



Asian Journal of Plant Sciences

ISSN 1682-3974

science
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A Comparative Analysis of Organic and Conventional Dried Apricot Production on Small Households in Turkey

Erdemir Gündoğmus

Department of Agriculture Economics, Faculty of Agriculture, Ankara University, Ankara, Turkey

Abstract: The scientific research exposing the economic performances of organic farms has not been done in Turkey up to now. This study compared productivity, profitability, producer-defined constraints and goals and research priorities between ten individually paired organic and conventional apricot farms in Turkey. Although three of the organic farms matched or exceeded the production of their conventional counterparts, the three-year mean yield of the organic farms as a group was 9% lower than that of the conventional farms. However, excluding organic certification costs, mean variable costs and net income were similar for both groups, mainly because organic price premiums received by the farmers compensated for lower yields. If current organic certification costs paid by firms were included, the price premiums paid to organic producers would have to increase to 24% in order to equal the net incomes from conventional dried apricot. Conventional farmers identified low and unstable prices as the main constraints for sustained production and stated further intensification of production as their main goal. Organic farmers centred on farm diversification and agronomic practices that permit organic farm management.

Key words: Organic farming, dried apricot, net income, variable costs, organic premiums

INTRODUCTION

The people have tended to obtain much more crops from the unit of area to provide the rising food demand in conjunction with beginning that the increase of population is getting more and more significant problem and the technology has improved in the world. Mechanization as well as chemicals being the product of developing science and technology with the Industrial Revolution applied to agriculture and the fact that fertilizers, pesticides, improved seeds, mechanization and irrigation with Green Revolution becoming effective especially after 1950's were used excessively gave rise to the entire change of the initial structure of agriculture^[1]. Lots of industrial goods began to be used in agriculture, so that productivity increased up to a certain extent.

As the insensible and excessive use of chemical inputs in agriculture have brought about the deterioration of ecological balance, the consumption of these crops produced in this manner has been in a position to threaten for human being and animal health. The organic agricultural system which developed to prevent this negative situation and produce safe crops and sustainable agriculture has turned an increasing trend throughout the world. The fact that the environmental sensible and sustainable production mind especially in developed countries gained importance has increased more interest to organic agriculture. It has proved this fact that the great part of organic agricultural areas is located

in Europe in the world and organic crops grown in developing countries are exported to these countries^[2,3].

The organic agriculture in Turkey has shown a fast progress with the demand of foreign trade companies since 1986. From 1986 to 2004, production areas have increased from 1000 ha to 57,000 ha, the number of organic farmers increased also from 313 to 18,385 and the numbers of organic product increased from 8 to 92 as well^[4,5]. Furthermore, the amount of organic products exported has also raised parallel with increasing of production amount.

The dried apricot is one of the agricultural crops having an important place in the traditional dried fruit exportation of Turkey. Apricots are mainly grown in the Mediterranean countries, the USA and CIS countries. Total world production of fresh apricots is approximately 2.2 million tons/year^[4].

Turkey is the leading producing country both in fresh and dried apricots. There are some 11 million trees from which approximately 440,000 tons of fresh apricots are obtained each year. Depending mainly on the climatic conditions experienced in a particular season, this production level might show large variation. Apricots are grown almost in all parts of Turkey except in the Black Sea Region where the humidity is too high. However, the principal growing region is in East Anatolia, namely in the Province of Malatya from where almost half of the total production is obtained from some 5 million trees. About 90% of the crop from Malatya is dried^[4].

While growing markets for organic produce particularly in EU countries, suggest that organic agriculture can be economically viable, little is known about the productivity and profitability of organic apricot production systems. Even though, there are a lot of researches about apricot production^[6-14], any study on economic comparison of organic and conventional apricot farming could not be come across.

The objective of the present study was to compare organic vs. conventional dried apricot farms in Turkey in terms of their productivity, labour use, production costs, net income, farmer-perceived constraints, farmer-defined goals and research needs for the future.

MATERIALS AND METHODS

Data were collected for a three-year period (2002-2004) via repeated semi-structured interviews with producers and corroborated with farm visits and review of records of the companies which the crop was sold to.

This study was carried out in Malatya Province. The production of organic dried apricot on average is 3,200 tones in Turkey. About 91% of this production is obtained in Malatya Province. The number of organic apricot producers is 171^[15].

Ten farm pairs, each of which consists of one organic and one conventional farm with less than 10 ha of apricot plantation, were selected in five districts (Akçadağ, Battalgazi, Darende, Hekimhan and Yazihan) of Malatya Province with varying agro ecological conditions. Each farm pair shared a similar biophysical and socioeconomic environment due to their proximity. Since there were fewer organic farms than conventional farms, organic farms were identified at first, followed by selecting comparable nearby conventional counterparts in order to be eligible for selection, organic farms had to: (i) have a history of at least three years under organic management (selected farms actually ranged from 5 to 9 years); (ii) be subject to active management using organic principles and (iii) have the majority of apricot plantations in production. The last criterion was also applied to conventional farms. The conventional farms were selected primarily according to proximity to their respective organic counterparts and the similarity of altitude and area under apricot plants.

On farms studied, accounting records do not exist. Although the most crucial materials to be supplied the sufficient and reliable data in agricultural economics researches are farm records, data gathered by surveys are also to be suitable and dependable method in case these records do not exist^[16]. In the study, the survey used in order to collect data from the producers was formed by discussing with experts of this subject. Survey form

consists of questions about general information about households, labour and other physical inputs used on apricot production, yield and income values and the aims, perspectives of apricot producers. The pre-test of questionnaire forms prepared was done in some local areas. Therefore, the application of survey forms facilitated to provide sufficiency of the aims of the study. Of the 20 farms studied, 8 had two different apricot plantations, 6 had three different apricot plantations and 6 had four plantations within apricot.

In addition, the studies and statistics concerning with the subject and research area of some organizations such as Agricultural Directorate, Farmer's Chamber, agricultural input suppliers, Union of Apricot Sales Cooperative (Kaysıbirlik), Industry and Trade Chamber of Malatya Province and export firms were also utilized.

For the analysis of organic agriculture to producer welfare, partial budget analysis was done^[17]. Total production costs and unit cost of product were calculated by being added variable costs with fixed costs such as depreciation, interest, management, maintenance etc. Productivity was calculated from interviews with farmers. Since apricot plant density differed in some cases between conventional and organic farms (ranging from 260 to 350 plants ha⁻¹), yields were expressed both on a per-area and per-tree basis. Gross Product Value (GPV) was calculated by being added dried apricot value with secondary product (pip) value. Farm net income from apricot production was calculated as GPV minus production costs^[17]. Gross margin was calculated as GPV minus variable costs. The indicators such as net income per hectare, per unit product and per hours labour were calculated in the study.

In organic dried apricot production, the necessary expenditures of production certification were paid by the firms buying product and farmers did not render any payment. Estimated costs of certification and inspection of organic production per farm were based on current national fees. Inspection costs consist of day rate, accommodation and traveling costs of inspector. Organic certification and inspection costs per hectare of apricot plantation is calculated by dividing the total organic certification and inspection costs paid by the firm to total apricot plantation areas allowed for, by considering of organic farmers who take the certification by individual. This cost is estimated as US \$ 225 ha⁻¹.

In order to complete the three year production and management data and get insight into the farmers' perspectives, the producers were asked to describe the main constraints for sustained apricot production, what their goals were for the future and what research they considered essential to alleviate these constraints.

RESULTS

The three-year mean yield ha^{-1} of the organic group was 9% lower than that of the conventional group (Table 1); expressed on a per-tree basis, organic yield was 3% lower. Interestingly, this yield depression was not uniform among farm pairs. While three organic farms produced only between 70 and 80% of the yields of their conventional counterparts and five organic farms produced between 90 and 97% of the yields of their conventional counterparts, the other two organic farms actually had slightly higher three-year mean yields ha^{-1} than their conventional counterparts (Fig. 1).

For five farm pairs, the organic and conventional apricot yield ratios calculated on a per-hectare basis differed markedly from those expressed on a per-tree basis (Fig. 1).

According to the researched period (2002-2004), the mean variable costs were US \$ 1674.1 $\text{ha}^{-1} \text{yr}^{-1}$ for organic and US \$ 1725.9 for conventional farms, i.e., 3.0% higher for the conventional group (Table 2). The predominant cost in both systems was labour for harvest and drying and cultural practices. On average, the organic group spent more money on labour for harvesting and drying and on labour for cultural practices including hoeing, fertilization and pruning of apricot trees (Table 3).

The conventional farms had higher costs for fertilizer and chemical plant protection, particularly fungicides and insecticides. On the other hand, two organic preparations were applied on organic farms. However, if the cost of labour for preparing organic fertilizers (farm manure) on organic farms were included in the fertilizer cost category (rather than in labour for cultural practices), the total cost for fertilizers would be similar to that of the conventional group.

Total labour used for dried apricot production is calculated as 1,074.8 h ha^{-1} on organic farms and 953.8 h ha^{-1} on conventional farms. Harvesting was the most time-consuming activity for both groups. Removing pits, drying, hoeing and pruning follow this. Fertilization including carrying and spreading of manure for organic farms required 3.4 times as much more labour as the conventional farms (49.1 vs. 14.3 $\text{h ha}^{-1} \text{yr}^{-1}$, respectively), which relied almost exclusively on chemical fertilizers. Organic farms do not applied sulphur in order to make apricot yellow. Although organic farms are saving labour from this process, the process of removing pits is needed much more labour than the conventional farms. Because removing pits easier after sulphur application on conventional farms, organic farmers have to take more attention while doing this process.

Table 1: Mean yield of dried apricot of organic and conventional farms in Turkey

Year	Organic ($\text{kg ha}^{-1} \text{yr}^{-1}$) (\pm SE)	Conventional ($\text{kg ha}^{-1} \text{yr}^{-1}$) (\pm SE)	Organic/conventional $\times 100$
2001/02	3437 \pm 425	3864 \pm 423	89
2002/03	3713 \pm 492	4003 \pm 432	93
2003/04	2153 \pm 326	2327 \pm 338	93
3-yr mean	3101 \pm 406	3398 \pm 394	91

Table 2: Economic performances of dried apricot production of organic and conventional farms in Turkey (3 yr mean)

Indicators	Organic	Conventional	Organic/ conventional $\times 100$
Gross Product Value (GPV) ^a (\$ ha^{-1})	4,752.1 \pm 214.4	4,843.0 \pm 198.3	98
Variable cost (\$ ha^{-1})	1,674.1 \pm 95.3	1,725.9 \pm 82.0	97
Production cost (\$ ha^{-1})	2,225.3 \pm 187.7	2,265.9 \pm 232.2	98
Unit cost of dried apricot (\$ kg^{-1}) ^b	0.61 \pm 0.06	0.56 \pm 0.05	109
Gross margin (\$ ha^{-1})	3,078.0 \pm 131.4	3,117.1 \pm 104.7	99
Net Income (\$ ha^{-1})	2,526.8 \pm 107.2	2,577.1 \pm 99.8	98
Net Income per unit product (\$ kg^{-1})	0.81 \pm 0.1	0.76 \pm 0.2	107
Net Income per hours labour (\$ h^{-1})	2.35 \pm 0.3	2.70 \pm 0.3	87

^a The value acquired from pits are included total GPV. The share of pits value in total GPV is 7.1% on organic group and 7.4% on conventional ones. ^b Compound cost calculation method is used in order to calculate the unit cost of product as total costs minus secondary product (pits) value dividing by production amount of main product (dried apricot).

Table 3: Mean distribution of variable costs of ten organic and conventional apricot farms in Turkey (2002-04)

Production processes	Distribution of variable costs %	
	Organic	Conventional
Labor for harvest and drying	57.84	50.78
Labor for maintenance processes	27.15	23.52
Machinery costs	9.73	9.87
Cost of chemical fertilizer	-	9.79
Cost of manure	2.80	0.87
Cost of organic preparats	2.48	-
Cost of Pesticides	-	5.17
Total	100.00	100.0

The extra time spent on fertilization, pruning, removing out pits, drying and packing in the organic group accounted for the difference in total labour use between the two groups. Pest control, cultivation and irrigation activities on conventional farms require much more labour than organic farms.

Income and product prices: Though dried apricot yield ha^{-1} on organic farms was 9% lower than the conventional ones, it was determined that the gross product value was only 2% higher on conventional farms (Table 2). It was made out that dried apricot prices were higher on organic farms. Like variable costs, production costs were also higher on conventional group. Nevertheless, it was calculated that the unit cost of product was 9% higher on organic farms than the

Table 4: Premium prices for organic dried apricots required to make the adjusted net income of ten organic farms equal to that of their conventional counterparts in Turkey (2002-04)

Organic number	Reference price (conventional) (US \$ tones dried apricot) ^a	Price received (organic)	Price required (organic)	Present organic premium	Required organic premium
				(% above the price farm received by conventional counterpart)	
1	1,401	1,447	1,471	3	5
2	1,241	1,415	1,579	14	27
3	1,348	1,348	1,730	0	28
4	1,326	1,436	1,584	8	19
5	1,387	1,426	1,555	2	12
6	1,312	1,438	1,764	9	34
7	1,347	1,454	2,058	8	53
8	1,294	1,472	1,315	14	2
9	1,241	1,416	1,855	14	49
10	1,340	1,440	1,482	8	11
Mean ±SE				8±3	24±9

^a US \$ = 1,410.000 Turkish Liras, September 2004.

Table 5: Mean labor use of dried apricot production of organic and conventional farms in Turkey

Activity	Organic group		Conventional group	
	Labor use (h ha)	Proportion of total labor (%)	Labor use (h ha)	Proportion of total labor (%)
Cultivation	3.9±1.1	0.4	4.3±1.4	0.4
Pruning	71.3±6.8	6.6	67.3±8.7	7.1
Fertilization	49.1±5.4	4.6	14.3±3.2	1.5
Pest control	8.2±0.8	0.8	13.6±0.9	1.4
Hoing	126.2±7.3	11.7	105.3±7.0	11.0
Irrigation	31.4±5.0	2.9	38.0±6.3	4.0
Harvesting	227.6±16.7	21.2	224.2±12.8	23.5
Steaming with sulphur pits	-±-	-	78.8±9.2	8.3
Removing pits	270.7±12.1	25.2	231.0±10.8	24.2
Drying	158.1±10.5	14.7	82.9±7.1	8.7
Classification and packing	73.1±3.9	6.8	42.7±4.1	4.5
Other ^a	55.2±4.5	5.1	51.4±5.8	5.4
Total	1,074.8±64.2	100.0	953.8±59.7	100.0

^aIncludes carrying and digging up tree foot.

conventional ones. Gross margin of dried apricot production of organic farms was nearly the same with conventional group.

Four of the organic farms even distinctively generated higher net incomes than those of conventional counterparts and two pairs were similar (Fig. 2). The lower net incomes of the remaining four organic farms were due to lower yields (Fig. 1) and an insufficient premium for organic dried apricot (farm pairs 3, 6, 7 and 9).

The mean price premium received by the ten organic farms was 8%, including one farm which received no premium (Table 4). The nine farms that did receive a premium had a mean of 9%. If organic certification costs are included, premium prices for organic dried apricot required to make the adjusted net income of ten organic

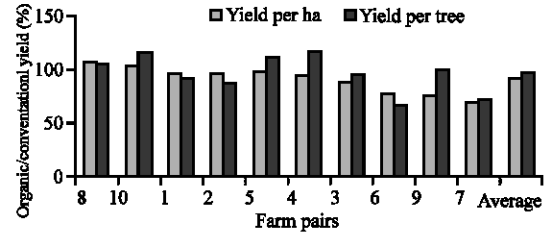


Fig. 1: Mean dried apricot yield per hectare and per tree over a three year period (2002-2004) for ten organic apricot farms in Turkey relative to the mean yield of their counterparts (100% = yield of conventional counterparts)

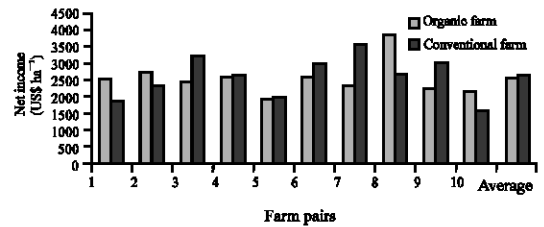


Fig. 2: Net income of ten organic and conventional apricot farms in Turkey in 2002-2004 (US \$ 1 = 1,410.275 Turkish liras, September 2004)

farms equal to that of their conventional counterparts should be 24% higher than the conventional apricot prices.

The required organic premium price on the farms which had nearly same dried apricot yields (farm pairs 1, 5 and 8) was at least. However, the required organic premium price on the organic farm that yield and net income per hectare was far less than its conventional counterpart is likely to rise up to 50% (farm pair 7 and 9).

Producer-defined constraints, goals and research priorities:

Both producer groups identified low and unstable dried apricot prices as the major limitation to sustain dried apricot production. The organic farmers considered that the premium prices offered were lower than a competitive market rate since there was not a serious yield variation between organic and conventional farms. Low incomes from the conventional farms forced the producers into a loan and debt cycle and/or to minimise investment in production. The latter effect of low incomes was also true for many of the organic farms, where low investment hindered the development of the organic systems in terms of diversification and biomass production, leading to a lack of on-farm recyclable organic material on several of these farms - a factor mentioned as a major constraint by many organic producers.

Future farm goals of both groups focused on increasing farm output. While conventional farmers envisioned achieving this through further intensification, the organic producers focused on increasing organic fertilizer, nutrient cycling and soil conservation as means of improving farm performance.

The research topics suggested by the conventional producers focused on alternative marketing (seven producers) and stabilization of the international dried apricot market (three producers) to control low and fluctuating prices. While the topic of marketing was also suggested by three organic producers, the topics most frequently mentioned by the organic group related to organic apricot production techniques, particularly geared towards weed and pest prevention/control (five producers) and nutrient management (two producers).

DISCUSSION

Dried apricot productivity: The variability of dried apricot yields during the three years (Table 1) may have been partly due to climatic differences. As a matter of fact, the yield level in 2003-04 production year was 40% lower than that of previous years in both farm groups. The lower per-hectare productivity of eight of the organic farms compared to their conventional counterparts was largely caused by the lower productivity of individual apricot plants (Fig. 1; farm pairs 1, 2, 7 and 8) and, in some cases, also by lower apricot plant densities (farm pairs 3, 4, 5 and 9).

The large differences between per-plant yield and per-ha yield for the farm pairs 3, 4, 5, 9 and 10 were due to large differences in apricot plant densities: in farm pair 9, the organic farm had 24% less plants ha⁻¹, in farm pairs 4, the organic farm had 20% less plants and for the others (farm pairs 3, 5 and 10) had 12% less plants ha⁻¹.

The chemical fertilizer usage in apricot production has not been extensive in research area. On conventional farms, the chemical fertilizer usage per ha as a physical amount was only 478 kg. This physical amount was equal to 139 kg nitrogenous (N) and 45 kg phosphorus (P₂O₅) per hectare. The unexcessive use of chemical fertilizer on conventional farms has brought about that the organic yields were not so much lower than the conventional yields. For this reason, when the chemical fertilizer is replaced adequately by farm manure, the yield variations between organic and conventional will disappear.

Costs and labour: Mean labour use in researched period was substantially 13% higher for the organic than for the

conventional group (Table 5). The excessive labour use on organic farming has originated from requiring more labour for spreading farm manure and from more attentively being done of some production processes such as removing pits, drying, pruning and harvest than conventional farms. A majority of total required labour is provided by family labour. Accordingly, organic farming may also be seen as an alternative production system for evaluating inactive labour force on small households.

The higher variable cost on organic farms is caused mainly by the excessive labour use. Despite low yield and low costs on organic farms, the higher organic sale prices explained approximate gross margin and net income than those of conventional farms.

Income and prices: Organic certification, inspection and annual registration costs were not included in the calculation of net incomes since they were not directly paid by the organic farms in the years studied. Actually, the organic farmers are not aware of the costs of organic certification, inspector and annual registration. The firms have already determined the producers that do not use chemical inputs and contracted with them. The firms buying dried apricot have offered nearly 10% higher level of conventional dried apricot price existing in cooperative (Kaysibirlik). Even so, it was seen that the prices given to organic farmers were lower than 10% (Table 4). When organic certification, inspector and annual registration costs were added to production cost of each organic farm individually, it was determined that required premium prices should be 24.0% higher than conventional dried apricot prices in order to make the adjusted net income of ten organic farms equal to that of their conventional counterparts (Table 2). The premium received by organic producers will depend on the buyer, the quantity and quality of dried apricot.

The number of private firms buying organic dried apricot is 16. Buying prices of dried apricot can be changed firm by firm. Therefore, it is seen that two organic farms (farms pairs 1 and 8) which have higher net incomes than other organic farms had higher sales prices (Table 4).

Producer-perceived constraints, goals and research priorities: For both farmer groups, the marketing of dried apricot represented the biggest issue. Most conventional producers considered low and unstable prices as the main limiting factor. The focus of the majority of organic producers on production issues illustrates the general lack of basic information about the ecology of organic systems and the currently inadequate or completely missing extension support for organic farmers. The goals of the conventional farmers focused on increasing farm

output through further intensification. In contrast, the goals of the organic farmers focused on increasing diversity, organic matter, nutrient cycling and soil conservation.

Both farmer- and researcher-controlled studies are needed to assess the effects of biophysical and agronomic factors on apricot health and productivity and to increase our knowledge about the ecology of organic apricot systems. Further research is needed on biological options to control apricot pests and diseases. Furthermore, studies to compare the productivity of alternative management systems along agro ecological gradients from marginal to optimum conditions for apricot could help establish guidelines as to where organic production would be more likely to have a comparative advantage. Another research is needed on possibilities of cooperation among organic farmers.

CONCLUSIONS

Despite lower mean yield for the organic group, the difference in net income between the organic and conventional producers was minimal mainly because of the premium prices paid for organic dried apricot.

Organic farming system applied as contract farming in the beginning have been carried out by private firms directions up to now. On the other hand, all sorts of costs related to organic certification of farmers covered by firms are resulted that the farmers are more and more dependent on firms. Marketing their product to any firm must be possible for farmers. Therefore, farmers should get their organic certification and some supports should be provided by the government for covering certification costs. In the contrary case, firms will continue to be able to purchase organic dried apricot by offering only 10% higher price than the conventional ones.

As soon as organic farmers did not get exact knowledge about how much organic certification and inspection cost did, they thought that certification costed so much higher. Getting organic certification by farmers own can be an important factor to increase their bargaining power in the market. If organic farmers get organic certification by individually, they will accept cost of 225 \$ per ha. The highest cost item in these is inspector costs. Likewise, the inspection fee is lower for groups and can be shared by the number of farms inspected in a day. As a matter of fact, an inspector can check nearly 10-15 numbers of different apricot plantations per day with a total cost of 650 \$/day. These costs could be decreased, if organic farmers applied to registrate organic certification as an organic farmers' organization. Although every apricot farmer is the member of the Apricot Sales

Cooperative (Kayısibirlik) in research area, organic farmers should also organize one another in order to get organic certification economically and more bargaining power.

According to study results, lower yields and net incomes for organic apricot farms can reduce the adaptation ratio of organic production system with other producers. In order to improve organic farming and increase the welfare of producers, some arrangements for input subsidies used on organic farming should be done and producers should be supported especially in conversion period like in the EU countries.

ACKNOWLEDGMENTS

This study would have been impossible of the participating producers all of whom shared their time and knowledge generously, the staff of Malatya Provincial Directorate of MARA and Union of Apricot Sales Cooperative (Kayısibirlik). I also thank to anonymous reviewers.

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