



Journal of Applied Sciences

ISSN 1812-5654

science
alert

ANSI*net*
an open access publisher
<http://ansinet.com>

The Econometric Analysis of Tomato Production with contracting in Turkey

Erdogan Gunes

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

Abstract: Turkey is the largest grower of processing tomatoes in the world after the US, Italy, China and Spain. Growing tomatoes for sauce is one of the two major uses of contract farming in Turkey and this activity involves arrangements between private sauce companies and farms. This practice is now wide spread since the 1970s, especially in the Marmara Region. Before the production season begins, sauce industry firms sign contracts with farms that guarantee the quality and quantity of their raw material and guarantee the growers sales at predetermined prices. In addition, plants served to farmers for more productivity by techniques such as drop irrigation and also their extension services and field demonstrations at this region. This research is based on interviews with 100 farms that growing tomatoes for sauce factories in Bursa province to determine relationships between plants and farms and factors affecting tomato cultivation land. At this research, farms were divided to two groups based on tomatoes cultivation land. It was found that plants had highly effective on tomatoes land by means of input and supports on finance to the farms with logarithmic models.

Key words: Tomato, production, sauce plant, contract farming

INTRODUCTION

Contract farming has been in existence for many years as a means of organizing the commercial agricultural production both in large and small-scale farm operations. It continues to expand, particularly in countries that previously followed a central planning policy and in those countries that have liberalized marketing by closing down marketing boards. Changes in consumption habits, such as the increasing number of fast-food outlets, the growing role that is played by supermarkets in many countries and the continued expansion of world trade in fresh and processed products, have also provided the impetus for further development of this mode of production (Eaton and Shepherd, 2001). Contract farming is defined as a system for the production and supply of agricultural/horticultural produce under forward contracts between producers/suppliers and buyers. The essence of such an arrangement is the commitment of the producer/seller to provide an agricultural commodity of a certain type, at a time and a price and in the quantity required by a known and committed buyer. Contract farming usually involves the following basic elements- pre-agreed price, quality, quantity or acreage (minimum/maximum) and time (Anonymous, 2003; Singh, 2005).

The relationships between farmers and food industry, called vertical coordination's, range in complexity from the spot market to complete integration. Contract farming is the most important of these relationships and therefore, must be specifically evaluated (Allen, 1972; Rehber, 1997).

It has an affect on land management, production diversity and marketing (Salvini, 1995). This farming system is successful in supplying credit, inputs, technical assistance information and a market to growers. It transfers production technology to the growers and provides a more secure market outlet (Minot and Abbott, 1993). In this system, both draw up a written contract containing many provisions on the production and marketing stages of the product in question, including the price, quality, standard as well as the monetary and technical assistance that the industry will provide to the farmer (Glover, 1987). It enables the agriculture-industry and private agribusiness to integrate will usually provide technology more productively than a government agricultural extension service because there is a direct economic interest in improving farmers' production (Dicken, 1986). There are some points that are agreed to in advance of production in contracts, including the level of required quality and details relating to cost and delivery. These agreements provide agricultural business distribution benefits, marketing opportunities and the sharing of business risks (Glovers *et al.*, 1994).

Growing tomatoes, other is sugar beet, for sauce is one of the two major uses of contractual farming in Turkey. Tomato production has developed in Turkey because of favorable factors such as suitable ecological conditions, increasing in public demand and desire of growers to generate more income. After China and USA, Turkey is the third tomato producer country in the world. Turkey is now the 5th largest grower of processing tomatoes in the world. In the point of fact, between

35,000 and 40,000 farm families produce about 6.8 million tones tomato in Turkey. Nearly between 20 and 30% of this production amount has been used in industry for production of processed products such as sauce, ketchup, tomatoes juice etc. Turkey has important potential for tomatoes production. Unfortunately, processing tomatoes amount has decreased from 2.2 million tones to 1.65 million tones in 2005-2006 season. When it consider production capacity, it can be increase this amount by using right policy and encouraging system. Turkish sauce products have not competitive foreign market because of insufficient supports compare to other exporters countries like China and Spain. They give important investment and export support to their tomatoes industry. But Turkish government has aimed to increase export subsidies recently.

The tomato production is labor intensive and bulk of production is mostly supported by small family farms. The biggest part of tomatoes production is provided from Marmara region in Turkey. Most of sauce firms have taken place in Balıkesir, Bursa and Canakkale province. Tomato cultivation for industry is commonly realized based on contract farming system which has been applied since 1970s. In this production system, plants sign contract with farms. By this way, either plants guarantee quality and quantity of their raw material or the farms have enhanced to sale their crops at predetermined prices. Some research showed that productivity and profit increased by means of this system. Farms operating by the contract farming utilize more input per unit area, technological innovations and obtain greater yields of tomatoes per unit area in Turkey-Canakkale province. The gross margin of contract-farming model farms is 13% while net profit is 19% higher when compared to non-contract model farms. A statistically significant difference was found between the two types of farming models with respect to the number of seedlings, usage of fertilizer, labor wages and amount of production (Tatlıdil and Akturk, 2004).

MATERIALS AND METHODS

Tomatoes for sauce have intensively grown in Marmara Region. That's why Bursa province was selected for applying farm survey. Questionnaires were filled out with farmers on total 100 farms. They were classifying according the tomato cultivating land as I. group (0.1-2.5 hectare) and II. group (3.0-10 hectare). Number of sample farms was determined by the simple randomized sampling method described in the study of Yamane *et al.* (2001). Data were analyzed in the framework of a multiple regression model. In this study, logarithmic model was

determined the most suitable model as statistics. The logarithmic regression model was determined as follows:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \dots + \beta_7 \ln X_7 + U \quad (1)$$

Where; β_0, \dots, β_7 are coefficients that indicate effect of the independent variables on the dependent variables (cultivation land). Coefficients were defined with formula.

$$B_1 = \frac{S_{xy}}{S_{x^2}} \quad (2)$$

Significance test of the regression coefficients were executed by t-test. At (1), Y represents contract tomato cultivation land, X_1 farm land, X_2 experience of contract farming, X_3 contractual tomato income, X_4 input and financial support by plants, X_5 agricultural income out of farm, X_6 non-agricultural income of farm, X_7 farm capital. All variables were included in the model based on the consideration of significant and economical criteria by Stepwise method (Rawlings, 1988). Selected each variable was statistically evaluated on the basis of determined coefficient, t and F statistics and auto-correlation by Durbin-Watson tests.

RESULTS AND DISCUSSION

According to data obtained from farms, farmers grows standard tomato cultivars such as Rio Grande, Rio Fuego, FV 6203, T₂ Improved, Albana and hybrid tomato cultivars such as Alta, Hema 1401, Brigad. The selection of tomato cultivars mostly depends on the plants processing product. Tomato cultivated land of selected farms is averagely 2.5 hectare. The tomato production amount of these farms is 6.2 ton per hectare. The rate of the farmers cultivating their own land is 78.9%. These lands are mostly irrigated land (91.5%). In tomato production, manpower has highly importance as an expenses item. Manpower was calculated as 32.7% within the total expenses. Generally, most of the farms investigated in this research have own manpower. But farms had bigger land can need additional manpower for some cultural practices such as irrigation, fertilization and harvest period. Second important expenses are land rent and these are responsible for 28.4% in total expenses. Input such as seed, fertilizer and pesticides are the third important expenses (15.6%). All firms are supported farms which are carrying out contract farming following a certain program at research area. Firms give some supports during the tomatoes production period. Distribution of all supports like cash and in kind can be given as follows due to the months:

Months	Firms supports
December-January	Contracting with farms and determining cultivated land
January-February	Delivering seed or seedling and pesticides
March-April-May	Distributing in kind like fertilizer (15-15-15), pesticides and determining cash support for field preparation
June-July	Distributing fertilizer (Ammonium nitrate) and financial support for hoe
July and after	Distributing production advance, delivering all products to the firms and paying of calm

At this research area, product advance, seedling, fertilizer, pesticide, hoe advance and seed consisted of all supports respectively as 36.6, 26.5, 17.5, 9.8, 6.5 and 3.1%. This means that while cash supports are compose of 43.1%, in kind support rate is 56.9%.

At the first group farms, the average of farm land is 4.4 hectare (Table 1). The rate of tomatoes is 29.5% in the farmland. This farm has grown contract tomatoes for 11.3 years. As it is looked correlation coefficient among variables; there are important and positive relation between contract tomatoes land (Y) and farm land (X₁), contract product income (X₃), firm supports (X₄) active capital (X₇). While farm land (X₁) has positive relation between contract product income (X₃) and active capital (X₇), it has a negative relation to the non-agricultural income (X₆) (Table 2). That is means when farm land is getting increase, agricultural income is decrease. Meanwhile, between firm supports (X₄) and active capital (X₇) has a positive relation.

At the second group farms, the average of farm land is 12.1 hectare tomatoes consist of 40.5% of farm land.

Farms have grown contract tomatoes for 13.3 years and this value is increasing until 34 years (Table 1). At these farms, there is important positive correlation between contract tomatoes land (Y) and contract production income (X₃), firms supports (X₄), active capital (X₇). While there is a positive important correlation between farm land (X₁) and contract production income (X₃), firms' supports (X₄) and active capital (X₇), non-agricultural income has negative effect above farm land. At this group, non-agricultural income is getting increasing, farm land are getting decreasing.

Supported by plants is highly effecting tomato cultivation land both groups. At the first group, average 10% of increasing production income from tomatoes (X₃) and firms supports (X₄), tomatoes land with contracts increase respectively 1.4 and 8.1% (Table 3). On the other hand, at the second group, if firm support is increasing as 10%, it is determined that tomatoes land with contracts can rise as 8.5%. Determination coefficients were found statistically significant at 0.97 and 0.82.

As it can seen that contract farming has important effect for growing tomatoes and production can orientate by means of firms supports. But this state, it is needed to support to firms that enables farms to support operating capital. Because nowadays Turkish tomatoes sauce sector has an export problem and that is why it is not able to complete to some countries. Urgently, it must increase export encourage for enabling competitions. During this process firms, farms and state must together and tomatoes sauce sector has to be support by encouraging.

Table 1: Descriptive statistics of variables for two groups

Variables	Mean		St. Dev.		Min.		Max	
	-----		-----		-----		-----	
	I	II	I	II	I	II	I	II
Y(ha)	1.3	4.9	0.7	2.1	0.5	3.0	2.5	10.0
X ₁ (ha)	4.4	12.1	3.9	6.6	0.8	3.5	22.0	34.0
X ₂ (Year)	11.3	13.3	5.8	7.1	2.0	3.0	26.0	27.0
X ₃ (YTL)	6.410	23.590	3.610	10.838	1.800	12.000	19.600	64.000
X ₄ (YTL)	3.088	12.417	1.612	5.563	952	6.877	6.500	26.000
X ₅ (YTL)	285	250	457	509	0	0	1.875	1.800
X ₆ (YTL)	418	828	830	1.539	0	0	3.600	6.000
X ₇ (YTL)	300.656	853.091	29.674	732.587	21.821	95.470	1.317.660	2.881.250

1 YTL = 1.65 Euro

Table 2: Correlation coefficients among variables for groups

Variables	Y		X ₁		X ₂		X ₃		X ₄		X ₅		X ₆	
	-----		-----		-----		-----		-----		-----		-----	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II
X ₁	0.492*	0.547*												
X ₂	0.028	0.064	0.037	-0.050										
X ₃	0.903*	0.872*	0.392**	0.454*	-0.022	0.067								
X ₄	0.980*	0.973*	0.471	0.542*	0.030	0.040	0.884*	0.852*						
X ₅	-0.010	-0.03	0.022	-0.014	-0.015	-0.060	0.036	-0.010	0.019	-0.030				
X ₆	0.027	0.015	-0.238**	-0.211**	-0.133	-0.057	0.028	0.018	0.101	0.064	0.074	-0.095		
X ₇	0.539*	0.559*	0.878*	0.862*	-0.085	-0.048	0.474*	0.487*	0.520*	0.551*	-0.065	-0.087	-0.210	-0.210**

*p≤0.01, **p≤0.05 at significant level

Table 3: Regression analysis results for the models

Tomato cultivation							
land groups	β_0	β_2	β_4	β_6	R ²	F-value	Durbin-watson statistic
I	-18.4	0.146 (0.045)	0.811 (0.045)	-0.0034 (0.001)	0.97	682.3	2.29**
II	-16.8	-	0.859 (0.050)	-	0.82	292.9	1.51**

All coefficients are significant at the level 0.01 and standard errors are shown in parentheses, There is no autocorrelation between error coefficients both groups. For the first group is $d_w = 4 - 2.29 = 1.71 > d_u (1.53)$ ($*p \leq 0.01, n = 68$ and $k = 3$). For the second group is $d_w = 1.51 > d_u (1.28)$ ($p \leq 0.01, n = 32$ and $k = 1$)

ACKNOWLEDGMENT

Research was supported by The Turkish Tomato Paste Exporters and Producers Association.

REFERENCES

Allen, G.R., 1972. An appraisal of contract farming. *J. Agric. Econ.*, 23: 89-98.

Anonymous, 2003. Contract Farming Ventures in India: A Few Successful Cases. The Director General, National Institute of Agricultural Extension Management (MANAGE). SPICE. Vol. 1, No. 4. <http://www.manage.gov.in/pgpabm/spice/March2k3.pdf>. India.

Dicken, P., 1986. *Global Shift: Industrial Change in A Turbulent World*. 1st Edn., University of Manchester, London, Paul Chapman.

Eaton, C. and A.W. Shepherd, 2001. Contract Farming Partnerships for Growth. *FAO Agricultural Services Bulletin*, 145, Rome.

Glover, D., 1987. Increasing the benefits to smallholders from contract farming: Problems for farmers. *Organization and Policy Makers World Development*, 15: 441-448.

Glover, D., J.V. Braun and E. Kennedy, 1994. Contract Farming and Commercialization Of Agriculture. In: *Developing Countries*. 1st Edn., Johns Hopkins University. Press, Maryland, USA.

Minot, N.W. and J. Abbot, 1993. Contract Farming and Its Impact on Small Farmers in Less Developed Countries. In: *Agricultural Food Marketing In Developing Country: Selected Readings*. Abbot, J., (Ed.), Wallingford, UK.

Rawlings, J.O., 1988. *Applied regression analysis*. Wadsworth and Brooks Inc., California.

Rehber, E., 1997. The Relationship between farmers and food industry in Bursa region. *Uludağ University Agricultural Faculty, Scientific Researches*, No. 17, Bursa.

Salvini, E., 1995. Contract farming and organizational innovation in agriculture. *Rivista-di-Politica-Agraria, Rassegna-della-Agricoltura*, 13: 7-15

Singh, S., 2005. Contract farming for agricultural development review of theory and practice with special reference to india. *New Concept Information Systems Pvt. Ltd. Center for Trade and Development*. http://www.centad.org/download/workingpaper_Contract_%20farming.pdf.

Tatlıdil, F.F. and D. Akturk, 2004. Comparative analysis of contract and non-contract farming model in tomato production. *J. Agron.*, 3: 305-310.

Yamane, T., E. Alptekin, C. Aydin, M.A. Bakir and E. Gurbuzsel, 2001. *Foundation sampling methods*. Literature Publish. ISBN 975-8431X. Istanbul.