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RESEARCH ARTICLE

A Study on The Relationship Between Organic Agriculture and Agricultural Employment in Türkiye

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Abstract

Organic agriculture is a sustainable agricultural system with different principles that is carried out within the scope of certain rules. Due to the substitution of organic inputs with chemical inputs, getting the products ready for sale, weed control, and similar operations by hand, enterprises engaged in organic farming require a larger labor force. All these jobs increase employment opportunities in rural areas and allow small family businesses to continue production. In this study, it has been tried to reveal the relationship between organic agriculture and agricultural employment with the help of an econometric model and to determine the effect of organic agriculture on employment. The study analyzed a 17-year time series of data spanning from 2004 to 2021 to identify the factors influencing agricultural employment, taking into account various aspects of organic agriculture, including the number of organic agricultural products, the count of farmers engaged in organic agriculture, the area dedicated to organic agricultural production, the organic wild collection area, the total area allocated for organic agricultural production, the quantity of organic agricultural production, the number of entrepreneurs involved in organic agriculture, the unit price of subsidy for organic agriculture, and the total amount of subsidy provided to organic agriculture. Based on the results of the regression analysis, it was determined that the number of organic products does not have a significant effect on agricultural employment. In addition, it was found that the wild harvesting area is positively significant for agricultural employment and that the total production area of organic agriculture and the amount of subsidy are negatively significant. The results of the research reveal that a 1% increase in the wild harvesting area related to organic agriculture would lead to an increase of more than 0.28% in the agricultural employment rate, while a 1% increase in the total production area and the amount of subsidy would lead to a decrease of 0.40% and 0.44% in the agricultural employment rate, respectively.

Keywords: *Organic agriculture, Agricultural Supports, Employment*
Jel Codes: *Q11, R12, Q14*

Türkiye'de Organik Tarım ile Tarımsal İstihdam İlişkisi Üzerine Bir İnceleme

Özet

Organik tarım birbirinden farklı prensipleri olan ve belirli kurallar çerçevesinde yürütülen sürdürülebilir tarım sistemidir. Organik girdilerin kimyasal girdilerle ikame edilmesi, ürünlerin satışa hazır duruma getirilmesi, yabancı ot kontrolü ve benzer işlerin elle yapılması gibi nedenlerden dolayı organik tarım yapan işletmeler daha fazla iş gücüne gereksinim duymaktadırlar. Bütün bu işler kırsal alanlarda istihdam olanaklarını artırarak küçük aile işletmelerinin üretime devam etmesine de olanak sağlamaktadır.Bu çalışmada Türkiye'de organik tarım ile tarımsal istihdam arasındaki ilişkinin bir ekonometrik model yardımıyla ortaya konulması ve organik tarımın istihdama etkisi belirlenmeye çalışılmıştır. Çalışmada, 2004-2021 yılları arası 17 yıllık zaman serisi verileri kullanılarak, organik tarım ürün sayısı, organik tarım çiftçi sayısı, organik yetiştiricilik yapılan alan (ha), organik doğal toplama alanı, organik tarım toplam üretim alanı, organik tarım üretim miktarı, organik tarım müteşebbis sayısı, organik tarım destekleme birim fiyatı, organik tarım destekleme tutarlarına ait değerler dikkate alınmış ve tarımsal istihdama etki eden faktörler belirlenmeye çalışılmıştır Elde edilen regresyon analizi sonuçlarına göre; organik ürün sayısının tarımsal istihdam üzerinde anlamlı etkiye sahip olmadığı tespit edilmiştir. Bununla birlikte doğal toplama alanının tarımsal istihdam üzerinde pozitif yönde anlamlı olduğu, organik tarım toplam üretim alanı ve destekleme tutarının ise negatif yönde anlamlı olduğu bulgusuna ulaşılmıştır. Araştırma sonucunda organik tarımla ilgili doğal toplama alanında meydana gelebilecek %1'lik artışın tarımsal istihdam oranında %0,28'den fazla artışa, toplam üretim alanında ve destekleme tutarında meydana gelebilecek %1'lik artışın sırasıyla tarımsal istihdam oranında %0,40 ve %0,44 oranında düşüşe neden olacağı ortaya konulmaktadır.

Anahtar kelimeler: *Organik tarım, Tarımsal Destekler, İstihdam*
Jel Kodu: *Q11, R12, Q14*

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1. INTRODUCTION

The growing world population and the unmet need for nutrition have brought about rapid advances in agriculture. These advances have led to excessive and unconscious use of chemicals, which has become harmful to wildlife. The desire of human beings to harvest more products has been the main reason for the decline in product quality, and concerns regarding the effects of products on human health have started to increase with the impact of the methods and materials used. In this period, the effects of chemical fertilizers, pesticides, and intensive irrigation activities on the natural environment and resources have also begun to be investigated. Within this scope, it has been revealed that modern agricultural methods (conventional agriculture) have effects on the emergence of problems such as chemical pesticides and their residues threatening human health, pollution of underground and aboveground resources, destruction of flora and fauna, soil compaction, and erosion (Kırımhan, 2005; Yürüdür and Kara, 2010). Based on the intensive use of fertilizers, treated seeds, and excessive irrigation, the "Green Revolution" has increased production but has led to the deterioration of the soil structure (Niggli et al., 2007). Concerns over nutrition and the destruction of natural life have led people to behave more responsibly. It can be argued that the emergence of organic agriculture is a result of these factors. Among the sustainable agricultural systems, ecological agriculture, which has various nomenclatures in different languages, is used synonymously with organic agriculture in Turkish (Eryılmaz et al., 2019; Şahinkoç and Öncel, 2022).

Organic agriculture has emerged as a form of production prohibiting the use of harmful inputs such as synthetic fertilizers, pesticides, genetically modified seeds, and additives without harming human health or the environment, and in which every stage from production to consumption is controlled and certified. Organic agriculture is a practice based on the ecosystem method, and it is also a production method that aims to protect vital resources such as air, water, and natural life and adopts the principle of increasing product quality rather than increasing the quantity of production (Rehber and Turhan, 2001; Demirbaş and Yılmaz, 2021). From this perspective, organic agriculture can be defined as the process of growing agricultural products based on organic and green fertilizers compatible with human health and nature. The organic farming process is monitored by a certified control and certification body from production to sales. This process increases the reliability of the products and provides consumers with products with high nutritional value (Boz and Kılıç, 2021).

Organic agriculture can be defined as the process of growing agricultural products without using any chemicals that would harm health or nature in general. In organic agriculture, substances defined in the legislation on organic agriculture, organic fertilizers, and green fertilizers are used instead of chemicals. In the control of weeds, biological and mechanical control methods are applied. A new structural transformation process has begun with the organic farming system, which stands out among the methods developed. The process of structural transformation has accelerated in line with the demand created by the high awareness of healthy living in developed countries. The increase in demand and the number of farmers have also stimulated the organic agriculture trade. Some countries in Europe have resorted to exporting organic products that do not grow and for which there is no domestic market or demand in their own countries (Yavuzer and Bengisu, 2015). The development process of organic agriculture in Türkiye has emerged in this way. At the demand of European producers, organic agriculture was initiated in Izmir in 1984 as raisin and dried fig cultivation. (Okudum et al., 2017). This process continued with organic apricots. In the early years of production, the needs of some European companies were met, but in the early 1990s, organic product cultivation began to be localized with the influence of Turkish experts (Balaban, 2014).

In countries that have not completed their economic development, practicing organic agriculture on a narrow and small scale can lead to increased costs and consequences, such as incomplete planning in terms of production and consumption. Since organic farming is a new practice in developing countries such as Türkiye, its contribution to the national economy remains relatively weak. To deal with the negative consequences, organic agriculture producers come together for a common purpose and introduce new models (Kurtar and Ayan, 2004; Kahveci and Ataseven, 2020). In the long term, the methods put forward will maintain soil fertility, prevent diseases, and stimulate the agricultural economy.

In this study, a conceptual explanation of organic agriculture is provided first. Then, the scientific studies considered closely related to the research are included in the literature section. Subsequently, organic agriculture activity, organic subsidies in Türkiye, and the employment creation potential of organic agriculture are discussed, and the implementation part of the study is initiated. Finally, in the implementation part, the impact of organic farming activities, and subsidies on agricultural employment is analyzed. The analysis revealed that wild harvesting areas have a positive contribution to agricultural employment, while agricultural subsidies and total production areas have a negative impact on agricultural employment.

There are few studies in the existing literature that closely resemble this study. The study serves a dual purpose: to contribute to the scientific field and provide guidance for future researchers contemplating similar investigations. What sets this study apart from its counterparts is its utilization of an econometric model to unveil the relationship between organic agriculture and agricultural employment in Türkiye, along with an examination of the variations in the variables employed.

2. Literature Review

In recent years, the negative impacts of modern agricultural practices on humans and the environment have resulted in the search for agricultural methods. Today, as agricultural and environmental sustainability policies have gained importance, environmentally friendly and healthy agricultural methods are more emphasized. In this regard, certified organic agriculture studies, which are practices that meet the demands of large circles, have been influential (Okudum et al., 2017). Organic agriculture is considered an approach to sustainable agricultural systems with its own special principles and practices, apart from natural agriculture and pesticide-free agriculture (Demiryürek, 2004). Besides all these, organic agriculture also envisages increasing economic welfare and quality of life from producers to consumers.

Not many studies are found in the national literature on the effects of organic agriculture on agricultural employment. The first study was conducted by Yolcu (2013). This study evaluates the employment generation potential of organic agriculture in Türkiye. Based on the finding that the labor force in Türkiye mostly works in the agricultural industry and lives in rural areas, the study states that as organic farming practices become widespread, they would provide a competitive advantage in favor of Türkiye. The study concludes with the recommendation that farmers should be given the necessary subsidies in the transition to organic agriculture. The second study was conducted by Çelik (2019). This study investigates the GAP Organic Agriculture Cluster established for the development of organic agriculture in Türkiye. Conducted through document analysis and survey techniques, this study found that the GAP Organic Agriculture Cluster has a positive impact on regional development and employment.

It is also possible to find a few studies on the effects of organic agriculture on employment in international literature. The first study was published by Pimentel et al. (2005). In the study, the authors compared organic and conventional farming systems through experimentation over twenty-two years. At the end of the study, they found that the labor force in organic agriculture is higher than in conventional agriculture. The second study was conducted in 2005 by Morison et al. In their study, they used 23% of organic farms in the UK and Ireland as a sample. As a result of the study, they found that the labor requirements of organic farms were higher than those of conventional farms. In another study, organic agriculture offers a potential solution to the problem of unemployment and an opportunity for economic growth (Reganold and Wachter, 2016).

Organic agriculture activities yield substantial effects in terms of bridging development disparities between regions, retaining populations in rural areas, and boosting income and wages. Besides these advantages, it also grapples with certain weaknesses, including the limited educational level of farmers, a lack of full-fledged farmer organizations, an insufficient number of intermediary technical personnel, and productivity losses. A study by Demirci et al. (2002) determined that the yield of certain organic products (such as seedless raisins, olives, cotton, barley, and wheat) was 5-20% lower than that of conventional products, while their sales prices were 10-15% higher. The study also highlighted that the price advantage of organic products does not consistently compensate for the yield losses, resulting in a net profit decline of 25-60% due to low yields and high unit costs. Another study supporting this situation was addressed by Karabas and Gurler (2011). According to a study, the primary reason farmers hesitate to transition to organic agriculture is the productivity losses encountered in this mode of farming. The adoption of organic agriculture faces additional challenges due to difficulties in implementation and higher yield losses resulting from the absence of chemical inputs.

3. Organic Agriculture Activity in Türkiye

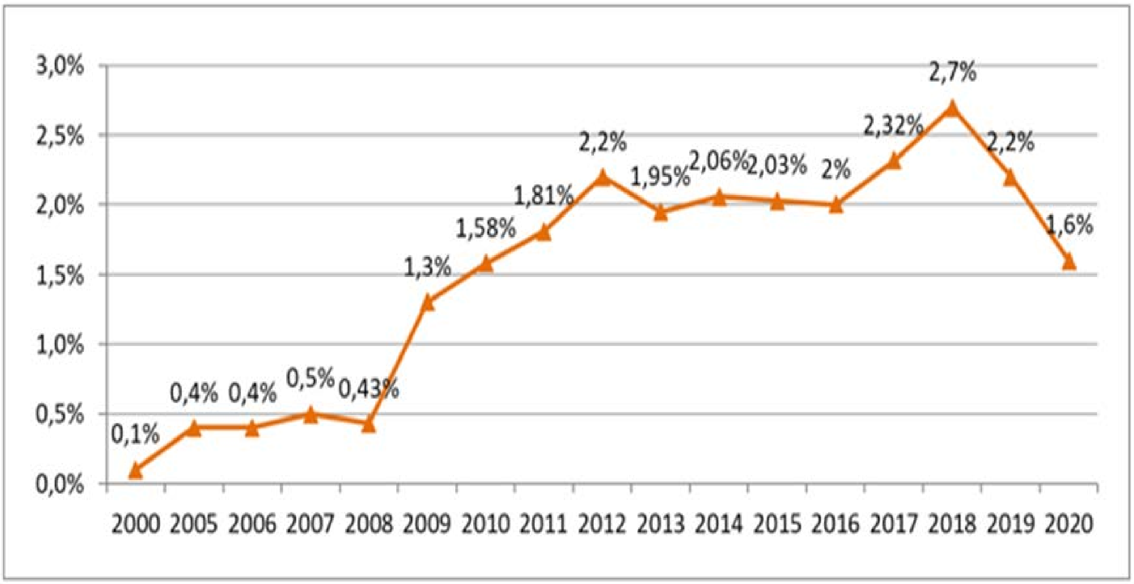
Organic agriculture in Türkiye first began in 1984 in the Aegean Region with the production of raisins and figs in line with the requests of European companies. Later, new products such as dried apricots and hazelnuts were added to these products, and the range of organic products was expanded. (Merdan, 2018). In the following years, products such as blackberries, rose hips, thyme, tomato paste, rose water, rose oil, raspberries, and fruit concentrate were added to the range of organic products, and this number increased to 267 by 2021.

The development process of organic agriculture in Türkiye started with export demand. Unlike European countries, organic products found customers in the international market; the development of the domestic market over time changed the product preferences of consumers; and the number and variety of products were shaped in line with the demands of the domestic market (Sirat, 2016).

The legal regulations on organic agriculture in Türkiye were established in 1992 by the Association of Ecological Agriculture Organization (ETO). Then, in 1994, a regulation on the production of plant and animal products by ecological methods was issued. Later, within the framework of EU alignment efforts, the "Regulation on the Principles and Implementation of Organic Agriculture" was published in 2002. In 2004, the "Organic Agriculture Law" numbered 5262 entered into force (Emir and Demiryürek, 2014). Türkiye's efforts to join the European Union (EU) and the importance the EU attaches to organic agriculture increase the likelihood of the development of organic agriculture (Bulut, 2006).

The ratio of organic agricultural areas to total agricultural areas in Türkiye was 0.1% in 2000. This rate has increased over the years, reaching 2.7% in 2018. After 2018, it declined again, falling to 2.2% in 2019 and 1.6% in 2020 (Figure 1). Based on 2019 data, organic agriculture is practiced in 1.6% of total agricultural areas worldwide. Compared to 2019 data, the area allocated to organic agriculture in total agricultural areas in Türkiye is above the world average. However, this rate is much lower than that of the EU countries. In the European Union countries, organic agriculture is practiced in 9.2% of the total agricultural area (Anonymous, 2022a).

Figure 1. Ratio of Organic Agriculture Areas to Total Agricultural Areas in Türkiye (%)



Reference: Anonymous, 2022b

Table 1 presents the data on organic agriculture in Türkiye by year. Based on these findings, there has been an increase in the number of organic products over the years. The number of products increased from 174 in 2004 to 267 in 2021. There has been a fluctuating trend in the number of organic farmers over the years. The number of farmers increased from 12,751 in 2004 to 48,244 in 2021. The largest increase in the number of organic farmers occurred in 2018 (79,563). The amount of organic production has also changed in parallel with the number of organic farmers. The amount of organic production, which was 377,616 tons in 2004, reached 1,590,086 tons in 2021. Although the amount of organic production has fluctuated over the years, it has increased by approximately 1,200,000 tons between 2004 and 2021. A similar increase was observed in the area under cultivation. The area under cultivation increased from 108,598 hectares in 2004 to 540,000 hectares in 2018. By 2021, this area had decreased to 317,585 hectares. The wild harvesting area, on the other hand, has shown an upward trend in some years from 2004 to 2021; however, it has been in a continuous downward trend since 2014. From 100,975 hectares in 2004, the wild harvesting area decreased to 34,334 hectares in 2021 (Table 1). In the total production area, an increase below expectations was observed in the years from 2004 to 2021. The largest increase was in 2014, with 842,216 hectares. As of 2018, total production areas have been on a downward trend (Figure 1; Table 1).

Table 1. Organic Agriculture Data in Türkiye by Years

Years	Number of Products	Number of Farmers	Amount of Production (tons)	Cultivation Area (ha)	Wild Harvesting Area (ha)	Total Production Area (ha)
2004	174	12,751	377,616	108,598	100,975	209,573
2005	205	14,401	421,934	93,134	110,677	203,811
2006	203	14,256	458,095	100,275	92,514	192,789
2007	201	16,276	568,128	124,263	50,020	174,283
2008	247	14,926	530,224	109,387	57,496	166,883
2009	212	35,565	983,715	325,831	175,810	501,641
2010	216	42,097	1,343,737	383,782	126,251	510,033
2011	225	42,460	1,659,543	442,581	172,037	614,618
2012	204	54,635	1,750,126	523,627	179,282	702,909
2013	213	60,797	1,620,466	461,395	307,619	769,014
2014	208	71,472	1,642,235	491,977	350,239	842,216
2015	197	69,967	1,829,291	486,069	29,199	515,268
2016	225	67,878	2,473,600	489,671	34,106	523,778
2017	214	75,067	2,406,606	513,981	22,148	543,033
2018	213	79,563	2,371,612	540,000	86,885	626,885
2019	213	74,547	3,260,997	502,127	33,283	505,551
2020	235	52,590	1,631,943	353,783	28,882	382,665
2021	267	48,244	1,590,086	317,585	34,334	351,919

Reference: Anonymous, 2022c

Based on the data in the table, it can be argued that the organic agriculture market is on the rise in line with the demand for products. However, the number of crops, the number of farmers, the amount of production, the cultivation area, the wild harvesting area, and the total production area have decreased in some years. Certain efforts should be put in place to prevent these declines. In this sense, it is necessary to include control prices in the subsidy with the certification and analysis prices of the farmers engaged in organic production; to provide incentives in processes where costs increase, such as consumption, processing, storage, packaging, and transportation during production stages; and to increase subsidies to producers per production and decade (Merdan, 2014).

In Türkiye, exports of organic products were initially realized as raw materials; however, today, these raw materials are exported as processed. The organic agriculture activity, which started in line with export-oriented demands, has shown continuous development, and the variety of products exported has reached 267. In recent years, with the establishment of private businesses selling organic products, sales of organic products for the domestic market have also started. Following these sales, the opening of organic product sections in large markets facilitated the introduction of products to consumers. The most crucial issues here are the introduction of products to potential consumers and the implementation of appropriate pricing policies (Boz and Kılıç, 2021).

4. Organic Agriculture Subsidies in Türkiye

New advancements in the production of organic products have led to the necessity of organic agriculture subsidies. Today, with the addition of the COVID-19 pandemic to the problems that started with global warming, a crisis that affected the whole world in the production and supply chain, and the outbreak of the Russian-Ukrainian War, humanity has revealed how valuable and indispensable agriculture is. All these negative developments have necessitated the need to support the agricultural sector.

In Türkiye, subsidies for organic agriculture were introduced in 2004. The first subsidy payment for organic agriculture in Türkiye operated in addition to Direct Income Support for the production of crops. In the following years, the scope of subsidies for organic agriculture was expanded. Findings on area-based subsidies by years are given in Table 2. There was only a decrease in the subsidy amount between 2013 and 2016. Since 2017, subsidy unit prices have been divided into 4 categories (Table 2). This practice has continued until today, and in 2022, a total of 54 million TRY subsidy payments were provided, of which 828 thousand TRY were for organic animal husbandry. From 2005 to September 2022, a total of 969 million TRY was paid in subsidies for organic agriculture. For organic agriculture, farmers are paid 10 to 100 TRY per decare based on the category, 15 TRY per hive for hives registered in the Organic Agriculture Information System with an organic status, and bumblebee breeders are paid 60 TRY per colony (Anonymous, 2023a).

Table 2. Organic Agriculture Subsidies by Years (Area Based Subsidies)

Years	Subsidy Unit Prices (TRY/da)	Amount (TRY)
2004	3	55,380
2005	3	73,863
2006	3	97,335
2006	3	131,275
2007	5	351,564
2008	18	653,732
2009	20	6,634,464
2010	25	7,036,497
2011	25	60,599,577
2012	25	67,797,484
2013	Fruit and vegetables /35	37,495,564
2014	Fruits and vegetables /70	68,354,404
2015	Fruits and vegetables /70	87,859,273
2016	Fruits and vegetables /70	57,877,494
2017	According to product certification (Products Divided into 4 Categories)	129,114,031
2018	According to product certification (Products Divided into 4 Categories)	380.141.830
2019	According to product certification (Products Divided into 3 Categories)	473.245.132
2020	According to product certification (Products Divided into 3 Categories)	412.346.187
2021	According to product certification (Products Divided into 3 Categories)	402.306.467

Reference: Anonymous, 2022d

In the production year 2022, farmers who raise bees for hives with organic status, registered in the Beekeeping Registration System and Organic Agriculture Information System, received subsidy payments for organic beekeeping. These payments were calculated based on the unit subsidy amount specified below. This information is summarized in Table 3. The results in the table reveal that organic agricultural support has been categorized since the 2017 production period. Since that time, the subsidy amount provided to individuals with product certificates has been twice as high as that for producer groups with product certificates.

Tablo 3. Organic Agriculture Support according to Product Certificate (2022)

Organic Agriculture Support	**Certificate Type**	**((TRY/da)**
First category products	Product certification (Individual)	100
	Product certification (Manufacturer group)	50
Second category products	Product certification (Individual)	40
	Product certification (Manufacturer group)	20
Third category products	Product certification (Individual/Producer group)	10
Organic Livestock Support		**TRY/bee/kovan)**
Bee Hive		15

Reference: Legislation, 2022 (https://www.mevzuat.gov.tr/MevzuatMetin/20.5.6243.pdf).

In Türkiye, farmers engaged in organic farming can generally benefit from direct income subsidies, interest-discounted agricultural subsidies, government land leasing, subsidies for the protection of agricultural land for environmental purposes, and subsidies for soil analysis (Türkan and Gürçam, 2020). Nevertheless, considering the subsidies provided in Türkiye, it can be stated that producers in organic agriculture production do not receive sufficient subsidies during the production and marketing stages of the product, and therefore producers are left isolated. In this regard, encouraging and supporting farmers in organic agriculture production would play an active role in the growth of organic agriculture (Ataseven, 2014; Türkan and Gürçam, 2020).

5. Assessment of The Employment Creation Potential of Organic Agriculture in Türkiye

Organic agriculture is a way of farming or living from which both people and nature benefit. The positive side-value of organic agriculture, which requires extraordinary interest and motivation, is that it is in high demand in the EU and other developed country markets. Furthermore, organic agriculture creates significant employment; 180 people are employed in organic agriculture as opposed to 100 people in conventional agriculture (Gündüz and Kaya, 2007).

Türkiye is in an exceedingly weak position in organic agriculture despite its trained labor force, diversity of more than 10,000 plant species, location between Asia and Europe, climate, and soil power. However, Türkiye's facilities and the EU preparation period offer significant opportunities in this framework. The fact that Türkiye has a very high population in rural areas and that a significant portion of this population is engaged in agricultural activities increases the importance of organic agriculture for the Turkish economy. Organic agriculture stands out as a promising sector in Türkiye due to its vital importance for natural balance and human beings, its openness to development, and the fact that it can be a profitable investment instrument.

The core of employment in organic agriculture is made up of farmers and advisory services. The first aspect of employment is the people working on the land, the farmers. There are approximately 48,244 organic producers in Türkiye, and this number is increasing day by day. Considering that the number of consumers is increasing in parallel with the increase in the number of producers, it can be stated that the number of jobs in organic agriculture will gradually increase. In developed countries, labor is a scarce factor, and wages are high. In Türkiye, labor is abundant and cheap compared to the EU. Türkiye has a high agricultural population and widespread unemployment. This situation would provide a competitive advantage as organic farming activity becomes widespread due to the low wages and high agricultural population in rural areas (Başarır and Çetin, 2006; Yolcu, 2013).

The second employment aspect of organic agriculture is the advisory service. At this point, farmers need consulting services while practicing organic agriculture. Agricultural advisors, food engineers, and agricultural engineers are needed to provide this service. Due to the misguided policies implemented in previous years, there has been an increase in the number of unemployed agricultural engineers after graduation due to the establishment of more agricultural faculties than the demand of the agricultural sector and the enrollment of more students than needed. As the number of people to be employed increases with the spread of organic agriculture activities, the demand for a trained labor force will also increase (Yolcu, 2013).

Organic agriculture provides employment not only in the field, but also in areas such as marketing, certification, and control processes. The marketing of organic products used to take place only in supermarket corners, but with the increase in organic agriculture, specialized markets and greengrocers are likely to emerge. In this case, the need for a trained labor force with a vision would increase. In this regard, professions such as agricultural engineers, college graduates, and marketers would also gain value, hence creating new employment opportunities (Rende, 2012).

6. Findings

This study delves into the relationship between organic agriculture and agricultural employment in Türkiye, spanning the years 2004 to 2021, employing an econometric model. To accomplish this, a regression analysis was conducted using a 17-year time series of data. The study aimed to identify the factors influencing agricultural employment, considering various factors, including the number of organic agricultural products, the count of farmers engaged in organic agriculture, the area designated for organic agricultural production, the organic wild collection area, the total area allocated for organic agricultural production, the quantity of organic agricultural production, the number of entrepreneurs involved in organic agriculture, the unit price of subsidy for organic agriculture, and the total amount of subsidy provided to organic agriculture.

6.1. Descriptive statistics

The number of organic agriculture products, the number of organic agriculture farmers, organic cultivation area (ha), organic wild harvesting area, organic agriculture total production area, organic agriculture production amount, the number of organic agriculture entrepreneurs, organic agriculture subsidy unit price, and the organic agriculture subsidy amount values were taken into consideration as the factors that are accepted to affect agricultural employment, and it was aimed to determine its development during the period under investigation. Since the number of farmers in organic agriculture, agricultural land, wild harvesting area, total production area, total production amount, and the number of entrepreneurs are simultaneous with agricultural employment, their lags are not included. As the unit price of organic agriculture subsidies and subsidy amounts affect agricultural employment with a one-period lag, their lagged values are included. In the model below, e1t and e2t denote the error terms for agricultural employment (number) and agricultural employment rate (%).

$$TISDH = \beta_0 + \beta_1 URNS + \beta_2 CIFTS + \beta_3 YTYA + \beta_4 DOTA + \beta_5 TOUA + \beta_5 URTM + \beta_5 MTSBS + \beta_5 DSTKBF_{t-1} + \beta_5 TUTAR_{t-1} + e_{1t}$$

$$TISTHYZD = \beta_0 + \beta_1 URNS + \beta_2 CIFTS + \beta_3 YTYA + \beta_4 DOTA + \beta_5 TOUA + \beta_5 URTM + \beta_5 MTSBS + \beta_5 DSTKBF_{t-1} + \beta_5 TUTAR_{t-1} + e_{2t}$$

The definitions and descriptive statistics of the variables included in the models are shown in Table 4.

Table 4. Descriptive Statistics of Variables

Variables	Abbreviation	Min.	Max.	Mean	SD	J-B	p
Agricultural Employment (person)	TISDH	4618.00	5713.00	5191.33	313.53	0.612	0.736
Agricultural Employment Rate (%)	TISTHYZD	17.01	29.10	21.73	3.35	0.557	0.756
Number of Organic Agriculture Products	URNS	150.00	267.00	210.05	25.13	2.780	0.249
Number of Organic Agriculture Farmers	CIFTS	12428.00	79563.00	43735.90	25053.33	1.625	0.443
Organic Farming Area (ha)	YTYA	57365.00	540000.00	324939.95	184005.05	2.260	0.322
Wild Harvesting Area (ha)	DOTA	22148.00	350239.00	103223.60	93314.40	5.528	0.063
Total Organic Production Area (ha)	TOUA	89827.00	842216.00	427015.85	228597.47	0.791	0.673
Total Organic Production Amount (tons)	URTM	310125.00	3260997.00	1377703.00	858223.86	0.461	0.793
Number of Organic Agriculture Entrepreneurs	MTSBS	423.00	47457.00	16051.80	16469.94	1.521	0.467
Organic Agriculture Subsidy Unit Price (TRY/da)	$DSTKBF_{t-1}$	3.00	70.00	29.67	27.10	1.817	0.402
Organic Agriculture Subsidy Amount (TRY)	$TUTAR_{t-1}$	55380.00	129114031.00	34942129.13	41288503.56	1.809	0.404

J-B: Jarque-Bera test statistic p: p-value of the Jarque-Bera test statistic

The results of the correlation test for the relationship between the independent and dependent variables included in the models are shown in Table 5.

Table 5. Descriptive Statistics of Variables

Variables	1	2	3	4	5	6	7	8	9	10	11
1.TISDH	1										
2.TISTHYZD	0.419	1									
3.URNS	-0.409	-0.525*	1								
4.CIFTS	0.120	-0.801**	0.346	1							
5.YTYA	0.239	-0.691**	0.362	0.958**	1						
6.DOTA	0.255	0.179	-0.008	0.170	0.288	1					
7.TOUA	0.325	-0.466*	0.288	0.834**	0.918**	0.644**	1				
8.URTM	-0.047	-0.814**	0.397	0.936**	0.908**	-0.008	0.714**	1			
9.MTSBS	0.239	-0.876**	0.089	0.922**	0.823**	0.043	0.677**	0.887**	1		
10.$DSTKBF_{t-1}$	0.383	-0.835**	0.136	0.903**	0.810**	-0.227	0.554*	0.920**	0.892**	1	
11.$TUTAR_{t-1}$	0.181	-0.841**	0.079	0.858**	0.771**	-0.030	0.605*	0.849**	0.978**	0.850**	1

*p<0.05 **p<0.01

According to Table 5, as the dependent variable number of people in agricultural employment is not significantly correlated with any of the independent variables, and as the dependent variable percentage of agricultural employment in total employment is significantly correlated with the independent variables, the percentage of agricultural employment in total employment (TISTHYZD) will be used as the dependent variable in the model.

The relationship between the independent variables shows that the number of products in organic agriculture (URNS), wild harvesting area (DOTA), and total production area (TOUA) variables are not correlated with other independent variables; that is, there will be no multicollinearity issue with the inclusion of these variables in the model. There is a high level of correlation (r>0.80) between these three variables and the other six independent variables and between each pair of the six independent variables. This indicates that the inclusion of variables other than URNS, DOTA, and TOUA in the model would lead to multicollinearity problems. When the assumptions of the classical linear regression model are fulfilled, estimation with the "Least Squares Method" (LSM) yields deviation, consistent and efficient estimators. The classical linear regression model assumes that the requirements of the model are accurate. Therefore, for this reason, autocorrelation, multicollinearity, collinearity, and heteroscedasticity were checked.

6.2. Research Findings

Table 6 presents the regression model using all independent variables. It is concluded that the p-value of the F statistic indicating model fit is higher than 0.05 and that model fit is not achieved. Although the R2 value obtained is very high, the fact that none of the independent variables is statistically significant indicates that the model is not applicable.

Table 6. Estimated Model Results (using all of the independent variables)

Independent Variables	B	SH	β	t	p	VIF
URNS	-0.046	0.034	-0.221	-1.321	0.244	1.613
CIFTS	-0.000	0.000	-0.735	-0.377	0.721	244.872
YTYA	0.000	0.000	-4.856	0.198	0.850	40417.33
DOTA	0.000	0.000	-2.546	0.181	0.863	12029.90
TOUA	-0.000	0.000	-5.676	-0.181	0.864	68101.78
URTM	-0.000	0.000	-0.077	-0.067	0.949	65.83077
MTSBS	0.000	0.000	-0.102	0.063	0.952	152.3589
$DSTKBF_{t-1}$	0.008	0.133	0.066	0.061	0.954	67.89715
$TUTAR_{t-1}$	-0.000	0.000	0.357	-0.362	0.732	57.32792
C	36.071	6.541	-	5.514	0.003	-
F = 4.252 p=0.063 R^2=0.884 ΔR^2=0.676						
Durbin Watson =1.917 BPG F=1.427; p=0.363 LM Test F=0.145; p=0.722						

Durbin-Watson and Breusch-Godfrey Serial Correlation LM tests are examined for the autocorrelation problem. The DW statistic, in the absence of autocorrelation, is around 2. In the presence of a positive serial correlation, it falls below 2 (in the worst case, it is close to zero). In the presence of a negative correlation, the statistic is somewhere between 2 and 4. Positive serial correlation is the most common form of dependence. As a general rule, with 50 or more observations and only a few independent variables, a DW statistic below about 1.5 is a strong indicator of positive first-order serial correlation (Johnston and DiNardo, 1997). The Breusch-Godfrey autocorrelation test (Breusch-Godfrey Serial Correlation LM Test) is an alternative to Q-statistics for testing autocorrelation. The test belongs to the category of asymptotic (large sample) tests known as Lagrange Multiplier (LM) tests. Unlike the Durbin-Watson statistic, the LM test can be used to test for higher-order ARMA errors and can be applied regardless of whether there are lagged dependent variables. The null hypothesis of the LM test is that there is no serial correlation up to the lag order (Wooldridge, 1990). Based on the results in Table 5, the Durbin-Watson statistic is 1.917, which indicates positive autocorrelation, although it does not deviate much from 2. On the other hand, the Breusch-Godfrey LM test result is F=0.145 and p=0.722, and since p is >0.05 (not significant), the null hypothesis is accepted. Accordingly, there is no autocorrelation problem in the model.

Breusch-Pagan-Godfrey (BPG) test is used for heteroskedasticity. The heteroskedasticity test allows testing for a range of heteroskedasticity specifications in the residuals of the equation. While ordinary least squares estimates are consistent with the heteroscedasticity problem, traditional computed standard errors will no longer be valid. When a heteroscedasticity problem is found, standard errors should be corrected. The Breusch-Pagan-Godfrey tests the null hypothesis "there is no heteroscedasticity problem" against the presence of heteroscedasticity in the form of a vector of independent variables by the Lagrange multiplier test (Breusch and Pagan, 1979; Godfrey, 1978).

Based on the results in Table 6, as the null hypothesis is accepted (BPG F=1.427; p=0.363), no heteroscedasticity problem exists in the model.

VIF (variance inflation factors) was checked for collinearity in the regression equation. VIF is a method of measuring the level of collinearity between regressions in an equation. It indicates how much of the variance of a regression coefficient estimate is inflated by collinearity with other regressions. A high VIF coefficient is evidence of collinearity, and a VIF coefficient less than 10 (VIF<10) indicates an acceptable limit (Hair, Anderson, Tatham, Black, 2006). Multivariate Data Analysis. Upper Saddle River, NJ: Prentice Hall.). Based on Table 5, VIF>10 for all independent variables except the number of products (URNS). As predicted in the correlation analysis in Table 4, the high correlation between independent variables caused multicollinearity. Therefore, in line with the estimation obtained based on the correlation analysis results, starting with the variable with the highest correlation coefficient, the variables were gradually removed until VIF<10, and the results in Table 7 were obtained.

Table 7. Estimated Model Results

Independent Variables	B	SH	β	t	p	VIF
URNS	-0.0175	0.0148	-0.0839	-1.179	0.265	1.053
DOTA	0.0006	0.0004	0.2782	2.299	**0.044**	3.152
TOUA	-0.0006	0.0002	-0.4043	-2.792	**0.019**	5.004
$TUTAR_{t-1}$	-0.0003	0.0009	-0.4412	-3.759	**0.004**	2.909
C	28.530	3.096	-	9.213	0.000	-

F = 29.834 p=0.000 R^2=0.922 ΔR^2=0.891
Durbin Watson =2.336 BPG F=0.341; p=0.844 LM Test F=0.486; p=0.503

Table 7 presents the regression model using the variables URNS, DOTA, TOUA, and TUTAR. It is observed that the p-value of the F statistic indicating model fit is less than 0.05 (F=29.83; p<0.05), and the model fit is achieved. This implies that the R2 value obtained is high (ΔR2=0.891) and that the explanatory power of the components of organic agriculture (URNS, DOTA, TOUA, TUTAR) in agricultural employment is high. The results of the analysis show that the number of organic products (URNS), one of the components of organic agriculture, does not have a significant effect on agricultural employment (β=-0.08; t=-1.18; p>0.05). Further analysis in Table 7 shows that the coefficient of natural catchment area (DOTA) is positively significant at the 1% significance level (β=0.28; t=2.30; p<0.05). This result implies that a 5% increase in the wild harvesting area related to organic agriculture would lead to an increase of more than 0.28% in the agricultural employment rate (similarly, a decrease in the wild harvesting area would lead to a decrease in the agricultural employment rate). The coefficient of the total production area of organic agriculture (TOUA) is negatively significant at a 5% significance level (β=-0.40; t=-2.79; p<0.05). This result implies that a 1% increase in the total production area related to organic agriculture would lead to a 0.40% decrease in the agricultural employment rate (similarly, a decrease in the total production area would lead to an increase in the agricultural employment rate). The coefficient of organic agriculture subsidy amount (TUTAR) is negatively significant at the 5% significance level (β=-0.44; t=-3.76; p<0.05). This result implies that a 1% increase in the amount of subsidy for organic agriculture would lead to a 0.44% decrease in the rate of agricultural employment (similarly, a decrease in the amount of support for organic agriculture would lead to an increase in the rate of agricultural employment). Based on the results of the regression analysis, the equation for the agricultural employment rate is determined as follows:

TISTHYZD= β0 - 0,084*URNS + 0,278*DOTA - 0,404*TOUA - 0,441*TUTARt-1 + et

Based on the results shown in Table 7, the Durbin-Watson statistic is 2.336, and the Breusch-Godfrey LM test result is F=0.486 and p=0.503, and as p>0.05 (not significant), the null hypothesis is accepted. Accordingly, there is no autocorrelation problem in the model. Based on Table 6, it is determined that VIF<10 for all independent variables, and there is no collinearity problem. Finally, the BPG test results for heteroscedasticity showed that there was no heteroscedasticity problem as BPG F=0.340 and p=0.844 (p>0.05).

7. Discussion

Türkiye has great potential for organic agriculture in terms of its general location, labor force, geographical characteristics, soil quality, unpolluted natural structure, diversity of plant and animal products, increasing feed crop cultivation areas, and centuries-old know-how. Despite all these positive developments, Türkiye is in an exceedingly weak position. However, the existing possibilities and the EU preparation period offer opportunities to reverse this position faster.

The fact that the organic agriculture sector is open to development and has vital importance for human life and natural balance requires more time and investment in this direction. The organic agriculture sector, which is not very new but has yet to utilize a limited part of its development potential, is considered to be an intriguing sector both in terms of respect for life and as a lucrative investment instrument.

The positive aspects of organic agriculture are incomparably higher than those of conventional agriculture. In particular, it addresses dietary and environmental problems. It also contributes significantly to employment. 180 workers are employed in organic agriculture, whereas 100 workers are employed in conventional agriculture.

In this study, the relationship between organic agriculture and agricultural employment in Türkiye between 2004-2021 is analyzed with the assistance of an econometric model. To this end, regression analysis was conducted using 17 years of time series data, and the factors affecting agricultural employment were identified. In this context, firstly, autocorrelation, collinearity, and heteroscedasticity in the model were taken into account. As a result of the Breusch-Godfrey LM test, F=0.145 and p=0.722, and since p>0.05, the null hypothesis is accepted, and it is concluded that there is no autocorrelation problem in the model, VIF<10 for independent variables, and there is no collinearity problem; and since the null hypothesis is accepted as a result of the Breusch-Pagan-Godfrey test (BPG F=1.427; p=0.363), it is accepted that there is no heteroscedasticity problem in the model.

Within the scope of other findings obtained in the study, it was observed that the p-value of the F statistic indicating model fit was less than 0.05 (F=29.83; p<0.05), and model fit was achieved. At the same time, it was determined that the R2 value obtained was high (ΔR2=0.891), and the explanatory power of the components of organic agriculture (URNS, DOTA, TOUA, TUTAR) for agricultural employment was also found to be high. The analysis findings revealed that the number of organic products (URNS), one of the components of organic agriculture, did not have a significant impact on agricultural employment. It was observed that the coefficient of wild harvesting area (NCA), one of the components of organic agriculture, was positively significant at a 5% significance level. This result implies that a 1% increase in the wild harvesting area related to organic agriculture would lead to an increase of more than 0.28% in the agricultural employment rate. The coefficient of the total production area of organic agriculture (TOUA) is found to be negatively significant at a 5% significance level. This result implies that a 1% increase in the total production area related to organic agriculture would cause a 0.40% decrease in the rate of agricultural employment. The coefficient of organic agriculture subsidy amount (TUTAR) is negatively significant at the 5% significance level. This result implies that a 1% increase in the amount of subsidy for organic agriculture would lead to a 0.44% decrease in the rate of agricultural employment.

The study results indicate that during the period from 2004 to 2021, expanding the wild collection areas related to organic agriculture had a positive impact on agricultural employment. Conversely, the provision of organic agricultural support and the expansion of the total production area were found to have a negative effect on agricultural employment. Notably, in the existing literature, wild collection areas have exhibited a declining trend in recent years. Additional results from the study suggest that agricultural subsidies and the expansion of total production areas will lead to a reduction in agricultural employment. Over the period from 2004 to 2021, there has been growth in total production areas, albeit below initial expectations. However, starting in 2018, there has been a tendency towards a decrease in total production areas. Concurrently, organic production areas have also shown a decline during this timeframe, resulting in a negative impact on agricultural employment. These results align with the study's outcomes. While it might be expected that an increase in organic agricultural subsidies would boost agricultural production and consequently lead to an increase in agricultural employment, it was uncovered that agricultural subsidies were perceived as inadequate during the study period, ultimately having a detrimental effect on agricultural employment.

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