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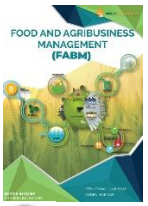


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RESEARCH ARTICLE

# SOCIO-ECONOMIC ANALYSIS OF MAIZE PRODUCTION IN DANG DISTRICT, NEPAL

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**ABSTRACT**

An interview-based questionnaire survey of randomly selected 90 respondents who were involved in maize production was carried out from two different sites of dang district i.e. Lamahi municipality and Tulsipur sub-metro Politian city to find the economic production of maize during 2080 B.S. The broad objective was to observe the return and profit margin per unit area of maize in the aforementioned areas. The specific objectives were finding profit margin, and benefit: cost ratio, finding out the problems of farmers and determining factors affecting maize yield. Data about total variable cost, profitability, return of maize farming, and factors affecting maize production were collected. Overall, the research revealed that the average cost of maize cultivation per hectare was NRs 40213.85 and the average return per hectare was NRs 72676.04 with average profit per hectare was found NRs. 32462.19. The average benefit-cost ratio was 1.80. The maize farm was distinguished into three categories as Small-sized farms (<10 Katha), Medium-sized farms (10-40 Katha) and Large-sized farms (>40 Katha). The cost of cultivation was found higher in the case of Small-sized farms. Mechanization cost covers 30.32% of the total cost of production. An increase in the age of the farmer by 1 year increases the yield by 2% this is seen at 1% level of significance. Also, Analysis showed that the Age of the farmer, Farm size, use of manure and use of mechanization for tillage are statistically significant to the gross return of Maize.

**KEYWORDS**

Benefit-cost Ratio, Profitability, Farm-size, cost of cultivation

## 1. INTRODUCTION

Maize (Zea mays L.) is the world's leading crop and is widely cultivated as cereal grain that was domesticated in Central America. It is one of the most versatile emerging crops having wider adaptability. Globally, maize is known as queen of cereals because of its highest genetic yield potential. Maize is the second most important crop after rice in terms of area and production in Nepal. The Per capita maize consumption in Nepal was 98g/person/day (Ranum et al., 2014). Nepal is an agricultural country where agriculture contributes more than 27% contribution to the National GDP and provides employment to more than 60% of the active population (MoALD, 2022). The total area under maize production is 985,565 ha with a production of 3,106,397 MT and productivity of 3.15 $tha^{-1}$ (MoALD, 2022). Maize is an essential source of various phytochemicals that plays important role in our health (Kopsell et al., 2009). The research has suggested that phytochemicals in grains due to their potent antioxidant activities demonstrate significant beneficial contribution in reducing the risk of many diseases (Madhujith and Shahidi, 2007).

Dang is the second-largest valley in Asia surrounded by Shivalik Hills and Mahabharata Range. In the dang district, the area under maize crop is 24,900 ha with a production 77,847 MT and productivity of 3.13 $tha^{-1}$ (MoALD, 2022). Dang district is a super-zone of maize production, crucial for linking maize-based industries to sustainable and self-reliant agriculture. The region's favourable climate and environmental conditions make it ideal for maize cultivation. Key factors such as suitable irrigation, fertile soil, and optimal rainfall contribute to the success of maize farming in Dang. Additionally, intercropping maize with legumes is an emerging trend that enhances sustainable highland maize production. Despite the advantageous agricultural conditions in Dang, farmers encounter numerous challenges, particularly a lack of adequate marketing facilities, lack of proper trainings, and lack of knowledge to use machinery. Among various factors, the socio-economic condition is one factor that affects the production of crops including maize. However, the socio-economic conditions of the farmers significantly impact crop production, including maize. Socioeconomic status refers to the social ranking or class of an individual or group, determined by a combination of their education, income and occupation (APA, 2021). For the improvement of socio-economic conditions of maize producers and yield of maize, it is necessary to identify the socio-economic conditions of producers as well as the major production and marketing constraints. Thus, this study was conducted to identify the condition of maize producers and major constraints in the Dang district of Nepal.

## 2. MATERIALS AND METHODS

### 2.1 Selection of the study area, respondents and sample size

The research was performed in the dang district which is located in the mid-western development region of Nepal. The study sites were deliberately chosen as, Tulsipur Municipality and Lamahi Municipality of Dang district. The study area is shown in Figure 1. It is not possible to take data from each individual, that's why sampling is necessary. Sampling is a significant part of the research and the majority of the farmers at the study sites are involved in the production of the maize. From the study areas, 90 growers were surveyed among which Forty-five (45) were from Tulsipur Sub-Metro Municipality and Forty-five (45) were from Lamahi municipality. They were chosen using a simple method of random sampling.

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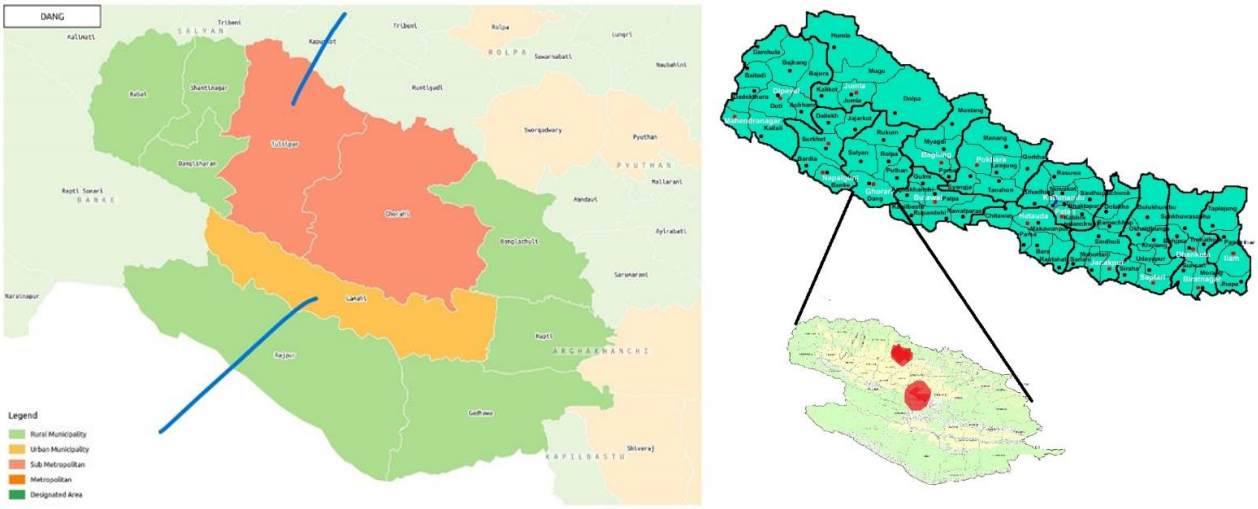


**Figure 1:** Map of the study area

### 2.2 Source of Data

Primary data were obtained using a well-structured questionnaire, Data was collected based on socio-economic variables such as gender, age, educational status, and household size and income level of the respondents. A single set of interview schedules was prepared for the collection of primary data so as to collect information from farmers. The secondary data were taken from the Department of Agriculture such as the Agriculture Knowledge Centre, Maize Research Centre, and MoALD along with related books and internet web resources.

### 2.3 Pre-testing and Field survey

Prior to distribution to the actual respondents, the interview plan and checklists were pre-tested. Pre-testing of the interview was done by asking the designed questionnaire to 10% of farmers in the adjoining area of the study sites in June 2023. The final interview schedule was prepared by taking due consideration and suggestion obtained during pre-testing. In July-August 2023, the field survey was performed. By visiting the respondent's homes, the respondents were interviewed using face-to-face approaches.

### 2.4 Data entry

The data collected were entered into MS Excel and Statistical Package for Social Science (SPSS) version 20 database using various techniques. Before entering the collected information, errors in data recording at field status were re-checked for omitting, coded, and then entered in SPSS.

### 2.5 Indexing

Various problems and solutions were ranked with the use of an index value. The following formula was use to find the index value of problems and suggestions.

$I = \sum SiFi/N$

Where, I = index value; $\sum$= summation; Si = Scale value of $I^{th}$ intensity; Fi = Frequency of $I^{th}$ intensity; N=total number of respondents

Scale value used for ranking problems and suggestions is demonstrated below:

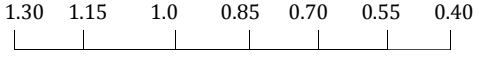


**Figure 2:** Scale value for indexing production problems


**Figure 3:** Scale Value for indexing solutions of production Problems


**Figure 4:** Scale value for marketing problems and their solutions

### 2.6 Profitability and economic analysis

Profitability and economic analysis were done by using the following formulas:

Cost of Production = $\sum$ cost of all items

Gross return = Total quantity marketed (quintal) × cost per unit (NRs.)

Gross margin = Gross return – Total variable cost

Net profit = Total revenue – Total cost

Benefit cost ratio (B: C) = Total revenue/ Total expenses

#### *2.6.1 Analysis of Factors Affecting Gross Income of Maize production*

The Cobb – Douglas production function model was to estimate the coefficients for factors affecting the gross income from maize production. The data was, therefore, subjected to functional analysis using the following form of Cobb – Douglas type of production function.

$Y = aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}e\mu$

"Y" is the dependent variable in this functional form. "$X_1$" stands for independent variables, "a" for the production functions intercept constant, and "$b_i$" for each variable's regression coefficient. This function yields a regression coefficient that shows production elasticity that is constant over the relevant input ranges. This function becomes the following kind of linear function:

$\ln Y=\ln a+b_1\ln X_1+b_2\ln X_2+b_3\ln X_3+b_4\ln X_4+b_5\ln X_5+b_6\ln X_6+b_7\ln X_7+b_8\ln X_8+b_9\ln X_9+\mu$

Where,

Y = Total income from maize production (NRs. Per hectare)

$X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9$ represents the farmer's age, area of production, mechanization cost, use of manure, machine use, mechanical tillage, government assistance, government office visit, use of paid labour respectively.

## 3. Results and Discussion

### 3.1 Socio-demographic characteristics

#### *3.1.1 Age, family type and main occupation*

In both municipality, the majority of the respondents involved in maize production were between 36-60 years old (Table 1). In Lamahi, 45.22% and in Tulsipur, 49.25% of the respondents belong to the age group of 36-60 years old. An increase in the age of the farmer by 1 year increases the yield by 2% this is seen at a 1% level of significance. The nuclear type of family was found more than joint family in both municipalities i.e. 59.22% in Lamahi and 61.57% in Tulsipur. In Lamahi, 72.91% of the respondents had agriculture as the main occupation while in Tulsipur, 69.11% of the respondents had agriculture as the main occupation.

| Table 1: Age, family type and main occupation of the respondents | | | | |
|---|---|---|---|---|
| Characteristics | Category | Respondents percentage | | |
| | | Lamahi | Tulsipur | Mean |
| Age of farmers | 20-35 | 37.24% | 34.41% | 35.83% |
| | 36-60 | 45.22% | 49.25% | 47.23% |
| | >60 | 17.54% | 16.34% | 16.94% |
| Family | Joint family | 40.78% | 38.43% | 39.61% |
| | Nuclear family | 59.22% | 61.57% | 60.39% |
| Main occupation | Agriculture | 72.91% | 69.11% | 71.01% |
| | Agriculture adds business | 7.77% | 8.42% | 8.09% |
| | Business | 6.66% | 8.23% | 7.44% |
| | Services | 4.44% | 5.13% | 4.79% |
| | Abroad | 8.22% | 9.11% | 8.67% |

### 3.1.2 Distribution of the respondents by gender

The study showed that most of the respondents involved in maize production were male in both municipality (Figure 5). In Lamahi municipality, 71% and in Tulsipur municipality 75% of total respondents involved in maize production were male while the female involved in maize production were 29% and 25% in Lamahi and Tulsipur, respectively. The percentage of females involved in maize production was more in Lamahi as compared to Tulsipur municipality.

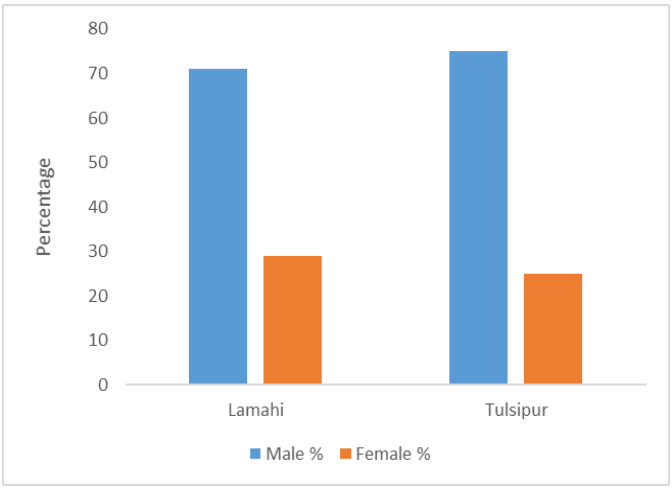


**Figure 5:** Male and female percentage of the respondents

### 3.1.3 Distribution of the respondents by educational status

The educational status of the respondents was illiterate, primary, secondary and higher secondary (Figure 6). In both municipality, the majority of the respondents involved in maize production were educated up to the primary level. In Lamahi, 33.33% of the respondents while in Tulsipur, 37.24% of the respondents were educated up to the primary level. The percentage of illiterate respondents was more in Lamahi as compared to Tulsipur municipality (Figure 6). The percentage of respondents educated up to secondary were 22.22% & 23.12% in Lamahi and Tulsipur, respectively. The percentage of respondents educated up to higher secondary level was 12.23% in Lamahi and 14.32% in Tulsipur municipality.

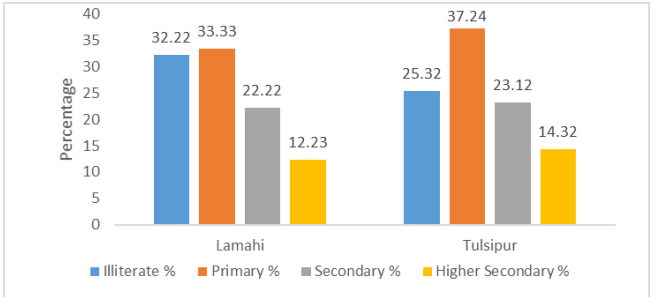


**Figure 6:** Educational status of the respondents

### 3.1.4 Food self- sufficiency

In Lamahi, 38.25% and 21.33% of the respondents reported the self-sufficiency of food up to 1-4 months and 9-12 months respectively while in Tulsipur, 33.42% and 28.23% reported the self-sufficiency of the food up to 1-4 months and 9-12 months respectively. The self-sufficiency of food up to 9-12 months was more in Tulsipur as compared to Lamahi.

| Table 2: Self-sufficiency of the respondents on food | | | |
|---|---|---|---|
| Self-sufficiency of food | Lamahi | Tulsipur | Mean |
| 1-4 months | 38.25% | 33.42% | 35.84% |
| 5-8 months | 40.42% | 38.35% | 39.38% |
| 9-12 months | 21.33% | 28.23% | 24.78% |

### 3.1.5 Farm size Category

Out of total, 6% of respondents had large size farm whereas 27% and 67% of respondents had medium size and small size farm respectively. Increase in production area of the crop by 1% increases the yield by1% this is seen at 1% level of significance.

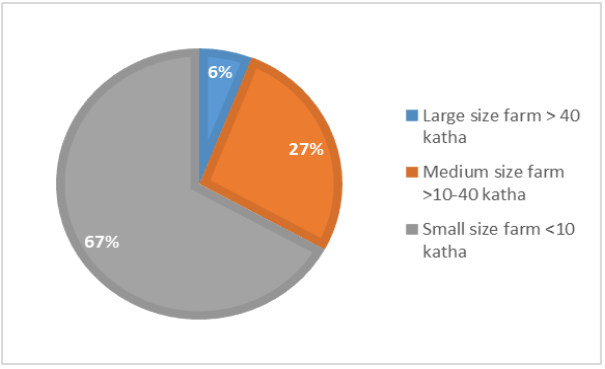


**Figure 7:** Farm size category

### 3.1.6 Ethnicity of Respondents

Mainly Brahmin, Chhetri, Janajati, Dalit were mainly involved in maize production (Table 3). In Lamahi, majority of the respondents involved in the maize production were Chhetri (47.20%) while majority of the respondents involved in maize production were Chhetri (48.43%) in Tulsipur as well.

| Table 3: Distribution of respondents by ethnicity | | | |
|---|---|---|---|
| Ethnicity | Lamahi | Tulsipur | Mean |
| Brahmin | 22.26 | 24.28 | 23.27 |
| Chhetri | 47.20 | 48.43 | 47.81 |
| Janajati | 17.14 | 14.23 | 15.69 |
| Dalit | 13.40 | 13.06 | 13.23 |

### 3.1.7 Application of FYM

Out of total the respondents, 72% applied FYM and remaining 28% of the respondents don't apply FYM for maize production as shown in (Figure 8). Using manure increases yield by 9% when compared to those who don't use it this is seen at a 1% level of significance.

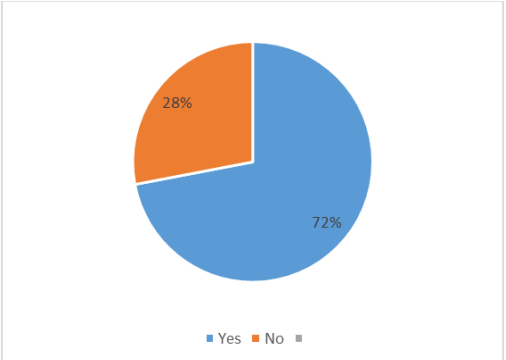


**Figure 8:** Application of FYM

## 3.2 Economic Analysis

### 3.2.1 Cost of Production

Maize production takes into account a heavy expenditure on different inputs. Among various expenses, the maximum expense was seen in mechanization cost in both municipality which was NRs.12232.02 per hectare and NRs.12150.32 per hectare in Lamahi and Tulsipur municipality respectively. The average expense on mechanization cost was NRs.12191.17 per hectare. The minimum expense on miscellaneous which includes irrigation, pest control and so on was NRs.3423.60 and NRs. 3432.73 per hectare in Lamahi and Tulsipur Municipality respectively.

**Table 4:** Production cost

| Particulars | Expenses per hectare in Nepalese Rupees (NRs.) | | | |
|---|---|---|---|---|
| | Lamahi | Tulsipur | Mean | Share (%) |
| Seed cost | 4238.12 | 4250.23 | 4244.17 | 10.55 |
| Mechanization cost | 12232.02 | 12150.32 | 12191.17 | 30.32 |
| Fertilizer cost | 6524.31 | 6535.41 | 6529.86 | 16.24 |
| Manure Cost | 6690.52 | 6595.6 | 6643.06 | 16.52 |
| Labour | 7232.27 | 7122.58 | 7177.43 | 17.85 |
| Miscellaneous cost | 3423.60 | 3432.73 | 3428.16 | 8.52 |
| Total expenses per hectare | 40340.84 | 40086.87 | 40213.85 | 100 |

### 3.2.2 Net profit

The total revenue per hectare was NRs.73216.76 in Lamahi while NRs.72135.32 in Tulsipur municipality. The mean total revenue per hectare was NRs.72676.04. Similarly, the net profit per hectare of Lamahi was NRs.32875.92 while NRs.32048.45 in Tulsipur municipality. The mean total net profit per hectare was NRs.32462.19.

### 3.2.3 Benefit-Cost Ratio

The benefit-cost ratio per hectare was found to be 1.81 in Lamahi and 1.79 in Tulsipur municipality. The mean benefit-cost ratio per hectare was 1.80. Benefit-cost ratio was 1.80 which is higher than study conducted in Sindhuli by (Dahal and Rijal, 2019). The benefit-cost ratio was 1.52 conducted in shantinagar, Dang by (Poudel et al., 2023).

**Table 5:** Total expense, total revenue, net profit and B:C per hectare in Nepalese Rupees (NRs.)

| Particulars | Lamahi | Tulsipur | Mean |
|---|---|---|---|
| Total expense (NRs.) | 40340.84 | 40086.87 | 40213.85 |
| Total revenue (NRs.) | 73216.76 | 72135.32 | 72676.04 |
| Net profit (NRs.) | 32875.92 | 32048.45 | 32462.19 |
| B:C | 1.81 | 1.79 | 1.80 |

### 3.2.4 Factor affecting the Maize production / Resource productivity

Regression analysis was carried out to find the various factor affecting maize production. It was done to analyse the impact of various inputs such as area, farmyard manure, fertilizer, cost of material, labour cost and various miscellaneous costs on the gross return of maize. The key aim of conducting the functional analysis was to assess resource productivity.

**Table 6:** Parameter estimated of the regression model for productivity

| Independent variables | Coefficient | Std. Error | p. value |
|---|---|---|---|
| Age | 2.00005 | 0.0000212 | 0.009 |
| Log of area | **1.00219*** ** | 0.0005311 | **0.000** |
| Log of mechanical cost | 0.0005826 | 0.0005347 | 0.279 |
| Manure use (Yes/No) | **9.001*** ** | 0.0006286 | **0.007** |
| Machine use (Yes/No) | 0.000366 | 0.0010811 | 0.736 |
| Mechanical tillage (Yes/No) | **7.001*** ** | 0.0017357 | **0.000** |
| Govt. assistance (Yes/No) | 0.0005836 | 0.0010288 | 0.572 |
| Govt. office visit (Yes/No) | 0.0008381 | 0.0006315 | 0.188 |
| Use of paid labour (Yes/No) | 0.0002394 | 0.0006534 | 0.715 |
| **_Constant** | **0.0066682** | **0.004284** | **0.124** |

It is evident from the table that the farm yard manure, area of production and use of mechanization tillage coefficient were 9.001, 1.00219, and 7.001 respectively and were found to be statistically important at the significance level of 1%. It shows that a rise of 1 % in the use of manure, area of production, and use of mechanization for tillage will rise the production by 9.001, 1.00219, and 7.001 respectively.

## 3.3 Ranking of problem

### 3.3.1 Ranking of production problems

The different production problems faced by the farmer were ranked with the help of index value (Table 7). Among various problems, pest and insect damage was ranked first with index value of 1.11 followed by lack of fertilizer with a 1.04 index value.

**Table 7:** Ranking of production problems

| Production problems | Index scale | | | | | | | Index Value | Rank |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |
| | 1.30 | 1.15 | 1.0 | 0.85 | 0.70 | 0.55 | 0.40 | | |
| Lack of training on production techniques | 18 | 22 | 15 | 8 | 12 | 9 | 6 | 0.96 | 4th |
| Lack of fertilizer | 32 | 15 | 18 | 7 | 13 | 3 | 2 | 1.04 | 2nd |
| Lack of quality inputs | 9 | 4 | 28 | 25 | 17 | 2 | 5 | 0.89 | 6th |
| Lack of agricultural loan | 23 | 25 | 12 | 4 | 9 | 10 | 7 | 0.97 | 3rd |
| Pest and insect damage | 37 | 25 | 19 | 1 | 3 | 1 | 4 | 1.11 | 1st |
| Unavailability of labour | 7 | 15 | 17 | 25 | 19 | 2 | 5 | 0.90 | 5th |

### 3.3.2 Marketing problems

The different marketing problems were ranked with the help of index value (Table 8). Among various marketing problems, price fluctuation was ranked first with 0.88 index value followed by due to the middleman with 0.80 index value. The index value of improper coordination between market players with a 0.76. Likewise, the lack of market information ranked with a 0.78 index value. According to farmers who sold their produce directly to consumers received a bigger percentage of the consumer's price than farmers who sold their produce through agents.

**Table 8:** Ranking of Marketing problems

| Marketing problems | Index scale | | | | Index Value | Rank |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | | |
| | 1.00 | 0.80 | 0.60 | 0.40 | | |
| Due to the intermediaries | 40 | 25 | 15 | 10 | 0.80 | 2nd |
| Lack of market information | 35 | 24 | 16 | 15 | 0.78 | 3rd |
| Price fluctuation | 45 | 30 | 7 | 13 | 0.88 | 1st |
| Improper coordination between market players | 36 | 24 | 11 | 19 | 0.76 | 4th |

### 3.4 Ranking of solutions

#### *3.4.1 Ranking of suggestions for production problems*

The various suggestions were ranked with index value (Table 9). Among various suggestions, pest management training with index value 0.86 was ranked in the first position followed by availability of fertilizer on time with a 0.83 index value. While an availability of quality inputs was ranked in the last position with a 0.54 index value. Likewise, the availability of agricultural loan was ranked third with a index value of 0.79. These suggestions can help to solve productions problems and increase the productivity.

**Table 9:** Ranking of suggestions

| Suggestions for production problems | Index scale | | | | | Index Value | Rank |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | | |
| | 1.00 | 0.85 | 0.70 | 0.55 | 0.40 | | |
| Availability of agriculture loan | 25 | 30 | 22 | 5 | 8 | 0.79 | 3rd |
| Availability of fertilizer on time | 42 | 22 | 10 | 9 | 7 | 0.83 | 2nd |
| Availability Quality inputs | 5 | 6 | 12 | 25 | 42 | 0.54 | 6th |
| Pest management training | 45 | 23 | 12 | 8 | 2 | 0.86 | 1st |
| Access to labour | 8 | 7 | 30 | 22 | 23 | 0.62 | 5th |
| Training on production | 17 | 37 | 20 | 10 | 6 | 0.78 | 4th |

#### *3.4.2 Ranking of suggestions for market problems*

The various suggestions were ranked with index value (Table 10). Among various suggestions, fixed price was ranked first with a 0.83 index value followed by reduction of middleman with a 0.79 index value. The proper coordination between market players was ranked last with a 0.62 index value. Similarly, the market information was ranked third with a 0.71 index value. These suggestions helps to overcome various market problems of maize production.

**Table 10:** Ranking of Suggestions for marketing problems

| Suggestions for Market problems | Index scale | | | | Index Value | Rank |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | | |
| | 1.00 | 0.80 | 0.60 | 0.40 | | |
| Reduction of intermediaries | 38 | 24 | 17 | 11 | 0.79 | 2nd |
| Market information | 30 | 20 | 12 | 28 | 0.71 | 3rd |
| Fixed price | 43 | 29 | 8 | 10 | 0.83 | 1st |
| proper coordination between market players | 11 | 19 | 27 | 33 | 0.62 | 4th |

### 3.5 SWOT Analysis of Maize production

**Table 11:** Swot analysis of maize production

| Strength | Weakness |
|---|---|
| 1. Suitable climate<br>2. Used as feed for livestock<br>3. Nutrient content<br>4. Fertile land | 1. Lack of quality inputs<br>2. Lack of knowledge and trainings in production techniques<br>3. Unknown about pest and diseases<br>4. Lack of market information |
| **Opportunities** | **Threats** |
| 1. Employment opportunities<br>2. Helps to uplift the living standard of farmers<br>3. Higher production than other cereals | 1. Incidence of pests and diseases<br>2. Price fluctuation<br>3. Use of chemical fertilizers deteriorates the soil fertility. |

## 4. Summary and Conclusion

From the study, it can be concluded that the majority of the respondents involved in Maze production were male and educated up to the primary level in both municipality. Out of total respondents, majority of the respondents were Chhetri i.e 47.20%, 48.43% in lamahi and Tulsipur municipality respectively. Among total respondents, 72% applied FYM and remaining 28% of the respondents didn't apply FYM for maize production. Using manure increases yield by 9% when compared to those who don't use it this is seen at a 1% level of significance. The average return per hectare was found to be NRs 72676.04 taken from the mean of 90 respondents. The average profit per hectare was found NRs. 32462.19 taken from the mean of 90 respondents. The study showed that the average benefit-cost ratio was 1.80. Meanwhile, the total expense, total revenue, net profit and benefit-cost ratio per hectare was more in Lamahi as compared to Tulsipur municipality. Pest and insect damage was ranked as the first production problem with a 1.11 index value while the price fluctuation was ranked as the first marketing problems with a 0.88 index value.

Producers weren't provided with a fair market price. For this purpose, the government should take effective measures to monitor the pricing system under strict rule regulations. Many farmers were participating in maize production due to the low cost of production, higher profitability, and higher demand in the poultry industry. The farmers were allocated a major share of their total cultivable land to maize. But, it was frequently discussed by the farmers and the policymakers that the farmers are not receiving the expected price due to various reasons such as higher marketing costs, a large number of intermediaries, lack of information, seasonal price variability, the high price difference between maximum and minimum price etc. Among various suggestions, pest management training was ranked as first for solving production problem with a 0.86

index value followed by availability of fertilizers on time and increment in agricultural loan. Likewise, fixed market price was ranked as first for solving marketing problems with a 0.83 index value. The research showed that with the increase in the production area, the use of manure and mechanization tillage increases production. The research could be more effective if further more parameters like cropping pattern, Postharvest technology and other data related to the respondents were available.

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