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RESEARCH ARTICLE

ECONOMIC ANALYSIS OF SUGARCANE PRODUCTION AND MARKETING IN NAWALPARASI DISTRICT OF NEPAL

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ABSTRACT

A survey in Pratapur and Ramgram municipalities of Nawalparasi district evaluated the economics of sugarcane production and marketing in western Nepal. Data from 40 sugarcane cultivating households revealed a predominantly male farming landscape (97.5%) with agriculture as the primary income source (65%). Despite high labor costs averaging Rs. 400,414.5362 per hectare, sugarcane cultivation remained profitable, yielding an average net profit of Rs. 416,364.3480 per hectare. Correlation analysis emphasized the importance of cost management and productivity strategies. Challenges such as drought stress and delayed payments were noted, suggesting areas for improvement to enhance the sustainability of sugarcane farming in the region.

KEYWORDS

B/C ratio, Cost analysis, Ratoon management, Sett

1. INTRODUCTION

Sugarcane (Saccharum officinarum) is crucial globally for its diverse applications, including sugar production (meeting 60% of the world's demand), economic impact, role in food and beverages, energy generation (ethanol), valuable by-products, adaptability to various climates, environmental benefits (carbon sequestration), and agricultural sustainability (improving soil fertility) (Bharati, 2018). A tropical crop, sugarcane, typically matures within 8 to 12 months. Matured cane can display various colors such as green, yellow, purplish, or reddish, indicating ripeness when its sugar content peaks (Onwuenme and Sinha, 1995). Sugarcane propagation involves stem cuttings known as setts, where each node possesses the potential to sprout new plants. Shoots emerge from underground nodes, leading to the growth of tillers. In the Terai region, sugarcane cultivation is pivotal, serving as a primary income source and supplying raw materials for diverse industries (Aina et al., 2015). The sugarcane industry stands out as the sole organized agro-industry in Nepal, serving as a vital source of income for numerous farming households. Its presence significantly contributes to poverty alleviation efforts in rural areas (Bhattarai et al., 2023).

Government records indicate a decrease of more than 305,000 metric tons in sugarcane production over the last three years (Lamsal, 2023). Data from the Ministry of Agriculture and Livestock Development reveals that in fiscal year 2075/76, sugarcane cultivation encompassed 71,625 hectares, yielding 3,557,934 tons. However, in FY 2077/78, the cultivation area decreased by 7,271 hectares to 64,354 hectares, resulting in a production decrease of 373,991 tons to 3,183,943 tons. Furthermore, sugarcane productivity declined to 49.47 tons per hectare from 49.6 tons in FY 2075/76 (Lamsal, 2023).

In Western Nepal, sugarcane cultivation is highly significant for the region's economy and the well-being of farmers. Nevertheless, despite its importance, there exists a notable gap in comprehending the economic dynamics and factors that shape sugarcane production in this area (Rijal, 2019). Furthermore, the economic framework of sugarcane production in this region is characterized by various challenges and complexities that warrant thorough investigation (Pandey et al., 2020). This research seeks to explore various aspects of the economic aspects of sugarcane production in western Nepal. It will investigate the costs and returns associated with cultivating sugarcane, including expenses such as land, labor, seeds, fertilizers, and irrigation. Additionally, the study will examine how government policies, subsidies, and market dynamics impact sugarcane farming practices and the profitability of farmers (Pandey and Devkota, 2020b).

2. MATERIALS AND METHODOLOGY

The study was carried out in Nawalparasi district, situated in the western development region of Nepal. Data collection and analysis were conducted based on a revised questionnaire. Respondents were chosen using simple random sampling from a sampling frame comprising sugarcane producers. A total of 40 samples were collected for the study, with 10 from Ramgram and 30 from the Partapur Rural Municipality, representing sugarcane-growing farmers in the area.

The main sources of information were commercial sugarcane growers, with additional insights sought from key informants when necessary. Secondary data were obtained from publications by relevant organizations such as the Ministry of Agriculture and Development, the Central Bureau of Statistics (CBS), District Agriculture Development Offices (DADO), and agricultural cooperatives. Primary data from commercial sugarcane growers were collected through face-to- face interviews using structured questionnaires. Data analysis was conducted using the Statistical Package for Social Science (SPSS). Problems and suggestions were prioritized using an index, and various analytical techniques were employed during the analysis process.

- Gross margin = sale value - variable cost
- Total cost = ∑Cost incurred in all variable cost

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- B/C ratio = Gross return / Total cost
- Problems on production and marketing

3. Results and Discussion

3.1 Socio-Economic Characteristics

The socio-economic characteristics of the respondents included the gender, caste, age, family size, education status which are described below.

3.1.1 Socio- Economic Characteristics of Respondents of Study Area (Categorical)

Table 1 represents the socio-economic distribution of respondents of the different surveyed areas. The results indicate that the majority of sampled respondents were male (97.5%), with females accounting for 2.5%. This skewed gender distribution reflects the patriarchal nature of Nepalese society, where males typically hold the role of economic decision-makers (Dhakal & Mueser, 2023). The survey area exhibits a predominant presence of Madhesi (72.5%), followed by Muslim (15%) and Janajati (12.5%). Similarly, Hinduism dominates the religious landscape (75%), with smaller percentages of Muslim and Christian (15% and 4%, respectively). These findings align with the societal hierarchy, where Brahmin and Chhetri castes, collectively known as the Khas ethnic groups, hold prominence at the top of the caste system (Central Bureau of Statistics, 1995). The majority of household heads (65%) rely on agriculture as their primary source of income. Off- farm income sources include Business (20%) and Service (15%) indicating diversified income streams among respondents.

Table 1: Socio- economic characteristics of respondents of study area (Categorical)

Variables	Category	Frequency
Gender	Male	39 (97.5%)
	Female	1 (2.5%)
Ethnicity	Madeshi	29(72.5%)
	Muslim	56(15%)
	Janajati	5 (12.5%)
Religion	Hindu	30 (75%)
	Muslim	6 (15%)
	Christian	4 (10%)
Primary Occupation of HH	Agriculture	26 (65%)
	Business	8 (20%)
	Service	6 (15%)
Primary Occupation of Family Member	Agriculture	40 (100%)

Source: Field Survey, 2023.

3.1.2 Socio- Economic Characteristics of Respondents of Study Area (Continuous)

The result shows that average age of the surveyed respondents was 49.70. Surveyed Household Head were seen to have level of schooling for 11.08 years on average. Overall average household size was 6.90, above the national average of 4.37 (National Statistics Office, 2023) where no. of male was 3.7 and female was 3.2. Economically active male was 2.7 and economically active female households were 2.45. About 6 years of the farming experience of sugarcane cultivation was seen among the farmers on average. On average each farmer had about 2.55ha land holding which was used for livestock rearing and agricultural purpose. The average landholding for the surveyed families was 2.55ha, which is greatly above the national average of 0.55 ha (Central Bureau of Statistics, 2023). The survey result showed that farmers on average rear 4.59unit livestock in each house. The majority of the member families in our survey were involved in livestock farming along with crop farming. Almost all farm families keep some livestock in Nepal, reflecting the complementarity between these activities (Aryal, 2017)

Table 2: Socio- economic characteristics of respondents of study sites (Continuous)

Descriptive Statistics	Mean	S. D
Age of HH Head	49.70	8.290
Education status of HH Head	11.08	5.806
Number of family member: male	3.70	1.159
Number of family member: female	3.20	1.137
Total family member	6.90	1.932
Number of economically active family member: male	2.70	0.939
Number of economically active family member: female	2.45	0.846
Total economically active family member	5.15	1.442
Number of family member involved in farming: male	2.47	1.012
Number of family member involved in farming: female	2.15	0.921
Total Family member involved in farming Total Livestock Unit Total Land in hectare	4.62 4.59 2.55	1.644 2.295 1.236

Source: Field Survey, 2023

3.2 Profitability Analysis

Growing sugarcane involves substantial expenses, with labor costs being the most significant. The expenditure amounts to approximately Rs. 400,414.5362 per hectare, with a workforce requirement of 800 laborers per hectare for various tasks including planting, weeding, and harvesting. Labor costs encompass both hired and home laborers. These findings are consistent with research conducted by (Pokharel et al., 2019) highlighting the labor-intensive nature of sugarcane cultivation. The expenditure on sugarcane setts stands out as a crucial aspect of production costs. This cost tends to be uniform across various situations, averaging at Rs. 610 per quintal, resulting in an average expense of Rs. 31,073.86075 per hectare.

The pie chart illustrates that harvesting costs represent the highest portion among the various variable production expenses, totaling approximately Rs. 93,494.2669 per hectare. Following closely behind is the initial cost, encompassing land preparation and planting, which amounts to Rs. 79,543.1156 per hectare. Subsequently, input costs rank as the third most significant variable, totaling Rs. 47,989.2282. Finally, intercultural expenses are the lowest, at Rs. 8,064.6899. These estimations were derived considering the prevailing market prices of different inputs, incorporating opportunity costs, and exclusively accounting for variable expenses (Pandey and Devkota, 2020a).

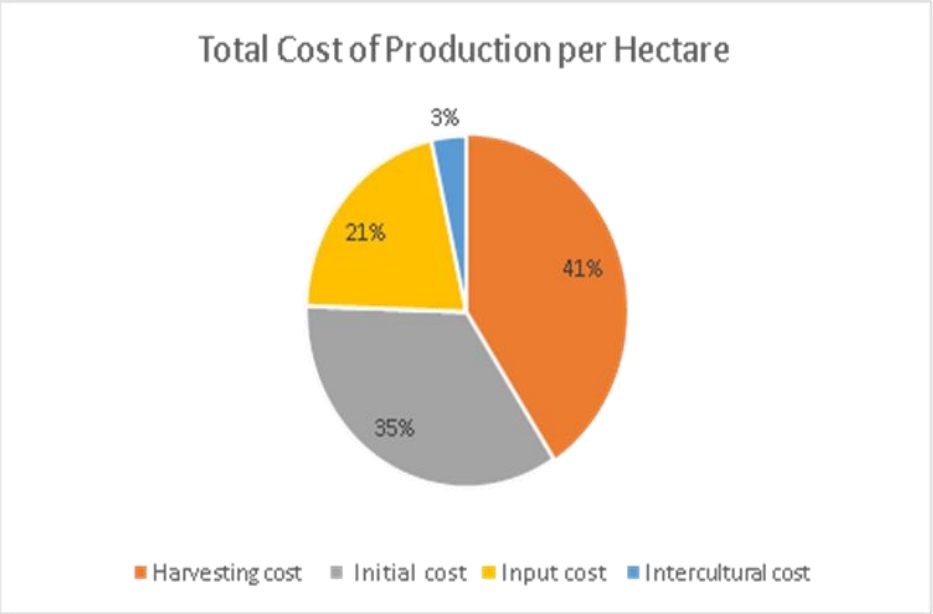

Figure 1: Total Cost of Production per Hectare

The average spending associated with sugarcane farming, covering expenses like land preparation, planting, labor, inputs, harvesting, and other operational costs, sums up to roughly Rs. 225,828.8006 per hectare. Conversely, the total earnings from selling the harvested sugarcane on one hectare of land, inclusive of revenue from market sales, averages about Rs. 660,598.1485 per hectare. The net profit, indicating overall profitability after considering all costs, stands at approximately Rs. 416,364.3480 per hectare.

Table 3: Comparative Total Cost, Total Revenue, Net Profit

Variables	Mean (Rs. per Ha)
Total Cost	225828.8006
Total Revenue	660598.1485
Net Profit	416364.3480

Source: Field Survey, 2023

3.3 Economic Analysis

3.3.1 Gross Margin Analysis

The gross margin was discovered to be higher, amounting to Rs. 416,364.3480 per hectare. Through the study, it was noted that farmers with smaller land holdings tended to achieve comparatively lower gross margins than those with larger areas. This could be attributed to the use of fewer inputs and traditional cultivation methods by small-scale farmers. In contrast, farmers with larger land holdings typically adopt advanced technologies and inputs, resulting in increased production. However, despite the higher output, limited availability of inputs and lower market prices for their produce may lead to reduced gross returns (Economic Analysis of Sugarcane 2024- 03-13, n.d.).

Furthermore, sugarcane, once planted, can yield crops for up to 3-4 years, leading to greater profitability in the long run. This extended duration of sugarcane cultivation enhances its potential for generating profits over time (Pandey et al., 2020).

3.3.2 B/C ratio Analysis

The benefit-cost ratio was determined to be 1.638. This analysis took into account the total expenses involved in sugarcane cultivation in relation to the overall benefits derived from it.

3.4 Correlation Between Different Parameters of Cost, Total Revenue with Productivity

Different parameters were found to have a significant effect upon the production of sugarcane in the study area. The analysis of correlations among parameters in sugarcane cultivation reveals significant relationships. Productivity displays strong positive correlations with Revenue (0.755**) and Profit (0.531**), indicating that higher productivity leads to increased revenue and profit. Labor cost shows a pronounced positive correlation with Harvesting cost (0.910**), suggesting that higher labor expenses coincide with elevated harvesting expenditures. Input cost exhibits positive correlations with Revenue (0.422**) and Profit (0.296), indicating that higher input expenses tend to yield greater revenue and profit. These findings underscore the intricate interplay between productivity, labor and input costs, and revenue, emphasizing the importance of managing these factors effectively to enhance profitability in sugarcane cultivation (Kumar et al., 2019).

Table 4: Correlation between different parameters of cost, total revenue with Productivity

Parameters	Productivity	Revenue	Profit	Labor cost	Input cost	Harvesting cost	Initial cost
Productivity	1	.755**	.531**	0.272	0.193	0.239	0.289
Revenue		1	.787**	.450**	.448**	.422**	.444**
Profit			1	0.094	0.296	0.112	.368*
Labor cost				1	0.292	.910**	-0.069
Input cost					1	0.261	.488**
Harvesting cost						1	-0.067
Initial cost							1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

3.5 Production and Marketing Problem Analysis

3.5.1 Production Problem

The table presents a ranking of production risks in sugarcane cultivation, indexed based on their significance. Topping the list is drought stress with an indexing score of 0.63, followed closely by biasness of subsidies at 0.27, and wind at 0.25. These factors are identified as the primary risks, categorized as I, II, and III, respectively. Further risks include problems of pest and insect (indexed at 0.24, IV), low quality planting materials (indexed at 0.20, V), and labor cost (indexed at 0.14, VI). This structured assessment offers valuable insights for prioritizing risk management strategies in sugarcane production (Sapkota et al., 2017).

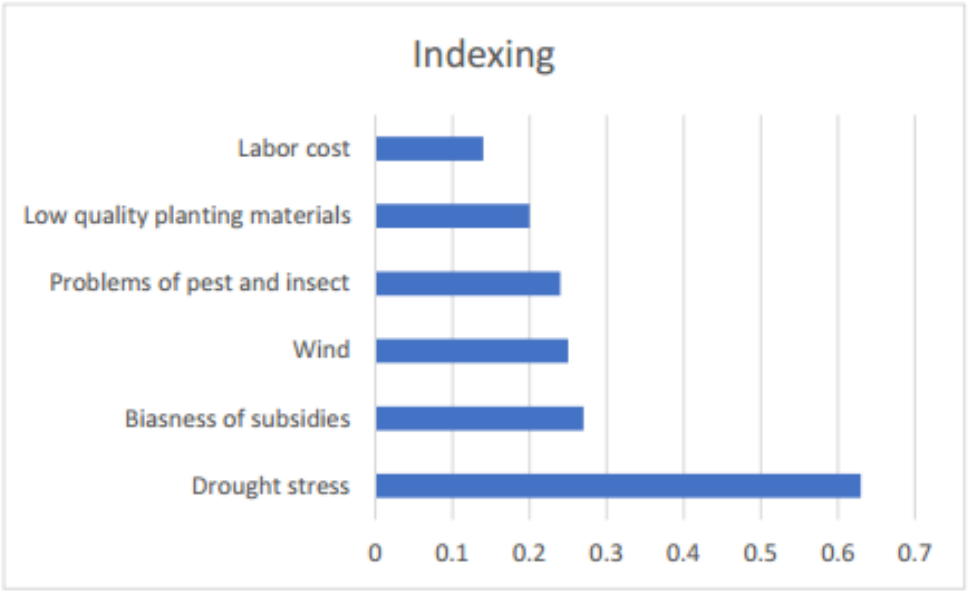

Figure 2: Production risk faced by farmers

Source: Field Survey, 2023.

3.6 Marketing Problem

The table outlines marketing risks in sugarcane cultivation, indexed and ranked accordingly. Topping the list is the delay in payment to farmers (I) with an indexing score of 0.39, followed by high transportation costs (II) at 0.35, and fluctuations in market prices (III) at 0.21. Unavailability of the nearest market is listed as the fourth-highest risk (IV) with an indexing score of 0.19. This structured assessment, based on field survey data from 2023, provides valuable insights for managing marketing risks in sugarcane production (Sapkota et al., 2017).

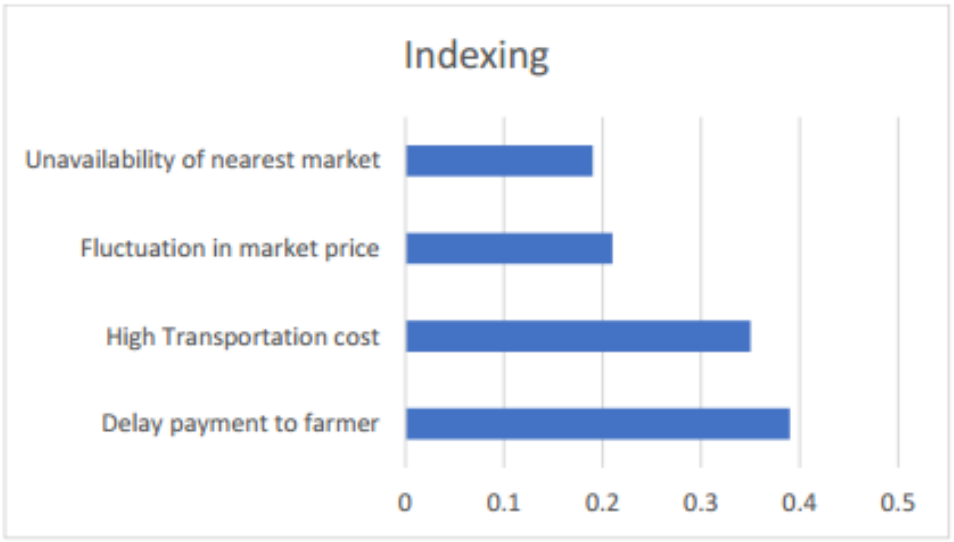

Figure 3: Marketing Problems faced by farmers

Source: Field Survey, 2023.

4. Summary and Conclusion

The study conducted in Pratapur and Ramgram rural municipalities of Nawalparasi district in the western Terai region of Nepal highlights the growing importance and profitability of sugarcane cultivation in the area. With sugarcane being considered a high priority commodity in the Terai regions, particularly in the western Terai, the research aimed to estimate costs and benefits, study marketing channels, and understand price determination systems for sugarcane in the study area. Data was collected from 40 purposively selected respondents through questionnaires and key informant surveys, with additional information gathered from relevant articles. The demographic profile of the respondents revealed that 97.5% of households were male-headed, with an average household head age of 49.70 years. Agriculture was the predominant occupation, with nearly all respondents (2.53 out of an average landholding of 2.55 hectares) utilizing their land for sugarcane cultivation.

The study found that sugarcane cultivation involved heavy expenditure on inputs, with labor costs being the highest (Rs. 400,414.5362 per hectare), followed by the cost of setts (Rs. 31,073.86). Despite these expenses, sugarcane production was highly profitable, with a gross return of Rs. 660,598.15 per hectare and a net profit of Rs. 416,364.35. The benefit-cost ratio was calculated to be 1.638, indicating favorable returns on investment. Resource use efficiency analysis revealed revenue to be significant at the 1% level, emphasizing its importance in sugarcane production. The marketing channel observed in the study area involved sugar mills, wholesalers, and retailers, with sugarcane prices determined by the mills. Major production challenges included drought stress and biases in subsidies, while marketing problems included delayed payments to farmers and high transaction costs. Efforts to enhance labor efficiency and minimize costs are crucial for the long- term profitability and sustainability of sugarcane farming. Techniques such as mechanization and improved management practices can help achieve the goal.

The study concludes that while sugarcane is an important crop in the area, there is room for improvement in input supply and marketing systems to

maximize profits for farmers. Traditional farming methods prevail, and there is a need for lower-cost technology to reduce cultivation expenses. A more organized marketing channel and government support in providing fair prices and low-cost input technologies could contribute to addressing these challenges and improving livelihoods for sugarcane farmers in Nawalparasi district

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