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Sürdürülebilirlik Temelli Tarımsal Sertifikaların Etkisinin Analizi: Aydın İli İncir Yetiştiriciliği Örneği¥

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ÖZ

Bu araştırma, Aydın ilinde kuru incir üreten tarımsal işletmelerin sahip oldukları sürdürülebilirlik temelli sertifikaların işletmelerin verim ve, tarımsal gelirene etkisini incelemektedirtir. Araştırma, 2019 yılı Mayıs-Haziran aylarında Aydın ilinde konvansiyonel, İyi Tarım Uygulamaları ve organik tarım üretim sistemleri ile kurutmalık incir üreten 225 tarımsal işletmeden yüz yüze anket yöntemiyle toplanan veriler araştırmanın ana materyalini oluşturmaktadır.İşletmelerin hangi üretim şeklini benimsedikleri çoklu nominal lojistik regresyon yardımıyla belirlenmiştir. İşletmelerin ekonomik analizinin ekonomik göstergelere etki eden faktörlerin etkisi uygulamanın etkisi yöntemiyle incelenmiştir. Organik tarımın ürün kalitesini ve verimini düşürdüğüne dair yaygın bir inanış olmasına rağmen, çalışmanın sonuçları bu inanıştan farklıdır. İşletme grupları arasında verim açısından büyük bir fark yoktur. Etki değerleme analizleri sonucuna göre sertifikalı işletmeler konvansiyonel üretime göre daha sürdürülebilirlerdir.

Anahtar kelimeler: Kuru İncir, Sürdürülebilir Tarım, Etki Değerleme Analizi

Analysis of the Impact of Sustainability-Based Agricultural Certificates: The Case of Fig Growing in Aydın Province

ABSTRACT

This research examines the impact of sustainability-based certifications on the productivity and agricultural income of fig-producing farms in Aydın province. The study's primary data were collected through face-to-face surveys conducted with 225 agricultural enterprises in Aydın, producing dried figs using conventional, Good Agricultural Practices (GAP), and organic farming systems during May-June 2019. The method of multiple nominal logistic regression was used to determine which production method the enterprises adopted. The economic analysis of the enterprises, examining factors affecting economic indicators, was conducted using the impact assessment method. Although there is a common belief that organic farming reduces product quality and yield, the study's results differ from this perception. There is no significant difference in productivity between the enterprise groups. According to the impact evaluation analysis, certified enterprises are more sustainable than conventional production systems.

Key words: Dried Fig, Sustainable Agriculture, Impact Assessment Analysis

INTRODUCTION

In recent years, the effects and causes of climatic and environmental changes in the world, together with many concepts, the concept of sustainability has gained importance. The biggest reason for this is undoubtedly the increase in the level of environmental and health awareness. With the increase in global environmental pollution, sustainability-based production of resources at both international and national level gains importance. With the increasing demand of consumers for food every day, sustainability is becoming

more prominent. Sustainable agriculture; It is a form of agriculture with low costs and high income, which provides the production of long-lasting food products that do not harm human health without harming natural resources, natural vitality and leaving waste materials in the environment.

With technological developments, chemical-containing pesticides and fertilisers, which have started to be used in many fields and especially in agriculture, have started to attract attention with their negative effects on the natural balance as well as their contribution as a result of increasing economic efficiency (İpek and Çil, 2010). Improper practices in food products have brought a different perspective and expectation to agricultural production in all societies. Agricultural pest control is important in order to provide high yield and quality, which is a requirement of intensification, and it is economical if it is used consciously and controlled. However, this method has led to environmental pollution due to unconscious and excessive spraying, disruption of the natural balance, resistance of diseases, pests and weeds to the drugs used, and the risk of poisoning in humans and other living things with the products containing pesticide residues. In parallel with the care and sensitivity they show about the quality of the products they consume, especially in developed and prosperous countries, societies have started to demand more natural and healthy products at the expense of paying more. This behavioural change in the demand for agricultural products has created a production area that is respectful to nature, less but at the same time optimises profit expectations for producers (Merdan, 2014). Products with food safety certificates have gained importance both in the domestic and foreign markets. These food safety practices have become mandatory for the products that Türkiye has a say in foreign markets. Hazelnuts, cherries, grapes, apricots and figs are the first products that come to mind when it comes to the products that Türkiye has a say in foreign markets. Fig takes the first place in the self-sufficiency rate with 700% and is a net export product. Fig is one of the most important products of the Mediterranean countries where 70% of figs are produced and it is an important part of the Mediterranean diet, which is a symbol of healthy and long life (Trichopoulou et al., 2006). In recent years, there has been an increasing interest in exotic fruits in the world market. Table figs have attracted great interest as an exotic fruit in Western and Northern European countries where they cannot be cultivated. The fact that figs are regarded as a sacred fruit and their nutritional content is higher than many other fruit species have been effective in this increase in interest (Polat and Caliskan 2008). In Türkiye, the Ministry of Agriculture and Forestry provides support for certified agricultural production under two main headings under the main heading of supporting plant production. These are good agricultural practices and organic agriculture supports. As of 2019, these supports are 70 TL per decare in good agricultural practices (GAP) in individual certification and 100 TL in organic agriculture (OA). In group certification, it is 35 TL in GAP and 50 TL in OA. The Ministry works to increase the number of farmers benefiting from these supports and encourages farmers to this sustainability-based agriculture (Anonymous, 2024). The adoption of organic or good agricultural practices rather than the impact of sustainability-based certificates (Bertuglia and Calatrava-Requena, 2006, Olgun et al. 2008; Khaledi et al., 2010, Mzoughi, 2011; Hasdemir, 2011; Rueda and Lambin, 2013; Bayraktar, 2015, Abdurahman, 2016). Studies on the production and marketing of certified products focus on cultivation and marketing (Sağdemir, 1998; Bektaş, 2003; Şahin and Konak, 2004, Çobanoğlu et al., 2005; Avşar and Yalçın, 2007; Işın et al., 2007, Adanacıoğlu, 2014; Adnacıoğlu, 2015). There are a limited number of studies on the impact of subsidies in Türkiye (Ağır and Akbay 2022; Akbay and Bilgiç, 2023 Merdan, 2014; Doğan and Kan, 2024), but there are not enough studies on the impact of sustainability-based certificates in Türkiye. Studies examining the effects of different certificates on economic parameters are generally conducted without the use of impact assessment analyses (Çobanoğlu and Işın, 2009; Artukoğlu et al., 2012; Soykan, 2015, İnci et al., 2022). Impact valuation analyses are frequently conducted for tropical and sub-tropical products and it is questioned that the certificate adds more added value to the products (Bacon, 2005; Ruben and Zuniga 2011; Ruben and Fort 2012; Chıputwa et al., 2015; Mitiku et al., 2017). In Türkiye, sustainability-based certificates such as Rainforest Alliance (RA), Fairtrade-Organic (FT-Org), UTZ are not yet used in dried figs. Organic Agriculture and Good Agricultural Practices are used in Türkiye. The main objective of the study was to analyse the impact of state-supported alternative agricultural production certificates on the sustainability of dried fig producers. As a result of the study, the effects of sustainability-based agricultural standards and the support given to these standards on enterprises will be analysed and will contribute to both national and international literature. Impact assessment analyses have gained momentum in countries' self-sufficiency and important export products (Kleemann et al., 2013; Chiputwa et al., 2015). The main research question of the study is "What is the economic impact of sustainability-based certificates on dried fig producers?".

The fig tree, which is a mulberry tree, is known as ficus carica. Named after the ancient settlement of Caria in the Aegean Region, figs have a history of thousands of years in Anatolia and the Aegean (Koçak, 2011).

Fig has not only commercial but also cultural importance for Aydın. Fig exports have a large share of 4% in agricultural exports (Table 1).

Table 1. Share of figs in agricultural exports in Turkey

Years	Agricultural Exports ($)	Fig Export Value ($)	Fig Share in Total Agricultural Exports (%)
2018	5,846,649,329	290,561,793	4.97
2019	5,588,545,345	286,517,656	5.13
2020	5,878,285,528	293,521,424	4.99
2021	7,190,516,647	330,512,550	4.60
2022	7,112,547,171	306,920,158	4.32
2023	8,730,942,207	339,853,334	3.89

Source: TURKSTAT, 2024

Fig production in the world increased from an average of 994.08 thousand tonnes between 1980-1989 to 1.1 million tonnes between 2010-2018. Turkey has a share of 28% in fig production in the world and ranks first (Table 2).

Table 2. World fresh fig production year average (tonnes)

Countries	2010-2018	2019	2020	2021	2022	2022(%)
Türkiye	289701,67	310000,00	320000,00	320000,00	350000,00	28.17
Egypt	179336,22	215450,00	299450,00	211438,00	187872,74	15.12
Morocco	115844,00	153471,57	144246,05	144153,00	109619,80	8.82
Algeria	121901,22	114092,00	116143,00	107266,00	112266,90	9.04
Iran	63605,33	130327,73	85245,65	66789,09	67860,55	5.46
World	1108483,78	1323700,39	1399829,22	1321021,82	1242449,04	100.00

(Kaynak: FAO, 2024)

According to International Trade Centre (ITC) trademap data, figs are not separated as wet and dry in world trade data, and it is thought that the sum of wet, dry and dried fig paste data are evaluated together. According to these data, the world fig import amount in 2022 was 192.67 thousand tonnes and the import value was 601.64 million USD, with a 1% increase in import amount and a 1.6% decrease in import value compared to the previous year (Table 3).

Table 3 World fig (fresh-dry total) import quantity (ton) and import value (USD)

	2021				2022			
	Import Quantitity	Rate(%)	Import Value	Rate(%)	Import Quantitity	Rate(%)	İmport Value	Rate(%)
Austria	10252.22	5.23	41732	5.29	10619.47	5.50	35271	5.30
France	19678.02	10.03	70608	8.94	16609.26	8.61	57852	8.70
Germany	20013.74	10.20	82496	10.45	20399.67	10.57	70266	10.57
İndia	23285.57	11.87	163800	20.75	14325.72	7.42	65299	9.82
İtaly	6037.00	3.08	27395	3.47	5111.59	2.65	22832	3.43
Russian Federation	5630.23	2.87	12098	1.53	6887.29	3.57	16090	2.42
United Kingdom of Great Britain and Northern Ireland	7194.78	3.67	30164	3.82	7027.53	3.64	27964	4.21
United States of America	14964.57	7.63	51590	6.53	15981.68	8.28	54954	8.26
World	196210.14	100.00	789506	100.00	192967.66	100.00	664994	100.00

Kaynak: ITC, 2024

In the world, the export amount was 200 million USD and the export value decreased by 5% and 2.2% compared to the previous year (Table 10). Turkey's fig export amount in 2022 is 95.31 thousand tonnes and ranks first in the world fig export ranking with a share of 47.44%. Turkey is followed by Afghanistan with

16.82 thousand tonnes and Austria with 22 thousand tonnes (Table 4).

Table 4. World fig (wet-dry total) export amount and export value

	2021				2022			
Countries	Export Quantity	Rate(%)	Export Value	Rate(%)	Export Quantity	Rate(%)	Export Value	Rate(%)
Afghanistan	149692	19.46	27154	13.23	62606	9.83	16818	8.37
Austria	34549	4.49	15115	7.37	28977	4.55	22855	11.38
Saudi Arabia	4029	0.52	3990	1.94	2451	0.38	3238	1.61
Spain	24762	3.22	7936	3.87	19858	3.12	6623	3.30
Türkiye	330296	42.95	91122	44.41	306720	48.17	95314	47.44
World	769034	100.00	205196	100.00	636783	100.00	200903	100.00

Source: ITC,2024

The area of fresh fig collective orchards in Turkey increased from 52 thousand da to 57.4 thousand da compared to 2019, while the area of fresh fig collective orchards in Aydın decreased by 20 thousand da compared to 2019. The percentage of Aydın's fresh fig area in Turkey decreased from 71.57% to 66.61% from 2019 to 2023 (Table 5).

Table 5. Turkey and Aydın fresh fig areas (da)

Years	Turkey Fresh Fig Mass Fruit Area (da)	Area of Fresh Fig Mass Fruiting (da)	Aydın's Share of Fresh Fig Area in Turkey (%)
2019	521164	373010	71.57
2020	536935	372655	69.40
2021	546975	374372	68.44
2022	572472	378950	66.20
2023	574587	382715	66.61

Source: TURKSTAT, 2024

Aydın's fresh fig production in 2023 increased by 4.42% compared to 2019. While Turkey's fresh fig production was 310 thousand tonnes in 2019, it increased to 356 thousand tonnes in 2023. Aydın's fresh fig production in 2019 was 190 thousand tonnes in 2019 and 204 thousand tonnes in 2023. In 2023, its share in Turkey in fresh fig production is 65.86% (Table 6).

Table 6. Fresh fig production in Turkey and Aydın (tonnes)

Years	Turkey Fresh Fig production (tonnes)	Aydin Fresh Fig production quantity (tonnes)	Aydın's Share in Fresh Fig Production in Turkey (%)
2019	310000	190445	61.43
2020	320000	183301	59.13
2021	320000	180899	58.35
2022	350000	202819	65.43
2023	356000	204156	65.86

Source: TURKSTAT, 2024

MATERIAL and METHOD

The main material of the study was based on the data obtained from the survey conducted with 225 fig producers in the Germencik, İncirliova, Nazilli, Sultanhisar, Köşk districts of Aydın province where dried fig production is the most intensive. In certified production, certification bodies do not issue certificates for lands under 10 decares. On the other hand, the Ministry of Agriculture and Forestry has determined that the sufficient income land size for Aydın province is 10 decares for figs (Official Gazette, 2014). Therefore, farms under 10 decares were not included in the sampling. Agricultural enterprises with a certificate must have a certificate for at least 3 years in order to see the effect of the certificate in impact evaluation analyses

(Çobanoğlu et al., 2018). For this reason, this condition was tried to be met in the samples taken from certified agricultural enterprises. The heterogeneous structure in yield and other outputs of enterprises may cause deviations in the econometric models used (Winship and Mare, 1992).

Sample selection is of great importance in impact assessment studies. Since taking samples from the regions where the enterprises with certificates are concentrated will cause bias, the probability of receiving the intervention/practice should be similar for all enterprises (Lee, 2009), and the samples should be taken from the same geographical conditions as much as possible (Tauchmann, 2014) in order to observe the effect of the intervention unbiasedly.

Purposive sampling, which is frequently used in impact evaluation analyses, was used in sampling. The following formula was used to determine the sample size (Yamane, 1967).

$$n = \frac{N.\sum(N_h.S_h{}^2)}{N^2.D^2 + \sum(N_h.S_h{}^2)}$$

In this formula;

n: sample size ; N: Number of units in the population

N_h: Number of units in the hth layer; S_h^2: variance of the hth layer

$D^2 = (d^2 / z^2)$ d: The maximum amount of error acceptable to the investigator or the difference between the sample mean and the population mean,

z: This is the z value in the standard normal distribution table according to the margin of error.

As a result of the sample size calculation, the sample size was determined as 67 with a 90% confidence interval and 10% margin of error from 6703 enterprises with more than 10 da of land. In order for the econometric methods to work more smoothly, 75 enterprises from conventional (control), intervention (Organic and Good Agricultural Practices certificate) groups were interviewed. Since different elevation and different climatic conditions have different effects on fig yield for each district (Şahin et al, 2018; Çobanoğlu, 2007, Günden 2008), samples were collected according to the weight of each region in the main population to prevent bias and ineffectiveness in the analysis results. Obtaining a homogenous data set is of great importance in impact evaluation analyses (Korkmaz and Çobanoğlu, 2018), and in order to achieve this, an equal number of samples were tried to be taken from the villages visited. If there is no producer in the field, the missing observations were completed from the producer in the nearest neighbourhood. Determining the factors affecting fig growers' reasons for choosing good agriculture, organic agriculture and conventional agriculture Multinominal Logistic Regression. Determining the effect of these supports on the producers who benefit from the supports applied to sustainable-based agricultural standards was analysed by using the Regression Correction Model.

Impact Assessment Analysis

The concept of Evaluation of Impacts of Rural Development Programmes is given great importance in Türkiye as well as in the world in general and in the EU countries, of which we are candidates for full membership, and intensive studies, approaches and projects have been developed and implemented in this regard, especially in the last 20 years (Çobanoğlu et al., 2018).

Regression Adjustment (RA), which is one of the impact assessment methods that allows the impact of different certificates on enterprises to be calculated in cross-sectional data, was used in the study. RA allows the comparison of average outputs by using the covariance between them after the estimation of those who receive support and those who do not. It is an estimator with low sensitivity to outliers and continuous variables in independent variables (Cerulli, 2014). There is more than one type of certificate in the study. In such cases, multivalued treatment effect analyses are used (Cattaneo et al., 2013). The differences between the economic indicators, social and behavioural characteristics of the enterprises benefiting from good agricultural practices (intervention 1), organic farming certificate (intervention 2) and conventional production (control group) supports will be revealed through these analyses. In these analyses, the dependent variable potential output (POM), average treatment effect (average treatment effect, ATE) and average treatment on treated (ATT) effect can be calculated.

$POM=E(y_\tau)$ average estimate of the dependent variable with the RA estimator

$ATE= E(y_{ki}- y_{0i})$ the treatment's impact on those who do not benefit from the treatment

$ATT = E(y_{ki} - y_{0i} \mid \tau = k)$ shows the treatment's impact on the beneficiaries of the intervention.

$y_0 = x\beta_0 + \varepsilon_0$ Control (conventional production) regression estimation

$y_1 = x\beta_1 + \varepsilon_1$ Regression estimation of Intervention 1 (good agricultural practices)

$y_2 = x\beta_2 + \varepsilon_2$ Regression estimation of Intervention 2 (organic farming)

$y = \tau y_k + (1 - \tau)\, y_0$ Indicates the RA estimate for the effect of interventions.

With RA estimators, potential outputs are calculated in the first stage. The differences of these calculated outputs are used in the calculation of ATE and ATT values.

Business owners prefer different certificates and obtain different benefits. In cases where the dependent variable is three or more, multinominal logistic regression is used to analyse trends and preferences. Multinominal logistic regression, which is a generalised version of binary logistic regression, is estimated with most similarity estimators. When there is an explanatory variable (X variable) in the model, 2 regression equations are needed for multinominal logistic regression. One of them gives the logarithm value of the probability of the first state of the response variable and the other gives the logarithm value of the probability of the second state according to the reference category (Green, 2012). These equations can be written as follows.

$$\ln\left[\frac{P(Y=1|X_1}{P(Y=0|X_0)}\right] = \alpha_1 + \beta_{11}X_1 \qquad \ln\left[\frac{P(Y=2|X_2}{P(Y=0|X_0)}\right] = \alpha_2 + \beta_{21}X_1$$

Conventional producers, which are the reference group, were reverse coded in the statistical package programme and the comparison of the other two groups was made.
In the investigation of the effect of treatments on dependent variables, comparison of averages without matching the groups will not be a treatment effect. Therefore, in order to make comparisons, potential outputs should be calculated and comparisons should be made accordingly. Matching is applied to find comparable observations based on similarity measures. In other words, by matching dependent variables according to similar independent variables, a homogenous dependent variable is created and its difference is revealed. Descriptive statistics of the variables used in the analyses are given in Table 7.

Table 7. Variables used in impact assessment analyses

	N	Min	Max	Mean	Std. Dev
Age(year)	225	20.00	87.00	54.07	11.85
Education (years)	225	0.00	16.00	5.97	3.15
Place of Residence	225	0.00	3.00	1.76	0.49
Fig experience(years)	225	1.00	72.00	32.88	14.99
Status of the 3rd Generation of Gardens (dummy)	225	0.00	1.00	0.60	0.49
Non-farm activity (dummy)	225	0.00	1.00	0.47	0.50
Land (da)	225	10.00	115.00	29.27	21.91
Sale price (₺)	225	10.45	18.00	14.03	2.26

RESULTS

The average land width of the dried fig enterprises subject to the research is 29,27 decares in conventional, 34,93 decares in organic dried fig enterprises, 31,69 decares in enterprises with GAP and 21,19 decares in conventional enterprises. The land width of the enterprises with organic certificate is higher than the other groups, this difference is statistically significant (Table 8). The average number of parcels of the enterprises is 3,30. The group with the highest number of parcels is organic farmers.

Table 8. Fig land widths and number of parcels of fig farms

Production Types		Fig Land Amount (da)	Number of Parcels (pcs)	Experience in Certified Agriculture (years)
Conventional	Mean	21.19	2.71	-
	Std.Deviation	13.29	1.94	-
GAP	Mean	31.69	3.63	4,25
	Std.Deviation	23.76	2.62	1,98
Organic	Mean	34.93	3.56	6,07
	Std.Deviation	24.64	2.64	2,69
Overall	Mean	29.27	3.30	3,44
	Std.Deviation	21.91	2.45	3,19
F (2,222)		8,607***	3.367***	-

Level of significance*; p < 0.10 **, p < 0.05, ***, p < 0.01

Table 9 shows the variable cost elements (TL/ha) for fig production branch. The total variable cost for 1 decare fig orchard is 1358,84 TL. The highest cost item is harvesting and drying with 700 TL. Then fertiliser and fertilising costs 133,85 liras and then pesticide and pilling costs. When the differences between the cost items of the enterprises are analysed with the help of one-way analysis of variance, as expected, organic farming and GAP differ from conventional production in pesticide and spraying process. There is a difference in the use of materials (crates, crates, exhibition cloth, etc.). Organic producers have purchased crates and other exhibition materials from TARIS and exporting companies and use this equipment in the drying process. In addition, the use of crates for transporting dried figs distinguishes the fig enterprises engaged in organic production from other enterprises. There is no difference in other variable expenditures

Table 9. Variable cost elements for fig production branch (₺/da)

	Conventional		GAP		Organic		Overall		
Costs	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**F (2;222)**
Steel sapling	24,97	50,57	20,70	38,42	13,40	19,43	19,69	38,47	1,74
Fertiliser and fertilisation	159,23	256,77	127,79	210,90	114,54	259,32	133,85	242,98	0,67
Medication and spraying	7,17	20,61	2,01	8,36	2,20	10,01	3,79	14,22	3,24**
caprification and caprificating	101,85	73,52	112,35	74,96	117,72	78,88	110,64	75,77	0,85
Material	16,03	9,03	18,57	10,47	21,15	9,01	18,58	9,71	5,42*
Transport	27,86	21,57	22,82	14,32	24,05	11,90	24,91	16,52	1,91
Pruning	84,19	57,61	92,99	63,72	98,11	54,01	91,76	58,61	1,08
Hoeing	89,77	61,12	103,95	78,60	93,20	80,26	95,64	73,75	0,75
Soil cultivation	191,21	131,72	196,32	121,28	184,99	70,99	190,84	110,80	0,20
Harvest exhibition in drying	696,91	433,95	639,19	398,88	671,30	319,70	669,13	386,13	0,42
Total costs	1399,18	626,38	1336,67	574,21	1340,65	459,90	1358,84	556,08	0,30

Level of significance*; p < 0.10 **, p < 0.05, ***, p < 0.01

When the yields of different production systems in terms of dried fig quality classes[1] are compared, A series figs obtained by conventional production enterprises are 44,83%, 46,88% by GAP enterprises and 43,40%

[1] Fig quality classes A series figs are very good quality figs in terms of size and colour, with a maximum of 65 figs per kilogram without any defects. B series figs are figs of good quality with a maximum of 120 pieces per kilogram without any defects. Class C figs are figs that have defects in colour, size and quality compared to series A and B, but which do not adversely affect the quality of consumption and for which shell defects are permitted. Scrap (industrial) is a fig class containing 10% directly edible figs with appearance and flavour problems not included in the A, B, C series (Turkish Standards Institute, 2006).

by organic production enterprises. There is no significant difference between the groups for A-series dried figs. When B-series fig rates are analysed, 24,21% of the figs of those who make conventional production, 22,76% of those who make GAP, 18,93% of those who make organic production. There is a statistically significant difference between the B series fig ratios obtained by the groups. This difference is due to the enterprises with organic certificate. When C series figs are compared in terms of different production systems, conventional 14,07%, GAP 12,42% and organic certified enterprises 8,99%. The difference is due to the fact that the rate of C class figs in enterprises with organic certificate is lower than the other groups. When scrap (industrial fig) rates are analysed, enterprises with organic certificate are lower than other groups. When the yields of the enterprises were investigated, no difference was found in terms of yields of different production types and yields per tree. The yields of the enterprises with conventional production are 262 kg and the yields of the enterprises with GAP are 280kg and the yields of the enterprises with organic certificate are 281kg. Yields per tree are 14,43 kg Conventional 14,43 kg GAP 14,69 kg Organic 15,43 kg. Although the yield per tree of organic producers is higher than the other groups, this difference is not statistically significant (Table 10).

Table 10. Distribution of dried figs according to quality classes and yield values

		Quality Classes Proportional Distribution (%)					
		A series	**B series**	**C series**	**Industrial**	**Yield (kg/da)**	**Yield per tree (kg)**
Conventional	Mean	44.83	24.21	14.07	7.56	262.39	14,43
	Std.Dev	19.26	13.94	8.87	4.42	78.76	4,84
GAP	Mean	46.88	22.76	12.42	6.03	280.10	14,69
	Std.Dev	21.09	12.83	7.07	3.82	61.70	4,48
Organic	Mean	43.40	18.93	8.99	4.85	281.39	15,43
	Std.Dev	26.74	13.42	6.88	3.52	51.89	4,53
Overall	Mean	45.04	21.97	11.83	6.15	274.62	14,85
	Std.Dev	22.53	13.53	7.91	4.07	65.36	4,62
F statsistic (2,222)		0,45	3.10**	8.58***	8.93***	2.00	0.94

Level of significance*; p < 0.10 **, p < 0.05, ***, p < 0.01

When 1 kg fig sales price and 1 kg fig costs are analysed for different production types; 1 kg fig sales price in conventional production is 13,46 Turkish Liras and the sum of kilogram variable costs is 5,64 Turkish Liras. The 1 kg sales price of the enterprises with GAP certificate is 14,23 Turkish Liras and the sum of kg variable costs is 4,95 Turkish Liras. In the enterprises with organic certificate, the sales price is 16,05 liras and the sum of kilogram variable costs is 4,89 liras. Organic production is different from the other groups in terms of both sales price and kilogram cost. The gross income of organic production is higher than the other groups (Table 11).

Table 11. kg fig sales price and cost

		sales price(kg)	**Cost(kg)**
Conventional	Mean	13.46	5,64
	Std.Dev	2.21	2,63
GAP	Mean	14.23	4,95
	Std.Dev	2.48	2,04
Organic	Mean	16.05	4,89
	Std.Dev	2.65	1,73
Overall	Mean	14.58	5,14
	Std.Dev	2.67	2,18
F (2,222)		22,08***	3.02**

Level of significance*; p < 0.10 **, p < 0.05, ***, p < 0.01

The changes in different parameters of the enterprises were asked in the period after receiving the support for the enterprises with certified production and in the 3 years after receiving the support for the conventional enterprises. In the areas used by the enterprises as fig planting areas, the enterprises with OA certificate increased more than the other groups. In agricultural income, except for conventional, other groups declared an increase. In terms of debts due to production, enterprises with OA certificate stated that their debts increased more than other groups. GAP and OA stated that variable costs and marketing opportunities increased. GAP and OA certified enterprises stated that the amount of inputs they used increased compared to

the period before they switched to certified agriculture and they used more fertiliser and labour force (Table 12). While the number of animals and saving opportunities of dried fig farmers engaged in conventional production decreased, this situation could not be mentioned in other groups. It was observed that the mountain villages with GAP and Organic certificates renewed the vehicles they use. Newly purchased vehicles are second-hand off-road vehicles called Mediterranean jeep in the region. They are used for travelling in fig orchards. The enterprises with GAP and OA certificates have stated that there is an increase in the state supports they use compared to conventional enterprises, the employment of family members has increased, and the investment in their farms has increased.

Table 12. Changes in some variables in fig enterprises after the support (%)

		Conventional	GAP	Organic	Total
Agricultural area (da)	Remained the same	89.33	77.33	62.67	76.44
	Increased	10.67	22.67	37.33	23.56
Agricultural Income (%)	Remained the same	97.33	74.67	61.33	77.78
	Increased	2.67	25.33	38.67	22.22
Machinery and Equipment (tractor etc.)	Remained the same	98.67	88.00	89.33	92.00
	Increased	1.33	12.00	10.67	8.00
Debts due to production (₺)	Decreased	2.67	2.67	0.00	1.78
	Remained the same	97.33	92.00	88.00	92.44
	Increased	0.00	5.33	12.00	5.78
Variable Costs (₺)	Decreased	1.33	0.00	2.67	1.33
	Remained the same	97.33	89.33	86.67	91.11
	Increased	1.33	10.67	10.67	7.56
Marketing Opportunities	Remained the same	96.00	78.67	72.00	82.22
	Increased	4.00	21.33	28.00	17.78
Home (Residence)	Remained the same	100.00	94.67	93.33	96.00
	Increased	0.00	5.33	6.67	4.00
The amount of inputs I use has increased	Decreased	2.67	1.33	1.33	1.78
	Remained the same	96.00	69.33	56.00	73.78
	Increased	1.33	29.33	42.67	24.44
Number of Animals	Decreased	2.67	0.00	0.00	0.89
	Remained the same	97.33	92.00	97.33	95.56
	Increased	0.00	8.00	2.67	3.56
Saving Money (Saving etc.)	Decreased	2.67	0.00	0.00	0.89
	Remained the same	96.00	77.33	58.67	77.33
	Increased	1.33	22.67	41.33	21.78
Passenger car used	Remained the same	100.00	88.00	88.00	92.00
	Increased	0.00	12.00	12.00	8.00
Number of support I benefited from	Remained the same	100.00	69.33	52.00	73.78
	Increased	0.00	30.67	48.00	26.22
Family employment	Remained the same	100.00	90.67	85.33	92.00
	Increased	0.00	9.33	14.67	8.00
Expenditure	Decreased	0.00	1.33	2.67	1.33
	Remained the same	93.33	81.33	74.67	83.11
	Increased	6.67	17.33	22.67	15.56
Budget allocated for children's education	Remained the same	94.67	84.00	77.33	85.33
	Increased	5.33	16.00	22.67	14.67
My investment in the farm	Decreased	0.00	1.33	2.67	1.33
	Remained the same	92.00	66.67	49.33	69.33
	Increased	8.00	32.00	48.00	29.33

The preference of enterprises for sustainability-based certificates was estimated using multinominal logistic regression. The increase in the age of the enterprise owner has a positive effect on the preference of the enterprise for sustainable agricultural certificates. If the place of residence is in the city centre, the likelihood of farmers to prefer GAP decreases. The fact that the grandfather of the enterprise owner is also engaged in figs reduces the possibility of transition to certified agriculture. The fact that the enterprises earn income from a non-agricultural activity has a negative effect on the certified agriculture of the enterprises. The

increase in fig sales price increases the possibility of enterprises to switch to OA. If the enterprises use organic fertiliser compared to chemical fertiliser use, the probability of switching to OA is higher than GAP. The change in the welfare level of the enterprises in the last 3 years contributes positively to the change parameter given in Table 13.

Table 13. Analysis of parameters affecting the preference for sustainability-based certificates

	Conventional -GAP			Conventional-OA			GAP-OA		
	Coefficient	Std. Error	p	Coefficient	Std. Error	p	Coefficient	Std. Error	p
Age	-0.0978***	0.0332	0.003	-0.1580***	0.0433	0.000	-0.0978***	0.0332	0.003
Education	0.1797**	0.088	0.041	0.1106	0.1043	0.289	0.1797**	0.088	0.041
Residence	-0.3035	0.4475	0.498	1.2962*	0.7331	0.077	-0.3035	0.4475	0.498
Fig Experience	0.0505**	0.0251	0.044	0.0553*	0.0303	0.068	0.0505**	0.0251	0.044
3rd Generation Ownership	0.6465	0.472	0.171	1.5949*	0.6179	0.010	0.6465	0.472	0.171
Status of the Enterprise									
Non-Farm Activity	0.8553	0.5484	0.119	1.7865**	0.6629	0.007	0.8553	0.5484	0.119
Having Social Security	1.3887**	0.7126	0.051	2.7281*	1.0627	0.010	1.3887**	0.7126	0.051
Total Number of Support Received	-1.5276***	0.3639	0.000	-2.2455***	0.4529	0.000	-1.5276***	0.3639	0.000
Loan Utilisation Status	-0.6518	0.5252	0.215	-1.2795**	0.6433	0.047	-0.6518	0.5252	0.215
Fig Sale Price	-0.3361***	0.0999	0.001	-0.4574***	0.1268	0.000	-0.3361***	0.0999	0.001
Fertiliser Preference	-1.3017***	0.477	0.006	-2.0086***	0.5889	0.001	-1.3017***	0.477	0.006
Index of Change	-0.0670**	0.0298	0.024	-0.2914***	0.0544	0.000	-0.0670**	0.0298	0.024
Constant	14.1264***	3.6303	0.000	27.6893***	4.5316	0.000	14.1264***	3.6303	0.000

Level of significance*; p < 0.10 **, p < 0.05, ***, p < 0.01

The analysis of the effect of different production methods on yield with treatment effect is given in Table 14. Considering the average effect of certificates on yield (ATE), if the enterprises did not have any certificate, the average yield of the enterprises would be 257 kg. If all of the farms had GAP certificate, they would have obtained 21,8 kg more yield compared to the potential average, and if conventional farmers did OA, they would have obtained 29,5 kg more yield. The yield difference between GAP and organic farming is statistically insignificant. The effect of GAP (ATET) is 23,1 kg in the enterprises benefiting from GAP certificate. The difference in the yields of the enterprises benefiting from OA certificate compared to the conventional production enterprises is 30,4 kg.

Çizelge 14. Effect of different certificates on yiled

ATE	**Coefficient**	**Std. Error**	**Z**	**p**
GAP vs Conventional	21.820**	10.567	2.06	0.039
OA vs Conventional	29.543**	11.894	2.48	0.013
GAP vs OA	-7.723	10.227	-0.76	0.450
Conventional Potential Mean	257.601***	8.826	29.19	0.000
ATET	**Coefficient**	**Std. Error**	**Z**	**p**
GAP vs Conventional	23.102**	10.097	2.29	0.022
OA vs Conventional	30.464**	12.008	2.54	0.011
GAP vs OA	7.36161	1.744	-0.69	0.493
Conventional Potential Mean	256.994***	8.963	28.67	0.000

Level of significance*; p < 0.10 **, p < 0.05, ***, p < 0.001

The effect of certificates is not statistically significant in enterprises producing dried figs with different production methods. No effect of certificates was found in terms of costs (Table 15).

Table 15. Effect of different certificates on total costs

ATE	Coefficient	Std. Error	Z	p
GAP vs Conventional	-76.678	92.8577	-0.83	0.409
OA vs Conventional	48.242	95.1250	0.51	0.612
GAP vs OA	-124.920	80.6797	-1.55	0.122
Conventional Potential Mean	1374.664***	74.5804	18.43	0.000
ATET	**Coefficient**	**Std. Error**	**Z**	**p**
GAP vs Conventional	-59.327	98.7887	-0.6	0.548
OA vs Conventional	62.644	100.7648	0.62	0.534
GAP vs OA	-121.971	88.8741	-1.37	0.170
Conventional Potential Mean	1395.998***	76.9845	18.13	0.000

Level of significance*; p < 0.10 **, p < 0.05, ***, p < 0.001

When the average effect of the certificates on gross profit is analysed, the average will be 2417₺. The average effect of the GAP certificate is 354,45 ₺. The average effect of OA certificate compared to conventional producers is 370,53 ₺. The average effect of the certificate in the enterprises applying GAP certificate is 339 ₺, and the average effect of the certificate in the enterprises benefiting from OA certificate is 352,74 ₺ (Table 16).

Table 16. Effect of different certificates on gross margins

ATE	Coefficient	Std. Error	Z	p
GAP vs Conventional	354.458**	149.348	2.37	0.018
OA vs Conventional	370.538**	193.810	1.91	0.056
GAP vs OA	-16.080	181.906	-0.09	0.930
Conventional Potential Mean	2417.205***	127.439	18.97	0.000
ATET	**Coefficient**	**Std. Error**	**Z**	**p**
GAP vs Conventional	339.275**	139.501	2.43	0.015
OA vs Conventional	352.743*	199.539	1.77	0.077
GAP vs OA	-13.467	186.952	-0.07	0.943
Conventional Potential Mean	2656.75***	182.426	14.56	0.000

Level of significance*; p < 0.10 **, p < 0.05, ***, p < 0.001

CONCLUSIONS and RECOMMENDATIONS

The average age of the operators is 54. Traditional farmers are younger than organic farmers. The average number of individuals residing together in the family is 3. Although many fig growers want a member of their family to take over the farm after them, the high number of individuals in the family leads to two results: the division of the land or the migration of a member of the family. Considering that the retirement age is 65, it is obvious that these situations will be encountered in 10-15 years in the future. The inclusion of fig orchards in the young farmer support and family farming supports will play an important role in preventing future problems. Business owners have long years of experience in fig cultivation. Operators are involved in agricultural production after the age of 18. In small family support and young farmer support, positive discrimination should be made in the support to be given to individuals who come from the farmer family and who produce on their own behalf.

Fig orchards have largely completed their economic life. Although the depreciation of fig orchard facilities is calculated as 20 years, it extends up to 50 years with the necessary maintenance. It would be more useful to organise the seedling supports for rehabilitation in a way that will enable the renewal of old gardens, the replacement of drying trees and drought and new certified seedlings more suitable for the conditions of the region. For example, if at least 50-100 saplings are purchased, it can be made appropriate to benefit from these supports.

In the dried fig enterprises participating in the survey, the crop pattern consists entirely of fixed orchards. However, due to the titles of product diversity and ensuring biodiversity in GAP and OA supports, the same product cannot be supported for more than 3 consecutive years. There is nothing that enterprises with fixed product pattern can do in this regard. Enterprises stated that if the supports do not continue, 71% of the enterprises with GAP certificate will abandon the practice and 69% of the enterprises with OA certificate will abandon OA. If agriculture is not supported by the state and other institutions and organisations, it is not possible to talk about a sustainable agriculture.

Although there is a widespread belief that organic farming reduces product quality and yield, the results of the study are different from this belief. There is no big difference between enterprise groups in terms of yield.

Organic production is different from the other groups in terms of both sales price and kilogram cost. The gross income of organic production is higher than other groups. Although the yield difference between the enterprises with organic and good agricultural practices certificates is very small, there is a big difference between the sales price. Due to this difference, the gross income of organic farming enterprises is higher. The difference in the GAP certificate should be increased. International validity or equivalence to certificates such as GLOBALAP must be ensured. Although enterprises are obliged to keep records in GAP and OA, these records are not available in enterprises, they are only filed in order to receive support from certification bodies. Enterprises do not use this data for planning, financing or other situations.

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[¥]:The study is based on the first author's PhD's thesis.

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