A STUDY OF THE COTTON SECTOR OF TURKEY: IMPLICATIONS FOR U.S. COTTON EXPORTS Srinivasa Konduru California State University Fresno, CA Fumiko Yamazaki Mechel Paggi Center for Agribusiness

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<u>Abstract</u>

Cotton is one of the most important crops in the world and is grown in about eighty countries. While China, India and the US produce more than two-thirds of the total cotton worldwide, the US is the biggest exporter of cotton. Among the importers, China followed by Turkey, are the top two importers (FAOSTAT). Though many studies have been done on Chinese cotton and textile markets, the Turkish market for cotton has been relatively less studied. The objective of this paper is to assess the cotton production and marketing system in Turkey. The assessment is focused on current conditions and perspectives on potential trends in production, consumption and trade. The focus is on developing an estimate of costs of production with a view towards developing a representative farm model for Turkish cotton production. The representative cotton farm model will be used in a stochastic simulation model to examine the effects of changes in critical variables like policy changes on farm level profitability. The paper analyzes the profitability of Turkish cotton farm in the event of Turkey acceding to European Union (EU). The results show that the profitability increases if Turkish government follows its own support programs along with support from EU Common Agricultural Policy (CAP). The results also show that the profitability in cotton farming will be lost if government support is withdrawn for cotton farmers. The paper concludes that Turkey will remain a very important destination for US cotton exports in the future.

Introduction

Cotton is one of the most important crops in the world and is grown in about eighty countries. While China, India and the US produce more than two-thirds of the total cotton worldwide, the US is the biggest exporter of cotton. China is the biggest import market for US cotton followed by Turkey (FAOSTAT). But, recently Turkey for the first time has become the biggest importer of cotton from US even surpassing China as Chinese buyers are looking for more yarn purchases rather than raw cotton (Prentice, 2013). Though many studies have been done on Chinese cotton and textile markets, the Turkish market for cotton has been relatively less studied. Cotton production in Turkey is relatively meager; in 2013 it is estimated to produce 2.3 million bales. But the consumption of cotton in Turkey is estimated to be around 6.2 million bales, thereby making it dependent on cotton imports. Investment in irrigation and infrastructure, particularly to build dams and irrigation channels in the Southeastern Anatolian region are expected to lead to significant increases in cotton acreage. In addition to these policy changes, Turkey would like to join European Union (EU) in the future, which would lead to changes in its agricultural policies such as the support that is given to cotton farmers. The objective of this paper is to assess the system of cotton production and marketing in Turkey. The assessment will focus on current conditions and perspectives on the potential trends in production, consumption and trade. The focus of this paper is to develop an estimate of costs of production and thereby develop a representative cotton farm model of Turkey. This model is further used to examine the effects of changes in critical variables like support payments on farm level profitability.

In the following section, a brief description of the cotton sector of Turkey is presented including the developments in the southeastern Anatolian region and the cotton policy differences between Turkey and EU. The third section provides a discussion of the data collection and methodology for this study. The final section discusses results and provides conclusions.

Cotton Sector in Turkey

Cotton is an important crop for Turkey and it ranks eight in the world in term of cotton production. In 2011-12, Turkey had a 2.7% share of total cotton production, 5.4% of total cotton consumption and 5.4% of total cotton imports in the world. The cotton production in Turkey in 2013 is estimated to be in 330,000 hectares and is

expected to yield around 2.3 million bales, much less than previous years (see table 1). But the consumption of cotton in Turkey in 2013 is estimated to be around 6.2 million bales, thereby making it dependent on cotton imports. The textile industry is one of the most important sectors for the Turkish economy, accounting for 8 percent of GNP, 16 percent of industrial employment and 17 percent of total exports. To meet the needs of the textile industry, Turkey imported about 3.3 million bales in 2012 and is estimated to import 2.3 million bales in 2013. The US is the leading exporter of cotton to Turkey followed by Greece, Brazil and Tajikistan in 2012.

Cotton is grown in three main regions in Turkey, the Southeastern Anatolian (GAP) region, Aegean region and Mediterranean region. The cotton acreage in these areas in the last decade is given in table 2. The cotton growing area in the Aegean region has been decreasing, whereas the cotton area in the GAP region has increased in the last two decades due to major investments in that area particularly in irrigation projects. The Turkish government has spent more than US\$25 billion over the past three decades on Southeast Anatolia (GAIN Report, 2013). It is estimated that once the irrigation projects are completed, about 1.3 million hectares of land will be irrigated, which could eventually increase cotton planting and production in the region.

The government of Turkey considers cotton sector to be very important as it contribution to the economy is quite large. Apart from various support activities to the textile sector, it also provides considerable support to cotton farmers who produce the raw material for the textile sector. The government provides a support of \$0.24 per kg of seed cotton, which includes the premium payment for cotton, subsidies to diesel and fertilizers that are given to farmers.

Year	Area (000ha)	Production (000 tons)	Kg/ha
2003	637	2346	3681
2004	640	2455	3836
2005	564	2240	3971
2006	590	2550	4324
2007	530	2275	4294
2008	495	1820	3678
2009	420	1725	4108
2010	480	2150	4475
2011	542	2580	4761
2012	489	2320	4740

Table 1: Cotton Area, Production and Yield in Turkey 2003-12.

Source: Turkstat

Table 2. Region wise cotton area in Turkey 2003-12 (000 ha)

	GAP	Aegean	Mediterranean	Total
2003	300	195	134	629
2004	325	168	139	631
2005	295	138	108	541
2006	310	147	130	587
2007	292	116	119	527
2008	313	81	99	494
2009	236	80	103	419
2010	288	83	109	480
2011	314	97	130	541
2012	302	83	103	488

Source: Turkstat

Accession of Turkey to EU

The accession of Turkey to EU is an issue that has been discussed for a long time. Turkey was accepted as a candidate for EU membership following the Helsinki European Council of December 1999, and formal accession negotiations with Turkey started in October 2005 (Leeuwen, et al. 2011). The accession of Turkey to EU may lead to the adoption of EU Common Agricultural Policy (CAP) by Turkey, which is expected to impact the agricultural sectors of both the EU and Turkey. The Turkish government may have to restructure its support payments to its farmers according to the CAP regime. Presently, the Turkish government pays 0.24/kg of seed cotton to farmers, but as per EU CAP, it may pay only \$0.16/kg of seed cotton in line with what EU pays to its cotton farmers in neighboring Greece. The Turkish government may also devise another plan whereby it pays 0.16/kg per the EU CAP regime along with a country specific envelope payment of 0.24/kg taking the total payment to Turkish cotton farmers to 0.40/kg in the event Turkey accedes to EU.

Data Collection and Methodology

Data Collection

Data was collected in two cotton producing regions of Turkey namely Aegean and Mediterranean regions. Rapid Rural Appraisal (RRA) methodology has been adopted to collect information, where in a multidisciplinary team conducted focus group discussions in various villages to get information and develop hypotheses. In each state, information was collected from focus groups in different villages and the information was aggregated. There were a total of five focus group discussions conducted with three around the city of Adana and two around the city of Izmir in summer of 2013 (See Figure 1). Each focus group constituted about 5-7 farmers and a survey instrument was used to provide structure to the discussion. Table 3 provides summary information on the cost of cultivation collected in all the focus group discussions. The data gathered from the two regions is aggregated to obtain a countrywide representative cotton model. The cost of production of cotton in Turkey is \$1479 per acre, whereas the revenue is \$1725 per acre. The price includes a government support payment of \$0.24 per kg of seed cotton. So, with a yield of 2000 kg/acre, the cotton farm has a profitability of \$246 per acre. The gross profit excludes returns to family labor and managerial compensation. The cost of production in the above table does not include transportation expenses from farm to processor. In all the locations, the buyer/broker who buys cotton from the farmers is responsible for the transportation and he also performs quality checking at the time of transaction. Almost all the transactions of the farmers are with private dealers who in turn may represent cotton ginners.



Figure 1: Map of Turkey

Cost of Cultivation	\$/acre
Land Rent	498
Land Preparation	120
Cost of Seed	50
Planting	20
Hoeing	70
Fertilizer and its application	179
Miscellaneous	8
Irrigation and labor expenses	68
Pesticides (Insecticides, herbicides, fungicides, etc.)	129
Harvesting	159
Transportation	20
Total Expenses	1321
Misc. Exp. (3%)	40
Interest Expenses (9%)	119
Total General expenses	1479
Yield per acre (KG/Ac)	2000
Price per Kg	0.86
Revenue	1725
Profit	246

Table 3. Cost of Cotton Cultivation and Gross Profit in Turkey (\$ per Acre)

Methodology

Stochastic simulation models are used to generate a large random sample of outcomes for a dependent variable where that dependent variable is a function of some selected set of explanatory variables. A unique feature of these types of models is that there is an explicit recognition that the independent variables have some probability distribution around their mean values.

The forecast of the dependent variable is thus a function of the probability distributions of the explanatory variables as well as their mean value. The simulated distribution of the dependent variables thus captures the variability or risk associated with forecasting the dependent variable that cannot be obtained by using simply the mean value of the explanatory variables. If the explanatory variables are uncorrelated an appropriate univariate probability distribution is chosen (e.g. normal, Poisson, empirical, etc).

It is also possible to capture the joint variability of two or more correlated explanatory variables on the dependent variable. The joint variability can be captured by determining the multivariate probability distribution (e.g. multivariate normal, multivariate empirical, etc.) for the two or more correlated explanatory variables. The multivariate probability distribution is developed much the same as the univariate probability distribution but includes information in the correlation matrix to account for the correlation between the independent variables. The determination of the appropriate probability distributions and the construction of stochastic models are followed from Richardson (2010).

The simulated forecast of dependent variables using either univariate or multivariate probability distributions of the explanatory variables is very useful in informing decision makers of the variability or risk in the dependent variable forecast, the skewness of the forecast, and the probability of a specific outcome for the dependent variable. Most stochastic simulation models have more than one dependent variable. The dependent variables in a stochastic simulation models are often referred to as Key Output Variables (KOV's).

From the sample of farms in the rapid assessment study, the impact of accession of Turkey with EU on the profitability of Turkish cotton farms can be analyzed. The Turkish cotton representative farm simulation model has been developed using information collected through focus groups. Representative farm models are stochastic simulation models that are used to analyze the impacts of current and changing market conditions and government policies on a number of KOV's. Examples of KOV's in a representative farm models are yearly net income, cash flow position, and financial ratios such as debt to equity or liquidity, and net present values of net income.

These models can be used for several purposes. They simulate the producer's income statement, statement of cash flows, and balance sheet as well as any financial indicator calculated from those three statements. From there we can analyze the impact a new policy may have on a producer's net income or net present value prior to implementation. They can also determine the impact a change in production practices may have on the producer's financial statements prior to actually changing practices. In other words, these models act as decision-making tools. The models are constructed in a way that allows for easy analysis of several variables.

By using a stoplight chart, one of the graphical capabilities of the model, we can compare probabilities for one or more alternatives for the target values of net present values of net income. In order to generate the stoplight chart, two value targets, lower and upper, are chosen from observed returns. The stoplight function calculates the probabilities of: (a) exceeding the upper target (green), (b) being less than the lower target (red), and (c) observing values between the targets (yellow). In this study, the stochastic simulation models are used to analyze the impact of accession of Turkey to EU on the net income of the representative cotton farm in Turkey. The analysis forecasts the net income for a period of two years from 2014-15. This paper analyzes whether the accession of Turkey to EU will change the profitability of cotton farms in Turkey. It analyzes a scenario in which the Turkish government payments are substituted with EU payments and compares it with a baseline scenario. The paper also analyzes another scenario in which both Turkish government payments and EU payments are given to Turkish cotton farmers is also analyzed.

Results and Conclusion

In the baseline scenario, the profitability of the representative cotton farm in Turkey is analyzed when the Turkish government pays 0.24/kg of seed cotton as income support. In scenario I, when Turkey accedes to EU, the EU CAP payments of \$0.16/kg of seed cotton replace the Turkish government payments. In scenario II, The cotton farmers in Turkey receive the Turkish government support of 0.24/kg along with the EU CAP payments of 0.16/kg as it is assumed that Turkey will pay its farmers from its own resources as part of country specific envelope. The scenario III is a depiction of the profitability of cotton farm in Turkey when no support is given to them. The income, cost of production and gross profit of all the three scenarios along with the baseline scenario are given in table 4.

The results of the simulations of baseline model and scenarios are analyzed for any differences in the revenues, cost of production and gross profit for years 2014 and 2015. The two-year forecast shown in Table 4 estimates that the gross profit of the farmers decreases by about 85 percent when EU payments substitute Turkish government payments. But, the gross profit increases by more than 1.5 times when EU payments are made along with Turkish government payments. In the scenario, in which the Turkish cotton farmers do not get any support, the gross profit decreases by almost 2.5 times and the cotton farm makes a loss of \$300 per acre. The charts in Figure 2 provide a comparison of the simulated probability distributions of net present value of sum of net income after taxes per acre in years 2014 and 2015 of all the scenarios. The removal of all the support payments in scenario III increases the probability of earning a net income of greater than \$2500 per acre by 43 percent over the baseline scenario. The probability of earning a positive net income of greater than \$2500 per acre increases by 34 percent in the scenario II where EU payments are made along with Turkish government payments.

Simulated Average of 2014 and 2015 (\$ Per Acre)	Baseline	EU payments	EU + Turkey payments	No Payments
Income	1140	975	1472	646
Production Cost	946	946	946	946
Gross profit	194	29	526	-300

Table 4. Comparison of results of various scenarios with baseline forecast



Figure 2. Stop-light Charts for baseline and other scenarios

Conclusion

In this paper we have analyzed the cotton sector of Turkey and the profitability of a representative Turkish cotton farm. Over the years, cotton cultivation area increased in the GAP region and decreased in Aegean and Mediterranean regions due to various reasons. The investment in irrigation infrastructure in the GAP region increased the irrigated land, which led to increase in the cotton cultivation area. The decrease in cotton area in Aegean and Mediterranean regions can be attributed to competition from other crops like corn and soybeans. Corn has recorded almost similar returns to that of cotton with much less reliance on government support in some regions. In order to understand more details about the shift in cropping patterns, further analysis needs to be done to understand the profitability of other substituting and competing crops of cotton in Turkey.

The paper also analyzed various scenarios if Turkey accedes to EU in the future. The returns to cotton farmers increase if Turkey follows the EU CAP payment regime that are being given to cotton farmers in EU countries along with its own country specific envelope payments. The returns will decrease if EU CAP payments replace the present Turkish government payments. In the case of no government payments to cotton farmers in Turkey, the cotton cultivation is no longer profitable, which shows the importance of government support to cotton farmers and to maintain cotton production in Turkey. On the consumption side, due to increased investments in the textile sector and its importance to the economy, Turkey is going to be a net importer of raw cotton, thereby keeping up the market for US cotton exporters. With China reducing its purchases of raw cotton, Turkey is likely to be become a much more important international destination for US cotton in the future.

Acknowledgements

The authors like to acknowledge the financial support given by Cotton Incorporated, support and participation of Dr. Jeanne Reeves in the project, cooperation and logistical support given by Dr. Fehmi Gulyasar of Set Tohumculuk, and Center for Agribusiness (CAB), Fresno for supplemental funding.

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