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Economic Analysis and Competitiveness of Cotton Farms in Mali, the Case of Founia District of Kita Province

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A R T I C L E I N F O	A B S T R A C T
	In this research, it is aimed to investigate the economic performance of cotton farms and to reveal the profitability and competitiveness of cotton production in Founia district of Kita province. The research data were obtained from the questionnaires conducted with 55 farms determined according to the stratified random sampling method. Policy Analysis Matrix was used to determine profitability and competitiveness in cotton production. The results of the research showed that the farms in Founia county have an average of 10.44 da farm land. Gross production value per farm is $3519.89, agricultural income is $2197.42. According to the result obtained from PAM, private profit of cotton production in Founia district was 58.97 $/ton social profit was 1017.38 $/ton. Within the scope of the research, Specific Cost Ratio (PCR) coefficients of 0.77 and Cost Ratio of Domestic Resources (DRC) of 0.19 obtained from PAM were found. However, according to the Nominal Protection Coefficient on Output (NPCO) (0.30), Nominal Protection Coefficient on Tradable Inputs (NPCI) (0.87) and Effective Protection Coefficient (EPC) (0.20) coefficients, it is seen that the cotton price is lower than the comparable world prices and the producer earns less profit from free trade. Therefore, in the short term, incentive premiums, direct financial support, protection of cotton prices, good communication with farms and extension policies should be implemented. The increase in yield with the introduction of irrigation systems will increase competitiveness.The government and the Compagnie Malienne pour le Développement des Textiles (CMDT) should assist in the leasing and long-term purchase of modern farm machinery, which is one of the fixed capitals, in order to increase productivity.

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Introduction

Agriculture is the main source of income for most of the world's poor people. Therefore, this sector plays a decisive role in reducing poverty, increasing incomes and improving food security.

Cotton, which meets most of the needs of people for agricultural products today, is an agricultural product that is frequently mentioned in archaeological excavations and travel books written by travelers that shed light on history. Cotton, which has been produced for thousands of years to date, has become a strategic product with its ability to meet the basic needs of people around the world. In addition to making great economic gains in the regions where it is grown, it has also become an important activity by having a say in the global agricultural market (Kaplan, 2020).

The cotton plant is grown in irrigated culture or by rain. Irrigated cotton fields represent approximately 55% of the total cotton fields and three-quarters of the world cotton harvest comes from these fields. Rain-growing cotton is common in West and Central African countries. The family farm type is common in these countries and the harvest is done by hand. In countries such as the United States, China and India, cotton cultivation has become mechanized. There are several hundred or even thousands of hectares of cotton farms.

As of 2019, cultivated cotton areas in the world are approximately 32 million hectares. India, China, the United States and Brazil are the world's largest cotton producers. Mali is the 7th largest cotton producer in the world in terms of cotton production area. It ranks 13th in cotton production (Figure 1). Despite the size of the production area, the reason why it is in the lower ranks in terms of production amount is due to the low cotton yield. In terms of cotton yield, Mali ranks 51st in the world (FAOSTAT, 2021).
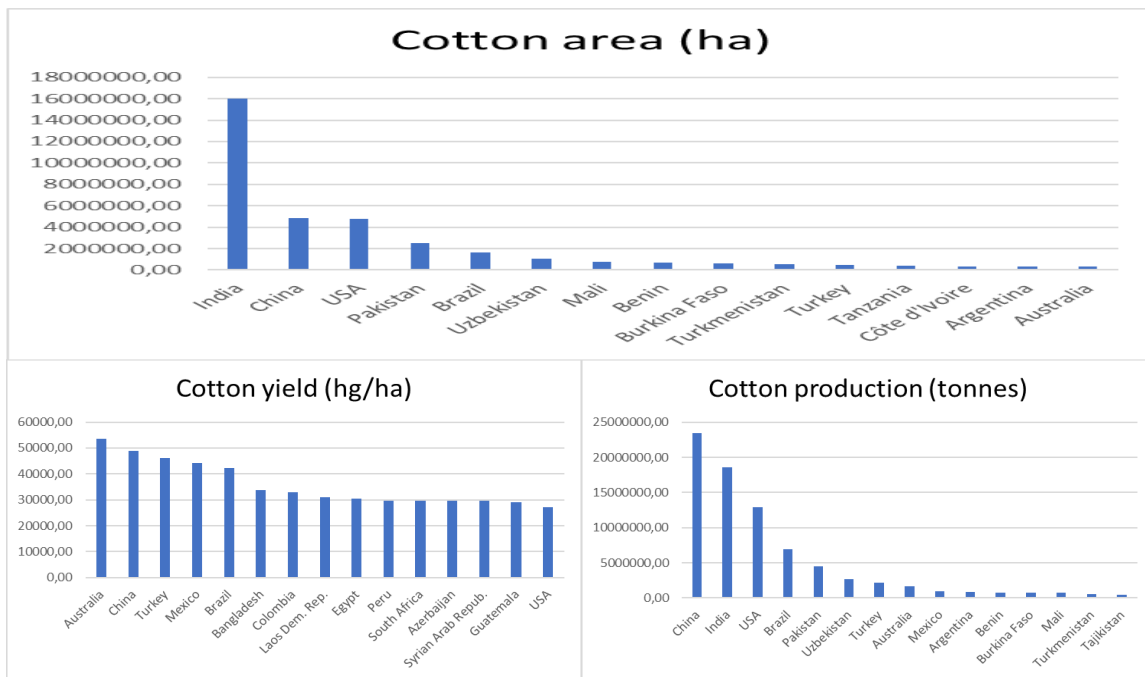
Figure 1. World cotton production data (FAOSTAT, 2021).

Figure 2. World cotton trade data (FAOSTAT, 2021).

The cotton export value in the world is 10 million tons. Usually, the USA, Brazil, India and Australia are the world's largest cotton exporters. Mali is in the 15th place in cotton export. China, Vietnam, Bangladesh and Turkey became the world's largest cotton importers (Figure 2). Mali is in the 22nd place in cotton imports (FAOSTAT, 2021).

Mali, a country in South Africa, has an economy based mainly on agriculture (Figure 3). The population is estimated to be over 19.66 million, with an annual growth rate of around 3.0%. It is one of the largest countries in Africa with a surface area of 1241.238 km² (World Bank, 2019). In Mali, agriculture accounts for 37% of GDP and 63% of employment. Cotton provides an opportunity to increase agricultural productivity in Mali and improve the incomes and well-being of more than four million people. Also at the heart of an economy largely dominated by agriculture, "white gold" provides income for 40% of Mali's rural population. The cotton industry contributes 22% of export revenues.

Continental province is a province of Mali which has the most cotton producing farms from the Compagnie

Malienne pour le Développement des Textiles CMDT agency. The province of Kita, which produced up to 90 000 tons of cotton in 2019, is the most cotton producing province in Mali after Koutiala and Sikasso provinces (Anonymus, 2020).

The main source of income of Founia county, located in the province of Kita, is agriculture. The most produced products in the district are cotton, sorghum, corn, millet and sesame. The most important reason for growing cotton in Founia is the good income. At the same time, cotton producing farms are supported by CMDT. Through these supports, agricultural inputs are obtained in an appropriate way. Therefore, it is correct to say that cotton production in Founia is the most important economic activity of the district.

There are many studies on the economic analysis of cotton farms in the literature (Carlson and Mohamed, 1986; Liapis and Moffitt, 1983; Teal, 1997; Yaşar, 2003; Hanks and Martin, 2007; Sabo et al., 2009; Yılmaz, 2012; Taheri-Rad, et al., 2015; Şahin, 2019; Fan, et al., 2020). Some researchers have discussed cotton production using primary data and analyzed it from an economic point of view (Rashid and Matin, 2018; Siamardov, 2020).

There are some studies on the economic analysis of cotton farms in Africa and Mali (Djouara et al., 2006; Nubukpo and Keita, 2006; Mahofa, 2007; Degla, 2012; Paraïso et al., 2012; Camara, 2015; Diallo, 2017; Fok et al., 2019; Toure, 2021). On the other hand, some researchers analyzed the competitiveness of the cotton industry with the help of the Policy Analysis Matrix (Mohanty et al.,2002; Bahadır, 2006). In a study conducted in Benin, the competitiveness of the cotton industry in Benin was analyzed with the help of the Policy Analysis Matrix. It has been investigated whether cotton farms have a comparative advantage in cotton production (Adanguidi, 2012).

However, the economic situation of cotton farms in Founia district of Kita province, which has an important place in cotton production for the world, has not been examined. Therefore, the aim of the research is to investigate the economic conditions of cotton farms in Founia district of Kita province and to reveal the profitability and competitiveness of cotton production. In this direction, this study will form a secondary data base for next scientific studies in the research area. In addition, it will guide the policies to be made with cotton production in the research area by revealing the economic profile of the farms.
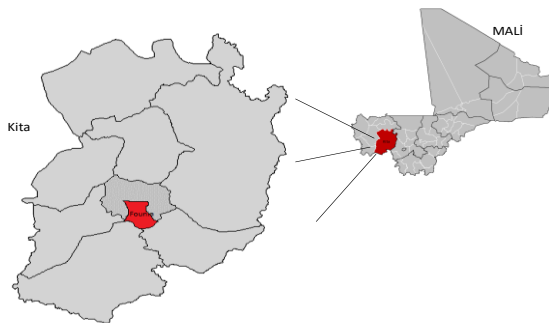

Figure 3. Map of the research area

Material and Methods

Material

In this study, primary data obtained through face-to-face surveys from cotton farms were used. In addition, secondary data obtained from statistical institutions such as CMDT, FAOSTAT, INSTAT and domestic and international studies on the subject were used.

The Method of Determining the Farms to Be Surveyed

The list of all cotton farms in Founia district and their cotton areas (decares) were obtained from the CMDT institution to be used in determining the farms to be surveyed. The number of farms to be surveyed was calculated using the stratified random sampling method. According to the Stratified Random Sampling Method, the number of farms was calculated with the following formula (Yamane, 1967).

$$n = \frac{(\sum NhSh)^2}{N^2 D^2 + \sum NhSh^2} \qquad\qquad D = \frac{d}{z}$$

In the formula; N: Number of farms in the population, Nh: Number of farms in the h'th layer, Sh²: Variance of the h'th layer, n: Number of samples, d: Allowable error margin from the population mean. Z: Expresses the z value in the standard normal distribution table according to the error rate. In line with the calculations, a total of 55 farms, 43 in the first layer (1-4.99 da) and 14 in the second layer (5 hectares and above) out of 243 cotton-producing farms with a 95% confidence limit and 10% error margin, were determined as samples. In the distribution of the determined sample volume to the layers;

$$\frac{Nh.Sh}{\sum (Nh.Sh)} \times n$$

formula is used (Yamane, 1967).

The Methods used in Calculating the Annual Activity Results of the Farms

In the socio-economic valuation of the farms, the farmer's statements and the purchase and sale values in the research area were taken into account (Erkuş, 1979). Amortization rates; 50 years for buildings, 10 years for land reclamation capital, 5 years for animals in farms and 15 years for agricultural equipment and machinery. When calculating the family labor wage provision, based on wages paid to foreign workers for similar jobs in Founia. Gross production value (GPV) on farms; it was calculated by adding the productive fixture value increase in animal capital to the value obtained by multiplying the market price of the plant and animal products produced in the farm. Gross product (GP) is calculated by adding non-farm agricultural income to the gross production value and housing rent (Erkuş et al., 1990). Net profit (NP) was determined by subtracting farm costs from GP (Demirci,1978). Gross profit is found by subtracting variable costs from GPV (Erkuş et al., 1990). Net profit is calculated by subtracting the total costs from the GPV. Agricultural income is found by subtracting the field rent and debt interests from the net product and adding the family labor wage (Erkuş ve Demirci, 1995). In order to examine the profitability of cotton farms, financial and economic profitability were calculated (Erkuş et al., 1995):

$$\text{Profitability Factor} = \frac{\text{Net product}}{\text{Gross product}} \times 100$$

$$\text{Return on farm equity} = \frac{\text{Net income}}{\text{Equity}} \times 100$$

$$\text{Rate of Return on Farm Assets} = \frac{\text{Net product}}{\text{Active capital}} \times 100$$

The Method used to Measure the Competitiveness of Farms

The competitiveness of cotton production situation in Founia district of Kita was revealed using the Policy Analysis Matrix (PAM) method. PAM is primarily based on cost-benefit analysis. A PAM table consists of three rows and four columns (Table 1).

If the specific cost ratio (PCR) is less than 1, it means that the relevant production is competitive. Therefore, the smaller the PCR ratio, the more competitively the production can be expressed. DRC> 1, indicates that the opportunity cost of domestic resources exceeds value added (in world prices). This means that the production of the relevant product is socially unprofitable and socially undesirable. This shows that the country's resources used for the production of the product are not used efficiently and that the country does not have international competitiveness in product production. NPCO <1 means that the farms sell their produce in the domestic market at a lower price than the world price. It can be said that this situation has negative effects on farms due to the applied policy and market order. If NPCI > 1, it means that the farms are buying at a higher price than the world price they see they receive. NPCI <1 means that the farms are buying at a lower price than the world price they see buying in the domestic market. EPC > 1 shows that transfers to product and merchants have the effect of increasing the impact of private profits on optimum levels. EPC <1 means that policies and negotiable views on the product lead to negative protection of farms. They are calculated with the following formula: PCR = C / (A-B), DRC = G / (E-F), NPCO = A / E, NPCI = B / F, EPC = (A-B) / (E-F)

1. Research Findings

1.1. Demographic characteristics of cotton farms

It was determined that 94.55% of the managers of the cotton farms in the investigated Founia district were male and 5.45% were female. In a study conducted in Poro district in Ivory Coast, it was determined that 100% of the farmers were male (Sinan et al., 2020).Considering their educational status, it has been determined that most of the administrators are not literate. It has been determined that 63.64% of the administrators are illiterate, 18.18% have been educated until primary school, 12.73% have secondary school education and 5.45% have high school education. The average age is 48 years. In addition, it has been determined that the maximum age of the managers is 87 and the minimum is 34. It has been determined that the average of agricultural experience is 30 years, and the experience of cotton production is 16 years (Table 2). In a study conducted in Fana and Koutiala Districts in Mali, farm managers have an average age of 56 and an average of 25 years of experience in cotton production (Toure et al., 2021).

Table 1. Policy Analysis Matrix table (Monke and Pearson, 1989)[*]

	Tradable Inputs		Domestic Resources	Profit
	Product	Inputs (seed, fertilizer, pesticide)		
Private Prices	A	B	C	D= A-B-C
Social Prices	E	F	G	H= E-F-G
Policy Impact (transfers)	I= A-E	J= B-F	K= C-G	L=(D-H) L=(İ-J-K)

[*]Private Profit (D) = A - (B +C); Social Profit (H) = E - (F + G); Output transfer (I) = A – E; Tradable input transfer (J) =B – F; Domestic factor transfer (K) = C – G; Net transfer (L) = D - H = I - (J+ K).

Table 2. General information of managers in farms

		Farm size (da)					
		0-4		5 - +		Total	
		n	%	n	%	n	%
Gender	Male	39	92.86	13	100.00	52	94.55
	Female	3	7.14	0	0.00	3	5.45
	Total	42	100.00	13	100.00	55	100.00
Educational level	Illiterate	27	64.29	8	61.54	35	63.64
	Primary school	10	23.81	0	0.00	10	18.18
	Middle school	4	9.52	3	23.08	7	12.73
	High school	1	2.38	2	15.38	3	5.45
	Total	42	100.00	13	100.00	55	100.00
Age	Mean	50		46		48	
	Min	35		32		32	
	Max	87		58		87	
Experience	Agricultural experience	38		22		30	
	Cotton experience	17		15		16	

Land Use Status in Farms

The total average land area in cotton farms in Founia district is 10.44 decares. Of this value, 46.87% is cotton, 17.24% is sorghum, 19.13% is millet, 14.50% is corn and 2.26% is sesame. This distribution varies according to the size of the embroideries (Table 3).

Population and Labor

The total population per farm in the examined farms was determined as 3.72 people. This average is well below the national average of 8 per household (INSTAT, 2018). Of this, 79.19% are men and 20.21% are women. The ratio of age groups to the population was determined as 48.84% of them were between 7-14 years old, 40.18% of them were between 15-49 years old and 10.98% of them were 50 years old and over. The male labor unit per cotton farm in Founia county was determined to be 2.77.

Since there is no mechanization in the farms studied and agricultural tools are based on labor, there is a great need for foreign labor (Picture 1). The average number of foreign workers in the surveyed farms was 17 people. It was determined that 30% of them were between the ages of 7-14, 64.41% were between the ages of 15-49 and 5.59% were aged 50 and over. The average foreign labor force per farm was calculated as 6.44 male labor force units (MLFU). Foreign labor in farms is one of the production factors that are very needed eprivately during the harvest period.

Annual Operating Results of Farms

Although there is no animal production in the researched farms, only farm animals are kept for the use of some agricultural tools (Picture 2). The GPV of the farms was calculated as $3519.89 per year. This value varies according to the size of the farms. While the GPV in the farms in the first layer was $ 1831.89 per year, the GVP in the farms in the second layer was determined as $ 5187.70 per year.

GP of the surveyed farms was calculated as $3674.62 and it was determined that 95.79% of this was GPV, 0.50% of non-farm agricultural income and 3.71% of house rent provisions. The GP was calculated as 1957.62 $ in the farms in the first stratum, and the GP in the farms in the second stratum was 5391.62 $. NP in cotton farms in Founia county was calculated as 1595.94 $. Therefore, it has been determined that 56.57% of the gross product is farm expenses and 43.43% is net product. It is seen that there is a difference in the farms in the two strata (Table 4). In a study conducted in Ouake district in Benin, it was determined that the average area of cotton enterprises was 1.04 ha and the average yield was 1085.29 kg/ha (Paraïso et al., 2012). In a study conducted in Tajikistan, the gross production value in cotton production was found to be 1232$/da (Siamardov, 2020).

In the cotton farms surveyed, variable costs consist of seeds, fertilizers, pesticides, casual workers, equipment repair and maintenance, general administration inputs and other (sacks, travel expenses and animal feed). The lands of the cotton farms in Founia district are dry and there is no irrigation system. Since the climate is favorable, there is a water well in every farm and the need for water is met in this way (Picture 3). There appear to be several reasons for the lack of marketing costs on the farms surveyed. The first of these is that the farms sell the harvested products without bringing them from the field to the market. Annual variable costs per farm were calculated as $1143.50. Annual variable costs vary according to the width of the farms, while variable costs in the first layer are 543.73 $, and in the second layer, annual variable costs are calculated as 1743.27$ (Table4).

Picture 1. Some tools and other pictures used in their business in Founia district

Picture 2. Animals used in agricultural activities in Founia county

Picture 3. Irrigation wells used in Founia county

Variable costs of cotton production account for 87.47% of the variable costs in the examined processes, and variable costs for other crop productions 12.53%. The variable costs of the cotton product were calculated as $1034.84. The rates of variable expenses were respectively 33.09% seed, 35.37% fertilizer, 11.95% pesticide, 3.89% casual labor, 0.51% tool repair and maintenance and 2% are other expenses. It is seen that as the width of the farms increases, their costs increase.

Fixed costs are costs incurred regardless of the amount of production on the farm. Examples of fixed costs are general administrative expenses, depreciation, building repair maintenance, tax, insurance, permanent labor and family labor wages. The fixed costs of the examined farms are given in Table 8 and calculated as 935.17 $. Fixed costs were respectively 3.7% general administrative expenses, 24.96% depreciation expenses, 1.66% building repair and maintenance, 0.40% tax and 69.51% family labor wages (Table 4).

It was determined that the gross profit of the surveyed farms was $2342.09. The average net profit of the farms was calculated as $1595.94. The profit values of the examined farms vary according to the farm width (Table 4). In a study conducted in the town of Koutiala in Mali. the gross profit was calculated as $3407.68 and the net profit as $1989.67 (Toure et al., 2021).

It was determined that the total family income in the surveyed farms was $2699.71. The total family income varies according to the size of the farms and while the total family income in the farms in the first stratum is $ 1776.57, the total family income of the farms in the second stratum is $ 3622.86 (Table 5).

It has been determined that the profitability factor of the examined processes is 43.43% on the average of the farms. In other words, $43.43 of every $100 of gross product is gross product. This rate varies according to the width of the farms (Table 6). In the general average of cotton farms, financial profitability is 18.35%. In other words, a profit of $ 18.35 is obtained with every $ 100 equity capital in the farms examined. Financial profitability ratio and profitability factor are directly proportional to farm size

(Table 6). The economic profitability is 19.23% on the average of the farms surveyed. This rate varies according to the width of the farms (Table 7).

Competitiveness in Farms

Income of cotton farms in Founia district with private price is $443.37/ton and with social price it is calculated as $1477.88/ton (Table 7). It is seen that the production costs with the private price are 376.97 $/da. It has been determined that 65.61% of this value is variable costs and 34.39% is fixed costs. The rate of variable cost elements are respectively 20.24% for seeds, 21.98% for fertilizers, 7.49% for pesticides, 1.77% for temporary workers, 12.05% for machinery rentals and 2.06% for the revolving fund interest rate and the rate of fixed expenses are respectively 1.97% for general administration inputs, 24.10% for land rent and 8.32% for family labor wages.

With the private price, the gross profit of the cotton farms in Founia district was 191.17 $/ton and the net profit was 58.97 $/ton. According to the results of the research, it is seen that the social price and production costs are 451.61 $/da. 60.20% is variable cost and 39.80% fixed cost of this value.

Table 3. Proportional distribution of cultivated area

	Farm size (da)					
	0-4		5 - +		Total	
	da	%	da	%	da	%
Cotton	2.48	41.48	7.80	52.26	5.14	46.87
Sorghum	1.36	22.73	1.75	11.76	1.56	17.24
Millet	0.90	15.05	3.46	23.20	2.18	19.13
Corn	1.04	17.35	1.74	11.65	1.39	14.50
Sesame	0.20	3.39	0.17	1.13	0.19	2.26
Total	5.97	100.00	14.92	100.00	10.44	100.00

Table 4. Annual activity and costs of farms

	Farm size (da)					
	0-4		5 - +		Total	
	$	%	$	%	$	%
Cotton varibale cost	444.26	81.71	1625.42	93,24	1034,84	87,47
Seed	167.34	30.78	617.08	35,40	392,21	33,09
Fertilizer	172.88	31.80	679.03	38,95	425,96	35,37
Pesticide	57.28	10.53	233.14	13,37	145,21	11,95
Casual worker	30.41	5.59	38.30	2,20	34,36	3,89
Tool repair/maintenance	4.36	0.80	3.92	0,22	4,14	0,51
Other costs	11.99	2.21	53.95	3,09	32,97	2,65
Others crop variable cost	99.47	18.29	117.85	6,76	108,66	12,53
Seed	12.35	2.27	23.73	1.36	18.04	1.82
Fertilizer	25.20	4.63	24.43	1.40	24.82	3.02
Pesticide	25.42	4.68	12.02	0.69	18.72	2.68
Casual worker	15.21	2.80	19.15	1.10	17.18	1.95
Tool repair/maintenance	8.72	1.60	7.83	0.45	8.28	1.03
Other costs	12.57	2.31	30.69	1.76	21.63	2.04
Total variable cost	543.73	100.00	1743.27	100.00	1143.50	100.00
Administrative costs (variable cost*%3)	16.31	2.01	52.29	4.93	34.3	3.47
Amortizations	182.83	22.56	290	27.36	236.41	24.96
Building repair/maintenance	13.3	1.64	17.79	1.68	15.54	1.66
Tax	3.66	0.45	3.66	0.35	3.66	0.40
Family labor wages	594.44	73.34	696.07	65.68	645.26	69.51
Total fixed costs	810.54	100.00	1059.81	100.00	935.17	100.00
Gross profit	1271.84		3412.33		2342.09	
Net profit	603.35		2588.53		1595.94	
GPV	1831.89	100.00	5207.89	100.00	3519.89	100.00
GP	1957.62	100.00	5391.62	100.00	3674.62	100.00
NP	603.35	30.82	2588.53	48.02	1595.94	43.43

Table 5. Total family income

	Farm size (da)		
	0-4	5 - +	Total
	$	$	$
Agricultural income	1166.72	3228.13	2197.42
Non-farm income	547.71	281.78	414.75
Total family income	1714.43	3509.91	2612.17

Table 6. The profitability of farms

	Farm size (da)		
	0-4	5 +	Total
Profitability Factor	% 30.82	% 48.01	% 43.43
Return on farm equity	% 13.56	% 19.72	% 18.35
Rate of Return on Farm Assets	% 15.88	% 20.22	% 19.23

Table 7. Profit of farms with private and social prices ($/ton)

Transactions	Private Price		Social Price	
	$/ton	%	$/ton	%
Cotton income	443.37	100	1477.88	100
Production costs	384.40	100	460.51	100
Variable costs	252.19	65.61	277.22	60.2
Seed	77.81	20.24	77.81	16.9
Fertilizer	84.50	21.98	113.09	24.56
Pesticide	28.81	7.49	28.81	6.26
Casual worker	6.81	1.77	2.46	0.53
Machine rental	46.32	12.05	46.32	10.06
Interest on expenses (DM/2*6.5%)	7.93	2.06	8.72	1.89
Fixed costs	132.20	34.39	183.29	39.8
General administration input (DM*3%)	7.57	1.97	8.32	1.81
Land rent	92.64	24.1	163.45	35.49
Family labor wages	32.00	8.32	11.52	2.5
Gross profit	191.17		1200.67	
Net profit	58.97		1017.38	

Table 8. Policy Analysis Matrix of Farms ($/ton)

		Private price	Social price	Net Transfers
	Product income	443.37	1477.88	-1034.52
Tradable Inputs	Seed	77.81	77.81	0.00
	Fertilizer	84.50	113.09	-28.59
	Pesticide	28.81	28.81	0.00
	Total	191.12	219.71	-28.59
Domestic Resources	Rental of land	92.64	163.45	-70.81
	Rental of machinery	46.32	46.32	0.00
	Family labor wages	32.00	11.52	20.48
	Casual labor wages	6.81	2.46	4.35
	Interest od Cost	7.93	8.72	-0.79
	Administrative cost	7.57	8.32	-0.75
	Total	193.27	240.79	-47.51
	Total Exp	384.40	460.51	-76.11
	Profit	58.97	1017.38	-958.41

Table 9. Competitiveness and policy impact indicators of cotton production

Indicator	Formula	Value
PCR	C/(A-B)	0.77
DRC	G/(E-F)	0.19
NPCO	A/E	0.30
NPCİ	B/F	0.87
EPC	(A-B)/(E-F)	0.20

The variable costs consisted of seeds (16.90%), fertilizers (24.56%), pesticides (6.26%), temporary labor (0.53%), machinery rental (10.06%), interest on expenses (1.89%), general administration inputs (1.81%), land rent (35.49%) and family labor wages(2.50%), respectively. With the social price, the gross profit of the cotton farms in Founia district is 1200.67 $/ton, and the net profit is 1017.38 $/ton (Table 7).

The private profit of cotton production in Founia district was $58.97/ton, while the social profit was $1017.38/ton. It has been revealed that the private and social profitability of cotton production is positive (Table 8). This shows that cotton production is profitable. The most important reason for the low private profitability in cotton production is the price at which the producer sells the product domestically. Farms sell their products domestically, far below world prices. The difference between private profit and social profit in the PAM table shows the net effect of all policies applied towards the production system. Cotton farms in Founia county produce below world prices and lose $958.41 per tonne due to policies for this product (Table 8).

According to the calculations made in PAM, PCR, one of the indicators of competitiveness, was found to be 0.77. A PCR of less than 1 indicates that cotton production is profitable and that it is in a position to compete in terms of profitability with other crops that can be grown in Founia county. According to the calculations, DRC, another indicator of competitiveness, was calculated as 0.19. The fact that the DRC is less than 1 indicates that Mali has a comparative advantage in cotton production (Table 9).

The NPCO, one of the policy impact indicators obtained from the PAM table, was found to be 0.30. A NPCO of less than 1 means that the price of cotton is lower than comparable world prices. The NPCI, another indicator of policy impact, was calculated as 0.87. An NPCI of less than 1 indicates that cotton farms purchase inputs domestically at less than the world price of inputs. EPC, a policy indicator, was found to be 0.20. If the EPC was greater than 1, the farms would be subsidized and protected by the state. If it is less than 1, it means that the producer is making less profit from free trade, that is, there is insufficient support. In a study on the competitiveness of cotton farmers in Benin, the lack of support and protection for the cotton market was revealed as a result of the analysis of the effects of government policies (Adanguidi, 2012).

Conclusion

In the farms studied, 94.55% of the managers are male and 5.45% are female. In Mali, men generally work in the fields more than women. It was determined that most of the managers were illiterate. This is one of the agricultural structure problems in rural areas in Mali. Therefore, the state should help the farms with education. Training and information system should be established on farms for more efficient production techniques and more income. It is known how important water is in cotton cultivation. There is no irrigation system in Founia district. The farmers irrigate the cotton by hand from the water in the wells. With the climate change, irrigation systems should be brought to the district on the grounds that water problems

will increase in the coming years. CMDT can help farms install irrigation systems. It was determined that the total active capital per farm in the capital structure of the surveyed farms was $12697.82. Its active capital consists almost of land capital. There are no irrigation systems, tractors, tools attached to tractor parts and harvesting machines in cotton production. Instead of agricultural mechanization, labor and animal power are used. This explains why the amount of production is less than in other countries, despite the large cotton cultivation areas. The government and CMDT should assist in the leasing and long-term purchase of modern farm machinery, which is one of the fixed capitals, in order to increase productivity. The GPV on farms was calculated as $3519.89. This value varies according to the size of the farms. GP was calculated as $3674.62 in the farms surveyed. Average variable costs of farms are $1143.50. The fixed costs of the surveyed farms were $935.17. NP of cotton farms in Founia county was calculated as 1595.94 $. It was determined that the GP of the surveyed farms was $2342.09. It has been calculated that the average net profit of the farms is $ 1595.94. It has been determined that the agricultural income of the cotton farms in Founia district is 2197.42$. The total family income in farms is $2612.17. It has been revealed that the private and social profitability of cotton production is positive. According to the results obtained from PAM within the scope of the research, it is shown that Mali's cotton production is profitable and has a comparative advantage in its production. However, according to the NPCO, NPCI, EPC coefficients, it is seen that the cotton price is lower than the comparable world prices and the producer makes less profit from free trade, in other words, there is insufficient support. Although cotton production is profitable in the examined cotton farms, it has been observed that the support and protection provided by the state is insufficient. Therefore, in the short term, incentive premiums, direct financial support, protection of cotton prices, good communication with farms and extension policies should be implemented.

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