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RESEARCH ARTICLE

Production economics of jute farming in Sunsari district, Nepal

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Abstract

Jute cultivation has shown decreasing trend in recent years globally despite the prospective demand. Being labor-intensive, with labor making up over 70% of the entire cost and technological advancements still not evident in farmers' fields limits productivity of jute in Nepal. This study aims to analyze the economic viability of jute production, factors affecting it and constraints of jute production in Sunsari district, Nepal. Well-structured and pretested interview schedule was used to acquire required data from 120 jute cultivators of Bhokhraha Narsingh and Duhabi municipality using random and purposive sampling technique. Benefit-cost ratio analysis and multiple regression were conducted using Excel 2019 and SPSS Version 25. Jute production is found profitable as shown by positive gross margin and the average Benefit-Cost ratio of 1.52. Highest education of the family, machinery and subsidy were positively significant with Benefit-cost ratio. Number of economically active female members had shown negative influence on benefit-cost ratio of jute production. Distance to nearest extension service center showed highly significant negative relation with benefit-cost ratio implying increasing distance lowers BC ratio by a greater extent. High cost of production and labor problem were ranked as major problem in sustainable jute production. To increase the jute productivity and sustainability, this study recommends focusing on labor issues and enhancing technology interventions. The findings of this study offer policymakers a foundation to implement strategies that strengthen jute production, fostering both economic stability and environmental sustainability in Sunsari district, Nepal.

Keywords: BC ratio; economic viability; regression

Introduction

Jute, often known as the golden fiber, is a natural fiber. It is one of the most affordable and durable natural fibers, and it is regarded as the fiber of the future (Uddin & Chowdhury, 2015). Jute is the cash crop for the poor and the marginal farmers and it continues to be an important commodity for employment and source of income for them (Kumari et al., 2018). Jute (Corchorus capsularis L. & Corchorus olitorius L.) is the world's second most produced natural bast fiber, with an anticipated average production of 2.39 million tons in 2020/21(Singh et al., 2019). The fibers are used to manufacture twine and rope, either alone or in combination with other types of fibers. Jute butts, which are the coarse ends of the stalks, are used to manufacture cheap cloth. In contrast, very fine jute threads can be extracted and turned into imitation silk (Islam & Ali, 2018). Jute has a long history of use in the sacking, carpet, wrapping fabric (cotton bale), and building fabric production industries (Islam & Ali, 2018). Man-made synthetic

fibers are created in many nations due to insufficient production to fulfill demand and limited geographical distribution in India, Pakistan, Bangladesh, and other Asian countries (Maiti & Singh, 2019). Countries are currently focusing heavily on developing eco-friendly products such as jute bags in order to reduce climate impact and save the environment. Farmers are returning to jute production as the price of jute continues to rise. Jute's market is rapidly expanding (Islam, 2018). To meet industry demands, jute and associated fiber production must be expanded. Increased productivity and increased jute cultivation area are two major ways to do this (Kumari et al., 2018). By lowering dependency on synthetic materials, improving soil health through rotation, and increasing biodiversity, increased jute production could be crucial to the advancement of sustainable agriculture techniques. Additionally, jute supports the creation of environmentally friendly products by offering biodegradable substitutes for plastics, which is in line with international sustainability objectives. Economically, by stabilizing farmer incomes and generating job opportunities, increased jute production strengthens rural communities. Despite such prospective demand, jute cultivation and area in the regions have shown changing trends in recent years. As a result, an attempt must be made to comprehend the current state of Jute farming, as well as the identification of limits from the perspective of growers. The dominance of marginal and small-scale farmers in jute farming is one of the limiting elements in the process of achieving cost competitiveness, resource use efficiency, and marketing efficacy (Kalita & Bhuyan, 2018). Technological progress is still not noticeable in the farmers' fields, and jute cultivation is labor intensive, accounting for almost 70% of the cost of human labor (S. Dutta & Mondal, 2021). The yield and quality of olitorius jute are now diminishing due to a lack of improved jute cultivars and other biotic stress factors. Insect pests are the most important biotic stressors in jute farming. Identifying the best jute varieties to grow on farms and utilizing quality tossa fibers in the jute sector industry would assist farmers in selecting the best jute varieties to grow (Karki et al., 2021).

In relation to this, knowing the economics of jute production and identifying the key factors affecting and/or causing variations among producers in this study area is found very imperative in the course of planning for improvement. In this regard, there was no similar study conducted on similar issue in the specific targeted study area and hence this study is meant to fill this information gap. This study sets out to analyze economics of jute farming in Sunsari district, and to identify characteristics that explain variation in the economic viability of the farmers. An understanding of these relationships could provide policymakers with information to design programs that can contribute to measures needed to expand the jute production potential of Sunsari district.

To analyze economics of jute farming in Sunsari district, the objectives are; To analyze the economic viability of jute farming, to identify factors affecting economic viability of jute farming and to identify problems associated with of jute farming in Sunsari district.

Methodology

Study Area

Sunsari District is a district in Koshi Zone, Eastern Development Region, Nepal at latitude 26°38′29.76″ North, longitude 87°07′44.76″ East. Sunsari district is the second highest jute producing district of Nepal where jute is cultivated in 1392 hectares with productivity 1.48 mt/ha. Sunsari has a moderate climate. There is a lot of rainfall in the summer, and in the winter, it is quite dry. Bhokraha Narsingh Rural Municipality and Duhabi Municipality were selected for the study as population of jute cultivating farmers is relatively high.

Sources of Data

Both primary and secondary data will be used. Primary data will be collected through well prepared and pretested questionnaire to the sampled farmers. Secondary data will be collected from different journals, publications, reports and different internet sites.

Sample Size Determination

From two selected municipalities, the representative respondents will be selected to enhance reliability and validity of the study. Accordingly, the sample size of the study is determined by using Kothari sampling design formula, (Kothari, 2004)

$$n = \frac{N}{1+N(e^2)}$$

Where,

n = sample size

N = total population

e = acceptable error term (0.1)

Simple random sampling was done to collect data from 120 jute farmers.

Sampling and Data Collection

The required quantitative data was collected through household survey using structured questionnaire which was pretested in 10 randomly selected jute growers of selected municipalities. We collected a list of jute cultivating farmers of Bhokhraha Narsingh and Duhabi municipality and selected 120 jute growers using simple random sampling technique. The data collection was carried out by visiting each household personally and interviewing them with the help of a pretested interview schedule. In each of jute producing respondent households, the household head or any adult who had lived with the household for at least one previous crop production seasons and conversant with the farming activities of the other household members were interviewed.

Data Analysis

Data collection was done by interview schedule, data was entered in SPSS version 25 and data was analyzed using SPSS version 25 and MS Excel 2019. Following analysis were done:

Gross margin analysis

Gross margin is the gross return over variable cost. Gross margin is calculated by deducting the total variable cost from the gross return (Bristy, 2020).

Gross margin = Gross return – Variable cost

Gross return

Gross return is calculated by multiplying the total amount of product with respective per unit price and adding value of by-product.

Gross return of jute production = Unit price of jute * Total production + value of by-product.

Net return

Net return or profit was calculated by deducting the total cultivation/production cost from the total return or gross return.

Net return = Total return – Total cultivation cost

Benefit cost ratio

Benefit Cost Ratio (BCR) is a relative measure, which is used to compare benefit per unit of cost.

BC ratio= Total return/Total cost

Factors affecting benefit cost ratio

Factors affecting benefit cost ratio were identified using multiple regression (Kothari, 2004).

Regression is the determination of a statistical relationship between two or more variables. In simple regression, we have only two variables, one variable (defined as independent) is the cause of the behavior of another one (defined as dependent variable). Regression can only interpret what exists physically i.e., there must be a physical way in which independent variable X can affect dependent variable Y. The basic relationship between X and Y is given by

$$Y = a + bX$$

This equation is known as the regression equation of Y on X (also represents the regression line of Y on X when drawn on a graph) which means that each unit change in X produces a change of b in Y, which is positive for direct and negative for inverse relationships. When there are two or more than two independent variables, the analysis concerning relationship is known as multiple correlation and the equation describing such relationship as the multiple regression equation. Multiple regression equation assumes the form ;

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \cdots \ldots \ldots \ldots + b_nX_n$$

The multiple regression equation for jute production is defined as;

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8$$

Where,

Y = B/C ratio

a = y-intercept

b = coefficient or slope for each variable

X_1 = Sex of Household

X_2 = Highest education in family

X_3 = Number of females economically active members

X_4 = Machinery

X_5 = Member of cooperatives

X_6 = Loan for jute

X_7 = Subsidy

X_8 = Distance to nearest extension service

Preference ranking

Indexing was done in order to rank the problem by using the formula.

$I = \Sigma S_i F_i / N$ (Miah, 1993)

Where,

I= Index Score

S_i = Scale value of i^{th} level

F_i = Frequency of i^{th} level

N =Total number of observations

Result and discussion

Descriptive Statistical Analysis of the Variables

Table 11 shows the population characteristics of continuous variables with their mean and standard deviation. The study found the overall mean highest education of family to be 11.89 years with standard deviation 2.83. Higher education among farmers helps to maximize yield per unit area by improving crop management practices. Average of 1.38 number of females were found to be economically active in study area. Furthermore, the study found nearest extension service center was 3.53 km far from household in average.

Table 1. Population characteristics (Continuous variables)

Variables	Mean	Std. Deviation
Highest education of family (years)	11.89	2.83
Number of economically active females	1.38	0.60
Distance to nearest extension service (km)	3.53	1.70

Source: Field survey 2024

Table 22 shows the population characteristics of categorical variables with their frequencies. Study shows majority of households (87.50%) have male household head while only 12.50% of female household head. 74.20% of farmers had some kind of machineries which indicated 25.80% of farmers are deprived of any kind of machineries. Very few farmers were member of cooperatives which might be due to low abundance of cooperatives or ineffective functions of cooperatives available there. Meanwhile 68.30% of farmers received subsidy on seed and fertilizer reducing cost of production. 31.70% of farmers were found to be out of reach from any kind of subsidy. Very few farmers were found to have drawn loan especially for jute production.

Table 2. Population Characteristics (Categorical variables)

Variables	Category	Frequency
Sex of HH	Male	105 (87.50%)
	Female	15 (12.50%)
Machinery	Yes	89 (74.20%)
	No	31 (25.80%)
Member of cooperatives	Yes	19 (15.80%)
	No	101 (84.20%)
Subsidy	Yes	82 (68.30%)
	No	38 (31.70%)
Loan for jute	Yes	3 (2.50%)
	No	117 (97.5%)

Source: Field survey 2024

Cost Structure of Jute Production

The average total cost of jute production per ha per season was found to be Nrs. 205891.23. Among all the costs contributing to total cost in jute production, labor cost accounts the highest cost (36%) followed by processing cost (25%), machinery cost (15%), variable cost (12%) and land rent (12%). This indicates jute production is labor intensive mostly used during weeding and harvesting. Machine introduced for harvesting of jute was rejected by farmers due to loss of jute sticks by breakage which is high value jute byproduct in study area. Introducing effective machineries to lower human labor requirement is recommended. Improvement in mechanization in jute farming will result in increased yield efficiency while minimizing labor requirement aligning with sustainable agriculture. Dutta (2012) also found labor cost constitute highest cost (55%) followed by variable cost. Within various variable costs, cost of fertilizer (urea, DAP and MOP) i.e. 48% was found highest followed by irrigation (31%), pesticide (12%), and seed (9%). This result is in line with result found by (Dutta, 2012) who also reported cost of fertilizer highest followed by irrigation. Figure 2 shows cost of pesticide is relatively lower which indicates farmers in study area use relatively lower quantity of pesticide. This highly contributes to sustainable agriculture.

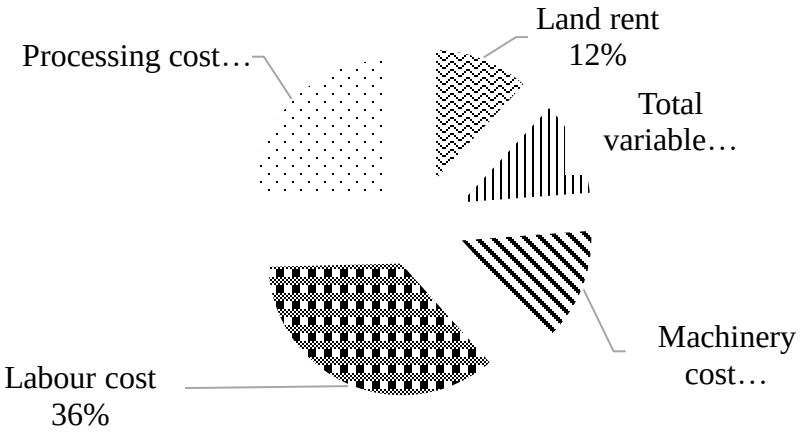

Figure 1: Pie-chart showing share of various cost in total cost

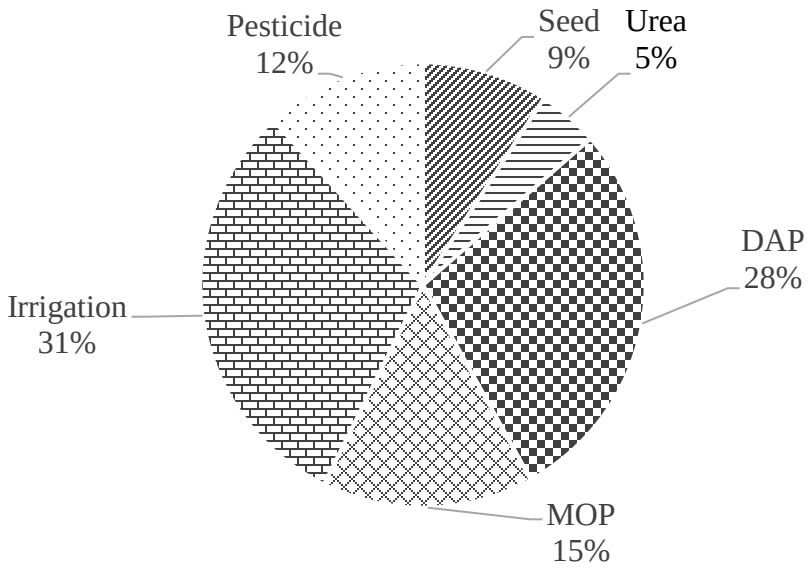

Figure 2: Pie-chart showing share of various inputs in total variable cost

Source: Field survey 2024

Gross Margin, Gross Return and BC Ratio

The study found gross return per ha land to be NPR 313423.36 which includes return from both main product and by-product with gross margin NPR 107532.13. Gross margin was found to be low due to high cost of production but low price of jute. Study found out BC ratio of jute production in study area to be 1.52. This implies with every 1-rupee investment 1.52 will be returned. Therefore, jute production is found profitable as shown by positive gross margin and the BC ratio greater than one. This result is similar with result found by (Islam, 2018) who also found BC ratio to be 1.52.

Table 3. Economic viability of jute production

Variable	Value
Total cost	205891.23
Gross margin	107532.13
Gross return	313423.36
BC ratio	1.52

Source: Field survey 2024

Factors Affecting Economic Viability

Table 44 shows highest education of family in years was found positively significant with BC ratio at 5% level of significance with coefficient 0.03 which implies 1 years increase in highest education of family increases BC ratio by 3%. Number of females economically active members in family was found to be highly significant with negative

coefficient at 1% level of significance. This explains with increase in one female economically active member, BC ratio decreases by 6%. This is due to less efficiency of female as compared to male during various works on jute production increasing cost of production. Presence of machinery had shown positive significant relation with BC ratio at 5% level of significance. Similarly, subsidy had also shown positive significant relation with BC ratio at 5% level of significance with coefficient 0.20 which describes one unit increase in subsidy will increase BC ratio by 20%. Providing subsidy to the farmers is seen to be highly effective in increasing profitability in jute production. Distance to nearest extension service center was found to be affecting BC ratio negatively at 1% level of significance. Increase in distance by 1 km decreases BC ratio by 31%. This is due to decrease in reach of farmers with extension service center in relation to subsidy and training with increase in distance.

Table 44 shows that the R^2 value for jute is 0.32 which means that 32% variation in the gross return of jute was explained by the independent variables included in the model respectively. The values of adjusted R^2 was found 0.27. This means that after considering the degrees of freedom (df), independent variables in the model still explained 27% of the variation in the gross return of jute. The F value for jute was found 6.58 which was highly significant at 1% level indicating the good fit of the model.

Table 4. Factors affecting economic viability of jute production

Variable	Beta coefficient
Sex of HH	-0.18 (0.12)
Highest education of family (years)	0.03 (0.01)**
Female economically active members	-0.06 (0.04)*
Machinery	0.23 (0.09)**
Member of cooperatives	-0.01 (0.11)
Loan for jute	-0.24 (0.25)
Subsidy	0.20 (0.08)**
Distance to nearest extension service	-0.31 (0.06)***
Constant	1.70 (0.21)***
F value	6.58***
R value	0.56
R square	0.32

Note: ***, ** and * signifies 1%, 5% and 10% level of significance respectively

Value in parenthesis indicates standard error

Source: Field survey 2024

Problem in Jute Production

The study found out high cost of production as primary problem with index 0.93 followed by labor problem (0.92), technology constraint (0.86), lack of irrigation facility (0.58), lack of retting pond (0.53) and unavailability of quality seed (0.53). So, the study suggests decreasing the cost of production which may be achieved by increasing subsidy and solving labor problem by technology intervention may result higher return in jute production. Rashid (2022) also found high cost of production as primary problem followed by unavailability and high cost of labor.

Table 5. Problems in jute production

Problem in production	Index	Rank
Unavailability of quality seed	0.53	VI
Labor problem	0.92	II
Lack of irrigation Facility	0.58	IV
High cost of production	0.93	I
Technology constraint	0.86	III
Lack of retting pond	0.53	V
Disease problem	0.36	VIII
Pest problem	0.42	VII

Source: Field survey 2024

Problem in Jute Marketing

The study found out low price of jute as major problem with index 0.94 followed by unstable price of jute (0.91), inadequate marketing infrastructures (0.71), fluctuating demand (0.68) and dominance of Indian market (0.61). Providing fair price to the farmers will improve return in jute production. Nowadays, many farmers were found to be shifting towards sugarcane and maize cultivation due to low profitability resulting from low price of jute as compared to cost of jute production. Rashid (2022) also found 55% farmers had problem of low price of jute as compared to production cost.

Table 6. Problems in jute marketing

Problem in marketing	Index	Rank
Dominance of Indian market	0.61	V
Low price of jute	0.94	I
Unstable price of jute	0.91	II
Fluctuating demand	0.68	IV
Transportation	0.26	VIII
Lack of market information	0.54	VI
Inadequate marketing infrastructures	0.71	III
Loss during marketing	0.32	VII

Source: Field survey 2024

Conclusion

This study presents significant results in jute production in Sunsari district, Nepal. The study found jute production profitable as shown by Benefit-cost ratio of 1.52 and positive gross margin. Highest education of the family, machinery and subsidy were found to be positively significant with Benefit-cost ratio. While, distance to nearest extension service center showed highly significant negative relation with benefit-cost ratio implying increasing distance lowers B/C ratio by a greater extent. High cost of production was found major problem in jute production and low price of jute as marketing problem. This study recommends providing subsidy and enhancing technology interventions is necessary to increase profitability in jute production. Also providing fair price of jute to the farmers

is necessary to stop jute growers from shifting towards other farming practices as shifting towards maize and sugarcane cultivation is seen more prevalent in Sunsari district. Increased income will enable farmers to afford nutritious food and help address hunger in long run. Strengthening jute farming can enhance Nepal's export revenue which eventually contributes to national economic growth. Jute being biodegradable and renewable, promoting jute usage aligns with responsible consumption practices. Jute farming also reduces environmental impact and improve soil health. So, we can conclude that enhancing jute sector in Nepal can reduce poverty, promote economic growth and improve environment. This describes jute farming as significant part of sustainable agriculture and sustainable development.

Declaration

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Authors contribution: Data collection, S Sharma, E Chaudhary; Data analysis, S Sharma; manuscript, S Sharma; Review and editing, S Sharma, K Regmi, P Gautam; Guidance and manuscript final review, K Regmi, H Neupane.

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