Original Research Article

Cost Analyses of Cotton Production in Tajikistan

Şule Turhan[1*] and Mukim Siamardov[1]

[1] Bursa Uludag University, Agricultural Faculty, Department of Agricultural Economics, Görükle, Bursa, TURKEY

ABSTRACT

As an agricultural country, in Tajikistan approximately ¾ of the population live in rural areas where agriculture remains the main activity. Tajikistan's agriculture sector accounts for the largest share of the country's economy and cotton ranks as the main product in the sector. Economically expensive, cotton also called "White Gold" is a product with great economic importance for the producing countries due to its widespread consumption and attributes to be used in several areas, as well as its capacities at creating added value and employment opportunities. Nowadays, cotton is produced almost all parts in Tajikistan. Annual production capacity turns arround 386 508 tons of cotton in Tajikistan. The positive developments occured in the production system help to improve the socio – economic live of producers in the country. In this study, the production costs of cotton grown in Tajikistan's Khatlon Region were calculated. The results that obtained in cotton production shows Average productivity (as 2200kg / ha), gross production value is ($ 1232 / da), gross profit is ($ 664.42 / ha), and net profit is ($ 88.88 / ha).

Keywords: Cotton, Tajikistan, economic, cost

INTRODUCTION

Cotton is an agricultural plant, The fruits of the Mallow family grow in three, four and five species in warm climates. (Anonim 2019). Cotton is produced in approximately 146 475 hectares of land in Tajikistan. Cotton cultivation and production are carried out in three main regions of Tajikistan (Khatlon, Soghd, republican sub-administration areas). Cotton cultivation and production cannot be done in the country only in one region (Badakhshan) because it is mountainous and cold. The most suitable region for cotton production is the Khatlon Region. Because the climatic conditions in the region are very suitable for cotton production. The quality and productivity of cotton in this region is quite high compared to other regions. Approximately 90% of the inhabitants of the region are engaged in agriculture, especially cotton production because of the small number of industries and factories. It has become traditional to grow cotton in the country. Khatlon Region has the largest share in cotton production in the country with its production of 119 550 hectares (Anonim 2018). In this study, cotton production, which is an important product for Tajikistan's economy, and the demographic structure of the producers were examined as a result of the survey studies conducted in the Khatlon Region. Cotton production costs were calculated.

MATERIALS and METHODS

In the research, a questionnaire study was applied with the enterprises producing cotton in Vakhsh Province, Khatlon Region of Tajikistan. Data on production and product costs were obtained and evaluated. Survey data cover the 2017 - 2018 production period. According to the statistical reports made by the Tajikistan Statistics Committee, the number of cotton producing agricultural enterprises registered in the research region on January 1, 2017 was 510. As a result of the analysis conducted with 510 enterprises producing cotton registered in the research region (with 90% sampling size reliability), it was determined that 81 samples represent the main population by using the simple random sampling method formula given below (Cohen 1988, Atış 2001, Neuman 2006, Vural 2011).

$$\frac{(Z^2 * \frac{(1-p)}{e^2})}{1 + Z^2 * \frac{p(1-p)}{e^2 N}} \text{ (Sampling formula)}$$

---

* Corresponding author e-mail:sbudak@uludag.edu.tr

The survey was carried out in the form of individual interviews. Questions asked in the survey were designed to collect information on age, education, number of households (size of the house, number of employees and non-business employees) and the size of the enterprise, irrigation amount, spraying etc. (Gürbüz and Modassır 2019) Expenditures were calculated using the partial budget analysis method. Therefore, the income - expense situation is calculated only for the cotton product produced in the enterprise. Partial budgeting process takes into consideration average yield, gross production value, fertilizer and fertilizer expenditures, all variable expenditures and net income (Özkan 1997, Yılmaz 2012, Yılmaz and Gül 2015). Since partial budget analysis is used in the study, even if the producers use their own machines, unit machine rent is taken as a basis. In the study, 3% of the total variable expenditures were taken as general administrative expenses. Circulating capital interest constitutes the opportunity cost of capital invested in production activities as a variable cost. Calculations were made by taking the interest rate (3%) used for the production credits of the agricultural plants in the region as the circulating capital interest. The annual depreciation of cotton plant expenditures is calculated by dividing the total facility costs during the facility period by the economic life of the cotton plots (one year) (Bursa and Ercan 1992).

The profitability of cotton production in cotton producing enterprises has also been found. Gross production value per unit area was obtained by multiplying total income (cotton fiber, seed oil, fodder, etc.) by unit price in cotton production. The gross profit is calculated by subtracting the variable costs from the gross production value of cotton. Net profit from cotton production was also calculated by subtracting total fixed expenses from gross profit.

RESEARCH FINDINGS

The villages where cotton production is made intensively in the research area and the number of surveys applied in these villages are given in Table 3.1.

Table 3.1. Surveyed villages.

Villages	Frequencies (f)	Percent (%)
Cavoni	5	6,2
Dehkanabat	6	7,4
Gülbog	8	9,9
İstiklal	10	12,3
Sultanabat	2	2,5
Şerozi Gagarin	1	1,2
Şahriyor	21	25,9
Şahriyor – 1	17	21
Şahdrez	8	9,9
Viyon	3	3,7
Total	**81**	**100,0**

The demographic characteristics of the producers participating in the survey are given in Table 3.2. According to the results obtained within the scope of the research, the age group of the farmers in cotton enterprises varies between 21 and 65 years. The density of households is between 4-6 people (49.4%). Some families were found to be very crowded (16+) in the examinations. Because two or three families work together in a business.

Table 3.2. Distribution of participants according to characteristics.

Age Groups	f	%	Number of family members	f	%
21-30	12	14,8	1–3	5	6,2
31-40	18	22,2	4–6	40	49,4
41-50	29	35,8	7–9	16	19,8
50+	22	27,2	10–12	17	21,0
Total	**81**	**100**	13–15	2	2,5
Education level	**f**	**%**	16+	1	1,2
Primary school	1	1,2	**Total**	**81**	**100**
Secondary school	57	70,4	**Farmers' agricultural experience**	**f**	**%**
High school	3	3,7	1-10	21	25,9
University	20	24,7	11-20	41	50,6
Master degree	00	00,0	21-30	17	20,9
Total	81	100	31+	2	2,6
			Total	81	100

Those with a small number of family members are those who have small business with 1 - 3 people, that is, those with a business size of less than 1 (0.5) hectare. When the education levels of the producers participating in the survey are examined, secondary school graduates take the first place with a rate of 70.4%, and undergraduate graduates take the second place with a rate of 24.7%. Some of the farmers with bachelor's degrees are graduates of agricultural universities and some are retired farmers from the Ministry of Agriculture. When the experiences of the producers in the field of agriculture are evaluated, producers with 16-20 years of experience are in the first place with a ratio of 33.3% (Table 3.2.).

The total agricultural income levels of the producers are given in Table 3.3. 23.5% of the producers have an income of 51 000 TJS (Tajikistan Somonis) (5408.27 $) and above.
The farmers were also asked about their income levels outside of agriculture. As can be seen in Table 3.4, 82,7% of the producers also earn income from non-agriculture.

Table 3.3. Agricultural Income of Producers.

Income	f	(%)
5000 TJS(**530,22$**) – 10 000 TJS(**1060,45$**)	13	16,0
11 000 TJS(**1166,49$**) – 20 000 TJS(**2120,89$**)	15	18,5
21 000 TJS(**2226,94$**) – 30 000 TJS(**3181,34$**)	14	17,3
31 000 TJS(**3287,38$**) – 40 000 TJS(**4241,78$**)	9	11,1
41 000 TJS(**4347,83$**) – 50 000 TJS(**5302,23$**)	11	13,6
51 000 TJS(**5408,27$**) ve Üzere	19	23,5
Total	**81**	**100,0**

1$ = 9.43 TJS

Table 3.4. Non-Farm Income of Producers.

Income	f	%
No Income	14	17,3
5 000 TJS(530,23$) – 10 000 TJS(1060,45$)	19	23,5
11 000 TJS(1166,49$) – 20 000 TJS(2120,89$)	34	42,0
21 000 TJS(2226,94) – 30 000 TJS(3181,34$)	11	13,6
31 000 TJS(3287,38$) – 40 000 TJS(4241,78$)	3	3,6
Total	**81**	**100,0**

1$ = 9.43 TJS

When Table 3.5 is examined, it has been revealed that 98.8% of the producers use family labor. In general, the daily workforce was used extensively during the Soviet Union. However, according to the new system, most producers do not work in other businesses other than their own.

Table 3.5. Labor.

Workers	f	%
Family members	80	98,8
Casual worker	1	1,2
Total	**81**	**100,0**

According to the survey results, 100% of the cotton harvest is done manually. Harvesting is preferred to be done manually in order not to spoil the quality of cotton. In addition, 76.5% of the producers prefer Dehkan Farm - Private Farm. The new system is a good system for producers and the better the farmer works, the more profit producer gets. But they must have personal tractors and other agricultural machinery. 23.5% of them prefer the Soviet system, namely Kolkhoz and Sovkhoz. Because this producer group does not prefer the new system as they do not have their own tractors and other agricultural machines. Because in the time of the Soviet Union, all expenses belong to Kolkhoz and Sovkhoz.

The Khatlon Region located in the southwest of Tajikistan where we conducted the study and Vakhsh Province in this region are defined as the region where cotton production is made the most. According to statistics data of 2017, cotton was produced in a total area of 9500 hectares in Vakhsh Province. Total cotton production amount is 21 000 kg / ton according to the same statistical reports (Anonim, 2018).

As a result of face-to-face survey interviews, it was determined that all cotton producers in the region own their lands. In the data we obtained within the scope of the research, there are no rental lands in Vakhsh. Considering that rental prices are effective in cotton production costs, the average land rents per hectare in the research area were found to be 530$. If the land is rented and used in cotton production, other expenses (water taxes, annual field tax, etc.) belong to the landowner. The tenant will only pay the annual rent of 530$ per hectare.

Since the cotton plant is an annual agricultural plant, the costs of the facility period are made in each production year. According to the studies, plowing and processing costs were found to be on average 211$ per hectare. Since cotton plants are grown in hot climates, irrigation is done 6 or 7 times a year. Sometimes it is seen that it was done 9 times in very hot regions. Irrigation costs are also calculated annually. Approximately irrigation continues for one or two days and labor costs are calculated as 6.37$ / day.

The types and amounts of fertilizers used in cotton production are calculated per hectare per year. Generally, there are two types of fertilization; organic fertilization and artificial fertilization. Organic fertilization is very rare. Only artificial fertilization is observed in the province where the research was conducted. In general, artificial fertilization for cotton production is done twice in a production period. Two types of fertilizers are used in artificial fertilization. These are nitrogen fertilizer (UREA) and ammonium nitrate. An average of 143kg per hectare is used annually from the two types of manure and the fertilizer purchase price is 61 $ / kg.

Recently, different pests and diseases are proliferating in the cotton sector due to climate change. Therefore, chemical drugs are used in liquid and powder form to get rid of pests and diseases. Approximately, the cost of chemical pesticide is $ 45 per hectare.

Weed control and hoeing takes place 3 or 4 times in a production period in cotton producing fields. No chemical pesticides are used to combat weeds. The fight against weeds is carried out manually (by hoeing) directly by the workers, ie members of each enterprise. Labor costs incurred during hoeing is in cash, on average, $ 48 per hectare. In the enterprises, the cotton area planted for hoeing is distributed according to the regions according to the number of members. For example, each member is only responsible for his own area during hoeing or other maintenance work. In addition, at the end of the production period, members collect cotton trees in their own fields and sell them as wood and earn an average of 101 $ profit. This means that a worker earns an annual profit of $ 149 on average cotton from hoeing and from the cotton tree. Cotton harvest is not included in this calculation. Since the cotton plant is a very sensitive plant, the soil should be softened. The tractor rent for the softening process was found as an average of 6.37 $ per hectare. The farmer arranges his own gasoline for this process. Softening cost is calculated together with the version part.

Cotton picking is done manually in the research area only. Cotton harvest varies between 3 and 5 a year. Harvest time varies according to the type of cotton, climatic conditions and planting time. Harvesting should begin when the cotton cocoons are about 60% open. One of the most important issues to be considered during harvest

time is that cotton is not collected with wet and trash. In other words, cotton should not be collected very early in the morning. Because cotton is wetter and it is not possible to collect it in rainy times. Finally, while collecting cotton, care should be taken that it is not collected with the leaves. As mentioned above, the worst enemy of cotton is rain. It is not possible to enter the field and harvest after rains. Cotton wool is kept on the plant to dry. One of the other important processes of cotton is baling. Cotton should not be damp and not raw for baling because dirt and moisture degrade the quality of the cotton. One of the most important issues in cotton harvest is the type of sack in which seed cotton is placed. In general, cloth sacks are preferred when collecting by hand. But most places also use plastic bags. There is a possibility that plastic bags can be a problem at ginning time and dyeing time. Hand-picking costs are increasing in cotton production. Therefore, in some countries (Australia, Israel, America, etc.) the harvest is completely done by machinery. The harvest cost in the research area was found to be $ 53 per ton.

It has been stated that the amount of seed sown per hectare in cotton production is 70 kg. The approximate average price of cotton seed was found to be 0.64$. For this reason, cotton seed cultivated in one hectare of land has been calculated as 44.8$. According to the survey results, the annual tax amount paid to the government is calculated as 74.3$ per hectare.

Gross Production Value (GPV)
Average yield in cotton production is 2.2 tonne ha. The average price of one kilogram of seed cotton in 2018 is $ 0.56. At the end of a year, the income from 1 ton of seed cotton is 563 $.

GPV = Total Yield x Price
Solid Cotton = 2,2 tonne x 0,56 = 1232$
GPV = 1232$ (Table 4.16)

Table 4.16. GPV (Cotton).

Products	tonne	$	Total ($)
Cotton wool	2,2	0,56	1232
Total GPV			**1232**

Fixed and Variable Costs
Changing cost factors in crop production; fertilizer, seed, irrigation, spraying, machine rental, temporary labor and marketing costs (collection, ginning, grading, drying, commission etc.). Changing costs are those that decrease or increase according to the intensity of production. The costs we mentioned arise through production and vary depending on the amount of production (Güneş 1993, İnan 1998, Küçük 2005, Karadaş 2016).

Fixed expenses, on the other hand, do not change depending on the amount of production and are the costs that arise whether the production is carried out or not (İnan1998). Crop production fixed costs elements; general administrative expenses, land expenses, the total of expenses consist of the interest provision and fixed worker expenses.

Within the scope of the study, the fixed and variable expenses of cotton producers during production were also calculated. Fixed and variable expenses incurred on one hectare of land at the end of the annual production are shown in the table below (Table 4.17).

Table 4.17. Fixed and Variable Costs.

Costs	Quantitative ($)	%
Total varible costs	567,58	42,97
Total fixed costs	753,3	57,03
Total	**1320,88**	**100,00**

Gross profit

Gross profit is found by subtracting the total varying costs from the overall gross production value of the enterprises. (Ögürsoy 2006). Within the scope of the study, the gross profit obtained from one hectare of land per year in cotton production was found as $ 664.42.

Gross profit = Gross Production Value – Varible Costs

Gross profit= 1232 – 567,58

Gross profit= 664.42$

Net income

Net profit is the income that remains after deducting fixed and variable costs from total income. This indicator is a basic value that measures the operating profitability of the business (Acar 2013). Within the scope of the study, the total net profit earned by cotton producing enterprises from one hectare at the end of the year is shown below.

Net income= Gross profit – Total Fixed Costs

Net income = 664,42 – 753,3

<u>**Net income = - 88,88 $**</u>

In the research, the cost per ton (hectare) in cotton production was calculated as $ 600.40.

$$\text{Cost Per Ton} = \frac{\text{Total costs}}{\text{Total yield}}$$

$$\text{Cost Per Ton} = \frac{1320,88}{2200}$$

<u>**Cost Per Ton = 600,40 $**</u>

Average Production Costs

In cotton production, the share of varying costs in total costs for one hectare of land was found to be 42.97%, and the share of fixed costs was 56.03%. In the working area;

1. year average cotton yield = 22,4 ton/ha
2. year average cotton yield = 20,7 ton/ha
3. year average cotton yield = 20,1 ton/ha
4. year average cotton yield = 20.1 ton/ha
5. year average cotton yield = 22,1 ton/ha

Since cotton is an annual plant, the amount of seed cotton obtained at the end of the production year is approximately 2.2 tons / ha per hectare. Regarding the above information, the cost of the cotton plant has been calculated as 600.40 $ / ton. The selling price per kg of cotton is 0.56 $ (Table 4.18).

Table 4.18. Cotton Production Cost (Facility Period Expenses).

Facilities	Unit	Quantity	Unit Price ($)	Total Amount ($)
Field rent	Period	1 ha		530
Tillage, plowing	Hour	7	30,14	211
Fertilization	Kg	2	30,5	61
Irrigation	Day	14	6,37	89,18
Hoing	Ha	3	49,66	149
Harvest	Tonne	2,2	0,53	116,6
Cottonseed	Kg	70	0,64	44,8
Chemical spraying	Kg	2	22,5	45
Tax	Year	1	74,3	74,3
Total costs				**1320,88**
General administrative expenses (%3)				39,62
Interest on the total expense (3% of 1/2)				19,81
Total Facility Term Expenses				**1380,31**

RESULTS

Cotton production in Tajikistan has been ~~going on~~ for very long and still continues widely. Cotton production has become traditional since it significantly contributes to the country's economy, the rural population and especially to farmers. This research was carried out in the Khatlon Region of Tajikistan, Vakhsh Province. Within the scope of the study, a survey was conducted with 81 cotton producers in the form of one-on-one interviews and the results were evaluated. The findings in this study cannot be compared since there is no research or study on cotton production in Tajikistan, especially in Vakhsh Province. In the cotton enterprises included in the study, the age group of the producers varies between 18 and 65 years. The average age was found to be 37.40. When the education levels of the producers within the scope of the research are examined; ~~It~~ has been determined that 70.4% of them are secondary school graduates, 24.7% are undergraduate and 1.2% are primary school graduates. In this case, it can be said that the education level of the producers is medium. Since the cotton plant is an annual plant, it yields every year. Cotton productivity varies by regions and provinces in Tajikistan. Cotton productivity in the research area was found to be 2200 g per hectare on average.

In cotton producing enterprises, the share of variable costs in total costs per hectare was found to be 42.97%, and the share of fixed costs was 56.03%. The cost of a ton of cotton in the study area is calculated as 600.40 $. The selling price per kg of seed cotton product is 0.56 $. For a ton of field cotton, the farmer selling price is calculated as $ 560. An average of $ 1232 has been earned from 2200kg cotton per hectare in the enterprises. Average GNP per hectare in enterprises was found to be $ 1320.88. Average gross profit of producers per hectare is calculated to be $ 664.42. The producers' net profit is also evaluated in the study. Net profit was found to be $ -88.88 per hectare. As you can see, producers get into debt during production. But all the land used by the producers belongs to them. Since the field rent is also included in the cost calculation, it is not considered profitable.

The major problem in cotton production in Tajikistan is low yield due to the negative effects of recent climate change, diseases and pests. In Tajikistan, the Khatlon Region, especially Vakhsh Province, is a very suitable region for cotton production and cotton productivity. In order to increase the cotton production capacity, the state, especially the Ministry of Agriculture, national and international institutions and organizations must make strategic plans. Farmers should be supported as much as possible and should be directed to quality cotton production. If the necessary support and incentives are provided, most of the producers will not go to Russia or other countries and turn to cotton production. Increasing production will also increase exports. Producing at world standards will increase exportsSince the unemployment rate is high in the country, it will provide job opportunities for unemployed people, especially women and rural people, and make a serious contribution to their economic independence. According to the results obtained from the study, if the existing problems in cotton production are solved, if cotton production is increased, if the cotton quality is produced according to world standards, the socio-

economic situation of the farmers in the region, especially female farmers, will be positively affected and the earnings from cotton exports will contribute significantly to the country's economy.

ACKNOWLEDGEMENTS

REFERENCES

Anonim, 2018. Cotton Farming in Tajikistan 1991, 2012, 2017 between years. Tajikistan Statistical Committee, 2018.

Anonim, 2019. Vikipedi. History of Cotton. https://en.wikipedia.org/wiki/History_of_cotton (20.02.2019).

Atış, E., 2001, The problem of land degradation in Turkey and policies for the solution of this problem, Turkey Union of Chambers of Agriculture Publications No:213, Ankara.

Bursa, N., Ercan Y., 1992. Cost accounting, Course Publications, (4): 1-2, Istanbul.

Cohen, J. 1988. Statistical power analysis for the behavioral sciences (2nd ed.). Hillside, NJ: Erlbaum.

Güneş, E. 1993. Çukurova'da Pamuk Üretimi, Üretim Maliyeti, Fşyat Oluşumu ve Pazarlaması Üzerine Bir Araştırma. Ankara Üniversitesi, Fen Bilimler Enstitüsü. Tarım Ekonomisi Anabilim Dalı. Yüksek Lisans Tezi.

Gürbüz İ.B., Modassır M., 2019. Factors Affecting Consumer's Behaviour in Purchasing and Consumption of Food Products Affecting Consumer's Behaviour in Purchasing and Consumption of Food Products. Sciemtific Papers Series Management Economic Engineering in Agriculture and Rural Development, 19 (1/2019), 215-223.

Karadaş, K. 2016. Ağrı İli Tarım İşletmele rinde Buğday Üretim Maliyetinin Hesaplanması. Iğdır Üniversitesi, Ziraat Fakültesi Tarım Ekonomisi Bölümü, Iğdır. Alınteri. 31 (B) - 2016 33 - 41 ISSN:1307-3311.

Küçük, E. 2005. Yeni Üretim Ortamında Genel Üretim Maliyetleri ve Kayseri'deki Bazı Uygulamalara İlişkin Bir Araştırma. Erciyes Üniversitesi, İİBF, İşletme Bölümü. Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, Sayı 25, Temmuz – Aralık 2005, ss.

Özkan, B., 1997. İkinci Ürün Mısırda Azot Gübrelemesinin Ekonomik Analizi. Anadolu, J. AARI, 7(1): 135 – 145.

Vural, H., 2017, Tarım ve Gıda Ekonomisi İstatistiği. Uludağ Üniversitesi, Ziraat Fakültesi, Ders Notları no.107.

Yılmaz, Ş. G. 2012. İşletmelerde Pamuk Üretim Maliyeti, Karlılık Düzeyi ve Uygulanan Politikaların Değerlendirilmesi: Antalya İli Örneği. Süleyman Demirel Üniversitesi. Fen Bilimler Enstitüsü. Yüksek Lisans Tezi. Tarım ekonomisi Anabilim dalı.

Yılmaz Ş.G. ve Gül, M. 2015. İşletmelerde Pamuk Üretim Maliyeti, Karlılık Düzeyinin Değerlendirilmesi: Antalya İli Örneği. Batı Akdeniz Tarımsal Araştırma Enstitüsü, 07100 Antalya. Süleyman Demirel Üniversitesi Ziraat Fakültesi Tarım Ekonomisi Bölümü, 32260 Isparta. ISSN:1300-9362 20(2):27-41 (2015).