

## RESEARCH ARTICLE

## AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF MAJOR VEGETABLES IN BHAKTAPUR DISTRICT, NEPAL

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## ARTICLE DETAILS

## Article History:

Received 21 August 2023  
Revised 24 September 2023  
Accepted 27 October 2023  
Available online 23 November 2023

## ABSTRACT

This study was conducted to analyze the economics of production and marketing of major vegetables in Bhaktapur district of Nepal. Primary data for the household survey were collected using a semi-structured questionnaire from sixty sampled respondents, from two municipalities namely, Madhyapur thimi municipality, Suryabinayak municipality by using simple random sampling method. The methodological tools such as household survey using pre-tested survey schedule, key informant interview, focus group discussion and different secondary data sources were used to collect the information. The primary data obtained from field survey were coded, tabulated and analyzed by using Statistical Package for the Social Sciences 25.0 and Microsoft Excel. Secondary data were collected through scientific journals, articles, and publications from agricultural organizations, projects, and programs. Simple indexing method was used for ranking of problems and identifying major determinant of production and benefit cost ratio, gross margin, net margin was calculated by using formula. Average area under vegetable cultivation was found to be 4.29 ropani. The cost of production per ropani for tomato, cauliflower and radish was NRs. 71,521, NRs. 32,930 and NRs. 27,900 respectively. The BC ratio was higher for tomato (1.9) followed by radish (1.70) and cauliflower (1.64). B: C ratio of all the vegetables under study was higher than one which implies that vegetable farming in the study area is profitable farm business. The marketing margin per kg of tomato, cauliflower and radish was NRs. 31.00, NRs. 39.50 and NRs. 19.00, respectively whereas the producer's share was found to be higher for tomato (55.71%) followed by radish (52.50%) and cauliflower (46.97%). Middlemen had major influence on pricing of vegetables. Analysis of the study showed that the major constraints in production and marketing of vegetables were incidence of disease/pest and low farm gate.

## KEYWORDS

Mudhyapur thimi, suryabinak, tomato, cauliflower

## 1. INTRODUCTION

## 1.1 Background Information

Agriculture is an important part of the Nepalese economy. Agriculture is playing a crucial role covering 28.75% of total land for the production of crops and contributing 26.98 percent in GDP. Vegetables cover 2, 84,875.0 hectares of land area with production of 41, 96,208.8 metric tons of vegetables and productivity of 14.7 metric ton per hectare per year (MOALD, 2020). Vegetable production accounts for 16.67% Agricultural GDP (MOALD, 2022). In fiscal year 2020/21, the vegetable production is estimated to have increased by 5.9 percent to 4.196 million metric tons compared to that of the fiscal year 2019/20. In 2019/20, with a trade balance of NRs. -31,983.9 million (MOF, Nepal Foreign Trade Statistics, 2020). This data illustrates that by maximizing production within the country, there is a significant potential for increasing export and decreasing imports of vegetables. Due to the raised income of the people, they are progressively shifting their food habit from cereal towards more fruits and vegetable consumption (Ghimire et al., 2018).

Nepal has varied agro-ecological variations which creates comparative advantages for the production and marketing of different vegetables and helps to grow various seasonal and off-season vegetables throughout the country. The production of vegetables, which has increased significantly in recent years, makes up a significant portion of the Nepalese farming system. Commercial vegetable farming is gaining attention from farmer and it is in increasing trend in recent years in Nepal Vegetables are most

important agricultural products both from the point of food as well as economic value providing cheap and rich source of dietary fiber, nutrients and vitamins (Gurung, 2016; CASA, 2020). Vegetables are less risky, grows quickly, and provide the best return on investment when compared to other cereal crops and fruits.

Bhaktapur District, which is part of Bagmati Province, is smallest district among Nepal's seventy-seven districts and is situated in the country's central mid-hill with population of 430,408. According to in Bagmati province, vegetable cultivation occupied 49,692 ha, with the grand total production of 717,089 mt along with the productivity of 14.90 mt/ha (MOALD, 2019/20). This district is very popular for vegetables production due to its range of climatic suitability for various vegetables and assessable market and inputs for production due to its proximity to Kathmandu. Bhaktapur district has been designated as a vegetable zone under the Prime Minister Agriculture Modernization Project (PMAMP), with the goal of enhancing vegetable yield and contributing to national production by implementing innovative technology. (MOALD, 2020).

## 1.2 Statement of The Problem

Insufficient systematic studies and research on production, marketing, growth pattern of major vegetable has narrowed down the development of vegetable sector (Ghimire et al., 2018). Some key issues to be addressed are unavailability of quality inputs, improved varieties, lack of modern farm equipment and technical knowledge, fluctuation in market price and insufficient access to market information (Paudel, 2019). These problems

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DOI:  
10.26480/faer.02.2023.68.78

hinder farmers to obtain optimum vegetable productivity. Price variations, poor farm gate prices, and a lack of storage facilities are some major issues to be discussed (Parajuli, 2018). Similarly, post-harvest loss of vegetable is nearly 20-50% in Nepal (Devkota et al., 2014). Middle men are playing major role to affect price instability (Mariyono, 2018). Dominating Indian market is clearly visualized in Nepal as they offer products in lower price. As vegetables are highly perishable, bulky and climate-sensitive, farmers have no control over market supply (Mishra and Kumar, 2012). Due to lack of knowledge about market information system and ineffective coordination among market actors, the middlemen are earning the high benefits. Even farmers also lose interest for commercialization as there is great fluctuation of market price. Marketing of vegetables is still on developing stage characterized by influences of demand, supply and price realization (Shrestha et al., 2014). Therefore, studying farm performance of vegetable production and marketing is very important to know the factors that affect the profitability from the enterprise.

### 1.3 Rationale of Study

Vegetable production and marketing is gradually emerging as an important subsector to help farmers boost their revenue and thereby contributing Gross Domestic Product (GDP). Improvement of production and marketing efficiencies is the only way to sustain local produce in market. Important aspect in vegetable production is marketing. Proper marketing channel, analysis of market situation, price stability are major concern for successful marketing of produced vegetables.

Studies on vegetable production and marketing to understand economic relation between farmers and traders are limited in Nepal. Even though rapid market appraisals and national seminars have raised some issues as problem, there seems no any significant results. Farmers' poor access to fair prices, marketing support services and policy weakness are observed as major problems (Mariyono, 2018). Lack of a proper and effective marketing structure for the produce is one of the major barriers that prevent development of agricultural sector. The government has placed a strong emphasis on commercializing vegetables, but still no significant work has been put into creating an agriculture marketing structure. Insignificant studies have been carried out regarding the production and marketing of major vegetables in Bhaktapur district.

Therefore, this study emphasizes to understand the major problem involved with a view to provide efficient services in production and transfer of farm produce and input from producers to consumers with major eyesight on cost reduction and profit maximization. This study would help to provide information about production status of major vegetables in the study area and findings encourage farmers for timely cultivation of vegetables in order to get reasonable prices and to choose the efficient marketing channel. Furthermore, this research helps to understand strength, weakness, opportunities and threat of vegetable production in the district. This study addresses such gaps and evidences and help in proper policy formulation and program planning regarding vegetable production and marketing promotion. Similarly, this study assists in developing strategies and policy for relevant organization, especially to prepare and develop such programs that help to obtain maximum productivity of vegetables.

### 1.4 Objectives

General objective of this study was to analyze the economics of production and marketing of major vegetables in the Bhaktapur district.

Specific objectives were as followed:

- To estimate the cost, return, and profitability of major vegetables in the study area.
- To identify the marketing channel and market situation of major

vegetables in the study area.

- To examine marketing margin and producer's share of major vegetables in the study area.
- To find out the major constraints in the production and marketing of major vegetables.

## 1.5 Scope and Limitations of The Study

### 1.5.1 Scope of The Study

This research project emphasizes the production economics and marketing of major vegetables. It addresses strength, weakness, opportunities and threat of vegetable production in Bhaktapur district. It helps to view how price spread occurs along marketing channel. The findings of the study will help the concerned stakeholder to know about production status of major vegetables and analyze demand and supply condition of vegetables in Bhaktapur district. The findings from this study would be useful for all stakeholders involved in vegetable production and in formulation of policies related to vegetables production and marketing for the study areas and other similar areas.

### 1.5.2 Limitations of The Study

Since data was collected from the municipalities within the command area of Vegetable Zone, it may not be sufficient to draw inference for the economics of production and marketing for the whole Bhaktapur district. Due to limited time and less area coverage, the conclusion drawn from the research may not be taken as generalization for other areas of the country. The relevancy of the information lies on the assumption that the respondents have given true information.

## 2. LITERATURE REVIEW

### 2.1 Production Status of Vegetable in Nepal

Vegetable farming has been identified as backbone in Nepalese agriculture. Vegetable production accounts for 16.67% agricultural GDP (MOALD, 2020). Vegetables have become utmost in context of balanced diet, nutrition, employment and play a vital role in providing nutritional security and national economy. It is also major livelihood option for marginal poor farmers. Even with the consistent increased production over the past 20 years the vegetable production still lags far behind the domestic demand (ADS, 2015). Farmers have been slowly moving toward commercialization. For vegetable production, growers are generally organized into groups and cooperatives (Mishra and Kumar, 2012). Vegetable demand has risen over time due to urbanization and people's greater health awareness (Tamang, 2014). This industry contributes to the well-being of marginal farmers by providing them with year-round work and revenue (Sharma, 2019).

In Nepal, the production and marketing of vegetables is gradually becoming a significant sub-sector with a notable impact on the country's economy (Pokhrel, 2010). During the last 5 years, area of vegetable crops has increased by about 11.34% from 266,937 ha in 2014/15 to 297,195 ha in 2018/19 whereas production increased by about 19.30% from 3,580,085 Mt in 2014/15 to 4,271,270 Mt in 2018/19 (MOAD, 2017). In these years the productivity has increased by 7.16%. Average productivity of vegetable for 10-year time period from 2009/10 to 2018/19 is 13.53Mt/ha. In 2019, more than 3.2 million farmers were involved in vegetable farming and produced 3.96 million tons of vegetables under 0.69 million acres of land with average yield of 5.74 tons/acre (MOALD, 2020). The area and production under vegetable production is continuously increasing since 2009/10 but production decline was observed in 2016/17. Production has increased after 2016/17 and increment in production of vegetable is greater compared to increment in area as shown in table below:

**Table 1: Area, Production and Productivity of Vegetables in Nepal**

Year	Area (ha)	Production (Mt)	Productivity(mt/ha)
2010/11	244,102	3,203,563	13.12
2011/12	245,037	3,298,816	13.46
2012/13	246,392	3,301,684	13.40
2013/14	254,932	3,421,035	13.42
2014/15	266,937	3,580,085	13.41
2015/16	280,807	3,929,034	13.99
2016/17	277,393	3,749,802	13.52
2017/18	286,864	3,958,230	13.80
2018/19	297,195	4,271,270	14.37
2019/20	281,132	3,962,383	14.09
2020/21	284,875	4,196,208	14.07

Source: MOALD (2021)

Source: MOALD (2020/2021)

## 2.2 Production Status of Vegetables and Major Vegetables in Bhaktapur District

The last four years data of vegetable production in Bhaktapur district is shown in below table. Table shows that the area, production and productivity has increases slightly.

## 2.3 Cost, Return And Profitability

Vegetable growers receive higher net return from high priced vegetables. Therefore, price plays a significant role in determining the profitability of vegetable farming. In terms of benefit-cost ratio and net return per unit area, vegetable production is typically more profitable than cereal crop cultivation. Since the net income from vegetable production was more than

18 times more than that from grain crops, it is a more profitable enterprise than other agricultural enterprises (EAD, 1991). In comparison to other agricultural operations, the production of vegetables is a profitable one. However, a large portion of vegetables are imported from India, suggesting that vegetable growing in India might be more economical than in Nepal (MOAC, 1991).

The total fixed and variable costs incurred during crop production are referred to as the cost of production. There exists substantial gap in our knowledge concerning critical aspects of farmer's decision regarding profitability. Data on production costs can aid farmers in choosing profitable ventures during the decision-making process. Benefit-cost ratio, also known as return per rupee invested, is the proportion of gross returns to cultivation costs.

**Table 1: Area, Production and Productivity of Vegetables in Bhaktapur District**

Year	Area (ha)	Production (Mt)	Productivity(mt/ha)
2017/18	3,126	49,510	16.00
2018/19	3,225	58,421	18.11
2019/20	3,258	58,555	17.97
2020/21	3,216	58,769	18.28

Source: (MOALD, 2021)

**Table 2: Area, Production and Productivity of Cauliflower in Bhaktapur District**

Year	Area (ha)	Production (Mt)	Productivity(mt/ha)
2018/19	222	4,665	21.02
2019/20	239	4,908	20.56
2020/21	220	4,569	20.77

(Source: MOALD, 2021)

**Table 3: Area, Production and Productivity of Tomato in Bhaktapur District**

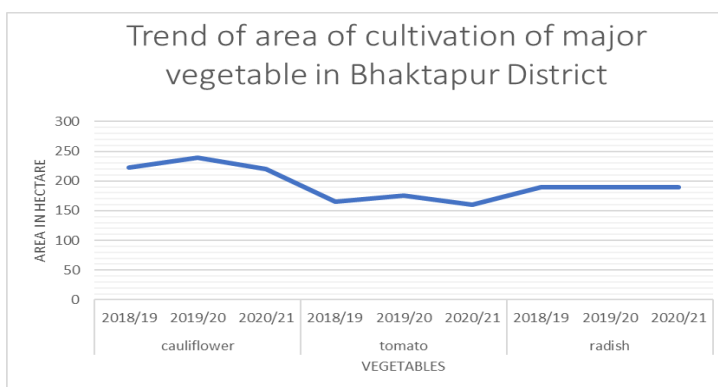
Year	Area (ha)	Production (Mt)	Productivity(Mt/ha)
2017/18	176	4,569	26.00
2018/19	165	4,195	25.42
2019/20	176	4,569	25.95
2020/21	160	5,489	34.31

Source: (MOALD, 2021)

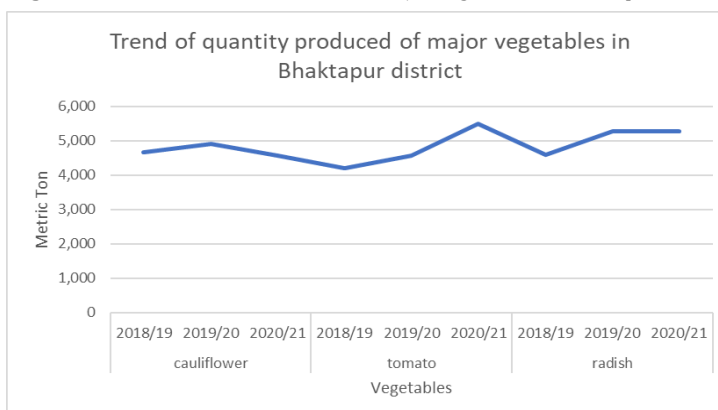
**Table 4: Area, Production and Productivity of Radish in Bhaktapur District**

Year	Area (ha)	Production (Mt)	Productivity(Mt/ha)
2018/19	189	4,589	24.25
2019/20	189	5,275	27.92
2020/21	189	5,275	27.92

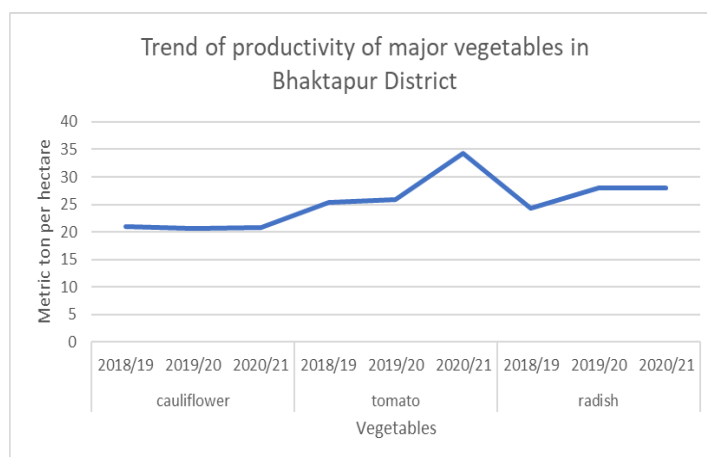
Source: (MOALD, 2021)



**Figure 1: Trend of area of cultivation of major vegetables in Bhaktapur district**



**Figure 2: Trend of quantity produced of major vegetables in Bhaktapur district**



**Figure 3:** Trend of productivity of major vegetables in Bhaktapur district

### 2.3 Cost, Return and Profitability

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The total fixed and variable costs incurred during crop production are referred to as the cost of production. There exists substantial gap in our knowledge concerning critical aspects of farmer's decision regarding profitability. Data on production costs can aid farmers in choosing profitable ventures during the decision-making process. Benefit-cost ratio, also known as return per rupee invested, is the proportion of gross returns to cultivation costs.

### 2.4 Market and Marketing

The process of using right promotion method for providing the right goods or service to the right people at right place in right price is marketing (Gitman et al., 2018). Agriculture marketing deals with the production, distribution and exchange of goods (Kullabs, 2019). According to Marketing creates the flows of goods and also provide opportunity to the people inside the country (Kullabs, 2019). Marketing is lock opener but production is door to economic development (Acharya and Agrawal, 1994). It creates the place, time and possession utilities by satisfying the human desire (Acharya, 2009).

### 2.5 Marketing Channel and Marketing System

Marketing channels are routes through which agricultural products move from producers to consumers. The length of the channel varies from commodity to commodity, depending on the quantity to be moved, the form of consumer demand and degree of regional specialization in production. The term "marketing channel" describes the path that products take from the producers to the final consumers. During the marketing process, agricultural products go through changes in time, place, form, and ownership, adding to their value. These chains serve as their marketing route, connecting producers and consumers of various produce (Bhandari, 1993). Marketing system involves broad range of activities and mechanism of delivering goods from one hand to another. An efficient marketing system minimizes the costs and provides benefit to all the sections of the society (Acharya and Agrawal, 1999). In a marketing system, the primary participants involved in carrying out various tasks include producers, traders, transporters, wholesalers, retailers, and consumers (MDD, 1999).

### 2.6 Gross Margin

Gross margin is the amount of money a company has left after subtracting all direct costs of producing or purchasing the goods or services it sells. It is the amount that is left over after deducting its gross return from its overall variable cost. The gross margin provides a clear indication of whether the variable production costs are covered by the value of the final product.

### 2.7 Marketing Margin and Producer's Share

Marketing margin is the difference between the price paid by the

consumers and that obtained by the producers. A marketing margin is the price of all utility-adding activities and the function performed by marketing firm such as collection, processing, transportation, retailing etc. this price include the expense of performing marketing functions and also marketing firms profit (Laton and Pahang, 2012).

If these marketing functions are performed in an efficient way these are lower marketing costs resulting in to lower marketing margin and higher producer' share in consumers' rupees. In the marketing of agricultural commodities, the difference between the price paid by consumer and the price received by the producer for an equivalent quantity of farm produce is generally termed as price spread (Acharya and Agrawal, 1994). Large margin points the need for public intervention in marketing system.

### 2.8 Constraints Related to Production and Marketing

There is a great scope for commercial vegetable farming in Nepal. However, many constraints frequent price fluctuation, dominance of Indian market, low farm gate price are major problem in vegetable sector. Similarly, incidence of insect pests, which lowers productivity and net return cause great problem in production of vegetables (Shrestha et al., 2014). Other significant issues with vegetable production include declining soil fertility, inadequate irrigation, a lack of high-quality inputs like seeds and fertilizer, a lack of improved variety, a lack of contemporary farm equipment and technical knowledge (Pokhrel, 2010). On the marketing side are price fluctuations, high marketing margins, a lack of market knowledge for farmers, poor road infrastructure, a lack of well-developed marketing channels, and farmer's limited ability to bargain (Pokhrel, 2010).

## 3. METHODOLOGY

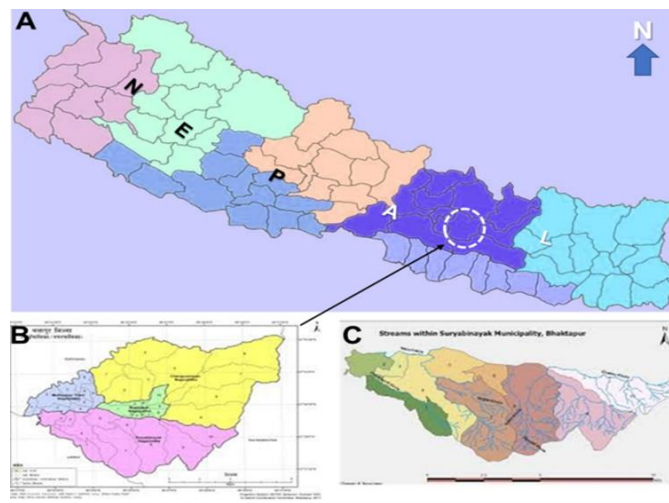
This chapter consists of different tools and techniques of research procedure such as selection of the study area, selection of sample, sources of information, data collection techniques and methods of data analysis.

### 3.1 Site Selection

Bhaktapur District, which is part of Bagmati Province, is smallest district among Nepal's seventy-seven districts and is situated in the eastern part of Kathmandu valley with an area of 396.9 km and population of 468,132 (CBS, 2011). This district consists of four municipality; Bhaktapur, Changanarayan, Suryabinayak and Madhyapur Thimi. Among them Suryabinayak and Madhyapur Thimi were selected purposively as the study area. Similarly, the map of Bhaktapur district showing the study site is shown below (Figure 4).

### 3.2 Sampling Size and Sampling Procedure

Altogether a sample of 75 individuals was purposively selected using simple random sampling technique. Vegetable producers, intermediaries, retailers and consumers of the selected area were the target population for the study. Out of 75 samples, 60 samples were taken randomly from producers of Suryabinayak and Madhyapur Thimi municipality and remaining 15 samples were taken from intermediaries and retailers (10) and consumer (5). Farmers were selected from list provide by PMAMP vegetable implementation unit. Household survey was conducted along with focus group discussions and key informant interview was done with farmers, specialist and all related stakeholders.



**Figure 4:** Map of Bhaktapur district showing study site

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### 3.3 Data and Data Types

Data collection is a procedure that involves systematic information gathering and evaluation on variables of interest in order to answer research questions, test hypotheses, and evaluate results (Babbie, 2010). Both qualitative and quantitative data were collected. To determine overall production, costs associated with production and marketing, and an estimate of net returns from vegetables, quantitative data was used. Ranking the primary production and marketing obstacles, as well as the potential for commercial growth, were done using qualitative data. Different procedures were used to collect both main and secondary data, and the information was then examined as necessary.

#### 3.3.1 Primary Data

Primary data is information gathered directly from primary sources and is considered the best type of data in science (Millward and Brewerton, 2001). Vegetable producers of study area were the major sources of primary data. It was obtained by household surveys using pre-tested semi-structured survey schedule together with key informant interview, focus group discussions (FGDs), field observation and verification.

#### 3.3.2 Secondary Data

Secondary data is the sort of information that has already been gathered and made available to researchers for use in the studies (Babbie, 2010). The secondary information was collected from various web reviews, published and unpublished literatures, newspapers, desk study of publications, reports and progress information of different governmental and non-governmental agencies i.e. NARC, PMAMP, MOALD, PACT, CBS, manuals of AKC of Lalitpur district and other stakeholders associated with vegetable sub sector, etc. to supplement the data from primary sources.

### 3.4 Research Instruments/Design

#### 3.4.1 Preliminary Field Visit

A preliminary study was carried out prior the main survey to collect various socio-economic, demographic, geophysical conditions of the study sites. This information was used in preparing questionnaires and deciding on sampling framework.

#### 3.4.2 Questionnaire Design

Simple model of the questionnaire was developed including the detailed

information on the respondent's socioeconomic characteristics, existing production practices, agricultural land holdings, farm characteristics, cost of production, inputs, income from vegetable production, various production and marketing challenges, incidence of various diseases and pests, etc.

#### 3.4.3 Pretesting of Interview Schedule

Pretesting was done to test the validity and effectiveness of the interview schedule. For this interview schedule was tested with ten respondents in the study site. The final questionnaire were modified as per the result of pretesting before actually applying it with real respondents.

#### 3.4.4 Household Survey

Field survey was conducted to collect information from selected respondents by visiting their household on particular topic. Farmers and traders were asked a series of open and closed ended questionnaire to collect useful information about the social dynamics, economic condition, production, marketing structure and price in the area. A total of 60 vegetable producing farmers of the research area were interviewed for the primary data collection.

#### 3.4.5 Key Informant Interview (KII)

KII is method of interviewing people who have particularly informed perspective on aspect of program being evaluated. Key informant including progressive farmers, official members of PIU, traders and NARC scientists were interviewed with the series of questions related to economics of production and marketing of vegetables in the study site.

#### 3.4.6 Focus Group Discussion (FGD)

Focus group discussion is group of people assembled together for discussion on particular topic for certain period of time where each and every individuals are free to express their opinions, attitudes and share their experiences without any personal inhibitions. Different informations were collected from farmers, local leaders, official members of PIU and commercial growers .

### 3.5 Data Analysis Technique

#### 3.5.1 Analysis of Socio-Economic Data From Survey

Descriptive statistical tools, such as frequency, percentages, and means were used for analysis of different variables such as family size, educational level and size of land holding, wherever applicable for the descriptive analysis of the socio-economic and farm characteristics.

### 3.6 Economic Analysis

#### 3.6.1 Cost of Production

Cost of production (TC) includes fixed costs and variable costs. The variable cost items included were labor, expenses in land preparation, seed cost, organic manure, chemical fertilizers, micronutrients, pesticides, irrigation, etc. Fixed cost includes costs such as land rent, land tax, etc. Total cost of production was calculated by summing up all the expenditure on variable

inputs and fixed costs.

### 3.6.2 Gross Return and Net Return of Producer

Gross return (GR) is the total revenue obtained by selling the produced item. It is simple and fast way of planning activities or analyzing a farm business.

Mathematically, Gross return = Q\*P

Where,

Q= Total quantity of product produced

P= Per unit price of the product

Net return (NR) is the difference of the gross return and the cost of production.

Mathematically, Net return = GR - TC

### 3.6.3 Benefit Cost Ratio Analysis

Benefit cost ratio is the ratio between the gross return and total cost of any enterprise. It gives idea about recovery of cost incurred during production by return from products.

Mathematically,  $\frac{B}{C}$  ratio =  $\frac{GR}{TC}$

Where,

B/C ratio= Benefit cost ratio

GR= Gross return

TC= Total cost

### 3.6.4 Marketing Margin and Producer's Share

Marketing margin or price spread is a commonly used measure of the performance of a marketing system (Abbott and Makeham, 1990). Marketing margin is the difference between the farm-gate price received by the farmer and the retailer's price paid by the consumer. It is also termed as price spread.

Marketing margin = Retailers price (Pr) – Farmgate price(Pf)

Producer's share is the price received by the farmer expressed as a percentage of the retail price, i.e., the price paid by the consumers. Mathematically it can be expressed as follows.

$Ps = \frac{Pf}{Pr} \times 100$

Where,

Ps= Producer's share

Pf= Farm gate price

Pr= Retailer's price

For calculating Marketing Efficiency, modified method as suggested by Acharya and Agarwal

$ME = FP / (MC + MM)$

Where, ME = Marketing efficiency

FP = Net price received by the farmer

MC = Total Marketing cost

MM = Total marketing margin

Source: (Acharya and Agarwal, 2004)

### 3.6.5 Scaling of Production and Marketing Problems

Scaling technique provides the direction and attitude of the respondents towards propositions. Farmer's perception towards the production and marketing problems can be presented by six points scale. The scale value of 1, 0.83, 0.67, 0.51, 0.35 and 0.17 were used where 1 indicated most serious and 0.17 indicated least serious. It was computed using the following formula.

Mathematically,  $I = \Sigma \left( \frac{S_i f_i}{N} \right)$

Where,

I = Index of importance

$\Sigma$  = Summation

$S_i$  = Scale value

$f_i$  = Frequency of respondents

N = Total number of respondents

### 3.6.6 SWOT Analysis

SWOT analysis is important for analyzing internal and external environments in order to attain a systematic approach and support for decision making. It is the most important tools for strategic planning specially in the stage of extracting strategies. It helps to identify internal and external conditions that are favorable and unfavorable to achieve specific objectives. Strengths relate to competitive advantages, weakness are limitations that hinder progress, opportunities are conditions favorable for achieving goals and threats are conditions harmful in achieving goals.

The strength, weakness, opportunities and threats related to vegetable in the study area were analyzed from focus group discussion, household interview, market survey and key informant's interview.

## 4. RESULTS AND DISCUSSION

This section deals with the results obtained through the analysis of information and data collected. It includes socio-demographic and production and marketing information, price spread of vegetables as well as strength, weakness, opportunities and threat of vegetable production in the district.

### 4.1 Socio-Economic and Demographic Characteristics Of The Respondents

The socio-economic characteristics of the respondents include gender distribution, age, ethnicity, education, family type, annual household income, food sufficiency level, farming experience, primary occupation, and land holding status.

### 4.2 Gender of The Respondents

Majority of the respondents were male (42) than female (18) in the study area. It was found that male and female respondent were 70.0% and 30.0%, respectively.

**Table 5:** Respondent's Distribution by Gender

Gender	Frequency	Percent
Male	42	70.0
Female	18	30.0
Total	60	100.0

### 4.4 Ethnicity

Different types of ethnicity groups were found in the study area. In study

area the respondents were Brahmin(40.0%), Chhetri (33.0%) followed by the Janajati (20.0%) and Dalit (7.00%). Brahmin and Chhetri were dominant ethnic group.

**Table 6: Age of the Respondents**

Ethnicity	Frequency	Percent
<30	11	18.3
30-40	19	31.7
40-50	17	28.3
>50	13	21.7
Total	60	100.0

**Table 7: Household Head Distribution by Ethnicity**

Ethnicity	Frequency	Percent
Brahmin	24	40.0
Chhetri	20	33.0
Janajati	12	20.0
Dalit	4	7.0
Total	60	100.0

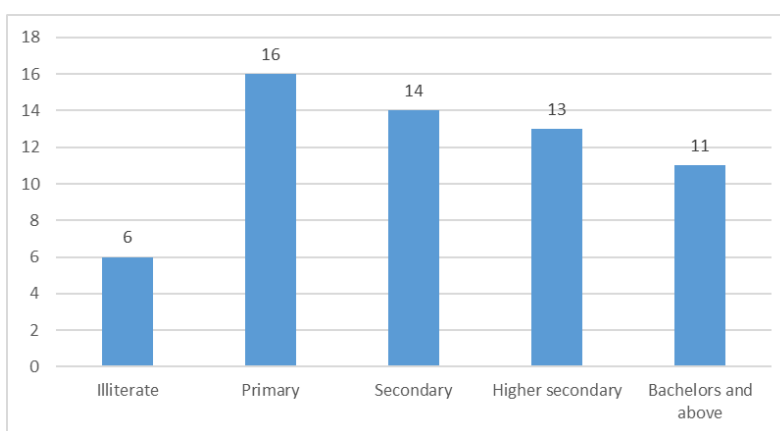
#### 4.5 Education Level of The Respondents

Education level was categorized into five groups. Illiterate are those who cannot read and write. Primary level refers to five years of schooling. Secondary level refers to the ten years of schooling. Higher secondary refers to formal education up to twelve and bachelors and above refers to the class above 12. Table 4 revealed that majority of the respondents (28.0

%) had primary level of education followed by secondary (24.0 %), higher secondary (22.0%), bachelors and above (18.0%) and illiterate (8%).

#### 4.6 Family Type of The Respondents

From the study, it was found that more respondents were having nuclear family (73.3 %) than joint family (26.7 %) as indicated in Table 5.

**Figure 5: Distribution of respondent by education level****Table 8: Family Type of Respondents**

Family type	Frequency	Percent
Nuclear	35	58.3
Joint	25	41.7
Total	60	100.0

#### 4.7 Primary Occupation of The Respondents

Majority of the occupation of the surveyed household population was agriculture (55.00%), followed by business (25.00%), service (10.00%) and foreign employment (10.00%).

#### 4.8 Annual Household Income from Vegetable Production

The annual income of households is categorized as below NRs. 300,000, NRs. 300,000-500,000 and above NRs. 500,000. The majority of the respondents (60.00%) were found to have an annual household income of NRs. 300,000-500,000. About (23.33%) respondents were reported having

annual household income of more than NRs. 500,000 and (16.67%) were found to have less than NRs. 300,000.

#### 4.9 Food Sufficiency Level

The results of the study showed the food self-sufficiency by on farm which is categorized into the 5 groups. In totality, about 31.67 percent of the sampled household had food self-sufficiency of 12 months and above, 23.33 percent had food self-sufficiency of 9-12 months. About 20.00 percent had food self-sufficiency of 3-6 months, 18.33 percent had food self-sufficiency of 6-9 months and 6.67 percent sample household population had food self-sufficiency of below 3 months.

**Table 9: Distribution of Respondents Based on Primary Occupation/Income Source.**

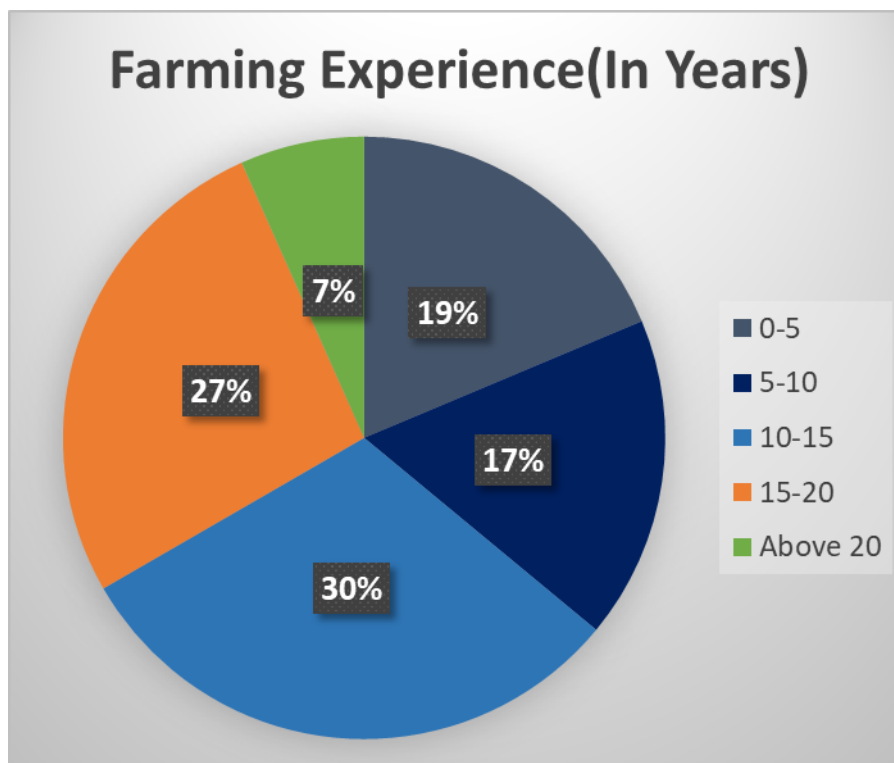
Primary occupation	Frequency	Percent
Agriculture	33	55.00
Service	6	10.00
Business	15	25.00
Foreign employment	6	10.00
Total	60	100.0

**Table 10: Annual Household Income from Vegetable Production**

Income category (In NRs.)	Frequency	Percent
< 300,000	10	16.67
300,000-500,000	36	60.00
>500,000	14	23.33
Total	60	100.0

**Table 11: Food Sufficiency Level from Own Production**

Category	Frequency	Percent
Below 3 months	4	6.67
3-6 months	12	20.00
6-9 months	11	18.33
9-12 months	14	23.33
12 months and above	19	31.67
Total	60	100.0



#### 4.10 Farming Experience of The Respondents

Duration of involvement in vegetable farming was categorized into five class. Majority of the respondents have the experience of 10-15 years (30.0%) on vegetable farming followed by above 15-20 (27.0%), less than 5 years (19.0%), 5-10 years (17.0%) and above 20 years (7.0%).

#### 4.11 Average Farm Size and Area Under Vegetable Production

The average landholding size in the study area was found to be 8.3 ropani.

Similarly, average farm size under vegetable production was 4.29 ropani with minimum of 4.00 ropani and maximum of 55.00 ropani.

#### 4.12 Economics of Production and Marketing of Major Vegetables

Economic analysis of production and marketing was done for cauliflower, tomato and cucumber which are the most commonly cultivated vegetables in the study area. Economics of production and marketing includes calculation of the total cost of production, the quantity of vegetables produced, cost per quintal, gross income, net profit, and benefit-cost ratio.

**Table 12: Distribution of Farm Size of The Sampled Households**

Landholding size	Total land (ropani)	Area under vegetable production (ropani)
Average	8.3	4.29
Minimum	4.00	1.20
Maximum	55.00	32.00
Total	498	171.6

#### 4.13 Cost of Production

Total cost of production includes fixed cost and variable cost. Cost of production of vegetables includes human labor (land preparation cost, planting cost, cost of intercultural operation and harvesting cost), machine costs (tractor/power used and irrigation), and input cost (cost of seeds, fertilizers, pesticides, and other supplements). Information on the cost of human labor, tractor/power tiller, irrigation, seed, manures, fertilizers, plant protection chemicals, and land rent for major vegetables were obtained from 60 sampled respondents and the total cost of production was calculated.

##### 4.13.1 Tomato

The results shows that the total cost of tomato production in one ropani land was NRs. 71,521. The variable cost was found to be NRs. 52,521 in which tunnel construction contributes the highest cost that is 48.78% followed by human labor (8.39%), manure (4.19%) and chemical fertilizer

plus micronutrients (3.19%). The fixed cost was NRs. 10,800 which included land rent and tax.

##### 4.13.2 Cauliflower

The average total cost of cauliflower production in one ropani land was NRs. 32,930. The variable cost was NRs. 13,930 in which human labor and manure contributes the highest cost that is 12.15% each and followed by seed (4.00%) and land preparation cost (3.87%). The fixed cost was NRs. 19,000 which included land rent and tax.

##### 4.13.3 Radish

The average total cost of radish production in one ropani land was NRs. 27,900. The variable cost was NRs. 8,900 in which human labor contributes the highest cost that is 10.75% followed by manure (8.96%) and land preparation cost (5.2%). The fixed cost was NRs. 19,000 which included land rent and tax.

**Table 13: Cost of Production of Major Vegetables in Bhaktapur District**

SN	Particulars	Tomato (NRs/ropani)	Cauliflower (NRs/ropani)	Radish (NRs/ropani)
	Variable costs			
1.	Human labor	6,000 (8.39)	4,000 (12.15)	3,000 (10.75)
2.	Land Preparation	1,455 (2.03)	1,275 (3.87)	1,450 (5.2)
3.	Irrigation	1,350 (1.89)	1,115 (3.39)	850 (3.04)
4.	Seed	2,100 (2.93)	1,315 (4.00)	600 (2.15)
5.	Manure	3,000 (4.19)	4,000 (12.15)	2,500 (8.96)
6.	Chemical fertilizer and micronutrients	2,280 (3.19)	1,175 (3.56)	500 (1.79)
7.	Tunnel	34,885 (48.78)	-	-
8.	Plant protection	1,451 (2.03)	1050 (3.18)	-
	Total variable cost	52,521 (73.43)	13,930 (42.3)	8,900 (31.9)
	Fixed costs			
1.	Land rent and tax	19,000 (26.57)	19,000 (57.7)	19,000 (68.1)
	TOTAL	71,521 (100)	32,930 (100)	27,900 (100)

Note: Figures in parentheses indicate percent.

#### 4.14 Production, Average Price, Net Return and Benefit Cost Ratio

Benefit-cost analysis can be done after the calculation of the total cost and gross return from the vegetable cultivation.

##### 4.14.1 Tomato (*Lycopersicum Esculentum*)

Average productivity of tomato in the study area was found to be 3,500 kg/ropani. The cost of production per Kg of tomato in the study area was found to be NRs. 20.43. The average price received per kg was NRs. 39.00 and benefit cost ratio of 1.90. The net profit per ropani was NRs. 64,979.

##### 4.14.2 Cauliflower (*Brassica Oleracea Var. Botrytis*)

Average productivity of cauliflower in the study area was found to be 1,550 kg/ropani. The cost of production per Kg of cauliflower in the study area was found to be NRs. 21.24. The average price received per kg was NRs. 35.00 and benefit cost ratio of 1.64. The net profit per ropani was NRs. 21,320.

##### 4.14.3 Radish (*Raphanus Sativus*)

Average productivity of radish in the study area was found to be 1,750 kg/ropani. The cost of production per Kg of radish in the study area was found to be NRs. 15.94. The average price received per kg was NRs. 27.00 and benefit cost ratio of 1.70. The net profit per ropani was NRs. 19,350.

#### 4.15 Marketing Margin and Producers Share

Marketing margin is the difference between price paid by the consumer and price received by the farmers. Producer's share is the proportion of the consumer's payment received by the producers. Marketing margin and producer's share area the indicator of efficiency of existing marketing system. Lower marketing margin and higher producer's share ensures efficiency of marketing system. Marketing margin of tomato was NRs. 31.00 with 55.71% producer's share.

For cauliflower marketing margin was NRs. 39.50 with 46.97% producer's share and for radish, marketing margin was NRs. 19.00 with 52.50% producer's share.

**Table 14: Average Production, Average Price, Net Return and Benefit Cost Ratio**

	Tomato	Cauliflower	Radish
Total cost of production (NRs.)	71,521	32,930	27,900
Average production (kg/ropani)	3,500	1,550	1,750
Per unit production cost (NRs./kg)	20.43	21.24	15.94
Average price per kg (NRs.)	39.00	35.00	27.00
Total income (NRs.)	136,500	54,250	47,250
Benefit cost ratio (BCR)	1.90	1.64	1.7
Net profit per ropani (NRs.)	64,979	21,320	19,350
Estimated net profit per hectare of land (NRs.)	12,76,837	4,18,938	3,80,227

**Table 15: Marketing Margin and Producer's Share of Major Vegetables**

S.N	Vegetable	Farm gate price (NRs.)	Retailers price (NRs.)	Marketing margin (NRs.)	Producer's share (%)
1	Tomato	39.00	70.00	31.00	55.71%
2	Cauliflower	35.00	74.50	39.50	46.97%
3	Radish	21.00	40.00	19.00	52.50%

#### 4.16 Marketing Channels

Marketing channel is the sequence of intermediaries or middlemen, and markets through which produce pass from producers to final consumers. The marketing channels are important aspects of agribusiness which affects the prices paid by consumers and the corresponding share received by the producer. Generally, the shorter the channel, lesser the market costs and cheaper the commodity to consumer (Pandey & Tewari, 2010). Table shows farmer's involvement on each channel for marketing of vegetables. About 30.00% of the farmers used long chain marketing channel (4) involving local traders followed by marketing channel 5 (25.00%), marketing channel 3 (21.66%), marketing channel 2 (16.67%) and marketing channel 1 (6.67%).

#### 4.17 Problem in Vegetable Production And Marketing

Various problems related to production and marketing of tomato were encountered by farmers. Indexing/scaling techniques was employed for analysis. The section deals with different problems associated with production and marketing of vegetables in Bhaktapur district.

#### 4.18 Production Problems

Ranking was done on the basis of six-point scaling technique (1,0.83,0.67,0.51,0.35,0.17) to find out the relative seriousness of the problems as precisely as possible. The value obtained from the rank scale showed that the diseases and pest was the most severe problem followed by inputs not being available on time, lack of credit, irrigation and lack of technical knowledge on vegetable farming.

**Table 16: Major Marketing Channels of Vegetables in Bhaktapur District**

S.N	Market channels	Frequency	Percent
1.	Producers-Consumers	4	6.67%
2.	Producers-Retailers-Consumers	10	16.67%
3.	Producers-Wholesalers-Retailers-Consumers	13	21.66%
4.	Producers-Local traders-Wholesalers-Retailers-Consumers	18	30.00%
5.	Producers-Collection center-Wholesalers-Retailers-Consumers	15	25.00%
	Total	60	100%

**Table 17: Problems in Vegetable Production**

Reasons	1	0.83	0.67	0.51	0.35	0.17	Index value	Rank
Disease, Insects and Pests	28	26	6	0	0	0	0.89	I
Irrigation	12	24	11	6	0	7	0.72	II
High cost of inputs	7	3	15	14	10	11	0.53	III
Inputs supply inappropriate time	7	7	9	11	12	14	0.52	IV
Limited technical knowledge vegetable farming	0	0	14	18	19	9	0.44	V
Limited credit facilities	6	0	5	8	19	22	0.40	VI

**Table 18: Problems in Vegetable Marketing**

Reasons	1	0.83	0.67	0.51	0.35	0.17	Index value	Rank
Low farm gate price	21	19	5	6	5	4	0.76	I
High price fluctuation	8	19	12	8	4	9	0.65	II
Insufficient storage facilities	9	4	14	13	8	12	0.55	III
Insufficient market information	4	7	14	14	14	7	0.54	IV
Insufficient processing facilities	7	8	9	12	10	14	0.53	V
No timely payment	11	3	6	7	19	14	0.50	VI

**Table 19: SWOT Analysis**

Strength	Weakness
<ul style="list-style-type: none"> <li>Climatic suitability and fertile land suitable for production of vegetables.</li> <li>Well improved road, market and access to inputs.</li> <li>Proximity to Kathmandu, one of the biggest marketing hub.</li> <li>The farmers are given technical information, training, and subsidies by PMAMP, PIU, vegetable zone</li> </ul>	<ul style="list-style-type: none"> <li>Inadequate market information.</li> <li>Lack of well-organized collection center and storage infrastructures.</li> <li>Excessive involvement of middlemen.</li> <li>Excessive use of chemical fertilizer and pesticides.</li> <li>Lack of price regulation mechanism.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>Increasing demand for vegetables.</li> <li>Suitable diversified climate for vegetable cultivation.</li> <li>Farmers obtain decent price.</li> <li>Reduce youth migration due to increase of employment opportunities.</li> <li>Favorable agricultural policies and support of inputs.</li> <li>Increased affordability and locals' awareness of the benefits of eating vegetables.</li> </ul>	<ul style="list-style-type: none"> <li>High incidence of disease and pests.</li> <li>Fluctuating market prices.</li> <li>Due to the open border, cheaper vegetables are available from overseas.</li> <li>High cost of quality inputs.</li> <li>Migration of young people causing a labor deficit.</li> <li>Lack of coordination between production and marketing sector.</li> </ul>

#### 4.19 Marketing Problems

There are also the marketing problems faced by the farmers in the marketing sector. Ranking was done on the basis of five-point scaling technique (1,0.83,0.67,0.51,0.35,0.17) to find out the relative seriousness of the problems as precisely as possible. The value obtained from the rank scale showed that the price fluctuation was the most severe problem followed by low farmgate price, traders' dominance over market, lack of storage and lack of market information system.

#### 4.20 SWOT Analysis

SWOT analysis of vegetable production and marketing in the study area

### 5. SUMMARY AND CONCLUSION

#### 5.1 Summary

The study was conducted with the broad objective of analyzing the economics of production and marketing of major vegetables in Bhaktapur district. The study was carried out in Suryabinayak and Madhyapur Thimi municipality in 2022. The total sample size for the study was 75 with 60 farmers and 15 traders and consumers, selected by simple random sampling technique from the list of known farmers cultivating vegetables obtained from Prime Minister Agriculture Modernization project, Project Implementation Unit (PIU). Pre tested semi-structured survey schedule was done to obtain primary information from farmers through field visits. In addition, Focus Group Discussions (FGDs), Key informants Interview were carried out to get qualitative data supporting the objectives of the study. Secondary sources of data were different publications relevant to the study conducted time to time in country. Acquired data was analyzed by using SPSS and MS EXCEL tools. Simple descriptive statistics, economic analysis and indexing was done by using formula to present data in final form.

There were more male respondents 42(70.00 %) than females 18(30.00 %) in the study area, for this research. Interviewed respondents were of different age group with majority of them belonging to age group 30-40 years (31.7 %). Most of the respondents (28.00%) in the study area were found educated up to primary level and 8 % of them were illiterate. Most of their family was nuclear type (58.3 %). Brahmin community was dominant ethnicity in study area with 40% followed by Chhetri (33.0%), Janajati (20.0%) and Dalit (7.0%) ethnic groups. Main occupation of the respondents or major source of family income was found agriculture only (55.00%) followed by business (25.00%) in study area. Most of the farmers had farming experience of 10-15 years with 30.00%.

The average cost of production per Ropani of tomato, cauliflower and radish was NRs. 71,521, NRs. 32,930 and NRs. 27,900, respectively. The BC ratio was higher for tomato (1.90) followed by radish (1.70) and cauliflower (1.64). The marketing margin per kg of tomato, cauliflower and radish was NRs. 31.00, NRs. 39.50 and NRs. 19.00, respectively whereas the producer's share was found to be higher for tomato (55.71%) followed by radish (52.5%) and cauliflower (46.97%). About 30.00% of the farmers used long chain marketing channel (4) involving local traders followed by marketing channel 5 (25.00%), marketing channel 3 (21.66%), marketing channel 2 (16.67%) and marketing channel 1 (6.67%).

Incidence of diseases and pest were the most severe production problem followed by irrigation, high cost of input, input supply inappropriate time and limited technical knowledge on vegetable farming and limited credit facilities. Low farm gate price was the most severe marketing problem followed by high price fluctuation, insufficient storage facilities, insufficient processing facilities and no timely payment.

#### 5.2 Conclusion

Hence, this research fulfills the objective of identifying the major constraints of production and marketing of vegetable sub-sector in Bhaktapur district. It helps to minimize the existing gap between producer and consumer minimizing middlemen. Tomato, cauliflower and radish occupied majority of the area under vegetable cultivation. Profit gained from the cultivation of major vegetables indicated that farmer were benefitted from the vegetable cultivation especially with the cultivation of tomato inside plastic house which has higher net return per unit area.

Suryabinayak and Madhyapur Thimi are potential vegetable production area due to its edaphic and climatic suitability. Since vegetables are highly perishable and due to lack of storage and processing facility farmers were forced to sell their product at the price fixed by local collectors. Farmers were only the price taker not the price maker. Farmers in the study area sell their products through different marketing channel of which marketing channel which involves cooperative was found to be effective with comparatively higher producer share. Various production-related problems, technical, post-harvest loss and marketing problems were being faced by vegetable producers during the cultivation. The study also showed that farmers were facing with several constraints related to production and marketing. Problem of diseases, insects and pests followed by irrigation problem, high cost of input and not being available on time, limited technical knowledge unavailability of credit and extension services were the major problems in production. Low farm gate price and high fluctuation in market prices were the major marketing problems..

## SUGGESTIONS

Based on the findings of the study, some suggestions have been made which could be useful to the related government authorities and other concerned agencies who are involved for the better improvement of vegetable production.

### For Farmers

- Maintain the book record related cost of input and selling price of different vegetables.
- Consult with concerned service providers for technical knowledge regarding vegetable cultivation practices.
- Demand based production on the basis of season and market information.

### For The Policy Makers And Stakeholders

- Policy formulation on subsidies in quality inputs, storage, transport facilities and required credit at affordable interest rate
- Policy interventions should be tailored to promote improved seed varieties in vegetable farming, provide effective extension services.
- Develop markets linking with production areas and manage proper linkage between different value chain actors

### For Researcher

- Proper study of site, sub-sector and climate must be made before pursuing research.
- Proper Consultation must be done with PMAMP Vegetable Zone, Bhaktapur, AKC, Lalitpur and local bodies.

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