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## EVALUATING THE FACTORS OF TRANSITION IN ORGANIC COTTON PRODUCTION FOR FARMERS: CASE OF SALIHILI, TURKEY

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### Abstract

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In this study, organic cotton production and the factors of transition in organic cotton production are discussed via probit model. Conventional farmers' decisions are mostly effected by "desiring more income". However in this study, apart from "desiring more income" issue, the other factors are also evaluated. A survey conducted to 25 organic and 25 conventional cotton farmers in Salihli, Turkey. The differences between organic and conventional cotton farmers' are examined and some suggestions are given to encourage organic cotton production.

*Key words:* cotton, organic cotton, farmer's preference

### Introduction

Growing cotton organically entails using cultural practices, natural fertilizers and biological controls rather than synthetic fertilizers and pesticides (Guerena and Sullivan, 2003). The global organic cotton fiber supply has increased 392 % since 2000-01 harvest to 25,394 metric tones during 2004-05 crop years. During the 2004-05 harvest, cotton was produced in 22 countries with Turkey growing 40.0 %, India, 25.0 %, The United States, 7.7 % and China, 7.3% respectively. In 2005-2006, these four countries combined are projected to produce 79.0% of the global organic cotton fiber crop (Organic Exchange, 2006).

In 2006-2007, organic cotton was grown in 23 countries; Australia, Benin, Brasil, Burkina Faso, China, Egypt, Greece, India, Israel, Kenya, Kyrgyzstan, Mali, Pakistan, Paraguay, Peru, Senegal,

Spain, Tanzania, Togo, Turkey, Uganda, USA and Zambia. Four countries; Australia, Spain, Greece have new or previously unreported organic cotton production since 2004/05 (Organic Exchange, 2007).

International Cotton Advisory Committee Secretariat estimated that the world cotton use would increase by 3 % to 26 million tons in 2005-06 cotton seasons. World cotton consumption increased every year between 1998 and 2005, and the expansions now the longest and the largest on record (ICAC, 2006)

Organic cotton production started in Turkey in Kahramanmara° in the Eastern Mediterranean region 1989/90. The project was called Good Food Foundation and was followed by a second multinational project initiated in Salihli (Manisa) in the Aegean Region by Rapunzel, a German company (ICAC, 2003).

Most of the organic cotton producers in Turkey

are located around Sanliurfa, Aydin, Izmir and Manisa regions (MARA, 2007). During the period 1998-2004, the number of organic cotton producers increased from 59 to 346 and organic cotton production area increased from 806 to 7838 ha in Turkey (Aksoy and Dolekoglu, 2003; MARA 2006). In same the period, total organic cotton production increased 20 times. In Turkey, organic cotton production is 1.6 % of total cotton production in 2005.

There are 9 independent control and certification institutions in Turkey (IMO, SKAL, ECOCERT-SA, BCS, ETKO, ECOTAR, CERES, ICEA and ORSER). These intuitions give a certificate of produce in the name of ministry of Agriculture and Rural Affairs. These institutions prepare a file about the producers and the area of production and inform it to the Ministry of Agriculture and Rural Affairs. These controls are done twice a year with or without informing the farmers. In these controls, necessary soil and leaf samples are taken and analyzed. When certificated organic cottons are turned into yarn weaved and treated in the textile, they are again controlled by the institutions of control and certificated. The last process which is textile product is presented to the market as certificated. Thus the production is controlled and certificated in the process from seed to shelf. This system enables the traceability of the products.

In Turkey, there are a limited number of firms who deal with organic cotton production and these firms keep on production with limited number of farmers. Especially, financial and technical support forms a critical point in attracting independent farmers' attention to organic cotton production. For marketing of organic cotton in Turkey, consultants of private firms make an agreement with the producer by giving a stock exchange price and premium. The premium which is given to the producers by private firms, changes between 10 - 15 %. At the end of the season farmers give their products either to firms of cotton gin plants contractual with private firm or to the firm's itself directly. The firm exports the organic cotton fiber either directly or by turning it into textile production. A small quantity of the produced organic cotton fiber is presented to national consumption as textile

product.

The objective of this study is to find out the appropriate factors influencing the production of organic cotton by using a case study and to propose the possible ways of providing more farmers to produce organic cotton. In addition, the opinions of the farmers about this farming branch have been taken from both organic and conventional ones.

## **Materials and Methods**

This study was carried out in Salihli-Manisa, west Turkey which has a Mediterranean climate where July is the warmest month and January is the coldest month. Salihli is a town in the Manisa province and it has a mass production in total organic cotton in Manisa. Salihli is the second multinational project initiated in Turkey (ICAC, 2003).

25 organic cotton producers were interviewed who responded the questions voluntarily in Salihli. Also 25 conventional cotton farmers, who have similar land sizes with the organic farmers, were interviewed too. These farmers were chosen by quota sampling method. The general results were evaluated with frequency distribution and cross tables.

Analyses of organic cotton data obtained from cross-sectional surveys that involve organic production-producer relationships, both measurable and binary responses because of the categorical nature of the decisions made by farmers. Due to the discrete nature of such decisions however, qualitative choice models are useful analytical tools. The models that can be used for such cases include the probit model, the logit model and the linear probability model (Falusi, 1976). These models use different distributional assumptions to determine the probability that  $Y_i$  is 0 or 1. However, the linear probability model has three important weaknesses: the error term may exhibit properties of heteroscedasticity; it may also possess elements of non-normality; and the predicted value of the dependent variable may fall outside the unit interval. Jones et al. (1989) show that while generalized least squares (GLS) may circumvent the problem of heteroscedasticity, truncating the value of the depen-

dent variable through logit analysis does not resolve the problem. Probit is used in this study for a number of reasons. First, probit has the ability to generate bounded probability estimates for each observation (Anim and Lyne, 1994). Second, the probit estimator assumes that the underlying error term follows a normal distribution which is the same distributional assumption typically made for continuous variables.

**Probit model** is a popular specification of a generalized linear model, using the probit link function. Let  $Y$  be a binary outcome variable, and let  $X$  be a vector of regressors. The probit model assumes that

$$\Pr(Y = 1|X = x) = \Phi(x'\beta),$$

where  $\Phi$  is the cumulative distribution function of the standard normal distribution. The parameters  $\hat{\beta}$  are typically estimated by maximum likelihood.

While easily motivated without it, the probit model can be generated by a simple latent variable model. Suppose that

$$Y^* = x'\beta + \varepsilon,$$

where  $\varepsilon|x \sim \mathcal{N}(0, 1)$  and suppose that  $Y$  is an indicator for whether the latent variable  $Y^*$  is positive:

$$Y \stackrel{\text{def}}{=} 1_{(Y^* > 0)} = \begin{cases} 1 & \text{if } Y^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

Then it is easy to show that

$$\Pr(Y = 1|X = x) = \Phi(x'\beta).$$

In this frame, the transition of the farmer to organic cotton production has been analyzed by Probit modeling. In this modeling, the conventional and organic farmers are basically taken as the dependent variable. Organic farmers are coded as 1 and the others 0. As independent variables; the age of the farmer, education period, experience in cotton farming, the share of cotton field in the total farming area, income level, membership of a cooperative, ownership in land and the amount of cotton field are taken.

## Results and Discussion

### *General Characteristic of the Farms*

In this study, average organic cotton production area in organic cotton farms was 11.50 ha and average yield was determined 3 310 kg/ha. The ratio of cotton production area in total production area was 38.1 %. Average conventional cotton production area in conventional cotton farms was 9.29 ha and average yield was determined 4 050 kg/ha. The ratio of conventional cotton production area in total production area was 29.3 %. The yield of the cotton is higher in conventional farms than the organic farms. This yield loss is very high in transaction period, in the following years this loss decreases related to climate and land's conditions.

The Research Institute of Organic Agriculture has analyzed the impact of organic cotton production on the livelihoods of farmers in India. The research results show that organic farms can achieve similar yields as conventional farms, but at lower production costs and without burdening the soil and the environment with chemical fertilizers and pesticides. Due to these cost savings and the organic price premium for cotton, the organic farmers achieved considerably higher incomes than their conventional neighbors (Perschau, 2007).

In the farms that organic cotton is produced, in addition to organic cotton (37 %) organic wheat (34.9 %), organic vineyard (4.6 %), organic olive oil (4.6 %), organic chick pea (1.8 %) are grown and on the rest conventional farming is done.

In the farms that produce conventional cotton (29.3 %) as well as conventional wheat, vineyard and olive are done. Farmers use biological control mechanisms to control pests and weeds in the organic cotton farms. Also, farmers use livestock manure for plant nutrition.

### *General Characteristics of the Farmers*

It is determined that the average age and the number of family members are more or less similar in both

**Table 1**  
**General characteristics of the farmers**

	Organic Cotton Farmers	Conventional Cotton Farmers
Average Age	46.6	45.6
Average Education Period	6	8
Average Number of Family Member	5	4
Average Period of Agricultural Experience	31.6	24.9

conventional and organic farming families. On the other hand, the average education duration is longer in conventional families comparing to organic ones. In general, when the agricultural experience is observed, it is determined that the experience of the organic ones is higher than the conventional ones (Table 1).

#### ***Organic Cotton Farming Practices in the Farms***

The organic agriculture farmers generally complain about lack of knowledge about organic farming, insufficient premium supports, and some difficulties due to storing without using chemicals for preserving products after cultivation. The farmers stated some problems in organic cotton cultivation. These are; organic cotton farming is not prevalent, to control weed hoeing is frequent and difficult. Farmers also added that in controlling pests and weeds, necessity to use acceptable chemicals on time is difficult, this cause lots of problems. The farmers stated that 64 % of them not change the organic cotton planting area, 24 % of them have not decided about the size of the area, 8 % of them would increase and the rest would decrease the area in the next season. All of the organic cotton farmers get the knowledge about marketing through private firms.

#### ***The Opinions of Conventional Cotton Farmers about Organic Cotton Production***

In the study, 23 % of conventional cotton producers stated that "I can start organic cotton production if the conditions are all right", 23 % "production should be motivated and should be more prevalent",

23 % "if there is a high priced marketing guarantee, I can start production" and the rest of them, "I can start production if technical knowledge and governmental support are given for organic production". Conventional farmers are mostly getting some information about marketing especially from private firms, their own researches, agricultural engineers, their neighbors and relatives.

#### ***An Evaluation on the Factors of Variables in Organic Farming Decision***

The reason of transition to organic cotton farming, the farmers conveyed that higher prices and market guaranteed selling compared to conventional one. A similar case has seen in a survey held in Tanzania. In this study, the rise of the farmers' income who signed the contract caused the shift of the conventional farmers to organic farming. For this reason, 112 farmers have registered for organic farming in 2007/08 season (Schwaller, 2007)

Although Turkey is one of the first countries that started to organic cotton farming, it still hasn't at a desired level. The first reason for this is that the insufficiency of the conventional farmers about organic farming and the disquiet on the future of this way of farming. For this reason, cotton farming experience of the farmers is also determined as a variable which affects the adoption of organic cotton farming adding to the socio economical conditions of the farmers. To this end, the estimated Probit model is given in the following table (Table 2).

The variables in the model explain the organic cotton decision in the ratio of 80 %. According to the model, the age of the farmers affects the transition in

**Table 2****The probit results of the factors that effects organic farmers' decision**

Depended Variable: (Organic Cotton Producers :1, Conventional Cotton Producers : 0)				
Conventional Cotton Producers : 0)				
Independent variables	Factor	Standard error	t-Statistic	$\alpha$
Constant	1 169 596 793	0.26993410	4 333	0
The age of farmer	*0.1004430162E-01	0.41816186E-02	2 402	0,0163
Education	*-0.3533990817E-01	0.11217859E-01	-3 150	0,0016
Experience on cotton farming	*-0.1668917140E-01	0.43346248E-02	-3 850	0,0001
the share of cotton field in the total farming	-0.2088126152E-02	0.24979925E-02	-0,836	0,4032
Income level	-0.3651404632E-01	0.78650605E-01	-0,464	0,6425
Cooperative Membership status	*-0.6509487491	0.1912904E-01	-7 947	0
Ownership in land parcel of cotton field	-0.5151177262E-02	0.39181651E-03	-1 315	0,1886
	0.4004022783E-03	0.9951179E-03	0,402	0,6874

\*  $\alpha = 0.1$  is statistically significant

R-squared=0.833715

Adjusted R-squared =0.80127

Log-L = 8.5617

F[8.41]=25.70\*

the organic farming positively. As the age rises, the possibility of shifting to the organic farming rises. The duration of education affects the transition in the organic farming negatively. In other words, the as length of the training rises their adoption to organic cotton farming becomes more difficult. Although this can be seen as a contradiction, it can be connected with the effective factors on farmers like; this is a new way of farming and there is no marketing formation yet. Because of this, it is necessary to give priority to the trained farmers in the studies of raising the number or organic cotton farmers.

The cotton farming period of the farmer effects the transition in organic cotton farming negatively. As the cotton farming experience increases, the persuasion of the farmer to shift organic cotton farming becomes more difficult. With the increasing experience in time, the farmer increases the yield. It is difficult to convince the farmer whose yield is high to shift to organic

cotton farming. This can be commented as the need of more premiums for organic cotton farming and technical support for the farmers who have less experience. As a result, the experienced farmers should be persuaded that they can have high yield with their experience and can have higher income due to the higher prices with organic cotton farming.

The total amount of field, the share of cotton field in the total farming, ownership in land and the parcel of cotton field are factors that don't effect the farmers' decision transition in organic farming.

Being a member of a cooperative is accepted as a factor for adoption to organic cotton farming. Shifting to organic cotton farming is easier for the farmers who are not a member of a cooperative. The reason is; these farmers are more sensitive to the supports like technical knowledge and income ensuring supplied by private firms.

The income level of the farmer doesn't affect the decision of shifting to organic cotton farming.

## Conclusion

Cotton farming provides livelihood for many million smallholders in developing countries. Over the last decades, many conventional farmers have been facing declining cotton yields despite increasing application of chemical fertilizers and pesticides. Increased input costs and decreasing marginal returns have led many cotton farmers into indebtedness. Organic cotton farming could be a way out of this situation, provided it effectively improves the ecological and socio-economic sustainability of cotton production. While the ecological benefits of producing cotton organically are evident, so far only few data have been available on the actual impact that the conversion to organic farming has on the farm economy. The main results with this survey are given below.

It is noted that the farmers do not claim to continue their experiences of cotton farming with the organic farming. This can be explained with the lack of knowledge of the farmers about both this way of farming and the effects of organic farming on human and environment. The farmers should be informed that they can produce healthier yield with the way of farming not by using the chemicals which have harmful effects on health and environment by governmental institutions, non governmental organizations (NGO's), certification bodies and universities and "pilot farmer" application is essential. For example, At least 20,000 people in developing countries die every year from poisoning by agricultural pesticides and 3 million suffer acute reproductive after effects (with a further 200,000 committing suicide using pesticides each year). In the small West African State of Benin one of the world's poorest countries, cotton pesticides killed at least 61 men, women and children between 1999-2001 (Ferrigno, 2004). In this scope, it is suggested for the firms which produce organic products, to make demonstrations with the aim of getting the farmers to accept this form of farming. In organic cotton rotation; determining proper products for the area which are able to market, make an increase on farmers' income and conveying information to the farmers are quite important.

The main purpose of making organic products as well as organic cotton consumption are being widespread; defining people of the affirmative effect of the organic cotton both to human health and to the environment.

Lastly, in lower income leveled areas, achieving rural development it can be suggested to be widespread the organic cotton that some applications could be done within the governmental support.

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