CHAPTER – I

INTRODUCTION

1.1 Background

Tomato (*Lycopersicum esculentum*) belongs to the family, Solanaceae. It has been described as a versatile commodity that can be eaten fresh or processed for a wide range of products; and can be utilized to improve the flavours and characters of other foods (Villareal, 1979). China is the largest producer (One quarter of world total production) of tomato, followed by India and the United States. The world dedicated 4.8 million hectares in 2017 for tomato cultivation and the total production was about 161.8 million tonnes. The average world farm yield for tomato was 33.6 tonnes per hectare, in 2012 (MoAD,2015/16). Tomato farms in the Netherlands were the most productive in 2012, with a nationwide average of 476 tonnes per hectare, followed by Belgium (463 tonnes per hectare) and Iceland (429 tonnes per hectare).

Despite decade long prioritizing agriculture sector on almost every planning on Nepal, it is continuously declining in terms of production and labor engagement. And various social, political, economic and geographical factors are behind the slow development of this sector. If such structural shift were systematic, it would be satisfactory. But in absence of sustainable development in other sectors like service and industry, such shift could be suicidal for a country having deep-rooted life style, culture, religion and knowledge based on agriculture. The proportion of population depending on agriculture has sharply declined along with its share in GDP. The share of agriculture in GDP has decreased from 69 percent in 1974/75 A.D to 28.3 percent in 2016/17A.D. Until recently Nepal was considered an 'Agricultural Country' with overwhelming proportion of its population involved in agriculture. It was a food exporting country a decade ago but now we are a food importing country. However, coming to the current time the country has shown dramatic change.

The diverse topographic features and climatic conditions in Nepal permit the successful production of a large number of vegetables. There are more than 247 cultivated vegetable crops, of which more than 50 are common in Nepal. The main vegetables grown are cauliflower, cabbage, radish, broadleaf mustard, carrot, peas,

beans, chilli , okra, brinjal , onion, cucumber, pumpkin, bitter gourd, bottle gourd. Cauliflower has occupied first position both in area and production, followed by cabbage, radish and tomato(Awasthi, 2007)..

Due to urbanization and changes in food habit the domestic production is no longer fulfilling the increasing demand. Due to the nutritive value of vegetables and health awareness of the consumers the per capita consumption of vegetables in Nepal has increased from 49 kg/head/year to 60 kg/head/year in last ten years, but still far below the human vegetable nutritional requirement i.e. 104 kg/person/year (Awasthi , 2007). Nepal imports 67 percent of vegetable consumption and 85 percent of its fruit consumption (Agriculture Project Services Centre and John Mellor Associates, 1995). Nepal Rastra Bank's data from past three years i.e from 2015 to 2017 show that Nepal imports vegetables worth Rs. 1 billion to 2 billion in the period of one month from mid-September to mid-October every year as the greatest festival of Nepalis , Dashain , falls in between. While the value of annual vegetable import stands at Rs 10 billion, almost one fourth is bought in this period. Import of fresh vegetables in eastern Nepal is increasing with each passing year. Increasing vegetables imports show that Nepali kitchens are fully dependent on foreign vegetables. Though the government has brought several plans to be self- sufficient on vegetables, it has not been able to implement them effectively. The data of Trade and Export Promotion Centre (TEPC) Biratnagar shows that potato and other vegetables worth Rs 1.40 billion were imported via different borders of eastern Nepal in 2013/2014. The import increased by three times in 2015/2016. Green vegetables worth Rs 5.76 billion were imported to eastern Nepal in 2015/16 through different border points.

In year 2011/12 total area of vegetable production was 245,037 Ha and production was 3,298,816 Mt while the yield in kg/ha was 13,463. Statistics shows that there was not satisfactory progress in terms of area, amount of production and yield of vegetables. There was total 280,807 ha area of production and total amount of vegetable produced was 3,929,034 Mt with yield of 13,992 kg/ha in year 2015/16 (MOAD, 2015/16). In Nepal, there is a great potentiality of growing large number of vegetable crops because of the availability of a wide range of agro-climatic and topographical conditions from subtropical, temperate to cold climate. Such diverse agro-ecological zones favor the successful cultivation of vegetable round the year in

the country. Nepal produces vegetables worth NRs 55 billion annually and around 70 percent of total household of country are being involving in vegetable farming with about NRs 12 billion investment in farming every year. Of the total production, 39 percent (1.10 million mt.) is used for household consumption and 61 percent for sale (PACT, 2012). Among the various potential vegetables, tomato is the major one from Terai to hills of Nepal. It is most important vegetable crop having high market potentialities. While open field cultivation during Autumn-Winter is common in Terai, inner Terai and foot hills, cultivation inside plastic tunnels in Summer-Rainy season in the hills is getting popularity which is sold as off-season product fetching higher prices in Terai of Nepal and nearby Indian markets. Thus, there is comparative advantage for mid hills and high hills for income generation and improve the livelihood through tomato farming.

A value chain (VC) sequence of productive processes from the provision of specific inputs for a particular product to primary production, transformation and marketing and distribution, and final consumption. The products pass through all activities of the chain in order, gaining value with each activity. The value chain analysis (VCA) examines the full range of activities that are required to bring a product in a particular enterprise from its conception to its end markets. The concept of "agricultural value chain" covers the full range of activities and participants involved in moving agricultural products from farmers' fields to consumers' tables.

Typically, the value chain analysis is important to understand all the major constraints to improve performance or competitiveness. The information gained through market chain analysis also helps in identifying the best market chain to work on a specific client and in locating key market chain actors who will buy produce.

An average measure of the efficiency of production is productivity. When all outputs and inputs are included in the productivity measure it is called total productivity. Outputs and inputs are defined in the total productivity measure as their economic values. The value of outputs minus the value of inputs is a measure of the income generated in a production process. It is a measure of total efficiency of a production process and as such the objective to be maximized in production process (Koutosoyiannis, 1997).

This study has analyzed the productivity of tomato production and marketing mechanism and identified problems and opportunities in it. Cobb Douglas (logarithmic) function is used to identify factors that determine tomato market supply of the farmers in that area.

1.2 Statement of the Problem

The marketing situation of vegetables is still in developing/rudimentary stage characterized by influences of supply and demand and price realization (Shrestha, 2008) .Actually, in Nepal, the trend of productive young brain going abroad for employment has been increasing rapidly on this decade. So, the cultivated land are becoming barren, only old people remains on villages so the results comes on decreasing agricultural production. If such youth labor force would remain on their own nation and engage on commercial agricultural production be it like vegetable farming using smart techniques then how the production would be increased. There may not be need of importing vegetables from neighboring countries. Rather they would be able to export and can earn foreign currencies.

It has been noticeable that vegetables growers are fetching less value share where as consumers are compelled to pay high price in retail markets. Actually, without considering intermediaries' costs on commodity transfer at various levels, the farmers claim, they have been exploiting by middlemen, road head contractors. This studies ' main motto is whether is it true or not, whether there is other truth which we are not seeing , who have the power of determining vegetables' prices , which actors dominates on value chain mechanism, has to be known through this research .

Regarding agricultural products ' marketing , a general knowledge has been that the traders usually tried transferring all sort of price risks to farmers and offered low prices to them by creating monopsonistic situation ,debt ties, & cartel (Thapa et al .,1995 .,cited by Pokhrel (2010) . However such thing has not been studied on production and marketing of seasonable vegetables on Baglung district, especially Kundule & Farse pocket area. Such mentioned things may not be true why we are being judgemental on value addition mechanism. Many other components on value addition are equally responsible for reducing farmers share.

This study may be helpful as it aims to seek the answers of following research questions:

1. What is the value share of actors (farmers, wholesalers, retailers, middlemen) in value chain of vegetables farming?
2. What is the productivity of vegetable production in selected pocket area of Baglung district?

1.3 Objectives of the Study

The general objective of the study is to analyze production and value chain of tomato in selected pocket areas of Baglung District.

The specific objective of the study is as follows:

Specific objectives:

- To know the market margin and value share of chain actors (farmers, wholesalers/retailers) in value chain of vegetables.
- To fit the Cobb-Douglas production function on tomato production.

1.4 Significance of the Study

This research explored the existing marketing system of tomato enterprise, its challenges and constraints in selected pocket area of Baglung District. Analysis of the whole system and identifying clearly the present situation constraints and opportunities will benefit policy makers, planners and implementers in indicating the area of advantage for what should be done to improve vegetable marketing. The findings from this study would be useful for all stakeholders involved in tomato enterprise and in formulation of policies related to tomato production and marketing for the study areas and other similar areas. . It would be useful as a guideline for further researchers in the similar fields.

1.5 Limitations of the Study

Every study has some limitations according to the geographical structure, environment, social status, thinking of local public etc of the study area. The present study is delimited to the following area:

- Since the coverage is limited for the research site, the inferences drawn from the research may not be taken as generalization for other areas of the country.
- Non-probability sampling method is used while collecting data of single season.
- Data collected on recall basis may lead to some response errors.
- The reliability and validity of data is based on the respondents' responses.
- The size of the sample taken may not be adequate due to resources and time constraints.

1.6 Organization of the Study

This study has been divided into five chapters. The first chapter describes about the introduction of the study which includes background information, statement of problem, research objective and research questions; and scope and limitation of the study. The second chapter discusses on different literatures reviewed for the study. The third chapter focuses light on research design and methodology followed in writing report. The fourth describes about the results and discussion. Finally, the last chapter describes about the conclusion and recommendation.

CHAPTER – II

REVIEW OF LITERATURE

For assessment of the present status of research at national and international level, in the areas of value chain of vegetable from production to consumption, the review of related literature is presented in this chapter.

2.1 Theoretical Concept

2.1.1 Value Chain

The concept of value added, in the form of the value chain, can be utilised to develop an organisation's sustainable competitive advantage in the business arena of the 21st century. All organisations consist of activities that link together to develop the value of the business, and together these activities form the organisation's value chain. Such activities may include purchasing activities, manufacturing the products, distribution and marketing of the company's products and activities (Lynch, 2003). The value chain framework has been used as a powerful analysis tool for the strategic planning of an organisation for nearly two decades. The aim of the value chain framework is to maximise value creation while minimising costs (www.wikipedia.org).

A value chain (VC) is a chain of value-creating activities which are not isolated from one another. Rather, one activity often affects the cost or performance of the others (www.netmba.com). It is a sequence of productive processes from the provision of specific inputs for a particular product to primary production, transformation, marketing and distribution, and final consumption (Amatya, 2009).

Miller & Jones (2010) explained that the concept of agricultural value chain includes the full range of activities and participants involved in moving agricultural products from input suppliers to farmers' fields and ultimately to consumers. Each stakeholder in the chain has a link to the next in order to form a viable chain. It is generally believed that small farm agriculture plays a central role in economic development, both in supplying a significant portion of the domestic food crop supplies and in generating income for low-income families. But on the other hand there are constraints related to access to production resources and markets (Minot, 1986).

2.1.2 Production Function

Cobb-Douglas production function is one of the widely used production function used in the economics. C.W Cobb and H. Douglas formulated this function in 1928. They formulated this production function with the ideal assumption that the sum of the elasticities should be equal to one. The strong view that the sum of the elasticities should be one has been dropped out with the criticism of Durand and a new function known as "Power function" came into existence, which is linear in logarithmic form.

The simplest Cobb-Douglas production function model has the following form:

$Q = A\ L^{\alpha}\ K^{\beta}$, Where, Q stands for output, L for labor, and K for capital. The parameters A, α, and β are estimated from empirical data. Also $0 < \alpha < 1$, $0 < \beta < 1$. Equivalent is a linear function of the logarithms of the three variables:

$\log (Q) = \log (A) + \alpha \log (L) + \beta \log (K) + u$; where residual u is added in the multiplicative form e^{u}.

In the case where constant returns to scale is present, then $\alpha + \beta = 1$. Alternatively, constant returns to scale may be imposed by putting $\alpha = 1 - \beta$ so that $Q = A\ L^{\alpha}\ K^{\beta}$ can be rewritten as:

$Q = A\ L^{1-\beta}\ K^{\beta}$, So, $Q/L = A\ (K/L)^{\beta}\ e^{u}$; and taking logarithms of both sides gives

$\log (Q/L) = \log A + \beta \log (K/L) + U$

This second form avoids multicollinearity between log K and log L and also reduces heteroscedasticity if the variance of K is correlated with L (Wynn and Holden, 1974).

Features of Cobb-Douglas Production function are:

a) It is homogeneous of degree $\alpha + \beta$. and consists of following conditions;

If $\alpha + \beta > 1$, then depicts increasing returns to scale (IRS)

If $\alpha + \beta = 1$, then depicts constant returns to scale (CRS)

If $\alpha + \beta < 1$, then depicts decreasing returns to scale (DRS)

b) In special case that is $\alpha + \beta = 1$, it is linearly homogeneous.

c) Its isoquants are negatively slopped throughout and strictly convex for positive value of K and L.

d) When it is linearly homogeneous, it is characterized by diminishing returns to each input for all positive levels of K and L.

Cobb-Douglas production function is also a special case of CES Production function. (Henderson & Quandt,1971 A.D).

2.2 International Context

Esengun et al. (2005) analyzed tomato production and marketing in Turkey. The average tomato production area was found to be 6.69 decare (1 decare = 1000m^2). Two-thirds of the farms produce tomatoes of indeterminate cultivars; the rest produced determinate cultivars. The most important production problems faced by growers include high input cost, low product price, pests and diseases, and marketing. Major share of the tomatoes produced by farmers were sold in the city itself or exported by foreign traders.

Siviero (2005) reported that in Italy area devoted to tomato crop increased by 28 percent compared to 2002, to touch 88,000 ha. Production at around six million tonne was up by 21.4 per cent compared to 2003, with yield per ha increasing from 65.35 tonne in 2003 to 73.2 tonne in 2004.

Suryavanshi et al. (2006) conducted a study to identify marketing channels, to estimate marketing cost, marketing margin and price elasticity. The study revealed that 80% of the tomato was sold through channel (producer-commission agent cum wholesaler-retailer-consumer). The cost of marketing incurred was the highest (Rs. 187.45) in channel-I, where as it was the lowest (Rs. 55.40) in channel (producer-consumer). And retailers enjoyed higher net proportion of margin as compared to commission agent cum wholesaler. Marketing efficiency was observed to be the highest (9.70%) in channel (producer-consumer) for achieving maximum profit and to reduce intermediary charges in trade, when the produce is in small quantity and if the produce is in large quantity channel-II should be selected to safeguard the interest of tomato growers.

Ahmed et al. (2007) investigated the determinants of smallholder farmers' participation decision in potato market in Kofele district of Ethiopia. The objective was to identify and analyze factors affecting farmers' decision in supplying their potato products to market. A multi-stage sampling procedure was used to select sample households for data collection. A total of 120 potato producer households were randomly selected from the district and semi-structured questionnaires were used to collect data. Their findings demonstrate that level of education, livestock owned, quantity of potato harvested, potato market price, and access to market information positively affect farmers participation decision whereas participation in off/non-farm activities were negatively affect farmers decision to participate in potato output market. They suggested that a policy that improves determinants of market participation is recommended to enhance farmers' market participation in potato output market.

Teka (2009a) found eight marketing channels for tomato in Ethiopia. The main receivers from the producers were wholesalers, retailers and rural assemblers, and with an estimated share of 44.7, 40.4 and 8.5 percent, respectively. The channel of producer-retailer-consumer was found to carry the largest share followed by producer-wholesaler-retailer-consumer with the volume of 552 quintal and 382 quintal respectively.

Bala et al. (2009) examined the cost of tomato cultivation amounted to be 54,800/ha. It was higher for large (60,700/ha) than small (53,200/ha) farms due to more expenditure on plant protection measures by the large farmers. Thus, the net returns per quintal were higher (1348) on small than large (1308) farms

Teka (2009b) conducted study with the objectives of analyzing fruit and vegetable marketing chains in Alamata District, southern zone of Tigray. Specifically the study attempted to assess structure-conduct-performance of fruit and vegetable marketing. It also analyzed market supply determinants, and the institutional support services of extension, input supply and credit. Profitability of fruit and vegetable production was calculated. Study identified problems and opportunities in fruit and vegetable production and marketing. Data came from 140 horticulture producing households, 9 horticulture wholesale and 30 retailers. Cobb Douglas (logarithmic function) econometric estimation procedure was employed to identify factors that determine

onion, tomato and papaya market supply of the farm households in the area. From simple calculation, on the average, a producer profited 11,293.09ETB from onion, 8,823.02ETB from tomato, and 11,432.93ETB from papaya per hectare production (assuming an average price of 1.79 ETB, 0.99 ETB and 2.19ETB per kg prices, respectively). Wholesalers and retailers profitability from the aforementioned crops were 35.49 ETB from onion, 24.24 ETB from tomato and 16.80 ETB from papaya for assembles per quintal. Wholesalers and retailers also obtain a profit of 47.80 ETB from onion, 34.30 ETB from tomato and 41.60 ETB from papaya and 30.04 ETB from onion, 24.33 ETB from tomato and 16.50 ETB from papaya, respectively per quintal (assuming an average price of 3.71 ETB for onion, 2.89 ETB for tomato and 3.56 ETB for papaya per kg at retile level). They noticed that the potential benefit is under challenges of imperfect marketing, unethical practices of cheating and information collusion that led to uncompetitive market behavior even though the calculated concentration ratio did not indicate oligoposony market behavior (24.56%).

Pramanik et al. (2010) analyzed the marketable surplus and marketing efficiency of vegetables (tomato, potato and cauliflower) in Indore District, India. The outcomes of the study revealed that marketable surplus of tomato, potato and cauliflower was observed to be 90%, 89% and 95.5%, respectively. Further, three types of marketing channels in the process of marketing vegetables were undertaken to estimate the marketing performance. It was concluded that marketing efficiency was affected by market intermediaries and perishable nature of the commodities.

Akter & Islam (2011) analyzed economics of winter vegetables production in some selected areas of Narsingdi district, Bangladesh. The collected data was tabular and quantitative analyses were done to achieve the major objectives of the study. The major findings of the study revealed that production of all the selected vegetables were profitable. The per hectare gross cost of production of tomato, cauliflower and cabbage were Tk. 118000, 116977 and 120522, respectively and the corresponding gross returns were Tk. 217020, 210000 and 220000, respectively. The per hectare net returns of producing tomato, cauliflower and cabbage were Tk. 97000, 93023 and 99478, respectively. The study reported some problems and constraints which are related to production and marketing of these vegetables.

Haruna (2012) studies carried out to analyze economics of fresh tomato marketers in Bauchi metropolis of Bauchi State, Nigeria. The costs and returns analysis revealed variable cost (99.99%) and fixed cost (0.01% of the total cost of tomato marketing with acquisition cost (87.46%) and cost of empty baskets (4.37%) constituting the highest. The findings of returns per naira invested of 1.20k disclosed that the enterprise is profitable. The cost of marketing was N68,670.00, total revenue was N80,000.00 and the net income of N11,330.00 was realized , indicating highly profitable.

Toppo et al. (2012) conducted in the Jashpur districts of Chhattisgarh. On an average the cost of cultivation per hectare of tomato was found Rs. 26576.89. Overall on an average the cost of production per quintal of tomato was observed as Rs. 222.84. Cost of production per quintal of these vegetables shows decreasing trend with increase in farm size where as cost of cultivation increases with increase in the farm size. Overall on an average the input-output ratio and Benefit-Cost ratio of tomato came to 1:3.70 and 1:2.70, respectively on the sample farms. The cost and return on average cost-A, cost-B, and cost-C were 16026.99, 18526.99 and 29254.64 Rs/ha. More than ninety five per cent marketable surpluses were observed in the tomato crops in different size groups of farmers. Average marketable surplus in tomato was 117.06 Qtl/ha

Toure & Wang(2013) evaluated the marketing margin of tomato in the district of Bamako of Mali in the period of abundance 2012. The study analyzed the marketing of tomato and identified the problems and opportunities for enhancing the gross margin. A survey was conducted using structured questionnaires to collect primary data from 40 wholesalers and 40 retailers. The results of the estimation of marketing margin functions were obtained using the relative price spread. This study revealed that the majority of respondents were more than 35 years of age; about 95% of them were female. It was also revealed that 50% of wholesalers were illiterate, while 7.5, 32.5 and 5%, had organic, primary and secondary education level, respectively. The results indicated that the farm-gate price (205.13 Fcfa/kg) and marketing cost (114.23 Fcfa/kg) of tomato are among the highly influential factors on the entire marketing margin. The wholesale margin function was affected by the wholesale price (408 Fcfa/kg) and wholesale cost, while the retail margin function was influenced by the retail price (421 Fcfa/kg) and the retailer cost

Imtiyaz and Soni (2013) carried out in Allahabad district, Uttar Pradesh, India during November, 2011 to March,2012 to evaluate the existing marketing supply chains of fresh tomato, cabbage and cauliflower (SC1: Producer– Consumer; SC2: Producer - Retailer – Consumer; SC3: Producer - Commission agent - Retailer – Consumer and SC4: Producer - Commission agent -Wholesaler - Retailer - Consumer). The marketing supply chains had significant effect on net marketing price of producer, net profit of producer, total marketing cost, total marketing loss, total net marketing margin, marketing efficiency, producer share in consumer price and consumer purchase price of fresh tomato, cabbage and cauliflower. The gross marketing price, net marketing price and net profit of producer for fresh tomato, cabbage and cauliflower were significantly higher in marketing supply chain SC1, followed by SC2, SC3 and SC4.

Shende et al. (2013) revealed that the cost of cultivation per hectare for tomato over the cost C2 was found 76417.41 Rs/ha .the net over cost C2 was found to 65139.23 Rs/ha. for tomato. The B:C ratio over cost A2 which is known as available cost was found to 3.73 for tomato . However the B:C ratio over C2 i.e. cost of cultivation was 1.85 for Tomato. The study identified for different marketing channel for Tomato vegetable. . It shown that Channel-I i.e. Producer to Consumer was best channel for marketing for selected vegetable. The marketing efficiency was worked out with three different method viz; Conventional method, Shepherd method and Acharya method. It reveal that efficiency was decline with increase in number of intermediaries. The different constraints were identified during production and marketing of Tomato vegetable.

Muthyalu (2014) studied to analyze the major problems and prospects of tomato marketing. The major challenges in tomato production are tomato weed, tomato frost and transportation related problems. The problems in tomato marketing are low price, lack of storage facilities, and lack of market centers. Opportunities for expansion of tomato marketing are market stability, infrastructure facility, market demand, improved yield, better price, storage facilities and processing facilities.

Kumar et al. (2015) examined the marketing efficiency in India. They found out total marketing cost and marketing margin involved in channel-I was Rs.100, Rs.466.42 in channel-II, Rs.731.19 in channel-III and Rs.154 in channel-IV. Since the marketing

cost and marketing margin in channel-III was higher, the marketing efficiency was very low for channel-III. For channel-I, because of saving of marketing cost due to absence of market intermediaries and relatively low consumer's price, the marketing efficiency was higher. It was highest for channel-I i.e. 16.30% and lowest in channel-III i.e. 2.735%. Thus channel-I is more efficient than all other channel of marketing of vegetables.

Noonari et al. (2016) conducted a study in India. They examined the costs and returns indicate that farmers incurred an average per hectare fixed costs Rs 33187.00 include Rs 700.00 for land tax, Rs 32487.00 for rent of land. The results revealed that tomato farmers incurred an average per hectare cost of Rs 19780.75 as labor cost. An average per acre marketing cost of 30457.65 on tomato capital input used, and an average per acre marketing cost was Rs. 4191.73 On an average per acre spent a total cost of production of Rs. 87617.13. An average per acre Physical productivity was 186.00 in mounds. An average per acre Revenue productivity was Rs.158750.00 and the Net income was 71133.00 an availed input output ratio 1:1.81 it means that with the investment of Rs.1.00 in tomato enterprises they yielded Rs.1.81. The cost benefit ratio of the cultivation of tomato at 1:0.81 it means that the tomato growers fetched Rs.0.81 on each rupee investment of tomato.

Bezabih and Hadera (2007) found that production of horticultural product was seasonal and price was inversely related to supply. During the peak supply period, prices decline and vice versa. The situation was worsened by the perishability of the products and poor storage facilities. They mentioned 25% of the product was spoiled along the marketing channel. As far as vegetable production in Toke kutayeworeda was concerned, seasonality was the major constraint, where surplus at harvest was the main characteristics of the product.

Paul et al. (2017) determine the level of technical efficiency in the production of tomato in smallholder farms, relying on primary data collected using a structured survey instrument administered to 80 tomato farmers in the Buea municipality of Cameroon. Data was analyzed using descriptive statistics and a stochastic frontier analysis method in the Cobb-Douglas production function. The results indicated that farmers were not fully technically efficient with a mean technical efficiency score of 0.68 with one farmer operating on the frontier. The study also revealed that most of

the farmers irrespective of the size of the holdings had shown technical inefficiency problems. The older farmers were observed with the best measures of technical efficiency. Education, age and the adoption and practice of agronomic techniques had a positive and significant influence on technical efficiency while the nearest distance to the extension agent had a rather negative influence on technical efficiency. The input-output relationship showed that the area of tomato cultivation and the quantity of improved seed used were positive and significantly related to output at the 5% level of probability. The authors recommended that farmers should increase their farm size, use of improved seeds and the adoption and practice of novel techniques in production.

Son et al. (2018) assessed producers' exposure level to pesticides in vegetable production in Burkina Faso. This study was carried out in 2016 and 2017 among 30 tomato producers in the municipalities of Kouka and Toussiana. Eighteen (18) commercial formulations were identified, with more than 50% of pesticides destined for cotton production. Eleven active substances were identified and the most frequently used were -cyhalothrin (35%), acetamiprid (22%) and profenofos (13%). The most commonly used chemical families were pyrethroids (28%) and organophosphates (18%). The studyn revealed a low level of training for producers, a high use of pesticides according to the Frequency Treatment Indicator, and a very low level of protection used by producers. The Health Risk Index shows that active substances such as methomyl, -cyhalothrin and profenofos present very high risk to operators' health. Based on the UK-POEM model, the predictive exposure levels obtained varied from 0.0105 mg/kg body weight/day to 1.7855 mg/kg body weight/day, which is several times higher than the Acceptable Operator Exposure Level. However, the study also showed that exposure can be greatly reduced if the required Personal Protective Equipment is worn. Producers' awareness and training on integrated pest management are necessary to reduce the risks linked to the pesticides use in Burkina Faso.

Sahu, Gauraha & Chanravanshi (2018) did study on economic analysis of shade net cultivation in durg district of Chhattisgarh, India. The cost of cultivation of tomato was found to be Rs. 119899.8 per hectare. The input – output ratio was 1:0.51. Tomato crop was is not profitable in the selected shade net cultivation due to lower

price and yield. The major constraints were quality of net is not appropriate, lack of knowledge about appropriate technology, high temperature and high labour requirement. Study suggested that the extensive demonstration of improved and high yielding varieties of vegetable crops should be given, definite provisions should be made for timely supply of crucial inputs at reasonable price and inadequate quality to sustain vegetable production on profitable basis.

2.3 National Context

Thapa & Paudyal (2003) published paper in which farmers bring their agro produces to the local market and sell either to retailers or directly to the consumer. Such type of marketing channels is found in the Terai and hill regions of Nepal. The type of marketing channels depends upon the scale of production, distance to the market and source of agro produce in Nepal.

Paudel (2006) conducted another study on production and marketing efficiency of cauliflower in Makwanpur district of Nepal. The result showed that the marketing system of the study area was poorly organized and purely private based system dominated by traders. He further mentioned that the local collectors had major influence on price fixation. Marketing margin was the highest in Chitlang (Rs 11.83/kg) with the lowest producers' share (54.39%), whereas the lowest marketing margin (Rs 11.14/kg) and the highest producers' share (57.05%) were found in Daman. Categorically, the lowest marketing margin (Rs 10.03/kg) and the highest producers' share (61.33%) were found in category 3 i.e. farmers having more than 6 ropani land.

Chaudhary (2010) studied the analysis of Tomato Marketing System in Lalitpur District, Nepal. This study was carried out to analyze the marketing system of tomato in Lalitpur district of Nepal during the year 2010. Specifically, this study was intended to identify marketing channels, to estimate gross margin, marketing margin 20 and producer share, to find out the situation of market information and to identify constraints related to production and marketing of vegetables, especially tomato. The channel of producer wholesaler-retailer- consumer was most common where about 50 percent tomato passed to consumer through this channel. The marketing margin was

estimated to be Rs. 20 per kg and producer share in the study area was 67 percent, which was highest among chain factors.

Pokhrel (2010) explored vegetable production and marketing related problems that could have hindered farmers from getting potential benefit. The the study evaluated farm performances in selective vegetable pockets of Kabhrepalanchok, Sindhupalchok and Kaski districts. It described about farm strategies on pre and post-harvest crop management. It explored marketing channels and mechanisms of commodity transfer and price formation and assesseed farm benefits of selective crops. Study method was based on exploration of processes and costs of production and marketing following observations and short interviews with local farmers in small groups, local traders in market centers and local informants. Because of perishability of the produces and lack of proper storage, the farmers had weaker position in price negotiation. Even then the marketing system is observed to perform well as the farms on an average were observed sharing 75% on wholesale prices, considered reasonable based on their feelings and costs involved.

Chapagain, Khatri & Mandal (2011) conducted study on Performance of Tomato Varieties during Rainy Season under Plastic House Conditions. It assessed the performance of tomato varieties under plastic house for two consecutive years from 2009 to 2010 at National Commercial Agriculture Research Program (NCARP), Pakhribas (1750m), Nepal. The experiment consisted of eight tomato varieties namely, All Rounder, Bishesh, Dalila, Manisha, Srijna, Suraksha, Trishul and US-04 laid out in a randomized complete block design with three replications. The varieties differed significantly for all observed traits. The highest marketable yield was recorded from All Rounder (86.6 t ha^{-1}) followed by Srijana (80.8 t ha^{-1}). Srijana took the shortest period for flowering and harvesting with an average of 37 and 77 days after transplanting respectively. This was also the tallest variety (268.7 cm) with more clusters (36.23) per plant. However, the highest average single fruit weight was recorded from Manisha (61.94g), and the largest fruit size in US-04 with a diameter of 5.78 cm. Based on yield parameter, the varieties All Rounder and Srijana were recommended for commercial cultivation under plastic house conditions

Paudel (2012) carried out study to identify structural causes of marketing margin for off-season vegetables value chain in a part of Surkhet-Dailekh road corridor during

July to August 2011. Cost of production and producer's price were calculated at collection point of Bubairakhe in Goganpani VDC of Surket, and consumer's price observed at 30km far end market in Birndranagar municipalty of Surkhet. From the result of study, the marketing margin found doubled in all types of off-season vegetables value chain. The share of post-harvest loss observed first most important factor for higher marketing margin, in tomato 42 percent and cauliflower 37 percent but was third important factor in cabbage 28 percent. The profit margin kept by value chain actors, with contrasting in common perception, observed second important factor for increasing marketing margin in tomato 31 percent, cauliflower 28 percent and cabbage 44 percent. He concluded that apposite attempts to reduce post-harvest loss in off-season vegetables value chain might be an important way for reducing marketing margin in off-season vegetables value chain.

The Nepal Economic, Agriculture, and Trade (NEAT) (2011) analyzed the value chain/market status of offseason vegetables and identified strategies to enhance the competitiveness of the sector with the private sector playing a prominent role. The findings of the study revealed that off-season vegetable production and marketing is very popular among farmers and marketers. Farmers were making a considerable income from offseason vegetable crops, and it wasn becoming a very attractive enterprise. The study found that post-harvest loss of off-season vegetable was 25-50 percent. The higher post-harvest losses were due to improper handling, packaging, low-level technology, and poor facilities at collection centers. These post-harvest losses indicate great potential for increasing farmers' incomes and improving the rural economy, as well as significant potential for import substitution of vegetables. The major constraints of this sector are: a) unavailability of quality planting materials, b) lack of knowledge among the producers of the proper usage of fertilizers and pesticides, as well as poor soil fertility management, c) lack of irrigation facilities, d) labor shortage, e) postharvest loss due the perishable nature of vegetables, f) limited access to reliable market information, g) unorganized market center, h) limited collection centers, and i) lack of proper packaging and transportation facilities.

Singh et al. (2013) found seven different vegetables trading marketing channels from 75 vegetable growers, 17 input suppliers, 38 vegetable traders, 30 consumers in Palpa district. Marketing Planning Committee (MPC) in local level and apex body in district

level used to facilitate for linking the retailers and farmers with getting nominal weighing charge. They used to facilitate for balancing the value shared and margin added in the vegetable production. Constraints can be managed through the improvement of production technology, management of marketing system, extension of linkage and network between service receiver and providers.

Bista, (2013) studied the value chain of tomato in Lamjung district. It identified the potential value chain actors and the technical information generated that helps for increasing the chain efficiency and improvement of the existing system. The study also identified the constraints and opportunities faced by the micro actors. In his study highest share among total production cost was comprised by labor(55%) followed by tools and equipment 23%.

Sharma, Dhakal ,Ghimire & Rijal (2015) did household survey in June,2014 in Pakuwa village development committee of Parbat district, Nepal. Data collection was done using semi-structured pre-tested questionnaire administered on 40 coffee producers selected randomly. Gross margin analysis, profitability index and the benefit-cost ratio was used to analyze the production economics of coffee in the study area. The results revealed coffee cultivation as a profitable enterprise in the study area. This is reflected by the gross margin of NRs. 90205.43 per hectare, benefit-cost ratio of 3.84 and profitability index of 1.23. Coffee sector alone contributed 16.26 percent of total household income showing positive sign for commercialization. The number of productive plants and cost on sapling were the most significant factor affecting coffee production. While keeping other explanatory variables constant, production function analysis resulted one percent change in number of productive plants and cost of sapling would increase the yield of coffee by 0.894 and 0.151 percent respectively. Further, increasing return to scale was observed in coffee production with value 1.26 lack of irrigation and lack of detailed knowledge about improved coffee production technology were ranked as production constraints whereas; low price and lack of processing facility stood as marketing constraints of coffee in the study area.

Gurung et al. (2016) conducted study named Commercial vegetable farming: an approach for poverty reduction in Nepal1. They noticed Poverty reduction of farmers from Kapilbastu and Kaski districts were evaluated with respect to the vegetable

farming where PRISM (Prosperity Realization through Irrigation and Smallholder Markets) technology was implemented. After the implementation of PRISM there has been considerable increase in vegetable farming area in both districts. Numbers of vegetable crops grown were increased with respect to yield and net return from both the winter and summer vegetables. With the opening of organized markets and provided wide range of vegetables for consumers as well.

Bajracharya & Sapkota, (2017) conducted research on potato production in two V.D.Cs (Bobang and Tara) of Baglung District. The pre-tested semi- structured questionnaire was used to collect primary data on household survey that was selected by using simple random sampling techniques. Altogether 120 samples, 60 from each V.D.C were selected and data were analyzed by using SPSS, STATA and Microsoft Excel. The result was that the productivity of potato was found 9.89 ton per hectares in the study area. Profit from potato farming per hectare was NRs 70,861 with B/C ration of 1.44.

Timilsina & Shivakoti (2018) analyzed overall existing vegetable seeds production environment, its marketing practice and perception of seed producers and users in Nepal. It was estimated that on average about 10–20% losses were observed in vegetable seeds from farm to wholesale due to poor drying, management and storage practices. The unfavorable environment immediately after harvesting and need to dry several times were ranked as first drying and storage problems, respectively. From the analysis, it was found that selection criteria for hybrid and open-pollinated were found significantly different among fresh vegetable growers. The reasons for choosing hybrids were due to their higher production, attractive fruits and more profit.

In this way , the researcher studied both international and national litereatures related to vegetable farming, productivity analysis using cobb-douglas production function, agricultural land conversion and its consequences, value chain analysis on any production of commodities and its mechanisms and so on. While doing literature review, it takes three months for researcher which is the most productive process on any research

work. To calculate regression equation , different materials related to agriculture, manufacturing ,banking sector using software SPSS and excel had been studied thoroughly in order to find the determinants of the research work

2.4 Research Gap

Several studies have been done on value chain analysis of both off-season and seasonal vegetable farming in Nepal, and few were done in Baglung District mainly on off-seasonal vegetables. No study has been done yet to find out the determinants of production of tomato and analysis of value chain of it. The vegetable farming has occupied great priority on every plan years inorder to decrease the dependency of importing vegetables from India and other countries. In this study, the researcher has tried to find out the production function and its determinants and different value chain actors that has affected on the process /mechanism of production of tomato and disposing it to the consumers. So, this is the deficit between past studies and these research studies which is the important for economists.

CHAPTER – III

RESEARCH METHODOLOGY

This chapter describes the selection of study area, sample size determination, sources of information, method and techniques of data collection and analysis. Each of these sections is described below.

3.1 Research Design

In order to meet the objective of the study, both quantitative and qualitative method and a descriptive research design has been used. Value chain analysis is done and production function of tomato in study area is calculated using Cobb-Douglas production function. This study has been conducted during August 2017 to July 2018.

The questionnaires has been prepared for the tomato growers, tomato wholesalers, retailers, input suppliers , government officials and consumers. The questionnaires for tomato growers consists of different two sections. The first section includes questions for collecting personal and other general information of the growing of tomato . The second section includes the production of tomato ,grading and trading of it.

Similarly, different stakeholders of tomato farming has been asked different questionnaires in order to meet the objective of the study.

3.2 Nature and Sources of Data

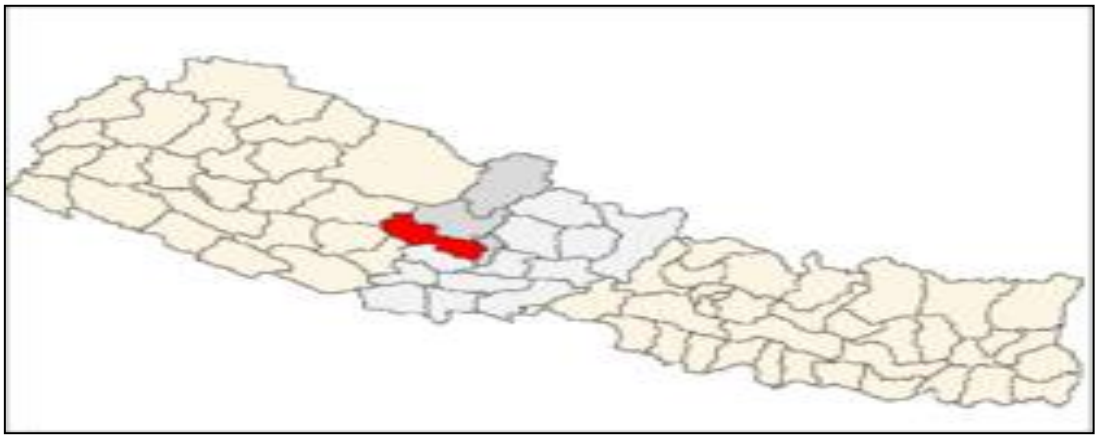
Both primary and secondary data were used for the study. Primary data was collected by the survey, observation, questionnaire and interview. Both published, unpublished materials related to the subject matter were used for secondary data. Both qualitative and quantitative data were collected as above process.

3.3 Description of the Study Area

Baglung district is one of the potential areas for tomato cultivation (MoAD, 2015/16). Geographically, it is located at 28°16′N and 83°36′E of Province No. 4 Gandaki

Pradesh. There are 18,683 holdings of vegetable farming and total area of vegetable farming is 452.2 Hectare.

Fig.3.1 Baglung District in Map of Nepal



There are 1842 active tomato growers in Baglung District in an area of 32.3 hectare. Tomato is being cultivated in Kundule and Farse of Baglung Municipality since long time. These were the potential tomato growing pocket area identified by District Agricultural Development Office (DADO) Baglung. Study area was selected purposively for this research. Baglung farmers started off-season vegetable production in commercial scale from 1995 onwards with the inspiration from Lumle Agriculture Research Station. Kundule and Farse are close to Baglung market and are the leading pockets in these areas. Vegetable production area of Kundule has stretched on elevations ranging from 1100 to 1300 meters whereas Farse is a low basin site with an elevation of only 750 meters. Vegetables in Kundule are produced under rain fed and residual moisture conditions from summer to early winter for about 8 months. The method of water harvesting and drip irrigation has recently been introduced in Baglung with the help of DADO. Farse receives all the year round irrigation to grow vegetables intensively. The average land holding per household in production pockets of Kundule and Farse is 4.30 and 7.98 ropanis respectively. Both the production pockets under this study have transport links with the highways. . In both the production areas, there are no cellar and cold storage facilities.

3.4 Sample Size, Sampling Method

3.4.1 Selection of Tomato Growers

The target population for this study has been the tomato growers of the selected areas. The farmers who grow tomato and sell have been selected as respondents. A list of tomato growers obtained from DADO Baglung . For the collection of primary data, the field survey has been conducted in Kundule and Farse of Baglung Municipality. According to District Agriculture Development Office (DADO) Baglung, there are 110 households in Kundule and 30 households in Farse, involved in commercial tomato farming. Using the formula mentioned below, the required sample size is 58. Convenience sampling method is used.

$$\text{Sample Size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1+\left(\frac{z^2 \times p(1-P)}{e^2 N}\right)}$$

Where N = population size,

e = Margin of error (percentage in decimal form)

z = z-score

For Confident Interval =95%, z score =1.96. Margin of error was taken 10%.

A total of fifty eight tomato growers on the proportion of three: eleven from each of the pocket areas i.e Farse : Kundule have been selected purposively for this study. Probability of choosing an element as sample has been 78 percent and 22 percent in Kundule and Farse respectively .

3.4.2 Selection of Wholesalers and Retailers

A list of vegetable wholesalers was obtained from Baglung Municipality and five wholesalers have been selected randomly for our study. Similarly, ten retailers from different vegetable market have been also selected randomly for this study.

3.4.3 Selection of Input Suppliers

There are only two large wholesalers in the Baglung municipality so they have been selected purposively. Four retailers and six vegetable nurserymen have been selected randomly.

3.4.4 Selection of Consumers

Total thirty consumers have selected randomly as respondent.

3.5 Methods and Tools of Data Analysis

Data has been collected from the study area through questionnaire method, interview method and field survey for primary data. Journals, published and unpublished research and reports has been used for the secondary data. Collected data has been grouped, sub-grouped and classified as necessary so as to meet the objectives of the study. Value chain analysis and Mapping has been done.

Information thus collected has been coded, tabulated and analyzed using Microsoft Excel and software SPSS version 20. For the analysis of socioeconomic data such as land holding, farm size, farming experience, simple descriptive statistics such as average, standard deviation and percentage has been used. Likewise, the economic analysis has been done through gross margin analysis, marketing margin, value share, producer's share and index of marketing problem. Results have been presented in descriptive, graphical and tabular forms. Regression, t-test, Cob-Douglas production function has been used to analyze the productivity of the tomato farming.

3.5.1 Coefficient of Determination (R-square)

The coefficient of determination (R^2) is defined as the square of the coefficient of multiple correlations. When it is multiplied by 100, it gives the percentage of variance in dependent variable which is associated with the variance in independent variables. The range of it is in between -1 to 1. If the value of is close to 1 it shows positive relationship and imply that more of the variability in dependent variable is explained by the regression model. So this gives the measurement of goodness of fit of a model.

Therefore, it is a very necessary statistic to compute for determination of validity of regression model. The sample coefficient of determination is given by**:**

$$R^2 = \frac{ESS}{TSS}$$

$$= 1 - \frac{RSS}{TSS};$$

Where,

ESS = Estimated sum of square,

RSS = Residual sum of square,

TSS = Total sum of square. (Gujarati & Sangeetha, 2007)

3.5.2 Goodness of fit: ANOVA Table

Analysis of Variance (ANOVA) is a technique to analy(sis the goodness of fit of the regression line. The total sum of square (TSS)is the sum of the squared of Y from the mean of Y. The explained variation (ESS)is the sum of squared deviation from the estimated value of Y, it is the variation due to regression and the unexplained variation or residual variation or error sum of square. It can be proved that the total sum of square (TSS) is the sum of the variation due to regression or explained variation(ESS) and the sum of the square due to error or residual (RSS).

3.5.3 To Test Multicollinearity , Variance Inflating Factor(VIF) Method is used

In order to detect the multicollinearity problem for continuous variables, the Variance Inflation factor (VIF) = $1 /1-Rj^2$, for each coefficient in a regression as a diagnostic statistic is used, where Rj represents a coefficient for determining the subsidiary or auxiliary regression of each independent continuous variable X. As a rule of thumb, if VIF value of a variable exceeds 10, which will happen if Rj^2 exceeds 0.9, there exists high degree of multicollinearity (Gujarati, 2003). Hence, in this study, Variance Inflation Factor (VIF) was employed to estimate the degree of multicollinearity among the explanatory continuous variables of the supply function.

3.5.4 To Test Autocorrelation, Darwin Watson (D-W) Method is used

This test uses the Durbin-Watson d-statistic,which is based on the sum of the squared difference in successive values of the estimated disturbance term (e_t)

3.6 Model Specification and Its Features

3.6.1 Cobb Douglas Production Function

Cobb-Douglas production function is one of the widely used production function used in the economics. C.W Cobb and P.H. Douglas formulated this function in 1928. They formulated this production function with the ideal assumption that the sum of the elasticities should be equal to one. The strong view that the sum of the elasticities should be one has been dropped out with the criticism of Durand and a new function known as “Power function” came into existence, which is linear in logarithmic form.

The simplest Cobb-Douglas production function model has the following form:

$Q = AL^{\alpha}K^{\beta}$, Where, Q stands for output, L for labor, and K for capital. The parameters A, α, and β are estimated from empirical data. Also $0 < \alpha < 1$, $0 < \beta < 1$. Equivalent is a linear function of the logarithms of the three variables:

$\log (Q) = \log (A) + \alpha \log (L) + \beta \log (K) + u$; where residual u is added in the multiplicative form e^{u}.

In the case where constant returns to scale is present, then $\alpha + \beta = 1$. Alternatively, constant returns to scale may be imposed by putting $\alpha = 1 - \beta$ so that $Q = A L^{\alpha} K^{\beta}$ can be rewritten as: $Q = A L^{1-\beta} K^{\beta}$

So, $Q/L = A (K/L)^{\beta} e^{u}$; and taking logarithms of both sides gives

$\log (Q/L) = \log A + \beta \log (K/L) + U$

CHAPTER – IV

PRESENTATION AND ANALYSIS OF DATA

This chapter describes the findings of the study that were obtained from the analysis of data. These findings include description of the study area, landholding size, farmers' experiences, cost of production and gross margin, marketing channels, marketing margin and productivity of tomato farming. In addition, this chapter also describes about the problems related to production and marketing. These findings are presented in the following sub-headings.

4.1 Description of Study Area

Baglung is one of the hills district. It is located at 28°16′N and 83°36′E of Province No. 4(Gandagi) of Nepal. It, covers an area of 1,784 km² and has a population (2011) of 268,613.There are 18,683 holdings of vegetable farming and total area of vegetable farming is 452.2 Hectare. There are 1842 active tomato growers in Baglung District in an area of 32.3 hectare.

4.2 Land Holding Size

Land use refers to the major classification of the use of the different parcels of land in the holdings. All land operated by agricultural holdings is classified as either agricultural land or non-agricultural land. The total area of all agricultural holdings in the country has been increasing. Census 1961/62 registered an area of 1,685 thousand hectares of all agricultural holdings. In 2001/02 the area increased to 2,654 thousand hectares - an increase of 63.3 percent in the span of 40 years. In 1961/62 about 1,626 thousand hectares out of the total land operated by agricultural holding was agricultural land. This increased to 2,498 thousand hectare of agricultural land operated in 2001/02. It is an increase of 53.6 percent over the 40 years period. According to national census 2011, Agricultural land cultivated was 3091 thousand hectares and agricultural land uncultivated was 1030 thousand hectares.

In most of the Least Developed Countries unequal distribution of landownership is most important determining factor for prevailing unequal distribution of wealth and income in rural areas (Todaro, 1988).

4.2.1 Land Holding Size of Active Tomato Growers of Baglung

Baglung district is considered as favorable place for vegetable farming and especially tomato farming. In Baglung Municipality, farmers in Kundule and Farse are growing vegetables commercially for decades. In this district 1842 households are cultaviting tomato in about 32.3 hectare.. Among 1842 active growers, 1013(54%) were farming tomato in area less than 1 hectare. Only 3.14 percent had more than 2 hectare land allocated for tomato farming.

Table 4.1: Size of Landholding

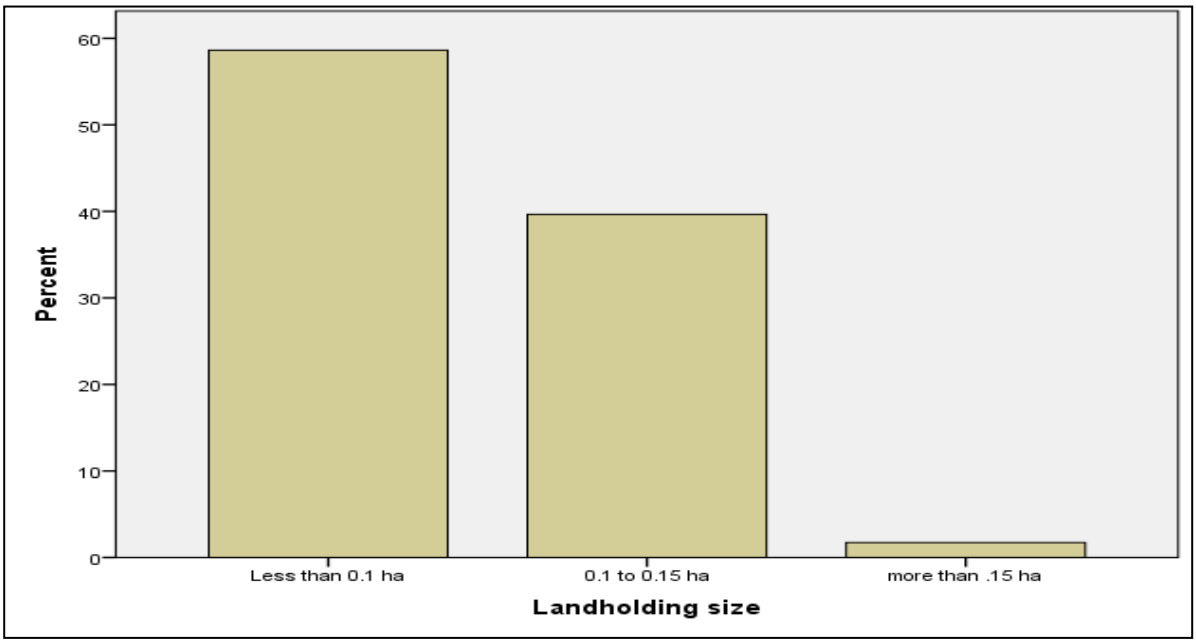
Total area of Holdings	**No of Holdings**	**Area(ha)**
Holding with land	1,842	32.3
Under 0.1 ha	146	0.8
0.2 ha and under 0.5 ha	146	2.1
0.5 ha and under 1 ha	721	9.9
1 ha and under 2 ha	526	12.2
2 ha and under 3 ha	58	1.7
Total	1,842	32.3

Source: CBS (Central Beureau of Statistics)(2012). National Sample Census of Agriculture 2011/12

4.2.2 Landholding Size of Tomato Growers on Selected Pocket Area of Baglung

In the study area, 58 Percent house holding are using less than 0.1 hectare (2 ropani) of land for tomato farming. Less than 10 percent house holding are using more than 3 ropani land for tomato farming in the study area.

Fig 4.1: Bar Diagram showing Land Holding Size of Study Area



Source: Field Survey, 2018

4.3 Farming Experience

Farming experience is an important variable in determining the quality and quantity of production as well as the adoption of new production technologies. In this study, it has observed that 39.7 percent of the farmers have been cultivating tomato for last ten years. It is interesting to note that 31 percent farmers in Kundule and Farse have more than 20 years' experience in tomato growing (figure 4.2)

Fig.4.2: Farmers' Experience in Tomato Growing

Source: Field Survey, 2018

4.4 Value Chain Mapping and Analysis

Input supply, production, marketing and consumption are the functions of the vegetable value chain of Baglung Municipality (Table 4.2). Different types of actors have been observed there like Agro-vets, master leader farmers (MLFs), nursery growers, farmers/producers /smaller collection centres; wholesaler (District), wholesaler (Out-district), retailer etc. There are some enablers to facilitate the actors for smooth functioning. Those enablers are district agriculture development office, non-government organizations, agriculture input corporation, agricultural production and marketing cooperatives, district cooperative.

Table 4.2 Actors and Enablers of Value Chain of Tomato

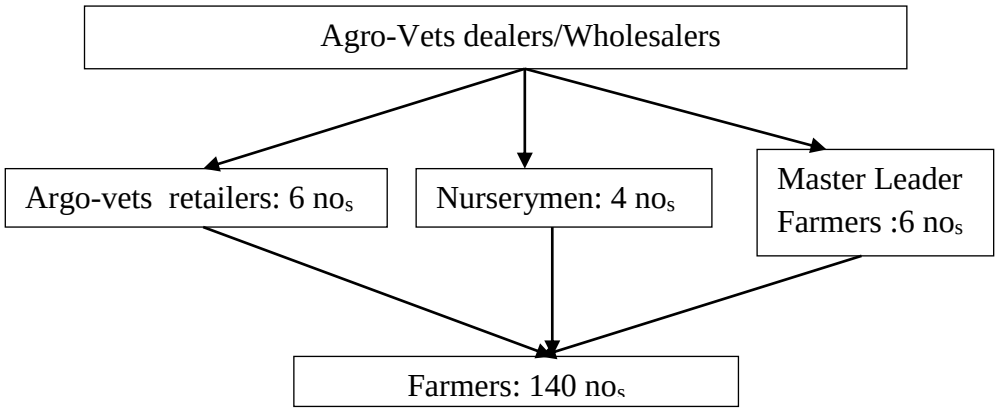
S.N.	Functions	Actors	No	Enablers
1	Input Supply	Agro-vet holders MLFs Nurserymen	6 6 4	DADO, NGO
2	Production	Farmers	140	
3	Marketing	Wholesaler(District) Wholesaler(Out-district) Retailers Middlemen/Collectors	3 2 80 28	Agricultural production and Marketing Cooperatives District Cooperative I/N/GOs
4	Consumption	Consumers	38000	

Source: Field Survey, 2018

4.4.1 Mapping the Flow of Input

There are 6 active Agro-Vets which purchased the inputs from regional dealers or from Kathmandu based dealers. There are 6 active local resource persons named Master Leader Farmers (MLFs) are developed within the farmers' community .They used to provide both the agricultural inputs and technical knowledge to the farmers. Below is the figure explaining flow of input in Study Area (figure 4.3)

Fig. 4.3: Flow of Inputs in Study Area



Source: Field Survey, 2018

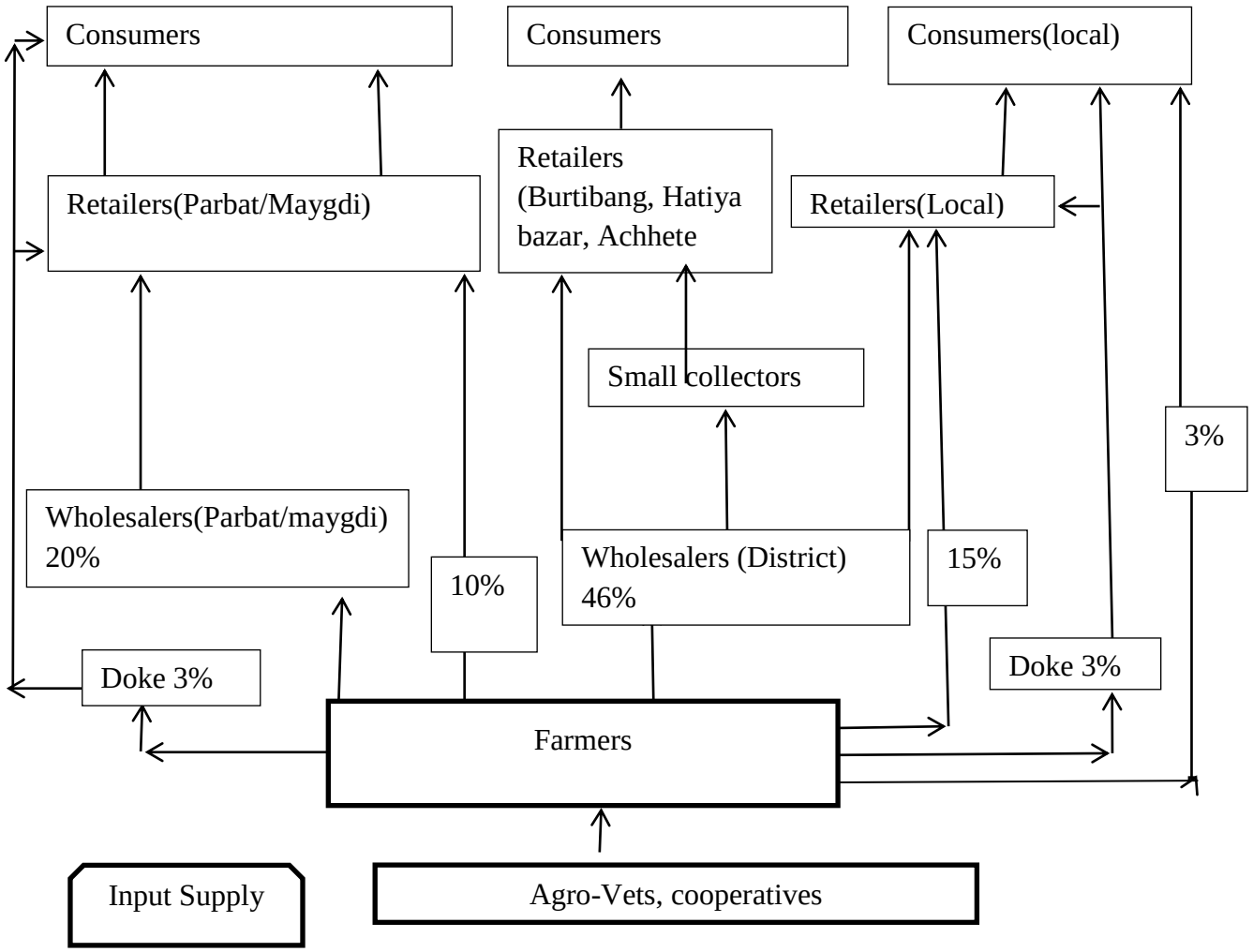
4.4.2 Marketing Channels

According to Acharya & Agarwal (1999), the marketing channels for vegetables vary from commodity to commodity, from producer to producer, lot to lot and time to time. In Nepal, agricultural commodities move from the farmer's field to consumers through several channels. Those farmers who cultivated vegetables in a small piece of land used to sale directly or immediately to the consumer, or the retailer of nearest market mostly highly perishable vegetables like leafy vegetables. But, those farmers who cultivated in larger area and produced higher amount used to sell in farther and bigger market. Survey results also showed that farmers of Kundule and Farse were using seven types of marketing channels to dispose tomato. Here is the list of marketing channels:

Channel-I = Farmers →Consumers
Channel-II = Farmers →Retailers→ Consumers
Channel-III = Farmers →Wholesalers (Baglung) →Retailers→Consumers
Channel-IV = Farmers→ wholesalers →collectors → Retailers(achete bazar, hatiya bazar, burtibang bazar)→consumers(achete bazar ,hatiya bazar, burtibang bazar)
Channel-V = Farmers →Wholesalers (Parbat)→ Retailers→Consumers
Channel-VI= Farmers →wholesalers(Maygdi)→ retailers →Consumers
Channel-VII= Farmers →middle men/Doke→ Retailers(Parbat/Maygdi)→ Consumers

Channel I involves disposing tomato directly to consumers, which constitute about 3 percent. It has also found that about 66 percent tomato passes to retailers through the Wholesalers. About 25 percent of tomato production reaches to retailers directly. Small collectors and Doke first buy from farmers and then sell to retailers and consumers, which is about 6 percent of total tomato production.

Figure 4.4: Value Chain Mapping of Study Area



Source: Field Survey, 2018.

Channel IV involves disposing tomato through wholesalers to different marketing places like Burtibang, Hatiyabazar, Achhete Bazar, outside Baglung municipality. In this channel small collectors are also involved, mainly in transportation of tomato. Some farmers distribute product directly to consumers by thela (cart), doko (bamboo basket) which accounts about 3 percent of total production. Value chain mapping of study area is presented in the figure 4.4

4.4.3 Marketing Margin and Producer's Share

Marketing margin refers to the difference between the retailer's price and farm gate price. Likewise, producer's share is the percentage share of producer on consumer rupee, i.e. retailer's price. Marketing margin and producer share give an indication of efficiency of existing marketing system. Lower marketing margin and higher producer share on retail price ensures efficiency of marketing system (Bastakoti, 2001). Keeping this concept in mind, marketing margin and producers' share has been worked out in this study.

From the study, it has been found that average farm gate price (Rs/kg) of tomato was Rs 35.1. Average retail price was Rs 50. So overall marketing margin of the study area is found to be Rs 14.9 whereas the producers' share was 70.2 percent. Marketing margin of tomato was higher (Rs 20) in a study done by Chaudhary in 2010, whereas producers share was similar to this study (Chaudhary, 2010). In another study ,Singh (2010b) had found 61 percent producer share in tomato marketing chain in India.

Table 4.3: Marketing Margin and Producers' Share

Particulars	**Value**
Average farm gate price(Rs/Kg)	35.1
Average retail price(Rs/Kg)	50
Marketing Margin(Rs/Kg)	14.9
Producers share (%)	70.2%

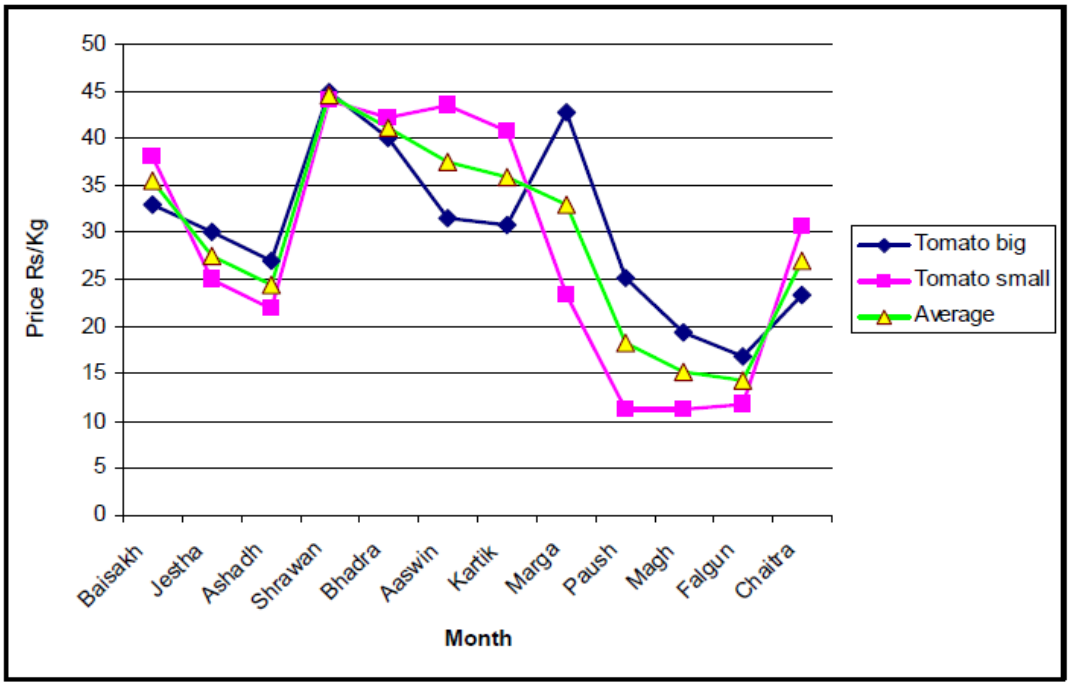
Source: Field Survey, 2018.

4.4.4 Price Behavior

Generally the price of tomato fluctuates markedly not only seasonally, but also daily and

hourly due to largely uncertainties in demand and supply (Adepetu, 2010). Tomato product quality is broadly categorized into two types: small and big. It was found that there was great variation in prices of smaller type of tomato than the big one.

Fig. 4.5: Graph Showing Price Behavior in Kalimati Vegetable Market



Source: KFVMDB (Kalimati Fruits and Vegetable Market Development Board), Ministry of Agriculture and Livestock Development, 2017.

Monthly wholesale prices of tomato in Kalimati market .The trend of price fluctuation has been shown in figure 4.5. It has clearly depicted that the wholesale prices of both types of tomato have sharply increased in Shrawan month where the price is recorded as most expensive. Afterwards prices have tended to decrease. However, the price of small tomato is expensive than the big one. After the month of Kartik, the price of big tomato has again increased in Marga month. Then price has started to fall till Falgun and starts again increasing.

4.4.5 Market Information

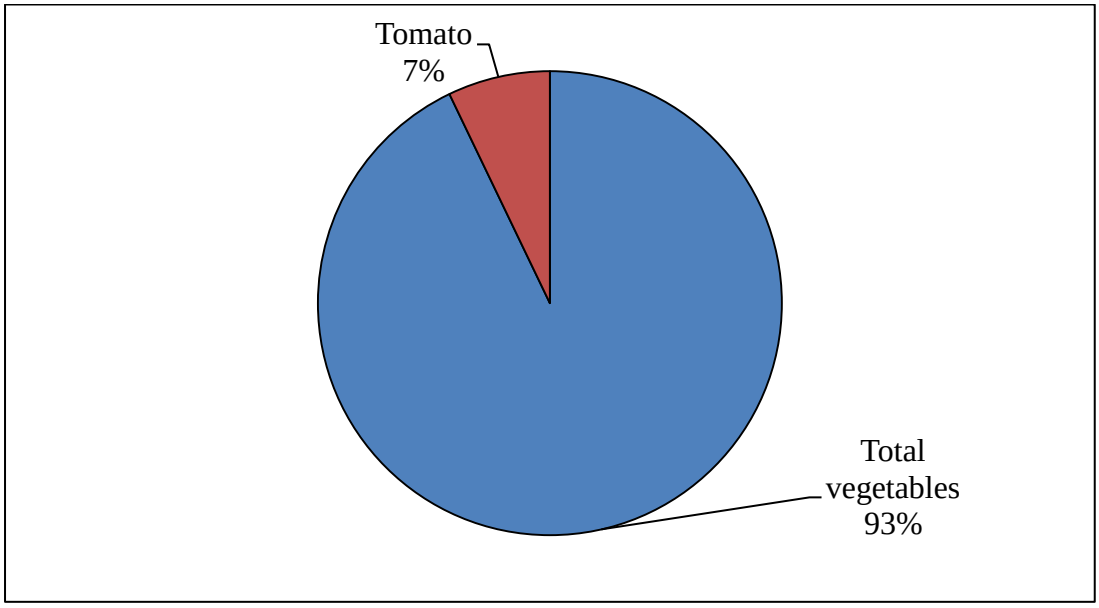
Market information includes information on price, product demand and supply, buyers and sellers. It is very important to have up to date knowledge and access to timely market information in order to reduce the risk of losing money on a market transaction (Teka, 2009). The different key actors in tomato marketing rely on different sources for up-to-date information on tomato price. It appears that 55 percent farmers received market information from neighbors and friends followed by radio and telephone call to market centres. Neither farmers nor traders (wholesalers and

retailers) were using newspaper as a source of market information. For wholesalers, telephone call is the most reliable and frequently used source of price information, while retailers use different sources-telephone call, neighbors and friends and radio broadcast-for price information. Nowadays, farmers are using mobile phone to get market information.

4.5 Economics of Production of Tomato

Total production of vegetables is 18760 mt in Baglung district where it occupies 1440 mt on tomato cultivation which accounts about 7 percent.

Fig.4.6: **Amount of Tomato Production in Comparison to Total Vegetable Production**



Source: *Statistical Book on Agriculture in Nepal*, MoAD, 2015/16

Tomato crops require higher amount of different inputs for successful cultivation and require proper care and management. Plastic tunnel, manure and chemical fertilizer, pesticides, irrigation and labor required for transplanting seedlings, weeding, manuring, harvesting constituted in variable costs. It was found that farmers took land on lease. Initial investment in plastic house construction is the major cost of production for plastic house tomato. Seeds, fertilizers, pesticides, wages, and

irrigation are other major cost items in production of plastic house and open field tomato.

According to stakeholders interviewed during field study, the average farm gate price for tomato was Rs 13.40 per Kg. According to Pokhrel (2016), the cost of production and net profit of tomato was estimated to around forty thousand rupees and one hundred and seventy thousand rupees per ropani in Hemja of Kaski district of Nepal. So the cost of production and net profit differ from place to place.

Table 4.4: Average Cost of Production Per Ropani

Particulars	Value	Unit
Production		Rs/Ropani
Poultry manure/FYM	7976	
Chemical Fertilizers	432.01	
Seeds	960.34	
Pesticides and vitamins	5208.72	
Plastic house, Rope and Others	14959.14	
Labors	16772.50	
Bullock/ploughman	1632.24	
Average Production Cost per ropani	47539.41	
Quantity of Tomato	4170.69	Kg/Ropani
Cost of tomato per kg	13.4	Rs/kg
Selling Price	35.1	Rs/kg
Benefit Cost ratio	1.61	

Source: Field Survey, 2018

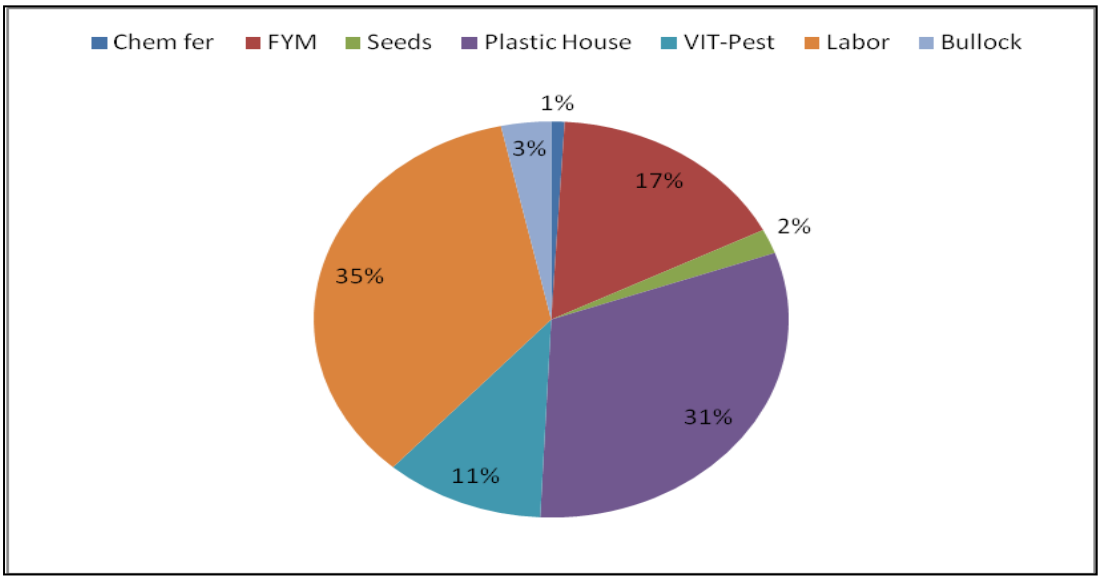
Initial investment in plastic house construction is the major cost of production for plastic house tomato. Traders reported that the high difference between producer and consumer price has been due to high transportation cost and storage loss. It has been estimated that post-harvest losses in fresh tomato was about five percent each at producers, collectors, wholesalers and retailers level. Higher land productivity is maintained by higher use of chemical fertilizers and pesticides. Frequent spraying with fungicide is common in tomato farming. Fertilizer and pesticide cost is lower in

tunnel farming compared to the open field cultivation. Detailed production cost of tomato in study areas are presented in Table 4.4.

4.5.1 Share of Different Cost Items for Tomato Production Per Ropani

Major cost of production of tomato in open field comprises six major cost items. Cost for labor and plastic house along with other infrastructure contribute major percentage of the total cost, each comprising 35 percent and 31 percent respectively. Manure and fertilizers contributed 17 percent of total production cost, followed by vitamin and pesticides (11%). Cost for bullock and seeds were 3 percent and 2 percent of total production cost respectively. Chemical fertilizer contributed 1 percent of total production cost. Less amount of chemical fertilizer was used in tomato farming under plastic tunnel. Bhandari et. al conducted a study about demand and supply of tomato in Nepal in 2016, and found that major cost of production of tomato in open field comprised five major cost items. They were seed, wage labor, fertilizer, pesticides, manure and stacking. Wage was recorded to be the highest cost component that comprised of 65 percent of total cost, followed by land rent, management cost and interest (22%), manure and fertilizers (11%), seed (1%) and pesticides (1%). In our study, it was noted that farmers spent more cost on plastic house in comparison to open field (Bhandari, 2016)

Fig. 4.7: Share of Different cost Items for Tomato Production Per Ropani



Source: Field Survey, 2018

4.5.2 Production Function Model Estimation and Productivity Analysis

The OLS regression has been done for Cobb-Douglass production function model. And parameters obtained from these models are used to estimate and compare the capital and labor productivity.

4.5.3 C-D Production Function

The simplest Cobb-Douglas production function model has the following form:

$Q = AL^{\alpha}K^{\beta}$, Where, Q stands for output, L for labor, and K for capital.

C-D production function can be expressed as

$Q=b_0 L^{\alpha} FYM^{\beta 1} C^{\beta 2} S^{\beta 3} P^{\beta 4} VP^{\beta 5} B^{\beta 6}$

Where,

Q = Output of tomato in Rs/ropani

b_0 = Constant Coefficient (intercept of a function)

L = Labor in man days per ropani,

FYM = Farmyard manure in Rs/Ropani

C = Chemical fertilizer in Rs/Ropani

S = Seeds in Rs/Ropani

P = Cost of plastic house in Rs/Ropani

VP = Vitamin and Pesticides in Rs/Ropani

B = cost of bullock in Rs/Ropani

β (i=1,2,3,4,5,6,7)= coefficient of L, FYM, C, S, P, VP, B.

u = Disturbance term

$\text{Log } Q=\log b_0 + \alpha \log L+ \beta 1 \log FYM+ \beta 2 \log C+ \beta 3 \log S+ \beta 4 \log P+ \beta 5 \log VP+ \beta 6 \log B + u$……(1)

Table 4.5: Result of OLS Regression as Log Linear C-D Production Function

Dependent Variable =total output in Rs/Ropani						
Variables	**Coefficients**	**Std. Error**	**t-statistic**	**p value**	**Tolerance**	**VIF**
Constant	2.927	0.905	3.235	0.002		
Log vit/pest	-0.011	0.060	-0.180	0.858	0.866	1.154
Log FYM	0.209	0.090	2.329	0.024	0.525	1.903
Log seeds	0.035	0.104	0.338	0.737	0.687	1.455
Log plastic house	0.283	0.139	2.030	0.048	0.395	2.532
Log bullock	-0.007	0.062	-0.110	0.913	0.911	1.098
Log labor	0.063	0.208	0.303	0.763	0.750	1.333
Log chemical fertilizer	0.087	0.072	1.197	0.237	0.509	1.963

Source: Computation with IBM SPSS Statistics 20 from Appendix A

From above table, we can say that only farmyard manure and plastic house have less than 5 percent level of significance which means both have more significance on the decrease and increase on income of tomato farming. But other inputs i.e vitamins/pesticides, seeds , cost of bullocks, chemical fertilizer are insignificant. Keeping all other factor constant, it evident that 1 percent increase in the cost of human labor would increase the income from tomato production by 0.063 percent; however, the increment is found statistically non significant. The result revealed that 1percent increase in cost of bullock labor would decrease the income from tomato production by 0.007 percent. There is an increase in days required for land preparation using bullock which increases the cost of production and reduces total income. Similarly, 1 percent increase in cost of seed would increase the total income by 0.035 percent which is found insignificant. The regression coefficient of FYM indicated that 1 percent increase in expenditure on FYM would increase the total income by 0.209 percentwhich was statistically significant at 5 percent level. Tolno et al revealed the positive impact of fertilizer on the production of potato in Guinea. Similar to this finding, Ghimire and Dhakal found a significant impact of organic manure on the productivity of cauliflower. Similarly, Akter et al also found the significant effect on the income from tomato production. Finally, 1 percent increase in the expenditure on vitamins and pesticides would decrease the total income from

potato production by 0.011 percent which is statistically nonsignificant. Tolno et al found the inputs such as seed,labor and fertilizer as over-utilized resources in the production of potato.

From table 4.5, the equation (1) of cobb -douglas production function can be written as :

Ln Q = 2.927 + 0.063Ln L+ 0.209Ln FYM+0.087LnC+0.035LnS+0.283LnP - 0.011LnVP- 0.007LnB…… (2)

Expression in its original form yields the following equation: Q = 2 **.927L$^{0.063}$ FYM$^{0.209}$C$^{0.087}$ S$^{0.035}$ P$^{0.283}$ VP$^{-0.011}$ B$^{-0.007}$**

From the equation (2), we have calculated the production function of tomato, for all the fifty eight different observations. Positive effect of chemical fertilizer is also noticed at 10 percent level of significance suggesting that chemical fertilizer affects positively on the production of tomato..

In order to detect the multicollinearity problem for continuous variables, the Variance Inflation factor (VIF) = $1/\ 1-Rj^{\ 2}$, for each coefficient in a regression as a diagnostic statistic is used, where Rj represents a coefficient for determining the subsidiary or auxiliary regression of each independent continuous variable X. As a rule of thumb, if VIF value of a variable exceeds 10, which will happen if $Rj^{\ 2}$ exceeds 0.9, there exists high degree of multicollinearity (Gujarati, 2003). Hence, in this study, Variance Inflation Factor (VIF) was employed to estimate the degree of multicollinearity among the explanatory continuous variables of the supply function.

In above table 4.5,a VIF value of all inputs are near to one suggests there is no multicollinearity on all above explanatory variables

Table.4.6: ANOVA TABLE and D-W Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.510	.260	.156	.09924	.260	2.505	7	50	.027	1.312

Source: Computation with Microsoft Office Excel 2007 from Appendix B

For the F-statistic, the calculated value is 2.205 and when it is compared with tabulated value of ($F_{7,50}$) i.e 2.02.Here critical value is greater than tabulated value so the null hypothesis is rejected. Thus,it has been found that the calculated multiple regression model is overall significance/ best fitted at 5 percent level of significance.

From table 4.7,we have R^2 is 0.260. From a purely statistical viewpoint, the estimated regression line does not fits the data very well. The R2 value is 0.260 means that near about 26 percent of variation in output is explained by the labor and capital and remaining 74 percent of variation is explained by other variables i,e season, irrigation overall climate etc.

From above calculated Durbin-Watson value (d) is 1.312. It is compared with critical values d_L and $d_{u,}$ as well as 4-d_L, &4-d_u.Our calculated d value lies between d_L and d_u, so it falls in indecisive zone, so we cannot conclude that autocorrelation does or does not exist in our calculated C-D production function of tomato faming.

4.5.4 Productivity of Tomato

From above table 4.5 total production of tomato on average in one ropani was 4170.69 kg/ropani which gives productivity 80mt/ha. In a study by Dinesh B. Thapa Magar in 2016, the average productivity of tomato in mid-western region was about 68mt/ht. Study area is considered as one of the favorable place for tomato production and Nepal Agriculture Research Council (NARC) is actively involved in the study site, helping farmers and doing researches with modern technologies and different kinds of seeds of tomato.

4.6 Constraints of Tomato Production and Marketing

Vegetable growers in the study area have faced several constraints related to production of vegetables in general and tomato in particular. Production constraints faced by vegetable growers are mentioned in table 4.6. It is clearly depicted that farmers were constrained by high input costs and timely unavailability of agricultural inputs (chemical fertilizers), quality seeds and lack of technical knowhow with first, second, third and fourth rank, respectively.

Table 4.7: Index of Production Constraints

Problems	**Value(1 to 5)**	**Rank**
Problem of diseases	4.05	4
Problem of insect and pests	4	5
High costs of input	4.85	1
Lack of irrigation facilities	3.9	6
Weak extension support services	4.25	3
Timely unavailability of chemical fertilizers	4.85	1
Unavailability of pure seeds	4.4	2
Unavailability of loan	3.1	7

Note: Respondents were asked to rank the problems ranging from most serious problem to the least serious problem by assigning 5 to 1 scales.

Source: Field Survey, 2018

It is worthwhile here to mention that unavailability of loan was the least problematic issue.

Most of farmers were found to take loan from neighbours and friends; and wholesalers in advance contract. Farmers also complained that loan from formal financial sources is a tedious job and long process. Adhikari (2002) also mentioned unavailability of pure seeds, disease and insects, timely unavailability of agro inputs as problems in production of cauliflower. Tomato growers in the research area have faced several constraints related to disposal of tomato in the market. The topmost problem faced was frequent transport obstruction called by political parties and

pressure groups, followed by high cost of transports, lower price in the market (4.7). Lack of storage facilities was the least problematic issue mentioned by farmers because they directly sold tomato on same day of harvest. In marketing of vegetables, Karki (2003) has also identified frequent fluctuation of market prices, lack of marketing information, Nepal banda (Nepal shut out), and inappropriate transport facilities as constraints in marketing of vegetables in Kathmandu valley. But in recent years, political situations are better, so marketing problems are somewhat different in study area.

Table 4.8: Index of Marketing Constraints

Problems	**Value**	**Rank**
Lower price of tomato	4	1
Lack of market information	3.55	5
Unorganized market	3.65	4
Fluctuation in market price	3.8	4
High transportation cost	3.85	2
Lack of Storage facilities	3.5	6
Lack of Processing facilities	3.65	4
Frequent transport obstruction	3.87	3

Note: Respondents were asked to rank the problems ranging from most serious problem to the least serious problem by assigning 5 to 1 scales.

Source: Field Survey, 2018

CHAPTER – V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The general objective of this study is to analyze the value chain and marketing system of tomato in selected pocket of Baglung District. This study also presents productivity analysis of tomato farming, which inputs have positive effect on production of tomato and also some problem faced by the farmers during tomato farming and the prospects of it in study area. This research is mainly based on the primary data. However, secondary data is also included as it required. This study is analytical as well as descriptive type. To meet the targeted objectives of this study, structured as well as unstructured questionnaire have been used. Collected data has been analyzed in Microsoft Excel and SPSS 20 and they are interpreted by using the Cobb-Douglas production function. And other objectives have been solved by elaborating the farmer's word.

Major Findings

The following are the major findings of this research study:

- Baglung district is considered as favorable place for vegetable farming and especially tomato farming. In Baglung Municipality, farmers in Kundule and Farse are growing vegetables commercially for decades. In this district 1842 households are cultivating tomato in about 32.3 hectare. Among 1842 active growers, 1013(54%) were farming tomato in area less than 1 hectare. Only 3.14 percent had more than 2 hectare land allocated for tomato farming .Less than 10 percent house holding were using more than 3 ropani land for tomato farming in the study area.
- It was observed that 39.7 percent of the farmers have been cultivating tomato for last ten years. It is interesting to note that 31 percent farmers in Kundule and Farse had more than 20 years experience in tomato growing. There are 6 active Agro-Vets which purchased the inputs from regional dealers or from

Kathmandu based dealers. There are 6 active local resource persons named Master Leader Farmers (MLFs) are developed within the farmers' community.

- We have found seven different marketing channels that the producers are using while trading their products :

  Channel-I = Farmers →Consumers

  Channel-II = Farmers →Retailers→ Consumers

  Channel-III = Farmers →Wholesalers (Baglung) →Retailers→Consumers

  Channel-IV = Farmers→ wholesalers →collectors → Retailers(achete bazar, hatiya bazar, burtibang bazar)→consumers(achete bazar ,hatiya bazar, burtibang bazar)

  Channel-V = Farmers →Wholesalers (Parbat)→ Retailers→Consumers

  Channel-VI= Farmers →wholesalers(Maygdi)→ retailers →Consumers

  Channel-VII= Farmers →middle men/Doke→ Retailers(Parbat/Maygdi)→ Consumers.

- About 66 percent tomato passes to retailers through the Wholesalers. About 25 percent of tomato production reaches to retailers directly. Small collectors and Doke first buy from farmers and then sell to retailers and consumers, which was about 6 percent of total tomato production.
- From the study, it was found that average farm gate price (Rs/kg) of tomato was Rs 35.1 Average retail price was Rs 50. So overall marketing margin of the study area was found Rs 14.9 whereas the producers' share was 70.2 percent.
- It is very important to have up to date knowledge and access to timely market information in order to reduce the risk of losing money on a market transaction. . It appears that 55 percent farmers received market information from neighbors and friends followed by radio and telephone call to market centres. Neither farmers nor traders (wholesalers and retailers) were using newspaper as a source of market information. For wholesalers, telephone call is the most reliable and frequently used source of price information, while retailers use different sources-telephone call, neighbors and friends and radio broadcast-for

price information. Nowadays, farmers are using mobile phone to get market information.

- According to stakeholders interviewed during field study, the average farm gate price for tomato was Rs 13.40 per Kg. Initial investment in plastic house construction is the major cost of production for plastic house tomato. Traders reported that the high difference between producer and consumer price was due to high transportation cost and storage loss. It was estimated that post-harvest losses in fresh tomato was about five percent each at producers, collectors, wholesalers and retailers level. Higher land productivity is maintained by higher use of chemical fertilizers and pesticides.
- Total production of tomato on average in one ropani was 4170.69 kg/ropani which gives productivity 80mt/ha. Vegetable growers in the study area have faced several constraints related to production of vegetables in general and tomato in particular. . It is clearly depicted that farmers were constrained by high input costs and timely unavailability of agricultural inputs (chemical fertilizers), quality seeds and lack of technical knowhow with first, second, third and fourth rank, respectively. Most of farmers were found to take loan from neighbours and friends; and wholesalers in advance contract. Farmers also complained that loan from formal financial sources is a tedious job and long process.
- It is found that the benefit -cost ration of tomato farming is 1.61
- Cobb -douglas production function can be written as :

  Ln Q = 2.927 + 0.063Ln L+ 0.209Ln FYM+0.087LnC+0.035LnS+0.283LnP - 0.011LnVP-……0.007logB…… (2)

  Expression in its original form yields the following equation: Q = $\mathbf{2.927 L^{0.063} FYM^{0.209} C^{0.087} S^{0.035} P^{0.283} VP^{-0.011} B^{-0.007}}$

- We have calculated production function of tomato, for all the fifty eight different observations. In other words, at the time of study, holding the capital inputs constant, a one percent increase in labor input would led on an average of 0.063 percent increase in the output. Similarly holding the labor, chemical fertilizer, seeds, plastic houses, vitamins and pesticides (inputs) constant, a one

percent increase in the farmyard manure led on the average of 0.209 percent increase in the output. Positive effect of chemical fertilizer is also noticed at 10% level of significance suggesting that chemical fertilizer affects positively on the production of tomato. Here, only farmyard manure and plastic house has best significance on the production of tomato at 5% significance level. Whereas ,an increase in cost of vitamins and pesticides and bullock have negative impact on the production of tomato .

- We have calculated R^2 i.e 0.260. From a purely statistical viewpoint, the estimated regression line does not best fitted the data very well. The R^2 value is 0.260 means that near about 26 percent of variation in output is explained by the labor and capital.(farmyard manure, chemical fertilizer, vitamins and pesticides, bullocks , plastic house and seeds) and remaining percentage is explained by other variables.
- We have calculated Variance Inflating Factor to test whether there is multicollinearity among all explanatory variables. We get VIF value of all inputs are near to one which suggests there is no multicollinearity on all above explanatory variables.
- We have calculated Durbin-Watson value (d) is 1.312. It is compared with critical values dL and du, as well as 4-dL, &4-du.Our calculated d value lies between dL and du, so it falls in indecisive zone, so we cannot conclude that autocorrelation does or does not exist in our calculated C-D production function of tomato faming.
- By F-statistic, it has been found that the calculated multiple regression model is overall significance/ best fitted at 5 percent level of significance
- In analyzing the fit during OLS multiple regression in fitted production function models; Cobb-Douglas, R^2 value is significant enough around 26 percentages in models which shows that this model is less able to establish the significant relation between inputs and the output.

Tomato growers in the research area have faced several constraints related to disposal of tomato in the market. The top most problem faced was frequent transport obstruction called by political parties and pressure groups, followed by high cost of transports, lower price in the market

5.2 Conclusions

Vegetable production and marketing is valued on account of its growing contribution to the national GDP and expanding areas with potentials to export earning, rural employment and poverty reduction. Such potentials of vegetable farming especially in smallholders could be harnessed only through improved performance of production and marketing systems. Some enterprising farmers have been fetching good income from year round cultivation of tomato in plastic houses and two-season cultivation of tomato. Because of perishability of the produces and lack of proper storage, the farmers have weaker position in price negotiation. Even then the marketing system is observed to perform well as the farms on an average were observed sharing 70.2 percent on tomato prices, considered reasonable based on their feelings and costs involved. On such ground, vegetable farming can be good source of income to reduce farm poverty especially in small holders. Despite the facts, farm supplies are irregular and below quantity demand leaving sufficient rooms for promotion of scale production and marketing improvements. In the study area marketing system is purely based on private undertakings. Producers and traders (wholesalers and retailers) are the main actors of the marketing system.

Producers are found to be involved in selling activity at the farm, and traders are involved in buying, assembling, transporting, selling activities. Seven types of marketing channels have been identified. About 91 percent tomato is found to reach to consumers through wholesalers and retailers. Plastic crates have been extensively used by almost all actors except few farmers in the marketing system. Bus and pick-up van are used for transportation of tomato from field to wholesale market and to retail markets. But in some cases producers directly retail their produce by vendor on bicycle, thela (cart), doko (bamboo basket). Gross margin analysis showed that tomato growing is an important option for smallholder farmers in contributing family income. The producer's share is highest among all actors in the value chain. Almost all respondents have been getting market information from neighbours and friends, newspapers, telephone calls as first source of market information so most of them are found using informal sources to receive market information. The study showed that farmers are facing with several constraints related to production and marketing.

Initial investment in plastic house construction is the major cost of of tomato production if plastic tunnel has been used. Labor cost contributed highest percentage in total production cost. Benefit Cost ratio is 1.61. In average 4170.69 kg of tomato is produced in one ropani of land. The regression coefficient for farmyard manure and plastic house is positively significant whereas for seeds and chemical fertilizer it is positive but not significant on less than 5 percent. From this study, we can conclude that tomato growing is a profitable and potential agricultural enterprise in the research area. For achieving higher return through high efficiency from tomato growing farmers should give emphasis on growing tomato in offseason and mode of selling. Moreover, in spite of selling tomato by bargaining, farmers should focus more on selling in commission. There is an immense need to adopt market oriented policy and programs linking with production in order to enhance production and marketing efficiency in the study area, in particular.

5.3 Recommendations

Based on the findings of the study following recommendations have been made, which are useful for policy makers and other agencies who are directly or indirectly involved in development of vegetable crops and agricultural marketing.

- Need to establish vegetable production and marketing cooperatives and sell their produce through group marketing practices
- Agricultural marketing information system should be improved. The present wholesale price dissemination should be accompanied with other information like information on demand and supply of vegetables, market arrivals, information on other markets.
- Government should focus on market oriented agricultural development programs by emphasizing more on marketing extension.
- There should not be any barriers for transportation of perishable agro produces like vegetables.
- Agricultural marketing infrastructure (retail market, collection centres etc.) should be developed in production pocket and rural areas.
- Government should provide agricultural inputs in right time and in required quantity.
- Transportation and storage facilities should be developed.

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APPENDICES

APPENDIX A

LIST OF FARMERS WITH PRODUCTION COST AND QUANTITY OF TOMATO PRODUCED PER ROPANI OF LAND

S.N. (1)	Name (2)	Age (3)	Gender (4)	Chemical Fertilizer Rs (5)	FYM per ropani in Rs (6)	SEEDS per ropani Rs (7)	PLASTIC house Rs(8)	VIT Pestisides Rs(9)	LABOR per ropani Rs(10)	BULLOCK per ropani Rs(11)	Quantity tomato in Kg(12)
1	Gita Subedi	32.	female	450.00	2950.00	500.00	8000.00	6000.00	12000.00	800.00	1800.00
2	Laxmi Acharya	32.	female	100.00	4100.00	1100.00	23000.00	5400.00	21000.00	1400.00	2600.00
3	Dp Sharma	34.	male	90.00	8310.00	1100.00	19500.00	6800.00	19000.00	3000.00	3200.00
4	Chitra Kumari Sapkota	40.	female	600.00	9000.00	1100.00	27800.00	20000.00	15000.00	1400.00	6500.00
5	Tika Ram Sapkota	55	male	400.00	2000.00	500.00	9000.00	3000.00	13000.00	1400.00	4000.00
6	Trilochan Sapkota	45	male	610.00	5890.00	1100.00	7000.00	3700.00	17800.00	1400.00	3200.00
7	Laxman Thapa	46	male	500.00	2400.00	500.00	8000.00	2900.00	13000.00	3500.00	3200.00
8	Hom Nath Subedi	29	male	100.00	9450.00	1100.00	25000.00	3000.00	15400.00	800.00	5400.00
9	Gopal Sapkota	50	male	570.00	7800.00	1100.00	9700.00	2800.00	18430.00	800.00	4800.00
10	Madan Sapkota	53	male	300.00	8200.00	500.00	11700.00	3400.00	17000.00	1500.00	2600.00

1	2	3	4	5	6	7	8	9	10	11	12
11	Khadga Kumari Sapkota	35	female	500.00	5400.00	550.00	11000.00	2700.00	17500.00	800.00	3000.00
12	Pavitra Acharya	39	female	450.00	3500.00	500.00	7000.00	3200.00	15050.00	800.00	2800.00
13	Tili Acharya	51	female	650.00	7450.00	1100.00	13000.00	3600.00	17150.00	3000.00	4500.00
14	Danda Pani Sapkota	62	male	300.00	3900.00	500.00	12000.00	2800.00	12500.00	800.00	4000.00
15	Yagya Sharma	48	male	365.00	3100.00	1100.00	11000.00	2800.00	15635.00	3000.00	3100.00
16	Bhumi Nath Paudel	55	male	400.00	7400.00	1100.00	20000.00	2700.00	14000.00	800.00	3300.00
17	Debaka Sapkota	40	female	590.00	3500.00	1100.00	8800.00	3400.00	15010.00	800.00	3500.00
18	Ramesh Thapa	27	male	600.00	9200.00	1100.00	8200.00	3000.00	16000.00	800.00	3800.00
19	Dinesh Chandra	38	male	150.00	9250.00	1100.00	24000.00	2500.00	21000.00	1400.00	5100.00
20	Dharmadatta Sapkota	52	male	400.00	8400.00	500.00	10000.00	2800.00	17300.00	1400.00	3400.00
21	Rita Acharya	44	female	350.00	7800.00	500.00	13000.00	3600.00	14650.00	1400.00	2700.00
22	Tul Bahadur Pun	40	male	120.00	8280.00	1100.00	17900.00	3600.00	16600.00	3000.00	4000.00
23	Himal Rana	45	male	400.00	5000.00	500.00	12800.00	2900.00	14000.00	800.00	2900.00
24	Shashidhar Sapkota	60	male	530.00	4140.00	550.00	11000.00	2500.00	15500.00	970.00	3000.00
25	Himal KC	43	male	100.00	7900.00	1000.00	23000.00	2900.00	16400.00	1200.00	5100.00
26	Rudra Mahat	51	male	470.00	7560.00	550.00	12700.00	4000.00	18290.00	800.00	4700.00
27	Gita Acharya	40	female	140.00	9780.00	500.00	24860.00	3890.00	19000.00	1200.00	4400.00
28	Nanda Kishor Pun	56	male	510.00	8360.00	1100.00	12500.00	2890.00	17800.00	2490.00	3200.00

1	2	3	4	5	6	7	8	9	10	11	12
29	Pashupati Neupane	47	male	380.00	9420.00	1100.00	16500.00	3100.00	13500.00	1400.00	3600.00
30	Resham Thapa	33	male	650.00	7800.00	1100.00	14000.00	3000.00	20350.00	3000.00	4200.00
31	Govinda Sharma	43	male	300.00	5400.00	1100.00	17800.00	4200.00	18600.00	1400.00	2900.00
32	Amar Rana	37	male	410.00	9700.00	1100.00	23000.00	3600.00	21190.00	1400.00	3800.00
33	kopila sapkota	32	female	540.00	8858.00	550.00	13400.00	4256.00	16960.00	1200.00	4900.00
34	Nar Bdr Pun	58	male	150.00	7000.00	1100.00	22000.00	3700.00	21850.00	800.00	4300.00
35	Bimal Babu Sharma	36	male	490.00	9510.00	1000.00	12500.00	3100.00	17500.00	3000.00	3700.00
36	Tanka Magar	42	male	160.00	12300.00	1100.00	27800.00	5400.00	23740.00	3000.00	4400.00
37	Maya Kc	34	female	350.00	6700.00	500.00	17150.00	3460.00	13600.00	1800.00	2900.00
38	Bipana BK	32	female	480.00	9800.00	1100.00	16000.00	3450.00	19400.00	3000.00	2800.00
39	Resham Rana	48	male	450.00	8700.00	1100.00	16300.00	4600.00	18250.00	1200.00	2900.00
40	Gita Sapkota	28	female	500.00	12000.00	1100.00	17400.00	3480.00	19400.00	3000.00	3800.00
41	Hari Acharya	54	male	782.00	17000.00	1100.00	12400.00	45200.00	21000.00	3000.00	4600.00
42	Sabina Sapkota	49	female	500.00	10500.00	1500.00	11400.00	4450.00	16500.00	2400.00	3000.00
43	Devendra Paudel	37	male	600.00	13800.00	1100.00	19300.00	2400.00	18400.00	1200.00	4000.00
44	Srijana Thapa	24	female	430.00	7680.00	1300.00	14870.00	4500.00	14200.00	1400.00	3200.00
45	Rudra Acharya	54	male	460.00	8440.00	1100.00	9800.00	4350.00	16800.00	800.00	3700.00
46	Arun Sharma	64	male	430.00	8770.00	1100.00	12000.00	3900.00	11360.00	1400.00	4100.00

1	2	3	4	5	6	7	8	9	10	11	12
47	Harihar Paudel	41	male	100.00	8800.00	1100.00	19800.00	6500.00	15800.00	1400.00	4100.00
48	Yam Rana	54	male	590.00	6900.00	1100.00	11300.00	4400.00	12700.00	2410.00	3900.00
49	Pralash Nepali	27	male	600.00	10400.00	1400.00	14600.00	2480.00	13000.00	3000.00	4100.00
50	Rupa Ghimire	48	female	300.00	9500.00	1100.00	16700.00	3000.00	18600.00	1800.00	2700.00
51	Lal Chandra Sapkota	59	male	610.00	10800.00	800.00	12300.00	4200.00	20390.00	800.00	4100.00
52	Laxmi Bhushal	40	female	700.00	8700.00	1100.00	11800.00	2500.00	18000.00	3000.00	4000.00
53	Meena Sapkota	32	female	600.00	12000.00	1000.00	12500.00	6600.00	19700.00	800.00	3500.00
54	Pramod Acharya	25	male	390.00	9500.00	1100.00	13400.00	4800.00	12800.00	800.00	3300.00
55	Kul Prasad	44	male	650.00	7000.00	1200.00	17600.00	13830.00	17500.00	800.00	4000.00
56	Indira Neupane	28	male	730.00	8200.00	1100.00	14300.00	12170.00	16400.00	1400.00	3500.00
57	Ghan Bahadur thapa	40	male	500.00	9300.00	1400.00	15470.00	8900.00	14700.00	1800.00	4100.00
58	Tirtha sapkota	53	male	480.00	8120.00	1100.00	12780.00	9800.00	15600.00	800.00	30000.00

APPENDIX B

LOG VALUE OF DIFFERENT COST ITEMS OF TOMATO PRODUCTION PER ROPANI

log fym	log chem fertilizer	log seeds	log plastic house	log vit -pest	log labour	log bullock	LTINC	Total quantity
3.469822016	2.653212514	2.698970004	3.903089987	3.77815125	4.079181246	2.903089987	4.73239376	1800
3.612783857	2	3.041392685	4.361727836	3.73239376	4.322219295	3.146128036	4.920123326	2600
3.919601024	1.954242509	3.041392685	4.290034611	3.832508913	4.278753601	3.477121255	4.982271233	3200
3.954242509	2.77815125	3.041392685	4.444044796	4.301029996	4.176091259	3.146128036	5.356981401	6500
3.301029996	2.602059991	2.698970004	3.954242509	3.477121255	4.113943352	3.146128036	5.146128036	4000
3.770115295	2.785329835	3.041392685	3.84509804	3.568201724	4.250420002	3.146128036	5.049218023	3200
3.380211242	2.698970004	2.698970004	3.903089987	3.462397998	4.113943352	3.544068044	5.084933575	3200
3.975431809	2	3.041392685	4.397940009	3.477121255	4.187520721	2.903089987	5.276461804	5400
3.892094603	2.755874856	3.041392685	3.986771734	3.447158031	4.265525335	2.903089987	5.172602931	4800
3.913813852	2.477121255	2.698970004	4.068185862	3.531478917	4.230448921	3.176091259	4.959041392	2600
3.73239376	2.698970004	2.740362689	4.041392685	3.431363764	4.243038049	2.903089987	5.021189299	3000
3.544068044	2.653212514	2.698970004	3.84509804	3.505149978	4.1775365	2.903089987	4.924279286	2800
3.872156273	2.812913357	3.041392685	4.113943352	3.556302501	4.234264124	3.477121255	5.158362492	4500

3.591064607	2.477121255	2.698970004	4.079181246	3.447158031	4.096910013	2.903089987	5.146128036	4000
3.491361694	2.562292864	3.041392685	4.041392685	3.447158031	4.194097886	3.477121255	5.009875634	3100
3.86923172	2.602059991	3.041392685	4.301029996	3.431363764	4.146128036	2.903089987	5.062581984	3300
3.544068044	2.770852012	3.041392685	3.944482672	3.531478917	4.176380692	2.903089987	5.146128036	3500
3.963787827	2.77815125	3.041392685	3.913813852	3.477121255	4.204119983	2.903089987	5.159567193	3800
3.966141733	2.176091259	3.041392685	4.380211242	3.397940009	4.322219295	3.146128036	5.25163822	5100
3.924279286	2.602059991	2.698970004	4	3.447158031	4.238046103	3.146128036	5.062957834	3400
3.892094603	2.544068044	2.698970004	4.113943352	3.556302501	4.165837625	3.146128036	4.962842681	2700
3.918030337	2.079181246	3.041392685	4.252853031	3.556302501	4.220108088	3.477121255	5.170261715	4000
3.698970004	2.602059991	2.698970004	4.10720997	3.462397998	4.146128036	2.903089987	4.993876915	2900
3.617000341	2.72427587	2.740362689	4.041392685	3.397940009	4.190331698	2.986771734	5.008600172	3000
3.897627091	2	3	4.361727836	3.462397998	4.214843848	3.079181246	5.25163822	5100
3.878521796	2.672097858	2.740362689	4.103803721	3.602059991	4.262213705	2.903089987	5.228400359	4700
3.990338855	2.146128036	2.698970004	4.395501124	3.589949601	4.278753601	3.079181246	5.211654401	4400
3.922206277	2.707570176	3.041392685	4.096910013	3.460897843	4.250420002	3.396199347	5.036628895	3200
3.974050903	2.579783597	3.041392685	4.217483944	3.491361694	4.130333768	3.146128036	5.100370545	3600
3.892094603	2.812913357	3.041392685	4.146128036	3.477121255	4.308564414	3.477121255	5.179551791	4200
3.73239376	2.477121255	3.041392685	4.250420002	3.62324929	4.269512944	3.146128036	5.018700499	2900
3.986771734	2.612783857	3.041392685	4.361727836	3.556302501	4.326130957	3.146128036	5.123851641	3800

3.947335676	2.73239376	2.740362689	4.127104798	3.629001619	4.229425848	3.079181246	5.246498581	4900
3.84509804	2.176091259	3.041392685	4.342422681	3.568201724	4.339451441	2.903089987	5.1775365	4300
3.978180517	2.69019608	3	4.096910013	3.491361694	4.243038049	3.477121255	5.136403448	3700
4.089905111	2.204119983	3.041392685	4.444044796	3.73239376	4.375480715	3.477121255	5.245512668	4400
3.826074803	2.544068044	2.698970004	4.234264124	3.539076099	4.133538908	3.255272505	4.993876915	2900
3.991226076	2.681241237	3.041392685	4.204119983	3.537819095	4.28780173	3.477121255	5.026941628	2800
3.939519253	2.653212514	3.041392685	4.212187604	3.662757832	4.261262869	3.079181246	4.967547976	2900
4.079181246	2.698970004	3.041392685	4.240549248	3.541579244	4.28780173	3.477121255	5.136086097	3800
4.230448921	2.893206753	3.041392685	4.093421685	4.655138435	4.322219295	3.477121255	5.242541428	4600
4.021189299	2.698970004	3.176091259	4.056904851	3.648360011	4.217483944	3.380211242	5.021189299	3000
4.139879086	2.77815125	3.041392685	4.285557309	3.380211242	4.264817823	3.079181246	5.170261715	4000
3.88536122	2.633468456	3.113943352	4.172310969	3.653212514	4.152288344	3.146128036	5.084933575	3200
3.926342447	2.662757832	3.041392685	3.991226076	3.638489257	4.225309282	2.903089987	5.112269768	3700
3.942999593	2.633468456	3.041392685	4.079181246	3.591064607	4.055378331	3.146128036	5.075181855	4100
3.944482672	2	3.041392685	4.29666519	3.812913357	4.198657087	3.146128036	5.144262774	4100
3.838849091	2.770852012	3.041392685	4.053078443	3.643452676	4.103803721	3.382017043	5.096214585	3900
4.017033339	2.77815125	3.146128036	4.164352856	3.394451681	4.113943352	3.477121255	5.180985581	4100
3.977723605	2.477121255	3.041392685	4.222716471	3.477121255	4.269512944	3.255272505	5.011147361	2700
4.033423755	2.785329835	2.903089987	4.089905111	3.62324929	4.309417226	2.903089987	5.156851901	4100

3.939519253	2.84509804	3.041392685	4.071882007	3.397940009	4.255272505	3.477121255	5.204119983	4000
4.079181246	2.77815125	3	4.096910013	3.819543936	4.294466226	2.903089987	5.100370545	3500
3.977723605	2.591064607	3.041392685	4.127104798	3.681241237	4.10720997	2.903089987	5.062581984	3300
3.84509804	2.812913357	3.079181246	4.245512668	4.14082218	4.243038049	2.903089987	5.158362492	4000
3.913813852	2.86332286	3.041392685	4.155336037	4.085290578	4.214843848	3.146128036	5.123851641	3500
3.968482949	2.698970004	3.146128036	4.189490314	3.949390007	4.167317335	3.255272505	5.144262774	4100
3.909556029	2.681241237	3.041392685	4.106530854	3.991226076	4.193124598	2.903089987	5.021189299	30000

APPENDIX C

SEMI-STRUCTURED QUESTIONNAIRE FOR FARMERS

1. Personal details:

Name:

Age:

Qualification:

Sex: Male/female

Address:

Head of the family name…… Relation with family head……

2. Total land (in ropani)

Type of land Own	Land in Lease		Total
Irrigated			
Non- irrigated			

3. From when have you been growing vegetables?

( ) Less than 5 year ( ) Above 5 yrs

( ) Above 10 yrs ( ) less than 1 year

4. What types of vegetables have you planted (with area and production)?

( ) cauliflower ( ) cabbage

( ) tomato ( ) potato

( ) leafy vegetables ( ) radish

( ) beans ( ) all type vegetables.

5. What is the cost of production of tomato (labour cost,) ?

S N	**Descriptions**	**Qty**	**Unit**	**Rate (Rs)**	**Total (Rs)**
A	Land Renting				
B	Inputs				
1	Seed		MT		
2	Staking Poles/ Wood				

3	Manure/Fertilizer	(kg/Doko)
4	Pesticide use	
5	Plastic sheet/ bags	
	Total (Production Input)	
C	Labour	
1	Land preparation	man-days
2	Ploughing	pair bullocks
3	Labour for FYM application	man-days
4	Workers including family labor	
5	Plantation	man-days
6	Weeding	man-days
7	Crop harvesting	man-days
8	Cleaning	man-days
Total (Production Labour)		
D	Transportation cost	per - tone
	Grand total cost	

Summary of the major costs	**Per kg**
Share %	
Planting material	
Labor	
Manure/Fertilizer	
Pesticide	
Others	
Total	

6. How much vegetables do you sell (with quantity and price) per day/ per one yield/ per year ?

7. Where do you sell tomato?

( ) Own farm ( ) Collection centre ( ) Wholesalers

( ) Middlemen ( ) Retailers ( ) Self selling in retail markets

8. Do you do contractual agreement with retailers/wholesalers/middlemen?

( ) Yes ( ) No

8. Do you do grading in tomato before selling?

( ) Yes ( ) No

9. What kind of packaging materials do use for tomato?

( ) Plastic crates ( ) Doko ( ) Plastic bag ( ) Wooden box

( ) Other

10. What means of transport do use for transportation to market?

( ) Bus/truck ( ) Delivery van/ jeep ( ) Porter

( ) Self head load ( ) Other

11. Where are the possible markets for your tomato?

( ) Myagdi ( ) Kushma ( ) Pokhara market centres

( ) chuwa ( ) other markets

12. When do you sell tomato?

( ) Same day of harvesting ( ) Next day of harvesting

13). How much do you pay for transporting tomato from farm to market?

14. What are the means of market information?

( ) Radio ( ) Television ( ) Newspaper

( ) Pokhara Market Center ( ) Telephone call ( ) Neighbors

( ) Other

15. In opinion, who is getting profit most from the tomato business?

( ) Farmer ( ) Cooperatives ( ) Retailers

( ) Wholesalers ( ) Middlemen ( ) Other

16. Which agency should play important role in production and marketing of tomato?

( ) Government agency-District Agriculture Development Office

( ) Non-governmental organization

( ) Farmers' cooperatives

( ) Private sector

( ) Other

17. What do you think that the government agency should conduct programs for more profit to farmers?

( ) yes ( ) No

18. How do you sell your tomato?

( ) By commission ( ) by bargaining

19. To whom you sell your tomato/potato?

( ) regular collectors ( ) cooperative ( ) wholesalers ( ) Doke ( ) carts ( ) retailers

19. How do you rate the problems on production of tomato?

S.N. Problems Scale of rating

5 4 3 2 1

1 Timely unavailability of chemical fertilizers ( )

2 Problem of insect and pests ( )

3 Pest and diseases ( )

4 Unavailability of loan ( )

5 Lack of irrigation facilities ( )

6 Weak extension support services ( )

7 High input costs ( )

8 Unavailability of pure seeds ( )

Note: 5- most serious, 4- serious, 3- moderate, 2- a little bit and 1- the least serious

Marketing problems:

S.N. Marketing problems Scale of rating

5 4 3 2 1

1 Lower price ( )

2 Unorganized market ( )

3 Frequent price fluctuation ( )

4 High transport cost ( )

5 Lack of storage facilities ( )

6 Lack of processing facilities ( )

7 Frequent transport obstruction ( )

8 Lack of market information ( )

Note: 5- most serious, 4- serious, 3- moderate, 2- a little bit and 1- the least serious

20. What suggestions do you think to solve those problems?

21. Are you satisfied with this business? ( ) Yes ( ) No

22. How trader behave to producers while buying vegetables product?

( ) Better price offering ( )Payment of cash at hand ( ) Paying advance money before cropping ( )Put payment on due after trading

23. To whom you sell your tomato/ potato?

( ) Regular collectors ( ) Cooperative ( ) wholesalers ( ) Doke

24.Potato and Tomato Retailers' demographic characteristics

S.N	Sex	Religion	Language Spoken	Education	Marital Status

Coding are as follows:

1.1 Male 2.1 Hindu 3.1 Nepali 4.1 Illiterate

1.2 Femal 2.2 Muslim 3.2 other 4.2 Literate

2.3 other 4.3 SLC Pass and above

4.5 Above Diploma

APPENDIX D

QUESTIONNAIRE OR WHOLESALERS AND RETAILERS

1. Personal details:

Name:

Age:

Qualification:

Sex: Male/female

Address:

2. From when did you start this business?

( ) Below 1 year ( ) 1-2 year ( ) Above 2 year -5year

( ) Above 5 year

3. What kinds of vegetables do you sell?

( ) cauliflower ( ) tomato ( ) potato ( )leafy green ( )beans

( ) others

4. From where do you buy tomato and at what price?

i)----------

ii)-------- per kg/ per crate/ per every 5 kg/ per quintal

5. How much tomato do you sell daily?

In main season……

In off-season…….

6. What is the selling price of tomato?

7. Which varieties of tomato do you sell?

8. To whom do you sell tomato?

( ) Individual consumers ( ) Retailers ( ) Wholesalers

( ) Institutional consumers (hotels, schools, army/police barrack)

9. Do you do grading in tomato before selling?

( ) Yes No ( )

10. Do you do contractual agreement with retailers/wholesalers/middlemen?

( ) Yes ( ) No

11. What kind of packaging materials do use for tomato?

( ) Plastic crates ( ) Doko ( ) Plastic bag

( ) Wooden box ( ) Other

12. What means of transport do use for transportation to market?

( ) Bus/truck ( ) Delivery van/ jeep ( ) Porter

( ) Self head load ( ) Other

13 . How much do you pay for transporting tomato from wholesale market to retail market and from farmers' field to wholesale market?

14. Do you have storage facility for storing tomato?

( ) Yes ( ) No

15 In opinion, who is getting profit most from the tomato/ potato business?

( ) Farmer ( ) Cooperatives ( ) Retailers

( ) Wholesalers ( ) Middlemen ( ) Other

16 Which agency should play important role in production and marketing of tomato?

( ) Government agency-District Agriculture Development Office

( ) Non-governmental organization

( ) Farmers' cooperatives

( ) Private sector

( ) Other

17 .What problems do you face in marketing of tomato?

18. What suggestions do you think to solve those problems?

19 .Are you satisfied with this business?

( ) Yes ( ) No

20. Do you have license for trading?

( ) Yes ( ) No