Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA)
Available online at www.inia.es/sjar

Spanish Journal of Agricultural Research 2007 5(1), 7-15
ISSN: 1695-971X

Economic analysis of processing tomato growing: the case study of Torbali, west Turkey

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Abstract

The cost, yield, and price data from the processing of tomato grown in Torbali-Izmir, Turkey, were analyzed to determine the profitability of contracted and non-contracted tomato growing. According to the results of this study, farms growing tomatoes with and without contracts, respectively, utilized an average tomato production area of 5.55 and 2.48 ha; the total tomato production was 75,915 and 71,971 kg ha^{-1}; the average cost of tomato production was 3,510 and 3,245 US$ ha^{-1}; the gross margin was 2,829 and 3,575 US$ ha^{-1}, and net profits were 1,804 and 2,513 US$ ha^{-1}. It was also determined that production and market risks both affect the profitability and economic viability of tomato growing. Farmers should gather all the economic data about the tomato production and market conditions before making production decisions.

Additional key words: agricultural enterprise, agricultural production model, contract-based agriculture, cost analysis, economic feasibility.

Resumen

Análisis económico del cultivo de tomate para procesar: el caso de Torbali, al oeste de Turquía

Se analizaron los datos de los costes, rendimiento y precios del tomate para procesar cultivado en Torbali-Izmir, Turquía, a fin de determinar la rentabilidad de la producción del tomate bajo contrato y sin contrato. Según los resultados de este estudio, las áreas de producción de las fincas productoras de tomate, bajo contrato y sin contrato, fueron 5,55 y 2,48 ha respectivamente, la producción de tomate fue de 75.915 y 71.971 kg ha^{-1}, el margen bruto 2.829 y 3.575 US$ ha^{-1}, y los beneficios netos 1.804 y 2.513 US$ ha^{-1}, respectivamente. También se determinó que tanto la producción como los riesgos de mercado afectan a la rentabilidad y viabilidad económica del cultivo del tomate. Los productores debería tener en cuenta todos los datos económicos acerca de la producción del tomate y las condiciones de mercado antes de tomar decisiones.

Palabras clave adicionales: agricultura basada en contratos, análisis de costes, empresa agrícola, modelo de producción agrícola, viabilidad económica.

Introduction

The United States is the largest producer of the tomato (*Lycopersicon esculentum* Mill.) in the world, followed by China, Turkey, Italy and India. Ecological and geographical conditions in Turkey allow for high quality tomatoes in large quantities all over the country, year-round. Therefore the tomato leads the list among other vegetables grown in the country. However, the tomato is the most important product in the fruits and vegetables processing sector. Every year, approximately 1.7 million tons of overall tomato production (8.9 million tons) goes to the processing industry in Turkey (EPC, 2002). The processed tomatoes are finally canned as paste (80%), sliced tomatoes (15%), and the rest as ketchup, juice and other products. Most of the paste producers in Turkey are located around the Balikesir, Bursa and Canakkale regions (Blake *et al.,* 2003).

Contract-based agriculture is very useful both for farmers and companies. The companies may obtain the necessary high quality raw materials at certain prices and under reasonable purchasing conditions. The companies are simultaneously involved in the issues concerning the raw material to be purchased, such as seeds, fertilizers, seedlings and agricultural chemicals. Due to the fixed price set in the contract documents, compa-

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Received: 08-06-06; Accepted: 05-02-07.

nies can easily calculate their cost, which leads to a clear forecast of future market conditions. Under non-contract, prices are determined according to the prevailing market conditions.

The relationship between farmers and the food industry ranges from carrying out spot market transactions to complete integration, characterized as vertical integration. The Turkish food industry is a promising sector, but still has a dual structure with some small-scale manufacturing alongside larger plants employing modern technologies. Balikesir, Bilecik, Bursa and Canakkale provinces have well developed vegetable, fruit, hop and sugar beet processing, as well as tomato paste and frozen food industries. The share of contract farming, especially in tomato and pea growing, may be anywhere between 1 and 100%, with an average of 75%. Contract farming is potentially beneficial for small farmers by providing various services, such as credit facilities, although there are some inherent problems in implementation. Farmers could, however, solve many of the problems involved in contract arrangements by establishing organizations to undertake cooperative bargaining on their behalf (Rehber, 2004).

In Turkey, the first tomato processing company was established in Bursa, in 1955. Today, tomato paste is produced by more than 60 companies, as well as many other canned food and jam variations. Most of these companies are established as corporations by the private sector. Processing tomatoes are mostly produced under contracts and there are more than 60 cultivars of tomato suitable for industry consumption in Turkey. In the world, the leading producer of both fresh tomato and paste tomato is the USA, followed by Italy and Turkey. Turkey has a productive capacity of 465,000 tons per year. Among all the fruits and vegetables processed, tomato paste supplies the highest amount of foreign exchange to the country. Moreover, due to the seasonal need of workers, the production process leads to contract-workers' employment, creating a positive effect on the agricultural sector (Tezel, 2003).

In recent years, many studies have focused on the economics of tomato production in fields (Vansickle *et al.*, 1994; Bassevinc and Esengun, 1995; Cicek *et al.*, 1999; Tanrivermis, 2000; Koc *et al*., 2001; Kasenge *et al*., 2001; Dartt *et al.,* 2002) and greenhouses (O'Dell, 1995; Estes and Peet, 1999; Engindeniz and Tuzel, 2002; Engindeniz, 2003). But, farmers should be aware of profitability and the cost of tomato production in different regions and adapt their production to obtain the highest possible net profit. Therefore, there is still need for study, especially at the local level.

The purposes of this study are: i) to perform an economic analysis of the processing tomato grown in Torbali-Izmir and ii) to provide a guide for processing tomato producers by developing a budget which identifies specific cost categories and also estimates a net profit of the production and the sale of processing tomatoes in Turkey.

Material and Methods

This study was carried out in Torbali-Izmir, West Turkey (between 38° 15' N and 27° and 28° 30' E) which has a Mediterranean climate (Fig. 1) where July is the warmest month and January is the coldest month. The annual precipitation is about 700 mm and the average relative humidity is 60%.

Torbali is a town in the Izmir (Smyrna) region and it produces approximately 30% of total tomato production in Izmir. Four villages were selected from Torbali, where 393 farmers were found growing tomatoes. The share of these villages in total tomato production for Torbali is approximately 75%. Data were collected from 51 farmers who were willing to participate, while 22 of the farmers grew tomatoes as contract-based and 29 under non-contract.

Generally, farmers were growing processing tomatoes, especially the Brixy variety. Plants are transferred to fields in April, while harvests start in June and continue until October. Water is available in fields and a water pump is used for irrigation.

Yield data and observations were recorded throughout the production period. Thus, income and cost data were collected on time. The costs of tomato production were classified into variable costs and fixed costs: i) The variable costs associated with tomato growing were all inputs related to the production of tomatoes and included labor, fertilizer, pesticide, seed-seedling, electricity, transport, etc. Variable costs were calculated by using market input prices and labor costs, as well as the interest on variable costs. In this study, interest on total variable costs was calculated by charging a simple interest rate of 6% (annual saving deposits interest rates on US$). However, interest on total variable costs were calculated for 6 months and the interest rate was assumed to be 3%, since tomato production and marketing period were approximately 6 months. ii) Fixed costs included administrative costs, land rent, a keeper

Figure 1. Torbali as research area.

fee, and land tax. Administrative costs are estimated to be 2-7% of total gross production value or 3-7% of total costs (Kiral *et al.*, 1999; Mulayim, 2001). In this study, administrative costs were estimated to be 3% of total costs (labour and machinery, input, and interest costs) as in previous studies (Cicek *et al.*, 1999; Tanrivermis, 2000; Koc *et al.*, 2001). Estimating the annual cost of using machinery, equipment, and other assets is a challenge in cost of production studies. Services such as land preparation were priced to the enterprise as a «bundled» service/task reflecting both the machinery and labour components of the service.

Total production costs are the sum of fixed and variable costs. Total costs were subtracted from total gross production value to calculate the net profit. The results of this study compare the farms which grow tomato as contract-based and farms which grow tomato as non-contract.

In this study, a logit model was estimated to determine which factors make farmers prefer to grow tomato as contract-based. When the dependent variable is a 0-1 binary variable, the logit or probit model estimation methods can be used. The logit model has the following functional form (Greene, 1993; Gujarati, 1995; Ramanathan, 1995):

$$P_i = E(Y = 1 / X_i) = \frac{1}{1 + e^{-(z_i)}} = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}} \quad [1]$$

In the logit model, the dependent variable (Y) is contract-based tomato growing. If farmers grow tomato as contract-based, the dependent variable takes the value 1, and 0 otherwise. X_i is a vector of explanatory variables related to farmer's growing tomato as contract-based and β is the vector of estimated coefficients. Positive coefficients increase the probability that a farmer grows tomatoes as contract-based. For the logit model, the most suitable estimation technique is maximum likelihood, where the maximum likelihood coefficient is consistent and asymptotically normally distributed (Bierens, 2004).

The function guarantees the probabilities will fall within the (0,1) range. The logit form also gives a plausible shape for the marginal effects. That is, for a continuous variable X_i, at relatively high values, a marginal change will give a relatively smaller change in the probability of a success ($Y = 1$). Additionally, $z_i = \beta_1 + \beta_2 X_i$ and $-\infty < z_i < +\infty$ in Eq. [1].

If the probability (P_i) of farmer's growing tomato as contract-based is given by Eq. [1], then the probability ($1 - P_i$) of farmer's growing tomato as non-contract is:

$$1 - P_i = \frac{1}{1 + e^{z_i}} \quad [2]$$

Consequently, it can also be written as the following equation:

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{z_i} \quad [3]$$

$P_i / (1 - P_i)$ is simply the odds ratio of a farmer growing tomatoes as contract-based, that is a ratio of the

probability that a farmer will grow tomato as contract-based over the probability that a farmer will not grow tomato as contract-based. If the natural logarithm of Eq. [3] is taken, the following logit model specification can be obtained.

$$L_i = 1n\left[\frac{P_i}{(1-P_i)}\right] = z_i = \beta_1 + \beta_2 X_i \qquad [4]$$

The logit model includes 11 explanatory variables. These variables are given in Table 1. The variables include social characteristics of farmers, characteristics of farms, providence, and use of inputs, and economic results of tomato growing as well as their expected effects on farmers' participation in contract-based tomato growing.

It is estimated that young, educated and experienced farmers have a tendency to accept contract-based growing. Therefore, it was hypothesized that age, education level and experience of farmers is positively related to contract-based growing.

It is also thought that tomato production area and tomato production (quantity) are positively related to contract-based growing because farmers with large production areas may have a preference for risk-free tomato production.

The number of parcels in tomato production areas is thought to negatively effect contract-based growing because the number of small parcels may create structural problems. If the tomato production area has small parcels, difficulties may occur with machine use, harvesting, and marketing.

It is estimated that cooperative memberships by farmers may negatively effect contract-based growing because cooperatives are more important for farmers. If cooperatives are active, farmers will obtain a high price and net profit.

Generally, farmers prefer the Brixy variety because it is more suitable for processing. This variety is more important for high productivity and gross production value. Further, the companies may provide seeds or seedlings for farmers. It is hypothesized that tomato varieties and providence of tomato seedling are positively related to contract-based growing.

The price of tomatoes and gross margin obtained from tomatoes are hypothesized to be negatively related to contract-based growing. Farmers who obtain a

Table 1. Using variables in logit model

Dependent variable (*Y*)	
Farmers who grow tomato as contract-based = 1 Farmers who grow tomato as non-contract = 0	
Independent variables (*X*)	Unit
Social characterictics of farmers	
Age of farmers	Year
Education level of farmers	Year
Tomato grow experience of farmers	Year
Cooperative membership of farmers (dummy variable)	Non-membership = 1, membership = 0
Characterisitics of farms	
Tomato growing area	ha
Number of parcel in tomato grow area	Each
Providence and using of inputs	
Providence of tomato seedling (dummy variable)	From companies = 1, Produced by farmers = 0
Tomato cultivars (dummy variable)	Brixy = 1, others = 0
Economic results of tomato growing	
Tomato production	kg ha^{-1}
Price of tomatoes	US$ kg^{-1}
Gross margin obtained from tomatoes	US$ kg^{-1}

high price and gross margin may not accept contract-based growing.

Results

Yield, costs, marketing, gross margin and net profit

The average yield in farms growing tomatoes as contract-based and non-contract were aproximately 75,915 kg ha^{-1} and 71,971 kg ha^{-1} (Table 2), respectively. Means are not significantly different at the 0.05 level of probability according to One-Way Anova (F: 6.486, $p > 0.05$).

The average production costs of tomatoes in farms which grow tomato as contract-based and non-contract were 3,510 US$ ha^{-1} and 3,245 US$ ha^{-1} (Table 3). Again, means were not significantly different at the 0.05 level of probability according to One-Way Anova (F: 3.813, $p > 0.05$). Variable and fixed costs form 70.80% and 29.20% of total production costs in farms which grow tomato as contract-based and 67.27% and 32.73% from farms which grow tomato as non-contract.

Farmers growing tomatoes as contract-based sell their whole tomato production to tomato processing companies and the average tomato price was 0.07 US$ kg^{-1}. Farmers who grow tomatoes with no contract sold their tomato production to retailers (84.25%), tomato processing companies (8.50%), or fresh fruit-vegetable marketing cooperatives (7.25%) and the average tomato price was 0.08 US$ kg^{-1}. Means were not significantly different at the 0.05 level of probability according to One-Way Anova (F: 3.178, $p > 0.05$).

Average gross margin and net profit obtained from tomatoes in farms which grow tomatoes as contract-based were 2,829 US$ ha^{-1} and 1,804 US$ ha^{-1}, respectively. However, the values in farms which grow tomato as non-contract were calculated to be 3,575 US$ ha^{-1} and 2,513 US$ ha^{-1} (Table 4). Means were not significantly different at the 0.05 level of probability according to One-Way Anova (F: 1.127 and 1.236, $p > 0.05$).

Results of logit model

The results of the logit model estimation is shown in Table 5. As it can be concluded from the results, McFadden R-squared shows that the model explains 78% of contract-based growing tomato. The likelihood ratio test statistic indicates that the model is statistically significant. Three variables in the model are significant at the 0.10 level. The results of the logit model estimation indicate that tomato growing area and providence of tomato seedling were positively related to farmer participation in contract-based tomato growing, while the price of tomatoes were negatively related.

Discussion

In this study, the average tomato production area on 51 farms was 3.81 ha and average yield was determined to be 74,342 kg ha^{-1} (Table 2). Tomato production in fields and greenhouses vary within a country or from country to country. For instance, in a similar study in Wakiso (Uganda), average fresh market tomato production was 46,237 kg ha^{-1} (Kasenge *et al.,* 2001). In a study done in Mexico (USA), average fresh market tomato production was 24,680 kg ha^{-1} (Vansickle *et al.,* 1994). In a study done in Indiana (USA), average processing tomato production was 64,616 kg ha^{-1} (Foster *et al*., 1993). In a study done in California (USA), average processing tomato production was 82,777 kg ha^{-1} (Hartz and Miyao, 1997). In a study done in Florida (USA), average fresh tomato production was determined to be 147,550 kg ha^{-1} (Deepak *et al.,* 1996).

Tomato production per hectare varies from region to region in Turkey. For example, in similar studies

Table 2. Yield obtained from tomato growing

Yield items	Farms which grow tomato as contract-based (22 farms)	Farms which grow tomato as non-contract (29 farms)	General (51 farms)
Average tomato production area (ha)	5.55	2.48	3.81
Average tomato production (kg ha^{-1})	75,915	71,971	74,342
Average total tomato production (kg)	421,330	178,488	283,244

Table 3. Total costs of tomato growing (US$ ha^{-1})

Cost items	Farms which grow tomato as contract-based (22 farms)	Farms which grow tomato as non-contract (29 farms)	General (51 farms)
1. Labor and machine costs			
Poughing	329	265	306
Seedling production	3	69	28
Planting	90	79	86
Fertilization	20	21	21
Hoeing	133	107	123
Irrigation	43	63	51
Pesticide application	10	11	11
Harvest and packing	504	500	503
Transport	1	31	12
Total	1,133	1,146	1,141
2. Input costs			
Seed-Seedling	706	171	508
Fertilizer	195	166	184
Pesticide	138	128	130
Peat	1	5	2
Viol	15	174	74
Electricity	224	318	258
Others	1	11	5
Total	1,280	973	1,161
3. Interest on total variable costs	72	64	69
A. Total variable costs (1 + 2 + 3)	2,485	2,183	2,371
B. Fixed costs			
Administrative costs	75	65	71
Land rent	925	978	945
Keeper fee	2	4	3
Land tax	23	15	20
Total	1,025	1,062	1,039
Total costs (A + B)	**3,510**	**3,245**	**3,410**

within the area of Tokat, the average yield was about 55,040 kg ha^{-1} (Bassevinc and Esengun, 1995), 34,580 kg ha^{-1} (Cicek *et al.,* 1999), and 51,000 kg ha^{-1} (AERI, 2001). However, in studies focusing on Middle Sakarya River Basin, Ankara, and Manisa, the average yield was 68,510 kg ha^{-1} (Tanrivermis, 2000), 50,130 kg ha^{-1} (AERI, 2001), and 60,240 kg ha^{-1} (AERI, 2001).

Factors affecting tomato production include the adaptation to season, fruit type, plant habit, soil texture, fertilization, irrigation, pruning, weed, insect, and disease control. Tomato production also is subject to weather variations, which may result in severe crop damage and losses. Farmers should choose good varieties that spread season, use their own or certified transplants, select medium-textured soils, test soil for fertilizer and nematicide, use a herbicide suited to weed conditions, spray weekly with a high pressure sprayer for disease control, prune early and string when needed, and irrigate to control cracking and blossom end rot.

Table 4. Gross margin and net profit obtained from tomatoes

Item	Farms which grow tomato as contract-based (22 farms)	Farms which grow tomato as non-contract (29 farms)	General (51 farms)
Tomato production (kg ha^{-1})	75,915	71,971	74,342
Average tomato price (US$ kg^{-1})	0.07	0.08	0.07
Gross production value (US$ ha^{-1})	5,314	5,758	5,204
Variable costs (US$ ha^{-1})	2,485	2,183	2,371
Total cost (US$ ha^{-1})	3,510	3,245	3,410
Gross margin (US$ ha^{-1})	2,829	3,575	2,833
Net profit (US$ ha^{-1})	1,804	2,513	1,794

Tomato production per hectare in greenhouses are higher than fields. In a study done in Izmir (Turkey), the total yield of greenhouse tomatoes was determined to be 113,095 kg ha^{-1} (Engindeniz, 2003), while a similar study done in Izmir found that the total yield of organic greenhouse tomatoes was 72,920 kg ha^{-1} (Engindeniz and Tuzel, 2002). In a study done in Western Virginia (USA), the total yield of greenhouse tomatoes was estimated to be 146,600 kg ha^{-1} (O'Dell, 1995). In North Carolina (USA), it was assumed that the total yield of greenhouse tomatoes was 178,200 kg ha^{-1} (Estes and Peet, 1999). In a study done in Besor (Israel), total yield of greenhouse tomatoes was an estimated 150,600 kg ha^{-1} (Taylor *et al.,* 2001).

In this study, the average production costs of tomatoes in 51 farms were calculated to be 3,410 US$ ha^{-1} (Table 3). Most farms do not enter their data into the register in Turkey, so researchers can not always find reliable data. Therefore, selected farmers were good representatives for research area. The total production cost of tomatoes calculated in previous similar studies done in Turkey and other countries were different from each other. For instance, in Turkey, in studies done in Tokat, total production costs of tomatoes were 2,205 US$ ha^{-1} (Bassevinc and Esengun, 1995), 4,312 US$ ha^{-1} (Cicek *et al*., 1999), and 6,172 US$ ha^{-1} (AERI, 2001); in studies done in Middle Sakarya River Basin, Ankara, and Manisa, total production costs of tomatoes were 5,750 US$ ha^{-1} (Tanrivermis, 2000), 3,437 U$ ha^{-1} (Koc *et al.,* 2001), and 2,480 US$ ha^{-1} (AERI, 2001). In Florida (USA), the total cost of fresh tomato production was determined

Table 5. Statistical results of logit model

Dependent variables (*Y*)

Farmers who grow tomato as contract-based =1
Farmers who grow tomato as non-contract =0

Independent variables	Coefficient	Std. error	z-statistic	Prob.
Constant	26.56484	18.48143	1.437380	0.1506
Age of farmers	–0.551912	0.393493	–1.402597	0.1607
Education level of farmers	–0.034627	0.026632	–1.300199	0.2006
Tomato grow experience of farmers	–0.676473	0.523003	–1.293439	0.1959
Cooperative membership of farmers	0.473491	0.943183	0.502014	0.6157
Tomato growing area	0.223833*	0.142521	1.742913	0.0813
Number of parcel in tomato grow area	1.074195	0.936360	1.147203	0.2513
Providence of tomato seedling	14.28785*	8.561269	1.668893	0.0951
Tomato varieties	–2.378427	1.978079	–1.202392	0.2292
Tomato production	0.000227	0.000750	0.302157	0.7625
Price of tomatoes	–9.030000*	5.190000	–1.738304	0.0822
Gross margin obtained from tomatoes	-1.150000	1.470000	–0.782166	0.4341

Log likelihood = –7.602445. McFadden R-squared (R^2) = 0.781969. * It is significant at the 0.10 level. Total observations = 51; observations with Dep. (1): 22; observations with Dep. (0): 29.

to be 15,011 US$ ha^{-1} (Deepak *et al.,* 1996), 28,416 US$ ha^{-1} (Aerts and Nesheim, 2000), and 28,663 US$ ha^{-1} (Bloem and Mizell, 2000). In Michigan, the total cost of processing tomato production was an estimated 6,032 US$ ha^{-1} (Dartt *et al*., 2002). On the other hand, in studies regarding the area of Antalya, Icel, and Izmir, Turkey, the total production costs of greenhouse tomatoes were estimated to be 44,170 US$ ha^{-1} (AERI, 2001), 30,973 US$ ha^{-1} (Koc *et al.,* 2001), and 3,736 US$ ha^{-1} (Engindeniz, 2003).

Production costs vary depending on spacing, staking, methods of trellising and cultivars. Labor requirements for production, harvesting, grading, packaging and transporting are very intense. Costs are reduced as growers become more efficient in methods of production. Further, farmers should avoid excessive applications and take necessary steps to improve production effiency and reduce production costs. Commercial tomato production requires a high level of management, large labor and capital inputs and close attention to detail. For this reason, it is recommended that farmers start with a smaller scale and become efficient at this scale rather than starting production on a large scale.

In this study, the average tomato price received by 51 farmers was 0.07 US$ kg^{-1} (Table 4). The average tomato price varied between 0.06 US$ kg^{-1} and 1.15 US$ kg^{-1} in previous similar studies done in Turkey (Bassevinc and Esengun, 1995; Cicek *et al.*, 1999; Tanrivermis, 2000; AERI, 2001). In Florida (USA), the average price of fresh tomatoes was calculated to be 0.34 US$ kg^{-1} (Aerts and Nesheim, 2000). Farmers should find their markets before they plant the first seed. Further, farmers should be aware of price changes and adapt their production to obtain the highest possible prices.

Average net profits obtained from tomatoes for the 51 farms observed was estimated to be 1,794 US$ ha^{-1} (Table 4). However, it was calculated higher in studies done in Tokat (2,749 US$ ha^{-1}) and Middle Sakarya River Basin (4,526 US$ ha^{-1}) (Bassevinc and Esengun, 1995; Tanrivermis, 2000). But, it was estimated lower in Tokat (875 US$ ha^{-1}), Ankara (1,576 US$ ha^{-1}), and Manisa (1,134 US$ ha^{-1}) (Cicek *et al.,* 1999; AERI, 2001). Further, it was determined that net profits in greenhouse production is higher in studies done in Mersin (19,993 US$ ha^{-1}) and Izmir (14,688 US$ ha^{-1}) (AERI, 2001; Engindeniz and Tuzel, 2002).

Important factors affecting the profitability of tomato growing are the market conditions. Farmers should study the market to evaluate seasonal trends in prices, supply and changes in consumer demand. Contract-based agriculture enables the corporation to control both supply and demand for tomato. Contracts detail future purchase agreements, which include grade and quality standards as well as methods of cultivation including the application of inputs, such as fertilizers. Contract-based agriculture can put farmers in a position to achieve greater access to credit, inputs (in particular, new technologies), and the market, relative to their peers who are not operating under contractual arrangements. Contracts tend to cover land management measures intended to optimize crop growth, crop quality, and production levels in the short-term agricultural cycle.

However, usually quality problems arise under the non-contract agriculture. The farmers, who do not sign contracts with the companies, are not keen on the harvesting period or the product quality. Loading into 20 ton capacity trucks, they try to sell the goods to companies after long distance transportations. Therefore, the goods have to wait much longer before being processed.

As a conclusion, this study indicates that processing tomato growing may be profitable. Net profits obtained from tomato production are higher in farms which grow tomato as non-contract. But, there are always high supply and low price risk for these farms. Therefore, farmers should gather all the economic data about processing tomato production, and market conditions of processing tomatoes before making production decisions. Also producers should investigate other enterprises and determine if processing tomatoes can be profitable. Although cost and return investment estimation is believed to be typical and realistic, individual farmers should adjust these values to their own specific situations and circumstances.

Acknowledgement

This study has been supported by Ege University Scientific Research Projects Commission. Appreciation is expressed to farmers and other individuals who provided assistance.

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