be compared, both I.st and II.nd generation unite root tests were used together. II.nd generation unit root tests also show horizontal dependency. Since models used in panel data include Vector Error Correction Model (VECM), cointegration was not analyzed. According to LLC unit root test results, whereas area does not contain unit root ($p < 0.05$), Quantity and Number of Farmers data contain unit root ($p > 0.05$). According to Pesaran's CADF test, all variables contain unit root ($p > 0.05$). Therefore, logarithmic transformations of variables were included in the analysis.

In panel data analysis, four models (Pooled OLS, Entity Fixed Effects Model, Random Effects Model and Entity and Time Fixed Effects Model) were used in order to compare fitness level of given models. Panel data analysis results for total organic farm production amount, organic farm area and number of farmers were given in the *Table 3*.

Table 3. Panel data analysis results for total organic farm production amount, organic farm area and number of farmers

	Pooled OLS	Entity Fixed Effects Model	Random Effects Model	Entity and Time Fixed Effects Model
Constant	2.677613*	3.145068*	3.059708*	3.000439*
Log (Farmer)	0.3291965*	0.4895464*	0.4695072*	0.4841949*
Log (Area)	0.5580943*	0.3783911*	0.4041707*	0.369698*
R ²	0.6779	0.6601	0.6649	0.6705
F-statistics for Hausmann Test	721.81 (2,683)	500.25 (2,641)	236.33 (Wald X ²)	65.12 (17,626)

According to the panel data analysis, explanation power of total organic agriculture production amount was 67.79% in OLS model, 66.01% in Entity Fixed Effects model, 66.49% in Random Effects model and 67.05% in Entity and Time Fixed model. These results indicated that in all panel data models, the total organic agricultural production across the country was between 66.01% and 67.79%, the number of farmers and the explanatory power of the production area and the organic agricultural production value between 34% and 35% depends on other factors.

According to regression coefficients of the parameters, it was found that the contribution of production area parameter to total organic production (0.5580943) was higher than the contribution of the number of farmers to total organic production (0.3291965) in OLS regression with the highest explanatory power. The ratio between these two parameters was $(0.3291965 / 0.5580943 \approx 59)$ is 59%. In other words, the contribution of the total production area was more important than the number of farmers. In this study, an evaluation was made in terms of agricultural area and number of farmers which are thought to be effective in increasing the amount of organic agricultural production. In the literature (Bor and Bayaner, 2009), it is pointed out that the area of the land to be cultivated is limited and other factors are more effective in increasing production. Although it is not possible to increase the area in conventional agriculture, the amount of production will be increased by increasing the area in terms of organic agriculture which has a very small share in total agricultural areas. In addition, the projection of minimizing the use of inputs such as pharmaceuticals and fertilizers in organic agriculture shows that the most important factor in the increase in production will be the increase in agricultural land. The results of this study confirm this.

It is seen that the amount of land and the number of farmers are important factors in increasing the amount of organic agricultural production. As the rate of adoption of organic agriculture increases, the number of farmers and the amount of land will increase accordingly. Brenes-Munoz et al. (2016) states that increases in organic area are affected by organic farming subsidies. Apart from this, other factors that are effective in the adoption of organic agriculture may also indirectly lead to an increase in the organic field. The most important of these factors are education (Gardebroek, 2002; Isin et al., 2007; Kafle, 2011), income (Jierwiryapant et al., 2012; Asadollahpour et al., 2014; Shams, 2017) and environmental factors (Toma and Mathijs, 2007; Alexopoulos et al., 2010; Lapple and Rensburg, 2011; Asadollahpour et al., 2014).

Conclusions

In today's world, agriculture maintains its importance in order to provide self-sufficiency and income for the survival of the societies and this importance reaches an even higher level. From this point of view, agricultural activities should be sustainable. However, from the past to the present day in order to ensure world nutrition, inputs used to increase productivity have threatened human health and the environment, as well as endangering food safety. Loss of biodiversity, erosion and degradation of soil structure, pollution and depletion of water resources and increasing greenhouse gas emissions are just some of the negative consequences of the current agricultural and food system (Çelik et al., 2017). Due to these negative results, the sustainability of agriculture has been suspected.

In order to ensure sustainability in agriculture, different methods and practices have been introduced over time. It was understood that agricultural inputs such as pesticides and fertilizers used to increase productivity caused great damage to productivity over time and consensus was reached on minimizing the amount of such production inputs within the framework of both good agricultural practices and organic farming practices.

On the basis of organic agriculture and good agricultural practices, however, it is more important to maintain living and environmental health, but also to optimize and conserve natural resource use, while at the same time ensuring agricultural sustainability. With an average of 2.9 million producers and a market size of 97 billion dollars, organic agriculture has grown by 102.6% and 105.3% in terms of organic agriculture, especially in the last decade when sustainability is on the agenda. Turkey's climate and soil characteristics, is an advantageous position for organic farming in terms of biodiversity. However, organic agricultural products are mainly made for export in our country. Turkey number of items in over a 16-year period from 2002-2018, 42%, manufacturer number of about 540%, production area is about 598%, the total amount of organic production was increased approximately 665%. Organic farming, despite the fact that the world has shown significant improvements in the overall share of organic farming in the total agricultural land is only 1.4% in the world and Turkey.

In order to Expansion of organic farming activities within the framework of sustainable agriculture and get an increasing share of the agricultural sector which has an important economic value in the world, it is necessary to increase the product range and production amounts.

Panel data show that the impact of the cultivation area is greater than the number of farmers. From this point of view, it can be said that in organic production, larger scale farmers or enterprises with more areas increased in years. In addition, it is beneficial to

open more areas to organic agriculture in the supports to be given. The contribution of the agricultural area and the number of farmers, which are the most basic data of organic agriculture production, to the total production is around 67% and a serious ratio of 33% points to other factors. For this reason, research should be carried out to determine the effect of these factors by including other factors which are effective on organic agricultural production in future studies. In addition, it should be investigated whether the factors affecting organic farming production have the same effect for different countries. According to the years, only two of the 43 provinces which regularly made production in Turkey has been seen increase in production area. Therefore, the increase in the area needs to be supported to increase the potential.

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