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Profitability analysis of cotton farming in Odisha

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Abstract
The present study entitled "Profitability analysis of cotton farming in Odisha" was undertaken with the major objectives to study the cost of cultivation and return of cotton production of sample farmers. This study used both secondary and primary data. Multi-stage random sampling was taken for this study. The districts selected for study were Kalahandi, Balangir and Rayagada of Odisha state. A total number of 120 cotton farmers i.e 71 farmers from small and 49 farmers from large size groups were selected at random based on probability proportion. Data pertaining to cost and return were collected for the present study from the selected farmers. The major findings revealed that the average operational cost of cotton per hectare was estimated to be Rs. 46842.38, out of which the major expenditure was for cost of human labour which accounted for 30.89 percent of the total operating cost, followed by rental value of land (16.24%), fertilizer cost (16.10%). Overall productivity in the area of cotton was reported to be 13.92 quintals of seed cotton per hectare and the net income of farmers for the crop ranges from RS.71662.25. The farm income increases with the increase in farm size and vice-versa.

Keywords: Cost of cultivation, return, operational cost

Introduction
India is home to around 17% of the world's population, 15% of the world's livestock and just about 2.4% of the world's land area and 4% of its water resources. Approximately half of the population still relies on agriculture as their primary source of income and it provides the raw materials for many other sectors. Agriculture contributes 14% of the country's GNP and approximately 11% of exports. The primary sector of the Indian economy, agriculture generates about 32% of the country's gross domestic product and employs 65% of the labour force. Additionally, 50% of our exports are made up of agricultural products, while another 20% of India's exports are made up of manufactured goods made with agricultural components (cloth, sugar, and manufactured jute). Agriculture has a significant part in the industrialization of the economy. This industry provides raw materials to agro-based businesses like those that produce sugar, jute, cotton, groundnuts, and oilseeds. Agriculture crop failure will be disastrous for Indian industries.

Since cotton is used to create clothing, the cotton trade has developed into a sizable industry. India's cotton processing industry experienced a sharp decline during British colonial expansion and the formation of colonial rule in the late eighteenth and early nineteenth centuries. The East India Company deindustrialized India, forcing the closure of cotton processing and manufacturing facilities there, in order to ensure that Indian markets only supplied raw materials and were required to purchase produced textiles from Britain.

India is the second largest producer of cotton in the world after China accounting for about 25 percent of the world cotton production. It has the distinction of having the largest area under cotton cultivation in the world constituting about 36 percent of the world area under cotton cultivation. The yield per hectare is however, the lowest against the world average. Cotton production which was just 103 lakh bales during 1991-92, increased to about 260 lakh bales by the year 2011-12, an increase of more than 150 percent.

In Odisha, a total of 1.57 lakh ha area was cultivated in 2018-19 which was increased to 1.69 lakh ha in 2019-20. In 2018, 4.55 lakh MT of cotton was produced (Odisha Economic Survey, 2019-20). An average of 3.5 lakhs bales of cotton is cultivated in the state out of which approximately 2 lakhs bales are ginned and pressed in the state and remaining cotton is procured by other states. But there lies the problem of selling the cotton in right price to the right agent or organization. Due to lack of efficient marketing system farmers are not getting the return they expect Cotton cultivation being only, the required financial aid is not available this is making farmers demoralized.

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Materials and Methods

The present study is an attempt to study the performance of cotton in selected areas of Odisha by identifying the price and non-price factors that are influencing the production, to analyse the profitability of cotton production.

Odisha is purposively selected for the study. Odisha formerly Orissa, is an Indian state located in Eastern India. It is the 8th largest state by area, and the 11th largest by population. The state has the third largest population of Scheduled Tribes in India. A multistage random sampling technique was adopted for selecting the sample farmers for the study. From Odisha three cotton growing districts *viz.* Balangir, Rayagada and Kalahandi were selected according to their productivity level. Among these 3 districts Rayagada was selected as high productivity area, Balangir as medium and Kalahandi as low productivity area. At the next stage one block having maximum area under cotton from each selected district was chosen. At the third stage from each selected blocks two villages having maximum area under cotton were selected. And in the final stage from each village small and large farmers were choosen proportionately for the study according to the availability of different category farmers. In all a total of 120 farmers spreads over 6 villages were included in the sample.

Table 1: Area, Yield and Production of cotton in major cotton producing districts of Odisha 2018-19

District	Area	Yield	Production
Balangir	43.96	14.34	128
Kalahandi	58.42	12.41	168.04
Rayagada	35.17	15.26	100.96
Odisha	157.88	14.63	455.07

Area in '000 ha, Yield in q/ha and Production in '000 MT/Bales

Estimation of production cost and returns
Cost concept

For examining the cost of production of Cotton, the following cost concepts are used.

Cost A_1=All actual expenses in cash and kind incurred in production by owner

Cost A_2= Cost A_1+ rent paid for leased in land

Cost B_1= Cost A_1+interest on fixed capital

Cost B_2= Cost B_1+ rent paid on leased in land + rental value of owned land

Cost C_1= Cost B_1+imputed value of family labour

Cost C_2= Cost B_2+ imputed value of family labour

Cost C_3= Cost C_2 + 10% of cost C_2 (on account of managerial function performed by the farmer)

Returns

1. Gross income= value of total output
2. Farm business income= gross income-cost A_1
3. Family labour income= gross income- cost B_2
4. Net income= gross income-cost C_2

Results and Discussion
Profitability of cotton on different farm size
Cost of cultivation in different size of farms (Rs/ha) 2018-19

District wise cost of cultivation for different size farm groups was calculated and presented in Table 2. It can be observed from the table 2 that, average cost of cultivation per hectare obtained was Rs. 43363.00 and Rs. 51046.00 for small and large farmers of Rayagada district respectively. Accordingly for Balangir district, average cost of cultivation per hectare obtained was Rs. 43079 and Rs. 50556.50 for small and large farmers respectively. In Kalahandi, average cost of cultivation per hectare obtained was Rs. 42763 and Rs. 50247 for small and large farmers respectively. Yield obtained per hectare in small farm sizes was12.96 q, 12.24 q and 11.94 q for Rayagada, Balangir and Kalahandi respectively. Whereas yield obtained per hectare in large farm sizes were 15.6 q, 15.45 q and 15.3 q for Rayagada, Balangir and Kalahandi respectively. Price of seed cotton per quintal was Rs. 5150.00. Average net return obtained for small farmers was Rs. 23381, Rs. 19957 and Rs. 18728 for Rayagada, Balangir and Kalahandi respectively. Whereas net return obtained for large farmers was Rs. 29294, Rs. 29011 and Rs. 28548 for Rayagada, Balangir and Kalahandi respectively. Cost of production per quintal is higher in small farmers of Kalahandi district (Rs. 3581.49). But profitability is higher for large farmer of Rayagada (Rs. 1877.82) due to higher yield. There was very less variation among the districts in return on rupee spent. By considering the following results of table 2, it was necessary to assess the difference between large and small farm size groups.

Table 2: Cost of cultivation of different size farmers group (Rs/ha) 2018-19`

Sl. No	Particulars	Rayagada		Balangir		Kalahandi	
		Small	Large	Small	Large	Small	Large
1	Average cost of cultivation (Rs/ha)	43363	51046	43079	50556.5	42763	50247
2	Yield (quintals/ha)	12.96	15.6	12.24	15.45	11.94	15.3
3	Price per quintal	5150	5150	5150	5150	5150	5150
4	Gross return (Rs/ha)	66744	80340	63036	79567.5	61491	78795
5	Net return (Rs/ha 0029	23381	29294	19957	29011	18728	28548
6	Cost of production (Rs/quintal)	3345.91	3272.18	3519.53	3272.27	3581.49	3284.12
7	Profit (Rs/quintal)	1804.09	1877.82	1630.47	1877.73	1568.51	1865.88
8	Return on rupee spent	1.54	1.57	1.46	1.57	1.44	1.57

Cost structure in different farm sizes (Rs/ha) 2018-19

Various components of cost incurred and returns realized from Cotton cultivation were calculated and presented in Table 3 and Table 4. The details on cost components in cotton were worked out and are summarized in Table 5. The share of total variable cost was 73.12 percent in the total cost. Among the two categories of farms, the total variable cost incurred per hectare by large farmers was more (Rs. 36834.64/ha) as compared to small farmers (Rs. 31669.92/ha).

The distribution pattern of operational cost under various inputs revealed that cost of human labour accounted for the highest share in the case of large farmers (Rs.15946/ha) and small farmers (Rs. 12992/ha). Bullock labour cost was more in the case of small farmers (Rs. 3400/ha) followed by large

farmers (Rs. 1470/ha). The cost of machine labour was lowest in small farmers (Rs. 2676/ha) and increased with the size of land holding. The cost of seeds was low in small farmers (Rs. 2592/ha) compared to the large farmers (Rs. 2628/ha). The cost of FYM was low on small farms (Rs. 1390/ha) compared to large farms (Rs. 1935/ha).

It could be also observed from the Table no 3 that the highest expenditure on fertilizers (Rs. 8755/ha) was observed on large farms followed by small farms (Rs. 6325/ha). The share of fixed cost in the total cost of cultivation was 26.88 percent in the overall study area. The farm category-wise analysis

revealed that fixed cost incurred per hectare by large farmers was high (Rs. 13781.88/ha) as compared to small farmers (Rs. 11398.32/ha). Among the different items of fixed costs, rental value of land was the highest which accounted for 16.24 percent of the total cost of cultivation in the overall study area. The other items like land revenue, depreciation charges and interest on fixed cost were of minor importance. Among the two categories of farmers the total cost incurred by the large farmers was high (Rs. 50616.52/ha) as compared to small farmers (Rs. 43068.24/ha) as presented in Table 3.

Table 3: Cost of cultivation of different size farmers group (Rs/ha) 2018-19

Sl. No.	Particulars	Small (n=71)	%	Large (n=49)	%	Pooled	%
	I. variable cost						
1	Cost of seed	2592.00	6.02	2628.00	5.19	2610	5.57
2	Manure	1390.00	3.23	1935.00	3.82	1662.5	3.55
3	Fertilizer	6325.00	14.69	8755.00	17.30	7540	16.10
4	Farm power & machinery	2676.00	6.21	3360.00	6.64	3018	6.44
5	Human labour	12992.00	30.17	15946.00	31.50	14469	30.89
6	Bullock labour	3400.00	7.89	1470.00	2.90	2435	5.20
7	Cost of pesticide	1123.00	2.61	1060.00	2.09	1091.5	2.33
8	Interest on working capital	1171.92	2.72	1680.64	3.32	1426.28	3.04
	Subtotal (I)	31669.92	73.53	36834.64	72.77	34252.28	73.12
	II. Fixed cost						
1	Rental value of own land	7080	16.44	8133	16.07	7606.5	16.24
2	Land revenue	16.00	0.04	9.00	0.02	12.5	0.03
3	Depreciation	3458	8.03	4619	9.13	4038.5	8.62
4	Interest on fixed capital	844.32	1.96	1020.88	2.02	932.6	1.99
	Subtotal (II)	11398.32	26.47	13781.88	27.23	12590.1	26.88
	Total cost of cultivation (I+II)	43068.24	100.00	50616.52	100.00	46842.38	100.00

The farm category wise analysis of gross returns revealed that the gross returns obtained per hectare by large farmers were high (Rs. 79567.50/ha) as compared to small farmers (Rs. 63757.00/ha). With respect to net returns also per hectare obtained by the large farmers were high (Rs. 28950.98/ha) as compared to small farmers (Rs. 20688.76/ha). Cost of production per quintal was Rs. 3426.04 and per quintal profits realized was Rs. 1723.96, due to very high price received by respondents. Thus, cultivation of cotton in the study area was found to be profitable as B: C Ratio was found to be 1.50 for overall study area.

Table 4: Cost and return analysis of cotton production 2018-19

Sl. No	Particulars	Small	Large	Overall
1	Average cost of cultivation (Rs/ha)	43068.24	50616.52	47673.38
2	Yield (quintals/ha)	12.38	15.45	13.92
3	Price per quintal	5150	5150	5150
4	Gross return (Rs/ha)	63757.00	79567.50	71662.25
5	Net return (Rs/ha)	20688.76	28950.98	23988.87
6	Cost of production (Rs/quintal)	3478.86	3276.15	3426.04
7	Profit (Rs/quintal)	1671.14	1873.85	1723.96
8	Return on rupee spent	1.48	1.57	1.50

Different income measures were calculated and presented in Table 5. It could be observed that farm business income was Rs. 32087.08, Rs. 42732.86 and Rs. 37409.97 for small, large and overall average of study area respectively. Farm labour income was Rs. 24162.76, Rs. 33578.98 and Rs. 28870.87 for small, large and overall average of study area respectively. Return per rupee invested over C2 was 1.48, 1.57 and 1.53 for small, large and overall average of study area respectively and

return per rupee invested over C3 was 1.35, 1.43 and 1.39 for small, large and overall average of study area respectively. By analyzing closely the table, it clearly indicated that the profit increases with increase in farm size and vice versa.

Table 5: Income measures among different size farmers group (Rs/ha)

Particulars	Small	Large	Pooled
Gross return (Rs/ha)	63757.00	79567.50	71662.25
Cost A1	31669.92	36834.64	34252.28
Rent paid for lease in land	1702.00	2151.00	1926.50
Cost A2	33371.92	38985.64	36178.78
Interest on values of own capital assets	844.32	1020.88	932.60
Cost B1	32514.24	37855.52	35184.88
Rental value of own land	5378.00	5982.00	5680.00
Cost B2	39594.24	45988.52	42791.38
Imputed value of family labour	3454.00	4628.00	4041.00
Cost C1	35968.24	42483.52	39225.88
Cost C2	43048.24	50616.52	46832.38
Managerial cost (10 percent of Cost C2)	4304.82	5061.65	4683.24
Cost C3 (cost C2+ managerial cost)	47353.06	55678.17	51515.62
FBI	32087.08	42732.86	37409.97
FLI	24162.76	33578.98	28870.87
Net income over C2	20708.76	28950.98	24829.87
Net income over C3	16403.94	23889.33	20146.63
Return per Rupee invested(over C2)	1.48	1.57	1.53
Return per rupee invested(over C3)	1.35	1.43	1.39

Harvesting/ picking operations consumed higher proportion of human labour as this operation was carried out 2-3 times. The entire crop cannot be harvested at one stretch and picking of the opened bolls had to be carried out at suitable intervals. As picking operation was spread over several weeks and higher

output of cotton requires huge amount of human labour. Weeding was the next major operation, which consumed substantial amount of human labour. This was mainly because weeding was carried out two to three times as there was greater weed incidence during the crop period.

Inputs used per hectare in cotton cultivation in the study area revealed that the average per hectare utilization of human labour was the highest in case of the large farmers followed by small farmers. Most of the small and large farmers used bullock labour as against use of tractor labour because use of bullock labour worked out to be cheaper than tractor labour use, but large farmers used tractor for ploughing and other operations hence the use of machine labour was more in these farms. This may be attributed to accomplishment of quick work and time constraint to cover large area.

Farmers in the study area used less quantity of farmyard manures. Among the various category of farms, the quantity of farmyard manure (FYM) applied per hectare was the highest in case of large farmers followed by small farmers. Results presented in previous chapter showed that there was high amount of application of chemical fertilizers in anticipation of good yield. Pesticides and other plant protection chemicals were used to minimize/ control the pests.

Cost and returns from cotton cultivation
The average operational cost of cotton per hectare was estimated to be Rs. 46842.38, out of which the major expenditure was for cost of human labour which accounted for 30.89 percent of the total operating cost, followed by rental value of land (16.24%), fertilizer cost (16.10%). Overall productivity in the area of cotton was reported to be 13.92 quintals of seed cotton per hectare. The farm income increases with the increase in farm size and vice-versa. This may be attributed to the fact that large farmers used high machine labour and applied more fertilizers than their counterparts (Pavan et al., 2008) [7]. The results are in conformity with the result of the study by Damte (2003) [3], Dalawi (2004) [2] and Kiresur et al. (2011) [4]. The per hectare expenditure in labour and chemical fertilizers was higher in large farms as compared to their counterpart.

The total cost of production per ha including interest on working capital, land revenue, depreciation charges, rental value of land, interest on fixed capital was worked out to be higher in case of large farmers compared to small farmers. The cost increased with increase in size of land holding. The study conducted by Mahendra Dev and Chandrasekhara Rao (2007) [5] indicated that the small cotton farmers obtained 23 percent lower yield as compared to the large farmers with a 20 percent lesser total cost of production and 3 percent higher cost per quintal.

Conclusion
Clothing has been recognized as an essential need of man since times immemorial and in a hot country like India, cotton has been the base for manufacture of textiles. After the onset of the green revolution, there has been a considerable increase in productivity and production of cotton in the country. Cotton is the backbone of textile industry, which consumes 70 percent of the country's total fibre production accounts for 38 % of the country's export and fetches over Rs. 80, 000 crores annually to the exchequer. Along with the industry which it sustains, it touches the country's economy at several points including employment and export earnings. India annually

cultivates around nine million hectares, the largest in the world. In fact, one out of every four hectares planted to cotton in the world is in India. About four million farmers grow the crop in about 13 states. Around 60 million people are estimated to depend on it one way or the other to eke out their living.

Cotton is being cultivated in 70 countries of the world with a total coverage of 32.30 m ha. Area wise, India ranks first in global scenario (about 33 percent of the world cotton area). However, in production it ranks second next to China. The cost return analysis in cultivation of cotton has revealed that cotton production is profitable both on large and small farms in cotton growing districts. Hence cultivation of cotton in these districts need to be encouraged by addressing the major problems like low yield, high seed cost, non-availability of quality seeds, lack of regulated markets and large price spread by the respective concerned agencies/government. Productivity levels of small farmers are lower compared to large farmers. Greater dosage of input utilization at appropriate times is expected to promote productivity increase, marketable surplus and thereby improve the prospects of higher returns.

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