Full Length Research Paper

The impact of EurepGAP requirements on farm income from greenhouse tomatoes in Turkey

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The aim of this study was to determine whether a difference existed between the income levels of farmers with EurepGAP certificates and farmers who produce conventionally (without a certificate). The data were collected from 16 certified households that produce tomatoes in greenhouses in the Antalya Province and 33 uncertified greenhouse farms who were chosen randomly in the same region. All data was analysed using the partial budget method. When comparing the economic performances of certified tomato producers with the economic performances of uncertified tomato producers, the certified group can be summarized as the ones who have lower productivity, spend less and obtain a higher level of net income. EurepGAP certified tomato producers were determined to have a net income that is 2.8 times more per unit area compared to uncertified tomato producers.

Key words: EurepGAP, good agriculture practice, greenhouse, tomatoes, Turkey.

INTRODUCTION

The increase in the incomes of consumers in parallel to their education levels also raises the issue of the importance of the reliability of the foods they buy, where according to the high demand, it has become compulsory for products to be eco-friendly, safe for human health and be produced under reliable conditions (CTR 2007). The increasing awareness concerning food safety brought up the issues of both the age and the structure of some systems and standards that are in order to present the consumers with a guarantee that processed foods are being safely produced. To this end, the World Health Organization (WHO) constituted a treaty containing the regulations on food safety in order to protect international standards concerning animal and plant health in the internatonal trade of agricultural products. First of the Sanitary and Phytosanitary Measures (SPS) is Hazard Analysis and Critical Control Points (HACCP) and the second one is Good Agricultural Practices (GAP), which is applied for fresh fruits and vegetables (CTR, 2007).

In accordance with these developments, GAP was first given a start by the US Department of Agriculture (USDA) and the Food and Drugs Administration (FDA) in order to provide food safety in fresh fruit and vegetables. The FAO (Food and Agriculture Organization) also carried out studies on the principles of good agricultural practices during the same period (EurepGAP, 2007). Finally, bigger retailers of fresh fruit and vegetables from the European Union Member States gathered together to constitute the Euro-Retailer Produce Working Group (EUREP) and prepared the EurepGAP protocol in 1999, covering the principles of good agricultural practices in the growing of fresh fruits and vegetables (EurepGAP, 2007).

The very first certificate was issued to a banana grower in Bologna in 2001. As of 2006, the number of certified growers was 59,301 and the total certified agricultural area was 12,000 ha (CTR, 2007). EurepGAP certification is carried out by more than 100 independent certification bodies in more than 80 countries (Table 1). The top three countries having the highest number of EurepGAP certified growers are Italy, Greece and Spain, respectively. On the other hand, England, the Netherlands and Spain take the top three places for the distribution of the area for certified products. Potatoes are the leading certified product; followed by apples and grapes (CTR, 2007).

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Table 1. The number of EurepGAP certified producers in 2006.

Countries	Number	Countries	Number	Countries	Number
Italy	12,263	Kenya	584	United States	153
Greece	8,269	New Zealand	356	Colombia	119
Spain	7,250	Peru	338	Mexico	117
Germany	6,516	Morocco	336	Portugal	116
Netherlands	4,493	Malta	334	Ghana	93
Turkey	3,222	Ecuador	331	Panama	73
Belgium	3,159	Poland	288	Ireland	50
France	1,415	Thailand	287	Canada	46
South Africa	1,378	Cyprus	281	Palestinian Te.	29
Hungary	1,119	Brazil	279	Croatia	28
Chile	1,080	China	246	Uruguay	28
India	952	Australia	210	Guatemala	23
Israel	946	Egypt	202	Martinique	21
Austria	881	Dominican Re.	173	Côte d'Ivoire	19
Argentina	828	Costa Rica	171	Denmark	18
				Total	59,301*

*plus 180 growers in 35 further countries.
Source: http://www.eurepgap.org.

Global GAP, formerly known as EurepGAP, is a special standard that contains no legal compulsion in terms of practicing it and is carried out on a voluntary basis. Many agricultural products' importers and producer companies that trade with the European countries chose to assume the mentioned standard voluntarily in order to become preferable and to increase competitiveness. Complying with these standards, the leading retailer companies of Europe demand to see the EurepGAP certification from suppliers.

Although GAP implementation began with the Directive on Good Agricultural Practices dated 08.09.2004 in Turkey, its foundations had dated back to long before (OG, 2004a). The Law on Plant Protection and Plant Quarantine No. 6968, which was put into effect in 1957, and other directives on the issue, laid the basis for GAP in Turkey (OG, 1957). The preparation of the GAP directive in Turkey was based on the articles of the Statutory Decree on Foundation and Duties of Ministry of Agriculture and Rural Affairs No. 441, Agricultural Struggle and Agricultural Quarantine No. 6968, and the Statutory Decree on the Production, Consumption, and Inspection of Foods No. 5179 (OG, 1991; OG, 2004b). The directive, which has been amended twice since, was finalized on 15.05.2006 (OG, 2006). One of the products with the highest field of implementation under the EurepGAP fresh fruits and vegetables standards is tomatoes.

Based on the mean average of the years 2003–2005 around the world, fresh tomato production is 123.7 million tons (Table 2). China and the USA are the largest producers, but they are also the largest consumers. Europe makes up 26% of the total production amount.

The main European producers are Turkey, Italy, Spain and France. In general, tomato production is largely consumed in the same region: about 95 per cent of the European production is consumed within a distance of 500 to 1000 km from the production region. Therefore, the largest exporting countries are mostly not the largest producers. Although the largest producers of tomatoes in Europe are Turkey (8% of the world production) and Italy (6%), the largest exporters are Spain and the Netherlands (FAO, 2008). Turkey has an annual tomato production of 10 million tons. Approximately 20% of this comes from greenhouse production. Turkey exports 230 thousand tons to 36 countries, and 21 of them are European countries (TSI, 2008). It is clear that Turkey should meet EurepGAP standards in fresh tomato production to keep its share in the European market.

Different sectors benefit from good agricultural practices. These beneficiaries are producers, consumers, retailers and the environment (CTR, 2007). Although there have been numerous studies on the contributions of the EurepGAP standards to the economy of a country or a region on a macro level (Dolan et al., 1999; Dolan and Humphrey, 2000; Will, 2003; Galdos, 2004; Aloui and Lahcen, 2005; Mausch et al., 2006; Asfaw, 2007; Hanafi, 2007), a study that compares the economic results of agricultural practises between certified and uncertified farms has not been encountered so far. This study focuses on the benefits of good agricultural practices to producers and attempts to test whether a difference exists between the incomes of farmers carrying out production activities in compliance with EurepGAP standards and farmers who produce with no certification, in the context of tomato production in greenhouses.

Table 2. World production and trade of fresh tomatoes in 2003–2005.

Production and trade	Fresh tomatoes (%)
World production (MT)	123.7
European production	26
World export (million $)	4,551
European export share	53
Largest exporters (world shares)	
-Spain	20
-Mexico	19
-Netherlands	16
-Turkey	5
European import shares	61
Largest importers (world shares)	
-USA	21
-Germany	14
-France	10
-UK	8

Source: Food And Agriculture Organization, available in: http://faostat.fao.org/site/535/default.aspx [04.01.2008].

MATERIALS AND METHODS

The selection of the case study farms and data collection

This study was carried out in the Serik district of Antalya Province in the 2006–2007 production year. The EurepGAP certified group is made up of 16 farmers from 3 different villages (AEU, 2007). The area covered by greenhouses of every single producer in this group ranged from 0.3 to 0.7 ha. The uncertified tomato producer group comprised 33 farmers who were randomly selected according to the stratified random sampling method shown below, from the producer population with at least 0.3 ha of greenhouse area (Yamane, 1967):

$$n = \frac{N.\sum N_h.S^2_h}{N^2D^2 + \sum N_h.S^2_h}$$

where N_h is the number of producers in the hth stratum, S^2_h is the variance of the hth stratum, D^2 is the value of $(d/t)^2$, d is the quantity of error permitted for the population mean and t = 1.96, in response to a 95% confidence limit.

In the study, when comparing the groups, the values of the average of the groups were taken into consideration. Although the greenhouses are owned by the producers, the studied region was mostly less than 1 ha and the unit values estimated in the research was given as the values per hectare. The accounting records for the farms in this study do not exist. Although the most crucial materials to ensure sufficient and reliable data in agricultural economics research are the farm records, the data gathered by surveys are also found to be a suitable and dependable method when these records do not exist (Yang, 1986). The data were collected for the 2006–2007 production year via repeated semi-structured interviews with the producers, corroborated by farm visits and a review of the records of the companies to which tomatoes were sold.

The human labour utilized in the enterprises was calculated based on gender and the hours for which they work. While determining the labour available and its utilization status, the labour force for different ages and genders was converted into manpower units and was given in the relevant tables as man working hours (Table 3). The wages paid to the labour hired in the region was taken as the basis for estimating labour costs. For family labour, the alternative expenses were calculated by taking the average wage levels valid in the region as the basis. As the total substances affecting the unit area of the farms, the amount of pesticides used, the commercial names of the pesticides used and their active substance ingredients were taken as the bases. Also, the amount of chemical fertilizers was given in terms of plant nutrients. In calculating interest costs, the interest rate (20%) on agricultural business credit given by the Republic of Turkey Agriculture Bank (T.C. Ziraat Bankasi) in the 2004 production year has been taken into consideration (Kiral et al., 1999). General management costs were found by taking 3% of the total expenses. In calculating the greenhouse rents, the actual paid rents for the rented greenhouses and alternative rents for enterprises carrying out activities in their own greenhouses were included in the calculation.

In estimating the depreciation for the greenhouse assets, a 10% depreciation rate was used. Since the depreciation was reserved according to the straight-line method, the interest costs were calculated by taking a 5% real interest rate over half of the greenhouse assets. In addition, the studies and statistical data related to the subject and the research area of organizations such as the Agricultural Directorate of Antalya Province, the Farmer's Chamber, the agricultural input suppliers, and the Akdeniz Exporters' Union were also utilized.

The evaluation of productivity and profitability

Gathered through carrying out the questionnaire, the data were analysed to determine the variable and the production costs for both producer groups, the farmers' selling prices, the productivity and the profitability of the crop in question, and the usage levels of labour, machinery, chemical fertilizers and pesticides. For the analysis of the GAP's effect on producer welfare, a partial budget

Table 3. Coefficient used for converting man power unit.

Age groups	Gender	Coefficients
0 - 6	Female, Male	-
7 - 14	Female, Male	0.50
15 - 49	Female	0.75
	Male	1.00
50-+	Female	0.50
	Male	0.75

Source: Açıl and Demirci (1984). Agricultural Economics Department, Ankara University Faculty of Agriculture Press, No: 880, Ankara p. 96-97.

analysis was performed (Kiral et al., 1999). Total production costs and the unit cost of the product were calculated by adding the variable costs to the fixed costs of greenhouses, such as depreciation, interest, management, maintenance etc. Productivity was calculated using the interviews with the farmers. Yields were expressed only on a per-area (hectares) basis. The net income of the farms from tomato production was calculated as the gross product value (GPV) minus the production costs. The gross margin was calculated as the GPV minus the variable costs. Besides, the unit cost of the product was calculated by dividing the total production cost per hectare into the average yield per hectare.

Since, in the study, all direct and fixed expenses were taken into consideration in estimating the production costs, the net income calculated according to the unit area manifests the economic profit of the selected activity (Kiral et al., 1999). Statistical tests for significant differences in the mean values of the variables across the producer groups were carried out. The formula for the t-test for two samples with unknown variances is shown below (Mood et al., 1974):

$$t = \frac{\bar{A} - \bar{B}}{\sqrt{\frac{\sum d_A{}^2 + \sum d_B{}^2}{(n_A - 1) + (n_B - 1)} \cdot \frac{n_A + n_B}{n_A . n_B}}}$$

Here, $\bar{A}$ and $\bar{B}$ refer to mean values of the variables of the EurepGAP certified tomato producers' group and uncertified tomato producers' group, respectively.

RESULTS AND DISCUSSION

The characteristics of households and management practices

Among the households under study, the average size of greenhouses in which the EurepGAP certified group produces covers 0.43 ha; this value was determined to be 0.46 ha for uncertified tomato producers. The EurepGAP certified group has been producing according to the EurepGAP standards since the 2004 production year. A difference was not observed among the producer groups in terms of the number of family members and the size of the labour force. While the average family

population was 7.8 people in EurepGAP certified producers, this number was found to be 8.3 people in uncertified producers. The presence of household labour force in the greenhouses in terms of manpower units (MWU) is 3.76 MWU in EurepGAP certified tomato producers and 3.88 MWU in the uncertified group. Greenhouse vegetable production is the single production activity in all of the surveyed households, and cucumbers and peppers are also produced in the greenhouses in addition to tomatoes.

Tomato growing processes in greenhouses in the examined producer groups does not differ. However the number of some of the growing processes or amount or forms of inputs differs. Three times cultivation for soil preparation is common practices. Ploughing is followed by two harrowing application. A nematicide application against nematodes is conducted in the greenhouses before planting. Later on, a phosphorous fertilizer is applied, known as a subsoil fertilizer. When the soil is ready, dripping irrigation pipes are laid out in the greenhouse. A heating oilcloth is then laid over the dripping irrigation system. The seedling planting period in the households under study is generally September. The locals call this 'late autumn planting'. Since it is an early crop, the product achieves high prices in the market. Seedlings are generally bought in the region. Since the fruit peel is thick and more durable for transportation, the most preferred varieties are Selin and M19. After keeping the dripping irrigation system working for an hour, seedlings are planted by hand. Fungicides are applied to the seedling roots following the planting. Two days after the planting, fertilization is carried out. Nematicide and fungicide applications are frequently conducted following the planting. The average pesticide application in the enterprises under study is 6.4 times for EurepGAP certified producers and 14.2 times for the uncertified group (Table 4).

Hand hoeing is carried out seven days after the planting. Plants are irrigated every five days. Fertilizers are generally applied together with irrigation. A difference in fertilizing occurs between the two groups. While the uncertified tomato producers apply fertilizers at an average of 22.9 times, the EurepGAP certified group

Table 4. Management practices for tomato production in greenhouses.

Agronomic practices/operations	EurepGAP certified tomato producers	Uncertified tomato producers
Common varieties	Selin and M19	Selin and M19
Fertilization period	October - April	September - May
Average number of fertilizations	12.1	22.9
Spraying period	September - March	September - May
Average number of sprayings	6.4	14.2
Bombus bee use	Yes	No
Plant growth regulators use	No	Yes
Harvest period	February - May	February - May

applies fertilizers at an average of 12.1 times during the whole production period. Tying up is carried out after hand hoeing. A string is tied to the stem and these strings are then tied up to the wires under the roof of the greenhouse. After tying up is done, the removal of lower leaves' (bud cutting) is carried out. For shadowing purposes, lime, ceruse or chalk dust is diluted and evenly brushed over the top of the greenhouse. Another difference between the production processes used by the two producer groups is the use of bombus bees. EurepGAP certified tomato producers release bombus bees into the greenhouse at a time close to the blooming period. Apart from this application, conducted in order to increase fertilization, the uncertified producers prefer using plant growth regulators. The most widely used plant growth regulator is the 4-CPA hormone from the phenoxin group of auxins.

In order for the seedlings to lengthen, tying up and bud breaking are carried out together. This process is done around 6–7 times. During the last process, the uppermost part of the seedling is broken and prevented from being taller. A constant weeding is conducted in the greenhouses by hand. Stoves are utilized to heat the greenhouses during the period between 1 December and 30 March. Generally, firewood is preferred as the fuel. After the tomatoes have reddened, the harvest begins in early February and continues until May. The entire amount of tomatoes produced by the EurepGAP certified group is generally exported to European countries. The uncertified tomato producers' products are generally marketed to the domestic market and to countries not requiring EurepGAP certification.

Costs and input use

The differences in tomato growing between the two producer groups draw attention in terms of physical input. The average labour use per hectare is lower in certified group than the uncertified ones (Table 5). Two main factors contribute higher labour. One is higher yield, which requires more picking and labour, the second one is more pesticide and fertilizer applications (Table 5). In the uncertified producer group, the amounts of nitrogen, phosphor and potassium used are 221.5, 431.8 and 205.7 kg/ha, respectively. These amounts in the EurepGAP certified group are 107.3 kg/ha nitrogen, 141.2 kg/ha phosphor and 154.8 kg/ha potassium. In other words, the EurepGAP certified group utilizes 52% less N, 67% less P and 25% less K compared with the other producer group.

A similar situation is seen in the use of pesticides. EurepGAP certified tomato producers use lower amounts of pesticides. The uncertified tomato producers utilize 34.1 kg of fungicide per hectare, and the EurepGAP certified group uses 9.7 kg/ha fungicide. Insecticide use is 2.3 and 0.5 kg/ha, respectively. Nematicide use is 9.3 and 2.9 kg/ha, respectively. A significant difference does not exist in terms of the number of seedlings planted into the unit area. The EurepGAP certified tomato producers use 8.9 colonies of bombus bees per hectare, and the uncertified group utilizes 2.1 litres of plant growth regulators. The uncertified tomato producers use 6.4% more labour per hectare which is significantly different from uncertified ones (p=0.05). The grounds for this difference lay in the more number of use of fertilizers and pesticides by the uncertified households. The amount of labour used for fertilizing and pesticide application is estimated to be between 41.0 to 594.8 h; these values correspond to 27.2 to 301.5 h for the EurepGAP certified group (Table 6).

Another difference is the amount of labour used in the heating of the greenhouses. In this process, the EurepGAP certified group uses more labour. When analysing the distribution of the total amount of labour used in terms of the production processes, a great difference is not observed between the grower groups except in pesticide application. In both groups, around 35% of the total labour is spent on harvesting. The second most demanding process in labour is the staking and bud-cutting procedure. The variable costs of tomato growing in greenhouses are given in Table 7. These costs are classified as labour, seedlings, heating, pesticides, fertilizer, machinery, interest on variable costs, certification, bombus bees, electricity and other materials. Total variable costs were calculated for the EurepGAP certified tomato producer group as 23,977.7 $/ha^{-1}, and it was found to be 7% lower compared to the

Table 5. Physical input use on tomato production of both producer groups in Turkey.

Inputs used	EurepGAP certified tomato producers	Uncertified tomato producers
Labour use (h/ha)	6600.2	7020.2
Tractor power (h/ha)	238.5	473.6
Chemical fertilizer use (kg/ha) [+]		
N	107.3	221.5
P	141.2	431.8
K	154.8	205.7
Pesticide use (kg/ha) [++]		
Fungicides	9.7	34.1
Insecticides	0.5	2.3
Nematocides	2.0	9.3
Seedlings (number)	29,010	28,990
Bombus bees (colonies)	8.9	-
Plant growth regulators (l/ha)	-	2.1

[+]Values are given as active substance ingredients; [++]Values are given as soil nutrients.

Table 6. Average labour use for tomato production of both producer groups in Turkey.

Activity	EurepGAP certified tomato producers			Uncertified tomato producers		
	Labour use (hours ha)		Proportion of total labour (%)	Labour use (hours ha)		Proportion of total labour (%)
	Mean	SE	Mean	Mean	SE	Mean
Cultivation and sowing	458.6 [a]	± 19.2	6.95	468.5 [a]	± 17.1	6.67
Hand hoeing	311.1 [a]	± 41.0	4.72	323.2 [a]	± 52.2	4.61
Fertilization	27.2 [a]	± 4.7	0.41	41.0 [b]	± 9.2	0.59
Tying up seedlings	308.9 [a]	± 64.2	4.68	304.9 [a]	± 59.6	4.34
Staking seedlings and bud cutting	2293.4 [a]	± 196.8	34.75	2257.7 [a]	± 227.5	32.16
Irrigation	59.6 [a]	± 6.0	0.90	60.7 [a]	± 8.8	0.87
Pest control	301.5 [a]	± 54.1	4.57	594.8 [b]	± 95.6	8.47
Picking up bottom leaves	340.5 [a]	± 82.3	5.16	369.5 [a]	91.8	5.26
Heating	97.8 [a]	± 9.4	1.48	85.8 [b]	5.0	1.22
Harvesting	2308.9 [a]	± 287.1	34.98	2421.2 [a]	± 229.1	34.49
Other[1]	92.7 [a]	8.6	1.40	92.9 [a]	8.9	1.32
Total	6600.2 [a]	± 58.4	100.00	7020.2 [b]	± 65.2	100.00

[1]Includes labour used for loading and transportation, shadowing greenhouses and letting fly the bombus bees in greenhouses.
[b]The mean labour use for the same activity for EurepGAP certified producer and traditional producer groups are statistically different (p<0.05).

uncertified producer group.

The two elements that have the highest share in the variable costs are the labour and the seedling costs, for both grower groups. These cost elements in the EurepGAP certified group are followed by heating, interest on variable costs, chemical fertilizers, pesticides, bombus bees, machinery and certification costs; the order for the uncertified group is pesticides, chemical fertilizers, interest on variable costs, heating and machinery. The EurepGAP certification costs have a share of 4.02% among all variable costs. The share of two cost elements not encountered in the uncertified tomato growing group (bombus bees and EurepGAP certification) makes up the 8.66% of the total variable costs. In other words, good agricultural practices produce an additional $2,148.4 in terms of tomato growing costs in the greenhouses. However, the same producers save $745.6 on chemical fertilizers and $1,927.7 on pesticides, compared to the uncertified households, adding up to a total of $2,673.3.

Table 7. The distribution of variable costs on tomato production of both producer groups.

Variable costs	EurepGAP certified tomato producers			Uncertified tomato producers		
	$/ha	SE	%	$/ha	SE	%
Labour costs	8,491.1 [a]	± 209.5	203.41	9,027.3 [b]	± 215.45	34.97
Seedling costs	3,738.3 [a]	± 110.9	15.59	3,627.4 [a]	± 99.43	14.05
Heating	2,840.6 [a]	± 184.7	11.85	2,309.1 [a]	± 144.33	8.95
Pesticide costs	1,191.7 [a]	± 133.6	4.97	3,119.4 [b]	± 171.44	12.09
Fertilizer costs	1,670.9 [a]	± 121.8	6.97	2,416.5 [b]	± 157.57	9.36
Bombus bees	1,174.5 [a]	± 40.0	4.90	-	± -	-
Machinery costs	1,112.4 [a]	± 109.4	4.64	1,514.4 [b]	± 127.86	5.87
Interest on variable costs	2,179.8 [a]	± 36.4	9.09	2,346.7 [a]	± 59.77	9.09
Certification costs	963.9 [a]	± 34.0	4.02	-	± -	-
Other material[1]	403.7 [a]	± 25.9	1.68	1,108.5 [b]	± 61.58	4.29
Electricity	210.8 [a]	± 10.9	0.88	344.3 [b]	± 14.85	1.33
Total	23,977.7 [a]	± 206.5	100.00	25,813.6 [b]	± 248.84	100.00

[1]Includes ceruse and ropes for both producer groups and plant growth regulator for traditional producers. 36% of this cost is comprised of plant growth regulator in the uncertified producer group.
[b]The mean variable cost for EurepGAP certified producer and traditional producer groups are statistically different (p<0.05).

Table 8. Economic performances of producer groups on tomato production (1 $=1.4 YTL).

Indicators	EurepGAP certified tomato producers		Uncertified tomato producers		Certified/Uncertified × 100
	Mean	SE	Mean	SE	
Tomato yield (kg/ha)	89,420.1 [a] ±	5,713.4	113,848.6 [b] ±	7,982.1	79
Selling price ($/tons)	459.9 [a] ±	9.7	321.8 [b] ±	8.4	143
Output (GPV) ($/ha)	41,133.2 [a] ±	3,554.1	36,636.5 [b] ±	2,715.5	112
Variable cost ($/ha)	23,977.7 [a] ±	1,623.7	25,813.6 [a] ±	1,567.7	93
Production cost ($/ha)	31,783.3 [a] ±	2,824.0	33,348.8 [a] ±	2,793.8	95
Unit cost of product ($/tons)	355.4 [a] ±	28.4	292.9 [b] ±	25.9	124
Gross margin ($/ha)	17,155.5 [a] ±	1,282.1	10,822.9 [b] ±	981.3	159
Net income ($/ha)	9,349.9 [a] ±	596.7	3287.7 [b] ±	284.5	284
Net income per unit product ($/kg)	0.10 [a] ±	0.04	0.03 [b] ±	0.01	333
Net income per hours labour ($/h)	1.42 [a] ±	0.8	0.47 [b] ±	0.6	323

[b]The mean values of performances for certified and traditional groups are statistically different (p<0.01).

The share of pesticide costs among the variable costs is higher for the uncertified tomato producers at a rate of 12.09% compared to the EurepGAP certified group (4.97%). The share of the fertilizer cost was estimated to be 9.36% and the difference between two groups is found statistically different.

Net income

The average tomato output of the producer groups under study was established to be higher for the uncertified tomato producers, at a value of 113,848.6 kg ha^{-1}, compared to the certified group (89,420.1 kg ha^{-1}) (Table 8). The differences between the two producer groups in terms of the obtained output were found to be statistically significant. On the other hand, there is a 43% difference between the sales prices of tomatoes produced in these households. While certified producers marketed 1 ton of

tomatoes for $459.9, the average price for uncertified producers was $321.8/ton. The fact that the product price is so high for the certified producer group results in a higher gross product value (GPV) in this enterprise group. The GPV in these enterprises was found to be 13% more compared to the uncertified tomato producers.

Conducting an evaluation based on the gross margin estimated by finding out the difference between the GPV's and the variable costs, the $17,155.5 of gross margin per hectare of the EurepGAP certified tomato producers was found to be 59% more than that of the uncertified tomato producers. While the EurepGAP certified tomato producers obtained a net income of $9,349.9 from growing one hectare of tomatoes, the uncertified tomato producers get a profit of $3,287.7. In other words, the EurepGAP certified tomato producers obtain 2.8 times more net income than the uncertified tomato growers. In the EurepGAP certified producers' group, the net income per product unit and the units of

labour used were found to be three times higher than those of the uncertified tomato producers.

CONCLUSION AND RECOMMENDATIONS

EurepGAP certification which is a relatively new application for tomato production in greenhouse in Turkey will became widespread in a long time. Greenhouse enterprises, which have continued tomato production as conventional, generally have opinion that low chemical (pesticide and fertilizer) use cannot provide sufficient yield. For that reason, the adoption of this production method is limited. Producers can sell their products at higher price EurepGAP certification through. If also other producers (conventional) experience the EurepGAP certification, the adoption of this production will accelerate.

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