

RESEARCH ARTICLE

PRODUCTION, MARKETING AND ECONOMIC DYNAMICS OF MANGO AT BHERIGANGA MUNICIPALITY, SURKHET, NEPAL

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ABSTRACT

The present study was carried out to assess the production, marketing and economic dynamics of mango in Bheriganga Municipality of Surkhet district in 2022. Purposefully, 81 mango growers having minimum mango orchards of 1 hectare in size and 10 to 15 years old were selected. A pre-tested and standard interview schedule was employed for a household survey to collect primary data. The findings of the study revealed that mango farming has a major contribution to household income. Dashari variety of mango was very popular among farmers and gradually changed the production system from subsistence to market oriented. The mango growers in the study area contributed an average NRs 189286.4 in cost of production/ha with average productivity of 11383.2 kg/ha. Gross revenue and net incomes were 628352.64 Rs/ha and 439066.24 Rs/ha respectively. BC ratio, profit-to-revenue ratio and input-output ratio were 2.32, 69.88 and 3.32 respectively. However, all the findings revealed with mango production were significant, but marketing is not well-organized, and the prices offered by each channel vary. In addition, farmers were more likely to exclude from market information due to long value chains, a lack of transparency and the presence of too many players. Despite serious irrigation, disease and insect problems, farmers were still able to produce a significant number of mangoes. However, due to the monopolized market system of middlemen and negligible efforts for value-addition practices, farmers were forced to accept lower farm gate prices while retail prices of those products were high. It was necessary to strengthen the marketing system, establish processing industries, and mobilize resources to give more negotiating power to the farmers because there was so much potential for value addition.

KEYWORDS

Mango Production, Market and Marketing, Financial Situation, SWOT

1. INTRODUCTION

Agriculture is the backbone of the Nepalese economy, employing 65.5 percent of the population and accounting for 27.08 percent of the nation's GDP however, the fruit sector alone shares 5.13 percent (MoALD, 2021; MoF, 2018). Agricultural sectors provide a diverse range of jobs and employment opportunities, but subsistence farming continues to dominate, resulting in low productivity. Agriculture needs diversification and commercialization by identifying high-value low volume crops (Joshi and Piya, 2021). Fruit crops play an important role in the national food security in Nepal. They are generally delicious and highly nutritious, mainly of vitamins and minerals that can balance cereal-based diets. The Global hunger index of Nepal is improving over the years from 37.4 in 2000 to 19.5 in 2020. Nepal ranks 73rd out of 107 qualifying countries (Pandey, et al., 2021). Fruit crops like citrus, banana, litchi, mango, pomegranate, etc are prominently grown. Fruits supply raw materials for local industries and create employment opportunities, particularly for farming communities. Poverty is predominantly in rural areas, facing a higher rate of poverty incidence (33%) than in urban areas (7%) (NPC, 2017).

Karnali province is rich in climatic diversity having the possibility for the production of different agricultural commodities. Due to diverse

geography, there is a lack of good connectivity of roadways for proper transportation of products. The variation in temporal, altitudinal, and topographical aspects has made agricultural biodiversity (Shrestha, 2007). The huge volume of agricultural products is being wasted due to poor quality narrow road that only links to the district headquarters. Fruit crops occupy 7,432 ha of land and 58,911 Mt of fruit is produced in the Karnali province. Summer fruit growing districts are Surkhet, Salyan, Rukum, Dailekh and Jajarkot under 2051 ha with a total production of 13725 Mt. with average productivity of 8.8mt/ha (MoLMAC/AEC, 2020). Mango farming in Karnali province is suitable; however, only 5 districts in the province had quite suitable weather for growing mangoes (MoALD, 2021). According to official statistics, the province of Karnali produced 6877 Mt of mangoes in 2019–20, from 689 hectares of mango orchard with a productivity of 7.43 Mt/ha.

A total of 5462 Mt of mangos were harvested in 2021 however, the Surkhet district alone produces the highest yielding (7.93 Mt/ha) within the province (MoALD, 2021). The required climatic factors for mango farming are best and have great potential to expand processing units in Karnali province. Besides, fruit crops are friendly to nature, sustain the environment, provide shade, and can easily be incorporated into any agro-forestry programs (Kayier, et al., 2019). It is, therefore, essential to explore the production, marketing, economic situation and problem faced by

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mango growers for optimum output. So far, none of the research related to mango were conducted in Karnali province, especially on production and distribution aspects. Keeping this in view, the present study was undertaken to analyze the production, marketing and financial-related issues of mango growers in the Bheriganga Municipality of Surkhet District.

2. MATERIALS AND METHODS

2.1 Study Area

Birendranagar is the district headquarters and state capital of Karnali Province, functioning as a commercial hub and documentation center (MFALD, 2018). The district's population in 2011 was 350,804, and it is growing to 417,776 in 2021 (CBS, 2021). The district has a variety of climatic regions covering 2.2 percent by tropical zone and 1.3 percent by temperate zone. The Mahabharat Range accounts for 43 percent of the entire area of the Surkhet district, with the remaining part in the Siwalik range particularly rich in natural forests. Bheriganga Municipality has a great potential area for mango in contrast with other districts of Karnali province. The municipality is surrounded by Gurbha Kot in the east, Barahatal in the west, Birendranagar and Lekbesi in the north and Bardiya District in the south and the study area lies in the Middle East part of the Surkhet district having geographic coordinates of 28.45° N and 81.61° E with an elevation of 1326 meters. In winter temperature declines near 5 °C are common, with summer exceeding 38 °C.

2.2 Sampling Procedure

Sampling was done by selecting individual members for statistical inferences to estimate the characteristics of the whole population. Judgment/ purposive sampling of non-probability sampling techniques was implied for data collection. Purposing sampling helps to use expertise to select a sample based on the specific purpose of the research.

2.3 Sample size

The sample size was selected to make inferences about the population. The sample size was determined based on the cost of data collection and based on sufficient statistical power. The 81 respondents who had a minimum mango orchard of 1 hectare with 10-15 years old were selected for a study in Bheriganga Municipality.

2.4 Tools and Techniques of Data Collection

2.4.1 Primary Data Collection

Primary data were collected by using a well-structured questionnaire survey, Key Informant interviews and Focused Group Discussion in the study sites.

Interview Schedule: A questionnaire was prepared to obtain information related to the economic and social aspects of mango producers.

Participant Observation: The researcher personally visited the study area and observed their daily way of life, residence, food habit, and family size. After a close study of their total economic and social conditions, information was recorded in a diary.

Checklist Interview: The information was collected through personal meetings and conversations. Special attention was paid to their answers, behavioral expressions and gestures of the respondents before recording.

2.4.2 Secondary Data

Recorded data related to mango production was obtained and gathered from books, articles, journals, the internet and other sources to accomplish the objectives of this study. Similarly, necessary and relevant data were reviewed from Agricultural Departments, NARCS, Farmer's Groups and many more where ever possible.

2.5 Data Processing and Techniques of Analysis

2.5.1 Socioeconomic Characteristics

The variables like family size, age, gender, educational status, land holding, etc. were analyzed using descriptive statistics like frequency table and mean.

2.5.2 Estimation of Average Fixed Cost

Average fixed cost is total fixed cost divided by the quantity of output produced. It was estimated by the following formula,

$$AFC = FC / Q$$

2.5.3 Estimation of Average Variable Cost

The average variable cost is the total variable cost divided by the quantity of output produced. It was calculated by the following formula,

$$AVC = VC / Q$$

2.5.4 Estimation of Average Total Cost

Average total cost is the sum of the average fixed cost and average variable cost. The quantity was calculated by using the following formula,

$$ATC = AFC + AVC$$

2.5.5 Estimation of Gross Revenue

Gross revenue is the amount of the average price of goods sold and the number of products sold. It was calculated as,

$$\text{Gross revenue} = (\text{number of goods sold}) \times (\text{price per item})$$

2.5.6 Estimation of Net Profit

Net profit was estimated by using the following formula,

$$\text{Net profit} = \text{Total revenue} - \text{Total expenses}$$

2.5.7 Estimation of Input-Output Ratio

The input-output ratio was estimated by using the following formula,

$$\text{Input-output ratio} = \text{Gross income} / \text{total expenditure}$$

2.5.8 Estimation of the Productivity Ratio

The productivity ratio was estimated by using the following formula,

$$\text{Productivity} = \text{Output} / \text{input}$$

2.5.9 Estimation of Benefit-Cost Analysis

Benefit-cost were analysed by calculating the total variable cost and gross return from the mango production. Gross return was calculated by obtaining income from product sales. Hence, the benefit-cost ratio was calculated by using the formula,

$$B/C \text{ ratio} = \text{Gross return} / \text{Cost of cultivation}$$

Where,

$$\text{Gross return} = \text{Total quantity of mango sold} * \text{average price}$$

2.5.10 Estimation of Net Profit Margin

The net profit margin is determined by dividing net profit by total revenues.

$$\text{Net profit margin} = \text{Net profit} / \text{Revenue} * 100$$

2.5.11 Estimation of Net Profit Ratio

$$\text{Net profit ratio} = \text{Net income} / \text{Revenue}$$

2.5.12 Estimation of Contribution Margin Ratio

$$\text{CM ratio} = \text{Total revenue} - \text{Variable costs} / \text{Total revenue}$$

3. RESULT AND DISCUSSION

3.1 Socio-Economic Characteristics Of Respondents (n=81)

About 29.63 percent of respondents had a primary level of education. Respondents can read or write formed 20.99 percent were literate. Similarly, 18.52 percent of respondents had completed a secondary level of education in the surveyed area. A total of 11.11 percent of respondents had a college-level of education. However, only 4.94 percent of respondents had a university level of education. An estimated 14.81 percent were found to be illiterate. This result indicates an acceptable level of education in the Bheriganga Municipality, a similar situation to Nepal.

A significant proportion (82.72 percent) of respondents had nuclear with male-headed (65.43 percent) households. The dominance of males in the household head is common in Nepal but the family structure transformed from joint to nuclear and changing lifestyles. A rising trend of nuclear families seems to be noticeable in the Bheriganga Municipality of the Surkhet district.

The average decision-age maker in the surveyed household was 51.4 percent; in addition, the mean of altogether family members was 5.3. Similarly, the respondents' total average owned land size was 5.7 ha, whereas the mean area under mango cultivation was 2.8 ha. Likewise, the average number of trees per hectare was 110 plants depending on varieties and spacing. The study found that 133.61 mangoes on average were grown by each farmer in the Bheriganga Municipality.

Table 1: Socio-Economic Characteristics of Respondents	
Variables	Percent of farmers
Education level	
Illiterate	14.81
Literate	20.99
Primary	29.63
Secondary	18.52
College level	11.11
University level	4.94
Percent of male-headed household	61.43
Percentage of a nuclear family	82.72
Variables	Mean
Mean age of the decision maker (years)	51.4
Mean number of total family members	5.3
Mean years farmer has been growing mangoes (years)	9.55
Mean total land size owned (hectare)	5.7
Mean land size under mangoes (hectare)	2.8
Mean number of trees per hectare	110
Mean total mango trees per farmer	133.61

Source: Field survey, 2022

Table 2: Ethnicity and Profession of Respondents in Bheriganga Municipality	
Caste/ Ethnicity	Percent
Brahmin	11.11
Chhetri	39.51
Janajati	28.4
Dalit	20.99
Profession	
Agriculture	35.8
Business	11.11
Services	8.64
Agriculture + business	16.05
Agriculture + service	11.11
Service + business	3.7
Agriculture + other	13.58

Source: Field survey, 2022

The caste systems in the study area were broadly divided into Brahmin, Chhetri, Janajati, and Dalit. Chhetri respondents comprised 39.51 percent followed by Janajati (28.10%), Dalit (20.99%), and Brahmin (11.11%) respectively. The variation of caste is due to the migrant of respondents from Dailekh, Jajarkot, Kalikot, and other districts having clustered settlements based on caste and origin place.

Agriculture-based income sources of respondents were 35.8 percent, followed by agriculture plus business (16.05 percent). Likewise, 13.58 percent of respondents engaged in the agriculture and construction sectors had a major income source. According to the above-mentioned data, the majority of respondents indicated agriculture as their primary source of income.

3.2 Practices Adopted by Farmers in Bheriganga Municipality, Surkhet.

3.2.1 Mango Variety Used by Farmers

The Dashari variety in the Bheriganga Municipality was preferred by many

farmers (38.27 %) and followed by the Maldah variety (25.93 %). Similar manner, the Amrapali and Bombai Green varieties were cultivated by 12.35 and 14.81 percent respectively. According to the study, local mango cultivars were gradually replaced by high-yielding cultivars for higher economic returns in Bheriganga Municipality.

Table 3: Mango Variety Used by Farmers in Bheriganga Municipality, Surkhet		
Variety	Frequency	Percent
Local	7	8.64
Dashari	31	38.27
Maldah	21	25.93
Amrapali	10	12.35
Bombai Green	12	14.81
Total	81	100.00

Source: Field survey, 2022

3.2.2 Different Activities Adopted by Farmers in A Mango Orchard

Farmers of Bheriganga Municipality used appropriate mango cultivation practices such as pruning, weeding, Bordeaux mixture, manure, fertilizer application, intercropping and irrigation. Equal percentages of producers apply manure, fertilizers, and Bordeaux mixture (23.49 percent) for higher profit from mango orchards. Similarly, to this, weeding and irrigation (15.77 percent) are crucial operations in the production of mangoes during the flowering period. Furthermore, 17.45 percent of farmers followed intercropped within orchards for better economic returns. Pruning and training (4.70 percent) operations were not commonly practiced.

Table 4: Cultivation Practices of Mango by Farmers in Bheriganga Municipality, Surkhet		
Practices	Frequency	Percent
Training and pruning	7	4.70
Weeding	23	15.44
Bordeaux mixture application	35	23.49
Intercropping	26	17.45
Manure and fertilizer application	35	23.49
Irrigation	23	15.44

Source: Field survey, 2022

3.2.3 Plant Protection Status Adopted by Farmers

The use of chemical pesticides to prevent disease and pests was common practice among farmers (72.84 percent) in Bheriganga Municipality. Similarly, among the respondents, 19.75 percent handle diseases and pests through indigenous tools and techniques. Very few respondents adopted IPM methods (7.41 percent) to suppress the incidence of disease and pests.

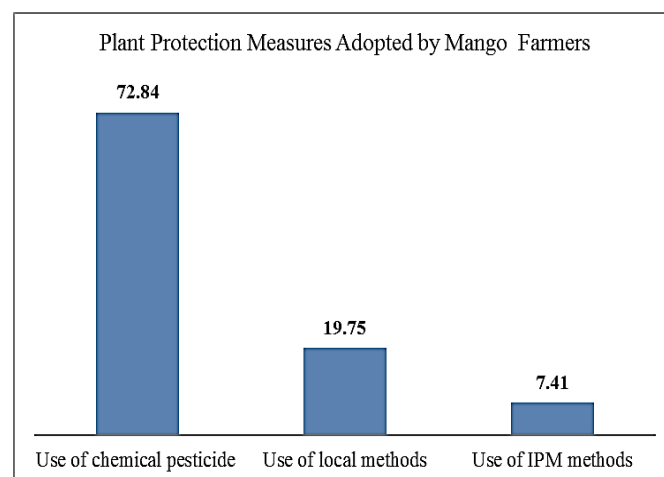


Figure 1: Different Plant Protection Measures Adopted by Mango Farmers in Bheriganga Municipality, Surkhet, Nepal

3.2.4 Satisfaction Level of Farmers from Mango Production

More than 50 percent of respondents agreed with a moderate level of satisfaction with mango production. Although higher prices and a significant increase in market demand, 32.10 percent of respondents indicated that they were very satisfied with this job. Regarding their level of satisfaction with mango production, 13.58 percent of respondents were undecided due to the improper data record on mango production. None of the respondents were strongly unsatisfied with mango production.

Satisfaction level	Frequency	Percentage	Rank
Strongly satisfied	26	32.10	II
Moderately satisfied	41	50.62	I
Undecided	11	13.58	III
Moderately unsatisfied	3	3.70	IV
Strongly unsatisfied	0	0.00	V
Total	81	100	

Source: Field survey, 2022

3.3 Mango Production Trend

There was an increasing trend in mango production responded by 64.20 percent due to higher selling prices in huge amounts. Decreasing trends in mango production were attributed to 19.61 percent of respondents. The decreasing trends may be an alternate bearing, pest outbreaks, and problems with fruit drops in the Bheriganga Municipality. A constant production trend was only noticed by 3.92 percent of the surveyed respondents.

Production trend of mango in Ramghat

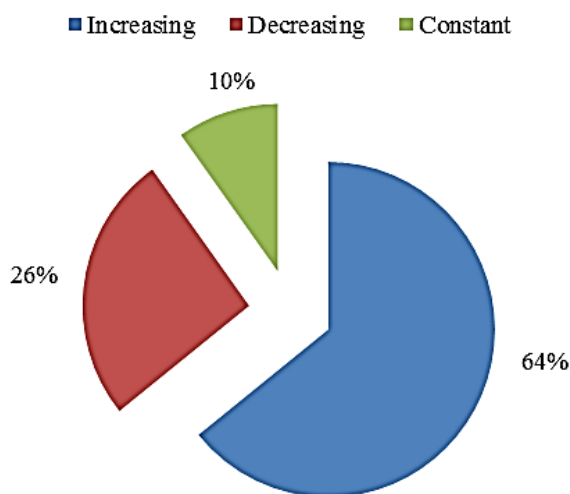


Figure 2: Production Trend of Mango in Bheriganga Municipality

3.4 Economic Attributes of Mango Production in Bheriganga Municipality

The study found that NRs. 189286.4 per ha was the average cost of mango production. The overall sum of variable and fixed costs incurred were NRs. 149050.3 and NRs. 40236.1, respectively. The average production of the mango was 11383.2 kg/ha. Bordeaux mixture and labor were the two factors with the highest average variable costs, representing approximately 11.80 and 9.28 percent respectively. Each kilogram of mango production cost Rs.16.63.

The average gross income per hectare was NRs. 628352.64. The outcomes revealed that the overall cost of production per hectare was NRs. 189286.4, whereas the total variable cost per hectare was NRs. 149050.3. The average net profit was NRs. 439066.24. The assessment of benefit-cost ratios revealed that mango cultivation was profitable at a B/C ratio of 2.32. The profit-to-revenue ratio, profit-to-cost ratio, and input-to-output ratio were 69.88, 231.96 and 3.32, respectively.

Description	The average cost of Production (Rs/ha)	Contribution of total average Cost (%)
Variable cost		
Human labor	17569.3	9.28
Power use	12356.3	6.53
Urea	8452.3	4.47
DAP	5783.6	3.06
Potash	7426.2	3.92
Manure	12385.9	6.54
Micronutrients	5483.3	2.90
Irrigation	5214.2	2.75
Pesticides and PGR	7783.1	4.11
Weeding	9723.9	5.14
Bordeaux mixture	22341.8	11.80
Marketing cost	34530.4	
Total Variable cost	149050.3	78.74
Fixed cost		
Land rent	40236.1	21.26
Total fixed cost	40236.1	21.26
Total cost (Rs)	189286.4	100.00
Average production (kg/ha)	11383.2	
Cost of production (Rs/kg)	16.63	

Source: Field survey, 2022

Criteria	Average value
Total variable cost (Rs/ha)	149050.30
Total fixed cost (Rs./ha)	40236.10
Total cost (Rs./ha)	189286.40
Production (Kg/ha)	11383.20
Average fixed cost	3.54/ unit
Average Variable cost	13.09/ Unit
Average total cost	16.63/ Unit
Average price (Rs./ha)	55.20
Gross revenue (Rs./ha)	628352.64
Net profit (Rs./ha)	439066.24
Benefit-cost ratio	2.32
Profit to revenue ratio (Net profit margin)	69.88
Net profit ratio	0.699
Profit-to-cost ratio	231.96
Input-output ratio	3.32
Contribution Margin Ratio (CM ratio)	0.76
Productivity ratio	3.31

3.5 Marketing Channel of mango in Bheriganga Municipality

The mango fruit is marketed to the ultimate consumers through various distribution channels. The price will rise as the frequency of marketing

competitors increases, and vice versa. The marketing channel for mango products is (i) farm gate to consumer (ii) through private, wholesalers and retailers and (iii) through processor the following are the dominant agriculture marketing channels that exist.

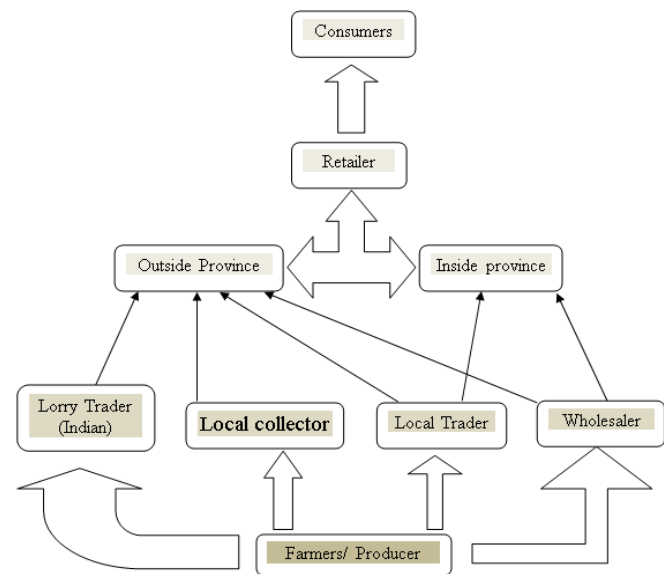


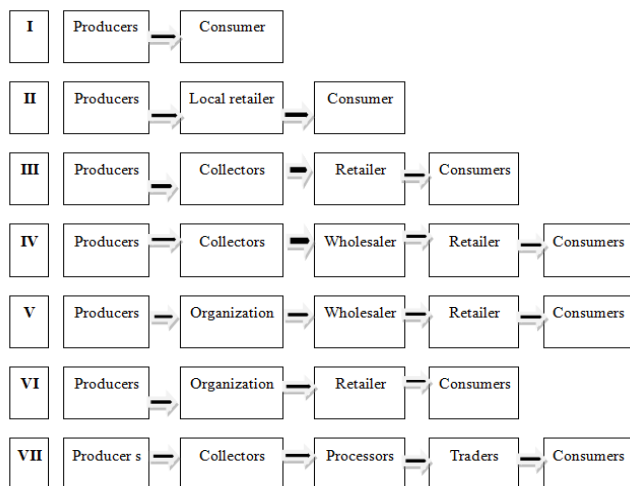
Figure 3: Marketing channel of mango in Bheriganga Municipality, Surkhet, Nepal

3.6 Collectors

No specific collectors participated in mango marketing in the Bheriganga Municipality. Traders and retailers handled the majority of the collection.

3.7 Wholesalers

Wholesalers had a significant deal with mango marketing. Large quantities of mango fruits were purchased and distributed amongst retailers in a range of markets both domestically and internationally. Contract farming was not popular and none of the agents were involved in these types of farming in the Bheriganga Municipality of the Surkhet district.



3.8 Retailers

Retailers are the final sellers who interact with their clients. Retailers based marketing was done by a few numbers of farmers. They played a key role in fixing the prices of mango in the study area. Considering the situation, they had been monopolizing the market while there is a risk of post-harvest loss.

3.9 Consumers

The end target of any commodity is the consumer. They are the price bearers. Very few percent of products were consumed in the Bheriganga Municipality area. The product of this region was exported into higher consumption areas, such as Kathmandu, Nepalgunj, Surkhet, and other districts within the province. Some of the products were exported to

Nepalgunj's Jamunaha border and consumed by the people of India.

3.10 SWOT analysis of mango farming in Bheriganga Municipality, Surkhet, Nepal

Table 8: SWOT Analysis of Mango Farming in Bheriganga Municipality	
Strength	Weakness
Production <ul style="list-style-type: none"> Tropical regions have a suitable climate Good source of income Possibility to install small-scale mango processing industry Can grow shade-loving crops to increase farm revenue The comparative advantage over cereals and other vegetable crops 	Production <ul style="list-style-type: none"> Alternate bearing characteristics Labor shortage Costly irrigation Lack of regular inputs Inappropriate skill, knowledge and production technology
Marketing <ul style="list-style-type: none"> Build personal relationships between agents Higher demand Scope of value addition Nearby local market 	Marketing <ul style="list-style-type: none"> Inadequate market information No processing unit The same variety (Dashari) on a large scale so producing a huge volume at the same time resulted in a price decline. No storage facility A large number of middlemen
Opportunities	Threats
Production <ul style="list-style-type: none"> Suitable soil and climate for mango production Establishment of MU agriculture college (GSAF) that facilitates regular supervision with technical support Employment Opportunity 	Production <ul style="list-style-type: none"> Alternate bearing in nature Severe flower and fruit drop during Chaitra - Baisakh month, fruit cracking Short self-life span after harvesting Thief and theft problem
Marketing <ul style="list-style-type: none"> Market accessibility (Kathmandu, Nepalgunj, Karnali province) High market demand for both fruit and value-added product of mango Networking of road 	Marketing <ul style="list-style-type: none"> Price fluctuation Monopoly of middleman Import from India at a cheap price Lack of proper coordination between the producer and marketing sector

4. CONCLUSION

Mango farming is the main source of income and responded positively to mango cultivation. Many growers used various intercultural practices like pruning, weeding, applying Bordeaux mixture, applying manure and fertilizer, intercropping, and irrigation. Collection tasks were undertaken by traders and retailers and then distributed products to end users through various marketing channels. Wholesalers purchased large quantities of mango fruits and sold them in a variety of domestic and foreign markets. Mangoes were exported to markets in Kathmandu, Nepalgunj, Surkhet, and other province-wide districts as well as beyond Nepalgunj's Jamunaha border to India. Mango farming created higher net revenues per hectare and four times higher output than its inputs after being established. The benefit-cost ratio and input-to-output ratio from mango production are greater which ensures more profitability. Bheriganga Municipality have the potential area for commercial mango fruit production to support the demand of the growing population, therefore there is necessary to address the efficient mango production practices, technology and issues at the policy level.

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