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Comparative economics of production of jute and mesta in Dakshin Dinajpur district of West Bengal

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ABSTRACT

The study attempts to find out the cost of cultivation and profitability for jute and mesta in Dakshin Dinajpur district of West Bengal. The study reveals that the cultivation for both the crops is profitable. The operational cost of mesta is slightly higher than Jute whereas the result is reverse in case of net return. The input-output relationship indicates that farmers apply negligible quantity of plant protection chemicals though net return may be augmented by taking care of plant protection Benefit-cost ratio for jute cultivation is higher than the mesta. The study exhibits that the family labour engagement is more than 43 per cent of total man days for both crops.

***Key words*:** Comparative economics, cost of cultivation, jute, mesta

Jute is a major fibre cash crop grown in eastern India and this is the second most important fibre in India after cotton. Jute and mesta are also important pre-kharif crops grown in some parts of the West Bengal besides pulse and sesame. Jute is grown in nearly 10 per cent of total Net Cropped Area (NCA) in Dakshin Dinajpur which is situated under the agro-climatic zone of Old Alluvial Zone (OAZ) whereas mesta occupies 1.22 per cent of NCA in the district in recent years. Dakshin Dinajpur occupies 3.22 per cent of total cultivated Jute area in West Bengal and mesta accounts for 26.74 per cent of total area in West Bengal. This district contributes 2.66 per cent to total production of Jute in West Bengal while mesta supplies 33.74 per cent of total production in the state. The average yield for jute is lower than the state average but for mesta, it is higher than the state average. Jute alone contributes 34.94 per cent of total labour employment in West Bengal (Economic Review, Govt. of West Bengal 2007). In national level, Jute earned Rs. 415.59 crore (Department of Agriculture and Cooperation Ministry of Agriculture, Govt. of India) foreign exchange from export for the year 2008-09.

So the comparative economic analyses along with the factors influencing the production of these two fibre crops assume great importance to identify the problems and constraints for production of jute and mesta. The study also points out the utilization pattern of resources (factors of production) for both the crops.

The major objectives of the study are as follows:

i. to find out the costs and return structure of jute and mesta cultivation in Dakshin Dinajpur district
ii. to observe the utilization pattern of human labours in different factors of production
iii. to identify the factors of production in terms of cost influencing the net return per unit area
iv. to observe the output-cost relationship in the study area,

MATERIALS AND METHODS

The data have been collected purposively from the villages of Alipur and Amrai under Balurghat block of Dakshin Dinajpur district which falls under the OAZ of West Bengal. Fifty farmers each from jute and mesta in the crop year of 2011-12 have been selected randomly to collect the data for the study through pre-tested schedule. Comparative economics along with the profitability indicators of jute and mesta have been calculated from the data. Percentage contribution of each factor of production to total operating cost has been calculated for both the crops along with the coefficient of variations (CV) to observe the variability among the factors in the sample. A separate sub-section on human labour utilization has been discussed to observe the contribution of family as well as hired labors to each operation.

Cobb-Douglas type of production function has been fitted to examine the input-output relationship and also to identify the factors influencing the net return from per hectare of production for both the crops along with the elasticity's of the resource use. The function fitted in the study is as follows:

$$Y=ax_1^{b_1}x_2^{b_2}x_3^{b_3}x_4^{b_4}x_5^{b_5}x_6^{b_6}x_7^{b_7}x_8^{b_8}x_9^{b_9}u$$

The function was translated into linear form by making logarithmic transformation and the function becomes

$$\ln Y=\ln a+b_1\ln x_1+b_2\ln x_2+b_3\ln x_3+b_4\ln x_4+b_5\ln x_5 +b_6\ln x_6+b_7\ln x_7+b_8\ln x_8+b_9\ln x_9+\ln u$$

where,

Y= net return (Rs. ha^{-1})
a= constant
X_1= field preparation (Rs. ha^{-1})
X_2= seed (Rs. ha^{-1})
X_3= farm yard manure (Rs. ha^{-1})
X_4= fertilizers (Rs. ha^{-1})

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X_5= plant protection chemicals (Rs. ha^{-1})
X_6= irrigation charges (Rs. ha^{-1})
X_7= transportation (Rs. ha^{-1})
X_8= family labour (Rs. ha^{-1})
X_9= hired labour (Rs. ha^{-1})
u= error term
b_1 to b_9= coefficients of respective variables to be estimated or output elasticity's of factors
The relationship between cost and output has been examined from the Cubic Cost Function (Gujarati, 2004) for both crops as follows:

$$Y_i = b_0 + b_1 X_i + b_2 X_i^2 + b_3 X_i^3 + U_i$$

$$Y = total\ cost\ and\ X = output$$

RESULTS AND DISCUSSION

The results obtained from analysis of the data collected from the sample farmers of Dakshin Dinajpur district for both the fiber crops have been presented in five sub-sections as follows.

I. Comparative economics of jute and mesta

Costs and returns structure and percentage contribution of each factor of production to total cost for both the crops have been presented in Table 1. The average operational costs per hectare for jute and mesta are found to be Rs. 23709 and Rs. 24000 per hectare during the study period of 2011. The study also observes that expenses on human labour constitute 52.12 per cent and 48.35 per cent of total operational cost, for jute and mesta respectively, Costs on total fertilizers accounts for 11.04 per cent of total operational cost followed by irrigation (9.51%), field preparation (8.72%), Farm Yard Manure (7.71%) and seed (5.61%) for jute Whereas, in case of mesta, costs of seed accounts for 16.63 per cent which is much higher than that of Jute followed by irrigation (8.18%), total fertilizers (8.16%), field preparation (7.35%) and FYM (6.53%). Costs on plant protection chemicals are very negligible for both the fibre crops grown in the district of Dakshin Dinajpur.

Table 1: Comparative economics of jute and mesta

Items	Jute			Mesta		
	Rs. ha^{-1}	Percentage	CV	Rs. ha^{-1}.	Percentage	CV
Field preparation	2069	8.72	16.57	1764	7.35	13.99
Seed	1330	5.61	6.82	3992	16.63	6.88
FYM	1827	7.71	23.77	1568	6.53	31.17
Fertilizers	2618	11.04	10.58	1958	8.16	14.90
Plant protection chemicals	208	0.88	20.01	104	0.43	36.47
Irrigation	2254	9.51	24.12	1962	8.18	17.23
Transport	327	1.38	37.85	321	1.34	34.63
Human labour	12358	52.12	8.44	11604	48.35	7.95
Operational cost	22991	-	7.86	23273	-	7.65
Interest on working capital	718	3.03	7.86	727	3.03	7.65
Total operational cost	23709	100	7.86	24000	100	7.65
Total return	46770		6.63	44672		6.20
Net return	23061		13.45	20672		12.55
B/C Ratio	1.97			1.86		
Net return excluding family lab (Rs.ha^{-1}.)	28760			25671		
B/C ratio excluding family lab	2.60			2.35		
Cost per quintal (Rs.)	1075			1114		
Net return per quintal (Rs.)	1045			959		
Cost per quintal excluding fam lab (Rs.)	816			882		
Average productivity	22.06			21.55		

More than 30 per cent variability is observed for transport costs in both the crops. Variability in cost components such as irrigation, plant protection chemicals and FYM are also observed for both the crops. Overall variability of operational costs for both the crops is more or less similar, 7.86 per cent for jute and 7.65 per cent for mesta.

The study reveals that net return per hectare of jute (Rs. 23061 ha^{-1}.) is higher than mesta (Rs. 20672.ha^{-1}.).The return per rupee investment for jute is 1.97 whereas for mesta, the value is 1.86. Apart from this, the area under mesta is gradually expanding in the district as the chances of crop failure for mesta is less than the jute. Table 1 reveals that the net returns per hectare of jute and mesta excluding the family labour are Rs. 28760 and Rs. 25671. The benefit cost ratios (B-C ratio) for both the crops are shown to be higher than the previous ratios, 2.6 and 2.35 for jute and mesta respectively, if the costs incurred on family labour is excluded from the cost analysis.

Costs of production for producing per quintal of fibres for both the crops have been calculated as the Minimum Support Price (MSP) is declared on the basis of costs per quintal and these two fibres also traded on per quintal basis. Cost per quintal of jute production is found to be Rs. 1075 (the projected cost (Cost A2+FL) of jute per quintal for West Bengal as decaled by CACP in 2009-10 was Rs. 858.55, Ministry of Agriculture, Govt. of India) whereas for mesta, the cost is Rs. 1114. The declared MSP for jute in 2011-12 for TD 5 grade was Rs. 1675 (Department of Agriculture andCooperation Ministry of Agriculture, Govt. of India) per quintal which is much higher than the calculated operational cost in the study. The study further reveals that the actual price in the study area ranges between Rs. 2000 to 2170 q^{-1} for jute whereas for mesta, the price varies between Rs.1750 to Rs. 1850 q^{-1} Net return per quintal is also higher in case of jute (Rs.1045) than that of mesta (Rs. 959). Average productivity of jute (22.06 q ha^{-1}) as well for mesta (21.55 q ha^{-1}) in the sample area is lower than that of district as well as state average (24.26 q ha^{-1} for jute in 2008-09, Economic Review, 2009-2010, Govt. West Bengal).

II. Human labour requirement for jute and mesta

Table 2: Operation-wise human labour requirement for jute and mesta cultivation in man-days

Items	Jute			Mesta		
	Family Labour	Hired Labour	Total Labour	Family Labour	Hired Labour	Total Labour
Field preparation	5.00 (9,65)	0.00 (0.00)	5.00 (4.45)	4.97 (10.93)	0.00 (0.00)	4.97 (4.71)
Seed	5.00 (9.65)	0.00 (0.00)	5.00 (4.45)	5.00 (11.00)	0.00 (0.00)	5.00 (4.74)
Fertilizers	10.30 (19.88)	0.00 (0.00)	10.30 (9.17)	10.10 (22.23)	0.00 (0.00)	10.10 (9.58)
P. P. chemicals	5.00 (9.65)	0.00 (0.00)	5.00 (4.45)	5.00 (11.00)	0.00 (0.00)	5.00 (4.74)
Irrigation	0.00 (0.00)	5.40 (8.92)	5.40 (4.81)	0.00 (0.00)	5.50 (9.16)	5.50 (5.21)
Weeding	5.00 (9.65)	21.73 (35.89)	26.73 (23.79)	5.38 (11.84)	20.38 (33.95)	25.76 (24.42)
Harvesting and post harvest	16.51 (31.87)	33.41 (55.19)	49.92 (44.43)	10.00 (22.00)	34.15 (56.89)	44.15 (41.86)
Transport	5.00 (9.65)	0.00 (0.00)	5.00 (4.45)	5.00 (11.00)	0.00 (0.00)	5.00 (4.74)
Total human labour	51.81 (100)	60.54 (100.00)	112.35 (100.00)	45.45 (100.00)	60.04 (100.00)	105.49 (100.00)

Figures in parentheses indicate the percentages

The share of human labour engagements in total cost of production for both the two fibre crops is nearly 50 per cent. It is interesting to note that family labour engagement in the process of production, is 46.11 per cent and 43.08 per cent of total man-days required for production of jute and mesta, respectively. Furthermore, it is also evident from the study that some of the intercultural operations are solely performed by the family labours viz. field preparation, seed sowing, application of fertilizers, application of plant protection chemicals and transportation of crops from field to farm house and farm house to market. This is noteworthy to mention here that the jute area under study ranges between 0.49 acres to 1.5 acres and area under mesta ranges between 0.25 to 1.5 acres. Highest share of family labours engagement to total family labours is observed in case of harvesting and post harvesting operations (31.87%) followed by fertilizers application (19.88%) in case of jute whereas for mesta the family labour engagement for these two operations is almost same (22%). Total family labour engagement per hectare for crop production is slightly higher in case jute than mesta.

The study reveals that the two most important intercultural operations viz. harvesting and post harvesting operations and weeding for both the crops depend on hired labours. Fifty five per cent man days of total man days required for hired labours is used for harvesting and post harvesting operations followed weeding (36%) in jute. In case of mesta, 57 and 34 per cent of total hired man days is required for these two operations, respectively.

The study points out that total man days required per hectare is slightly higher in case of jute (112.35) than mesta (105.49). Harvesting and post harvesting operations, the most important operation in production of fibre crops, alone consumes more than 40 per cent of total man days requirement followed by weeding, nearly 24 per cent.

III. Input-output relationship in terms of cost and return

The input and output relationship in terms of net return and costs incurred of different inputs has been discussed in this section. Table 3 and table 4 exhibit the correlation among the dependent and independent variables expressed as returns and costs. Both the tables express different degrees of correlation for both the crops.

Table 3: Pearson correlation co-efficient matrix of jute between net return and other costs of factors of production

	NR	FP	SEED	FYM	FERT	PPC	IR	TP	FL	HL
NR	1.00									
FP	-0.22***	1.00								
SEED	-0.03	-0.02	1.00							
FYM	-0.10	-0.33*	0.23***	1.00						
FERT	-0.42*	0.05	0.41*	-0.04	1.00					
PPC	0.20***	-0.02	0.34*	0.03	0.30**	1.00				
IR	-0.02	0.34*	0.20***	0.34*	0.14	0.26**	1.00			
TP	-0.04	0.30*	0.14	0.30**	0.11	0.61*	0.54*	1.00		
FL	0.23***	0.07	0.04	-0.14	0.05	0.36*	0.22***	0.43*	1.00	
HL	-0.36*	0.38*	0.13	0.04	0.22***	0.27**	0.31**	0.54*	0.31*	1.00

*Note: *, ** and *** denote significance at 1%, 5% and 10% level, respectively*

Table 4: Pearson correlation co-efficient matrix of mesta between net return and other costs of factors of production

	NR	FP	SEED	FYM	FERT	PPC	IR	TP	FL	HL
NR	1.00									
FP	-0.46*	1.00								
SEED	-0.21***	-0.11	1.00							
FYM	-0.02	0.42*	0.04	1.00						
FERT	0.07	0.09	0.10	0.06	1.00					
PPC	0.01	0.26**	0.01	0.40*	-0.02	1.00				
IR	-0.31*	0.81*	-0.04	0.42*	0.17	0.30*	1.00			
TP	-0.19***	0.28**	0.20***	0.40*	0.01	0.86*	0.32*	1.00		
FL	0.04	0.00	0.10	0.23***	0.24**	-0.02	0.01	-0.09	1.00	
HL	-0.19***	0.71*	0.01	0.61*	0.06	0.43*	0.74*	0.47*	-0.01	1.00

*Note: *, ** and *** denote significance at 1%, 5% and 10% level, respectively*

NR : Net Return; FP : refers to Field Preparation; FYM : Farm Yard Manure; PPC : Plant Protection Chemicals; IR : Irrigation; TP : Transportation; FL : Family Labour; HL : Hired Labour

Table 5: Estimated value of coefficients of Cobb Douglas functional model of net return

Variables	Coefficients	
	Jute	Mesta
(Constant)	11.17*	18.85***
Field preparation	-0.12	-0.57*
Seed	0.24	-0.35
Farm yard manure	-0.12	0.06
Fertilizers	-0.68*	0.14
Plant protection chemicals	0.25**	0.19**
Irrigation charges	0.12	0.00
Transportation	-0.05	-0.23**
Family labour	0.62***	-0.59
Hired labour	-0.35*	0.25
R^2	0.53	0.46
R^2 (adjusted)	0.42	0.34
N (No. of observations)	50	50
F	4.95***	3.77***

Note: Dependant Variable: Net Return

, ** and * denote significance at 1%, 5% and 10% level, respectively*

Table 5 presents the values of independent variables along with the R^2 and F values for two models of jute and mesta, respectively. The co-efficient of multiple determinations, R^2, is found to be 0.53 and 0.46 for jute and mesta, respectively. Co-efficient of multiple determinations expresses the percent variations of explanatory variables included in the model. The F-values for both the models are significant at 1 per cent level of confidence. Significant F-value implies that the included variables collectively are important for explaining the variations of dependant variables. The significant along with non-significant contributors of specified cost-factors affecting net return of these two fibre crops are presented in the Table 5 as the coefficients of regression equation.

Input-output relationship in case of jute

The positive significant coefficients of factor-cost variables determining the net return of jute are constant, plant protection chemicals and family labour in the model. The positive signs indicate that net return from jute can be increased by increasing the costs incurred on these particular factors. In different words, it can be said that there are scopes for increasing the net returns of jute by using more family labor and plant protection chemicals. This implies that 1 per cent increase of costs incurred on plant protection chemical will lead to 0.25 per cent increase in net return if other factors remaining constant. Net return can also be increased at the rate of 0.62 per cent if cost on family labour is increased by 1 per cent with other factors remaining constant.

The significant negative factors in the model are costs on fertilizers and hired labours which imply that 1 per cent increase in each factor costs will lead to decrease the net return at the rate of value of coefficients. In other words, the over-use of the particular factor is detected in the process of production. Costs on fertilizers and hired labour in case of jute exhibit the negative coefficient values. In order to have hired labour more productive, a part of hired labour may be withdrawn from the land. This is an ideal example of pressure of population on land. Fertilizers are also recommended to use less keeping other factors remaining constant to increase the net return from jute.

Non significant values of coefficients indicate that the coefficients are not different from zero. The non significant variables are costs on field preparation, seed, FYM, irrigation charges and transportation.

Input-output relationship in case of mesta

Only two independent variables determining the net return of mesta are constant and plant protection chemicals which exhibit positive effect on dependant variable. The model for mesta indicates that if the cost on plant protection chemicals is increased by 1 per cent, keeping other factors remaining constant, the net return of mesta per hectare will be increased by 0.19 per cent.

Field preparation and transport costs have the negative relation with the net return. So, the costs incurred on these two items need to be reduced to augment the net return from mesta.

Variables exhibiting the non-significant values of coefficients are seed, FYM, irrigation charges, family and hired labour.

IV. Cost functions of jute and mesta

The Cubic Cost Function has been fitted for both the crops grown in Dakshin Dinajpur district. Correlation matrix for both the crops exhibit very higher degree of multicollinearity among the independent variables. As a result, step-wise regression analysis has been performed. Both the cost models exhibit higher degree of R^2 values (significant at 1% level of confidence) which imply that a large portion of the variation in the data set could be explained from the models. F values for both the models are significant at 1 per cent level of confidence.

Table 6: Estimates of cubic cost function for jute and mesta

Items	Coefficients	
	Jute	Mesta
Constant	1556.49*	1399.91*
X_i	740.639*	725.31*
R^2	0.94	0.96
F	795.89*	1198.17*

Note: Dependent variable: Cost, Independent Variable: Output, Excluded Variables: Xi^2, Xi^3
** Indicates 1% level of significance*

Both the models include only X_i (output) to explain the costs functions and the coefficients for explanatory variables are highly significant at 1 per cent level. The two models for jute and mesta exclude the other two variables from the variables (Xi^2, Xi^3). The residuals for both models are distributed normally at near zero mean. Only limitation for these two models to be mentioned here is the models will be best explained above the land size of 0.25 acre (minimum land sizes for the crops in the sample area).

The study points out that the cultivation for both the crops are profitable. The operational cost per

hectare for mesta is slightly higher than the jute whereas the result is contrary in case of net return per hectare. It is also observed from the study that cost incurred on seeds of mesta is three times higher than that of jute. Farmers apply negligible quantity of plant protection chemicals as management practices of pests and diseases are neglected for these two fibre crops unlike cotton though there is a scope for augmentation of income from this management as evident from input-output relationship. Farmers apply FYM according to the availability and this is indicated in the higher variability of FYM uses. Benefit-cost ratio for jute cultivation is slightly higher than the mesta. Similarly, cost per quintal of production of mesta is higher than that of jute. Furthermore, the study also indicates that the realized price for jute is higher than that of Minimum Support Price declared by the Government of India. The study also reveals that the family labour engagement in the process of production is more than 43 per cent of total man days required. The sample farmers are mainly dominated by marginal farmers. So it may be concluded that marginal farmers engage more family labours for their subsistence level of living. The maximum man-days are required for harvesting and post harvesting operations followed by weeding for both the crops. The input-output relationship churns out the plant protection chemicals and family labour as positive significant coefficients which indicate the scope for augmentation of net return by increasing the costs on aforesaid two factors for jute. A part of hired labour may be withdrawn from the land as indicated in input-output relationship. Most of the independent variables exhibiting negative or non-significant coefficients indicate the poor resource allocation strategy of the sampled farmers.

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