

**A STUDY OF TOMATO FARMING IN RAJGHAT VDC OF
SARLAHI DISTRICT NEPAL**

**A Thesis Submitted to
The Central Department of Rural Development, Tribhuvan University
in partial fulfillment of the requirements for the Degree of the
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In
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RECOMMENDATION LETTER

The thesis entitled “**A Study of Tomato Farming in Rajghat VDC of Sarlahi District Nepal**” has been prepared by **Gun Maya Tumsing Magar** under my guidance and supervision. I hereby forward this thesis to the evaluation committee for final evaluation and approval.

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DECLARATION

I hereby declare that the thesis entitled “**A Study of Tomato Farming in Rajghat VDC of Sarlahi District Nepal**” submitted to the Central Department of Rural Development, Tribhuvan University, is entirely my original work prepared under the guidance and supervision of my supervisor. I have made due acknowledgements to all ideas and information borrowed from different sources in the course of writing this thesis. The results of thesis have not been presented or submitted anywhere else for the award of any degree or for any other purposes. I assure that no part of the content of this thesis has been published in any form before.

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ABSTRACT

Tomato (*Lycopersicon esculentum*, Mill) is one of the most commonly grown vegetables in Nepal. It has occupied the fourth and fifth position in terms of production and acreage respectively. Despite the fact that Tomato growing is a viable option to increase farm income and hence alleviate widespread poverty considerable attention has not been given for its marketing aspects. Therefore, this study was carried out to “*A Study of Tomato Farming in Rajghat VDC of Sarlahi District Nepal*” during the year 2014. Specifically, this study was intended to identify condition of Tomato production to estimate gross margin, marketing margin and producer share, to find out the situation of using bio-pesticide and to identify constraints related to production and marketing of vegetables, especially Tomato. Accordingly, a representative sample size of 65 Tomato growers comprising 7 each wards from Rajghat village development committees were purposively selected. Similarly, 2 wholesalers from Hariwon fruits and vegetables wholesale market and 5 retailers from Barthawa vegetable market were purposively selected. The required information was obtained by interviewing with semi-structured questionnaire. This was supplemented with information from focus group discussion with farmer groups and key informants; and observation.

From the study it was found that the average cost of production per Kattha was higher in Rajghat wd -3 than in Rajghat-8. Likewise, gross margin was higher in Rajghat-3 than in Rajghat-8 due to lower cost of production and higher yield in former case. In addition, the benefit cost ratio was also found to higher in Rajghat. In the marketing system, the channel of producer, wholesaler-retailer- consumer was most common where about 50 percent Tomato passes 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 actors. The mode of selling Tomato in commission was higher in Rajghat-1,2,3,4,5 than in Rajghat 5,6,7,8,9 where farmers sold Tomato by bargaining. However, there was not significant difference in mode of selling. In Hariwan wholesale market, two types of Tomato were found to selling and the wholesale price of Tomato big was found higher than of small one. In the case of total volume of Tomato arrival, about 85

percent Tomato was from different districts of Nepal and rest from India. Plastic crate was the most common packaging material.

Likewise, telephone, neighbors and friends were the major means of market information for majority of respondents. The study showed that farmers were facing with several constraints related to production and marketing. Among several production constraints, the most common constraints faced by producers in the study area were high cost of agricultural inputs (seed, fertilizers, and bio-pesticide and agro chemicals), timely unavailability of chemical fertilizers, unavailability of pure seed, lack of technical knowhow, disease and insect pest problems etc. Likewise in marketing constraints, the most common constraints faced by farmers were frequent transport obstruction, high transportation cost, lower price, fluctuation in market prices, unorganized retail markets, lack of processing facilities.

The research showed that Tomato growing is a profitable and potential agricultural enterprise in the research area. In conclusion, 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.

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ABBREVIATION/ACRONYM

| | | |
|---------|---|---|
| ADB | : | Asian Development Bank |
| AEPB | : | Agricultural Enterprise Promotion Board |
| AGDP | : | Agricultural Gross Domestic Product |
| APMDD | : | Agribusiness Promotion & Marketing Development Directorate |
| APP | : | Agriculture Perspective Plan |
| APROSC | : | Agriculture Project Services Centre |
| ASC | : | Agriculture Service Centre |
| BIMSTEC | : | Bay of Bengal Initiative for Multisectoral Technical and Economic Cooperation |
| BS | : | Bikram Sambat |
| DADO | : | District Agricultural Development Office |
| Df | : | Degree of Freedom |
| GDP | : | Gross Domestic Product |
| GM | : | Gross Margin |
| GR | : | Gross Revenue |
| Ha | : | Hectare |
| HHs | : | Households |
| HVCs | : | High Value Crops |
| Kg | : | Kilo gram |
| Km | : | Kilo metre |
| MDD | : | Marketing Development Directorate/Division |
| MM | : | Marketing margin |
| MOAC | : | Ministry of Agriculture & Cooperatives |
| MOF | : | Ministry of Finance |
| No. | : | Number |
| N/Rs. | : | Nepalese Rupees |
| Qntl | : | Quintal |
| Ltr | : | Liter |
| U.S | : | United State |
| NRB | : | Nepal Ratra Bank |
| NARC | : | Nepal Agriculture Research Council |
| NGOs | : | Nepal Non-governmental Organizations |

| | | |
|-------|---|--|
| INGOs | : | International Nepal Non-governmental Organizations |
| CBS | : | Central Bureau of Statistics |
| SAFTA | : | South Asia Free Trade Agreement |
| USA | : | United States of America |
| VDCs | : | Village Development Committees |
| VDD | : | Vegetable Development Directorate |
| WTO | : | World Trade Organizatio |
| WB | : | World Bank |
| VIF | : | Virtually Impersonable Films |
| ET | : | Evapotranspiration |
| TSWV | : | Tomato Spotted Wilt Virus |
| CMV | : | Cucumber Mosaic Viruss |
| TYLCW | : | Tomato Yellow Leaf Curl Virus |
| NAFTA | : | North American Free Trade Agreement |

CHAPTER I

INTRODUCTION

1.1 Background of the Study

Agriculture is the back bone of the Nepalese economy which contributes 33% share in the GDP (Gross Domestic Product) and more than 66% people are engaged on agriculture as main occupation (MoAC,2011). Agriculture is the major sector of the Nepalese economy. But unfortunately only 18% of the land has been brought under agricultural operation of which 53% is in the Terai and only 47 in Hills. In 2012/13 the contribution of GDP by agriculture is 33% (Bista,2012/13). Although, the economy of Nepal is based on agriculture, there is diversity in production. Paddy, maize, wheat, potato, millet, and Barley are the main agricultural production in Nepal. Majority of the production have been involving in this of farming is prevailed in agriculture from the very beginning. Nepalese agriculture is in subsistence and traditional level. Farmers are reluctant to adopt new technology and transform the traditional agricultural pattern into modern one.

Tomato is supposed to be one of the most profitable businesses and referred to as a cash crop. So foreign currency earning is possible through exporting local Tomato to other countries. The Tomato farming is considered as one of the cash crop. Yet, the production process of local Tomato is only at infant stage in Nepal. Moreover, as Tomato farming is a relatively new business to the Nepalese people.

Tomato plant which is botanically known as the Tomato in latin is an important cash crop cultivated in Rajghat VDC as well as in various parts of Nepal. It is usually grown as an annual plant as an erect personal herb with Mandrake, or “love plant” belonging to the Solanaceae family. Generally it has 1- 3 m tall, with an edible, brightly colored (usually red, from the pigment lycopene) berry, 1-2 cm diameter in wild plants, commonly much larger in cultivated forms. Though it is botanically a berry, a subset of fruit, the Tomato is nutritionally categorized as a vegetable. The product of Tomato is “Mandrake” of plant itself, which weakly woody stem that usually scrambles over other plants. It is mainly used as soup, salad, pickles, ketchup, puree, sauces and in many others ways for domestic cooking purpose,

flavoring materials in the food industry, for flavoring pickle and fruit products. It is used by manufactures of confectionery soap, shampoo and other precooked, canned food, soft drinks, pickles' chutney, meat processors, fish sweet, vegetable alcoholic and benefit the heart among other things, as it contains lycopene, one of the most powerful natural antioxidants which, especially when cooked, has been found to help prevent prostate, lung, stomach, pancreatic, colorectal, esophageal, oral, breast and cervical cancers medicines and syrups has also got importance from different point of view.

The word Tomato is derived from "Mandrake" and it is said to have originated from South America but growing in temperate climates worldwide. Moreover, it is believed that it was cultivated in Spanish conquistadors as early as 15th century. After the Spanish conquest of South America, the Spanish distributed the Tomato throughout their colonies in the Caribbean. They also brought it to the Philippines, from where it moved to Southeast Asia and then to the entire Asian continent as well as Tomato became a cash crop of Asia. Once it was imported to British North America in the 17th century. It is found that in the 15th century, according to Smith, this changed in the early 19th C., first in the Southern states and throughout the country, but whatever the histories of Tomato cultivation in previous days. Nowadays Tomato is introduced by different countries in the world i.e. Nepal, India, China, Japan, Jamaica, Nigeria, Thailand, Taiwan. In Nepal Tomato is cultivated in the various hilly and Tarai districts like, Sarlahi, Dhanusha, Bara, Dhading, Nuwakot, Kavre, Siraha, Dhankuta, Sunsari, Morang and Jhapa are the major Tomato productive districts in Nepal. (FAO 2006)

Since, Nepal has largely an agro-based economy majority of the people still rely on agriculture, which has remained the major source of employment and income. Agriculture contributes the large share of the GDP. Obviously, the STAT, 2004) country cannot steer the trajectory of sustainable development in the absence of agriculture development. In the logic of this undeniable fact, the agriculture is accorded the topmost priority in previous development plans. Agriculture business promotion policy 2063 (2006) has been executed aiming fostering the national and global markets there by developing the strong foundation to make the agricultural practices some commercial and competitive.

In Nepal land is divided into three part (Himal, Pahad and Terai). Total area of Nepal is 1,47,181 square kilometers. There is 3091 square kilometers (21%) agriculture land cultivated and 1032(7%) square kilometer agriculture land uncultivated. Agriculture contributes in GDP 34.6%.

Large population of the Nepalese majority population depends upon agriculture. There are two types of agriculture, one cash and cereal crop; Cash crops are crops which are produced for sell and not for consumption by the farmers and their families.” Among various cash crops, the Tomato is one of the main crops of Nepal nowadays. The Tomato is a weakly woody stem and vegetable having usually scrambles over other plants and it has been mostly used as vegetables, fruits and medicine for many years. It gives special flavor and sharp test. It can be mixed in various foods the delicious Tomato tastes for a long time.

Nepal has a wide range of climate and soil mainly due to topography and altitude variation. More or less 152 horticultural crops are being cultivated. Tomato is one of the most commercial fresh and edible fruits vegetable after cabbage and cauliflower the productivity of Tomato in Spain is 66.81 ton/ha, India has 17.50 ton/ha, and China has 24.23 ton/ha, (FAO STAT,2004).The Tomato plays an important role in the overall employment and income generation of smallholders farm communities, it is one of the most important ”protective foods” because of its nutritive value, it is most versatile vegetable with wide usage in the Nepalese culinary tradition. It is used as for soup, salad, pickles, ketchup, puree, sauces and in many others ways. The total area of Tomato production in Nepal is 15,572 hectare with 219,184 mt (14mt/h). Sarlahi, Dhanusha, Bara, Dhading, Nuwakot, Kavre, Siraha, Dhankuta, Sunsari, Morang and Jhapa are the major Tomato productive districts in Nepal. Among them, Kavre has occupied first position 1,863 hectare with 13.7 mt/ha while Sarlahi has occupied second position 1,800 hectare with 13.3 mt/ha (VDD, 2010). Sarlahi district is famous for Tomato production since long period. It is year round producing crop. The cost of production per hectare at farm gate is Rs.42930 where the net return is Rs.219766 in hill (VDD, 2010).The average productivity of Tomato is very poor in Nepal as complete to others countries. The major constraints in Tomato production are low yielding varieties, disease susceptible varieties, diseases (late blight, bacterial, wilt, Tomato leaf curl virus), insects (fruit borer), over and

improper use of pesticide, poor linking with adaptive research and extension, drought stress, post harvest losses, fake inputs, limited land, labor and capital of smallholder farmers, poor soil fertility, poor harvest handling and poor marketing knowledge.

Tomato is an important cash crop which is cultivated in most of the hilly and Terai regions of Nepal. Sarlahi district also belongs to the same region where Tomato farming has been lunched since past few years as a cash crop. The area under the Tomato cultivation is increasing slowly and gradually due to the attractive income obtained from it.

Sarlahi district is one of large Tomato production area in Nepal. Thus, the Sarlahi district where the Tomato is produced commercially with the heavy use of chemical inputs to get high profit. Therefore, farmers as well as traders are interested, motivated and initiated towards organic Tomato production. Government of Nepal has prioritized organic vegetables in different plans and policies. Tomato is more profitable commodity per unit area as compared to other cereal crops. Therefore, Tomato production would be a viable option to the farmers to generate farm income.

1.2 Statement of the Problem

Nepalese agriculture is supposed to be a major contributor to the national economy. Till now, it has been contributing almost 32 percent to the Gross Domestic Products (GDP). Despite this fact, agriculture in Nepal has not been a sustainable source of job, income and GDP.

Primarily, traditional pattern of farming is its serious problem where farmers depend on primitive technologies and method of production. Similarly, lack of agricultural inputs such as fertilizer, seed has affected the productivity of the agricultural sector. In case of cash crops like Tomato, lack of market and proper transportation mechanism seems challenging issue. In case of Tomato, storage facility, packaging and transportation channels are associated problems. Precisely, it can be said that lack of commercialization is a serious problem of Nepalese agriculture.

The Government of Nepal has declared Tomato pocket areas in Nepal, one of them is Sarlahi district. Now a day, many people in Nepal specially in Tarai region including Sarlaha District are cultivating Tomato. There are so many problems concerned with Tomato production such as transportation, lack of market, lack of warehouse, seed and fertilizer and lack of loan etc. Similarly, Tomato is highly sensitive to several biotic and non-biotic stresses. Fungal diseases (especially early blight, late blight and Fusarium wilt), bacterial diseases (bacterial wilt, bacterial spot, etc.) and virus diseases (tobacco mosaic virus, leaf curl, spotted wilt, etc.) are a serious problem in several areas where Tomato is produced. It is sensitive to a number of environmental stresses, especially extreme temperature, salinity, drought, excessive moisture and environmental pollution, and there is a need to develop varieties that can withstand such environmental stress. Apart from environmental stresses, Tomato yield is also affected by breeding techniques, varieties, growth habit, etc.

With reference to the above mentioned problems of Tomato production, the present study aims to address following research questions.

- How is the present condition of Tomato farming in study area?
- What type of fertilizer do the farmers apply in Tomato farming?
- What are the marketing strategies of Tomato growers in the study area?
- What are the problems and difficulties facing Tomato farming in the area?

1.3 Objective of the Study

The general objective of the study is to ensure the economic effect to the livelihood of local people in Sarlahi district.

- To analyze Tomato production system in the study area.
- To find out the use of fertilizer and pesticides for the production of Tomato in the study area
- To analyze the marketing strategy of Tomato by the farmers in the study area.

1.4 Significance of the Study

In Nepal it is found that more than 75% people are engaged in agriculture. However, it imports heavy amount of vegetables from rest of the world especially from India. This is due to lack of commitment & investment in development of Agricultural sector. Better production & productivity depends upon Agricultural cash crops especially it depends on vegetable farming; in Sarlahi development of vegetable production system is very poor such as Tomato production. So it is necessary to develop Tomato production system for Agricultural development & as a whole economic development. Which needs huge amount of investment; for which this study will be useful for government sector & private sector as well as all those who want to make investment in vegetable sector especially in Tomato production system in Terai belt?

The data and information of this study will give meaningful guidelines for sustainable environment friendly and economic project in related field. This research has significance as it gives figures the existing Tomato production system of Rajghat VDC. This study will useful to economists, planners, interested agricultural institutions and other interested persons. This study will helpful for further researcher. And finally this study will be practically helpful to develop Tomato production system to develop agricultural sector of related area.

1.6 Limitation of the Study

This study has been the following limitations:

- The study has covered only one VDC of Sarlahi district i.e. Rajghat VDC.
- Existing organic Tomato farming of Rajghat vdc of Sarlahi district i.e. 250 household's is universe of the study.
- Due to limited time and sample method has used and taken about 25% HHS of the universe for data analysis.

1.7 Organization of the Study

This study has been organized in five chapters. First chapter includes background of the study, statement of the problem, objectives of the study, significance of the study, limitation of the study and organization of study.

Second chapter is literature review which deals with Review of concepts and history of Tomato Production, Review of related studies, Nepal, thesis, Summary of review

Third chapter discuss research methodology adopted in this study which includes research design, and selection of the study area, nature and sources of data, sampling procedure, tools and technique of data collection, and method of data analysis.

Fourth chapter deals about the presentation, interpretation and analysis of data.

Fifth chapter presents major finding and summary, conclusion and recommendation of the study.

CHAPTER II

LITERATURE REVIEW

2.1 Review of Concepts and History of Tomato Production

Agriculture is the oldest occupation in the world. Tomato farming in agriculture is not a recent phenomenon. The accurate origin of Tomato cultivation is not known though; it has been noticed since thousands of years in region of Asia, Africa and America. when people left their stone age then practice agriculture farming then it began in many parts of the arid and semi arid of the world. The fact data about Tomato farming of ancient period is not available. Nobody can give the answer when and how the tomato farming system has started. But there were many kinds Of tomato farming methods was in practice since ancient period such as well, food crops, commercial etc.

First of all, according to the different experts views about Tomato's history, in 1753 the Tomato was placed in the genus *Solanum* by Linnaeus as *Solanum lycopersicum* L. (derivation, 'lyco', wolf, plus 'persicum', peach, i.e., "wolf-peach"). However, in 1768, Philip Miller placed it in its own genus, and he named it *Lycopersicon esculentum*. This name came into wide use, but was in breach of the plant naming rules. Technically the combination *Lycopersicon lycopersicum* (L.) H. Karst, would be correct, but this name (published in 1881) has hardly ever been used. Therefore it was decided to conserve the well-known *Lycopersicon esculentum*, making this the correct name for the Tomato when it is placed in the genus *Lycopersicon*.

However, genetic evidence (e.g. Peralta & Spooner, 2001) has now shown that Linnaeus was correct in the placement of the Tomato in the genus *Solanum*, making the Linnaean name correct; if *Lycopersicon* is excluded from *Solanum*, *Solanum* is left as a paraphyletic taxon. Despite this, it is likely that the exact taxonomic placement of the Tomato will be controversial for some time to come, with both names found in the literature.

Botanically speaking a Tomato is the ovary, together with its seeds, of a flowering plant, i.e. a fruit. However, from a culinary perspective the Tomato is

typically served as a meal, or part of a main course of a meal, meaning that it would be considered a vegetable

This argument has led to actual legal implications in the United States. In 1887, U.S. tariff laws which imposed a duty on vegetables but not on fruits caused the Tomato's status to become a matter of legal importance.

The U.S. Supreme Court settled this controversy in 1893, declaring that the Tomato is a vegetable, using the popular definition which classifies vegetables by use, that they are generally served with dinner and not dessert. The case is known as *Nix v. Hedden*. It should be noted that strictly speaking the holding of the case applies only to the interpretation of the Tariff Act of March 3, 1883 and not much else. The court does not purport to reclassify Tomato for botanical or for any other purpose other than paying a tax under a tariff act. In concordance with this classification, the Tomato has been proposed as the state fruit of New Jersey. In Europe the Tomato is classified as a fruit.

In generally, the Tomato is a short lived perennial plant, grown as an annual plant, in the Solanaceae or nightshade family, typically growing to 1-3 m tall, with a weakly woody stem that usually scrambles over other plants. The fruit is an edible, brightly colored such as usually red, from the pigment lycopene berry, 1-2 cm diameter in wild plants, commonly much larger in cultivated forms. Though it is botanically a berry, a subset of fruit, the Tomato is nutritionally categorized as a vegetable.

And the Tomato is native to South America but growing in temperate climates worldwide. The Tomato begins its colorful and varied history upon the coastal highlands of western South America, where it was being enjoyed by the native peoples for a long time. Evidence supports the theory that from Peru it found its way to Central America where it was domesticated as a little yellow fruit, called 'xitomatl', meaning "plump thing with a navel", and later called 'tomatl' by other Mesoamerican peoples.

Another thing to be noted down here is that Maya and other peoples in the region used the fruit in their cooking, and it was being cultivated in southern

Mexico, and probably in other areas, by the 16th C. It is thought that the Pueblo believed that those who witnessed the ingestion of Tomato seeds were blessed with powers of divination. The large, lumpy Tomato, a mutation from a smoother, smaller fruit, originated and was encouraged in Central America, the direct ancestor of some modern cultivated Tomatoes. Unfortunately, much horticultural knowledge was lost after the arrival of Europeans, as the Roman Catholic Church had a policy of burning pre-Columbian information as pagan.

California is the leading producer of processing Tomatoes in the United States. Indiana, Michigan and Ohio are other major producers. California and Florida are the leading fresh market Tomato producers in the United States. Ohio, Tennessee, Virginia and Georgia produce significant amounts of fresh market Tomatoes as well.

Today it is so beloved that several dozens, if not hundreds, of Tomato varieties can be found in markets throughout the world in any one season. New Tomato varieties are constantly being improved upon to enhance one feature or another, as well as heirloom Tomato seeds saved and kept true over several generations by family farmers and others dedicated to saving rare and historic varieties. One of these varieties is the "Pomme d'Amour" variety, once grown by Thomas Jefferson at Monticello, and still cultivated by the Monticello estate. You can purchase these seeds at Monticello - Plants and Seeds on line store or try one of the other historical and heirloom varieties.

The tomato's medicinal properties had already been endorsed in Continental Europe in the 16th C. and their consumption was believed to benefit the heart among other things, as it contains lycopene, one of the most powerful natural antioxidants which, especially when cooked, has been found to help prevent prostate, lung, stomach, pancreatic, colorectal, esophageal, oral, breast and cervical cancers.

Lycopenes (1753), bioflavonoid closely related to beta carotene, are potent antioxidants present in Tomatoes and seem to be responsible for these natural cancer-fighting properties. Cooking Tomatoes more than doubles the effectiveness of the lycopene they contain, while a small amount of olive oil, such as what you would add in a pizza or Tomato sauce, intensifies the protective effect further.

Numerous other studies have also shown that consuming Tomato products containing lycopene reduces the risk of cardiovascular disease and found that Tomatoes help to dissolve animal fat in butter, cheese, eggs, pork, beef and many deep fried foods, preventing hardening of the arteries, while the high potassium content helps in reducing high blood pressure, a major risk factor for coronary heart diseases and stroke. The plant is a cornucopia of health remedies and, among the Incas of South America and some tribes of Papua New Guinea, the fresh leaf of the Tomato plant (by many considered poisonous), crushed with some water into a poultice, was even applied as an antibiotic to infected areas of the body

Recent research has demonstrated that lycopene is at least twice as effective as b-carotene in protecting blood lymphocytes from NO₂ radical damage. Lycopene also reduces LDL oxidation more effectively than beta-carotene and scientists have found that a combination of lycopene with vitamin E prevents LDL oxidation more effectively than each substance separately. Potassium is also very important for the kidneys as it reduces high blood pressure: one jumbo Tomato (approximately 3 inches in diameter and weighing about 7 oz.) contains nearly 450 mg. of potassium.

On the other hand, comparison to our neighbor country such as China and India of Tomato production, due to the growing price hike of Tomato sauce in 2008, the Tomato planting area worldwide has largely increased. In 2009, the output of Tomatoes for processing in the world has increased by 15.6% year-on-year to 42.317 million tons. In particular, China experienced the largest growth in output of Tomatoes for processing in the world has increased by 15.6% year-on-year to 42.317 million tons. In particular, China experienced the largest growth in output Tomatoes for processing. The output of Tomatoes for processing in China reached 8.65 million tons in 2009, up 35.1% from a year earlier, increasing the proportion to 20.5% in the global total output for processing; while China's output of Tomato products approximated 1.1 million tons.

The global consumption of Tomato products maintains stable growth, and it reached 38.5 million tons in 2009, a slightly increase of 2.4% from a year earlier. The oversupply of Tomato for processing in the world caused the price slump of Tomato products in 2009, resulting in the fluctuation of global Tomato products in

2009, resulting in the fluctuation of global market in the industry. China, as the leading exporter of raw material of tomato products, was inflicted even worse

And Indian average yield of Tomato is 9.6 tons per hectare. Tomato products such as puree, juice, ketchup are commonly used commodities in households, hotels and restaurants. These items are used to enhance the taste of different food products. Tomato puree is used as a substitute of fresh Tomato in cooking consumption of Tomato based products is expected to go up steadily. At present, the market of ketchup/puree, especially in the urban areas, is dominated by brands likes MEGGI and KISSAN. Some Medium and Small Companies are also engaged in its production. Estimated production of Sauce/Ketchup etc. in North India was around 4000 MT in 1995. The estimated demand for the products for the same period was 10000 MT which is expected to grow up to 12000 MT by 2005 AD. Thus presence of a demand supply gap of 6000 MT can be observed which may reach a figure of 8000 MT in 2005 AD. Thus there is ample scope for a unit to come up in this product sector to cater especially to the semi urban and rural sectors of north India. Tomato processing in India is still not very significant. Recently, there was a steady rise in production due to the entry of multinationals with better market infrastructure and sales promotion campaigns. With high fluctuation in market prices of fresh Tomatoes in the urban market, there are good prospects for Tomato juice, and Tomato puree in place of freshes in household sector. Besides the boom in the food service sector including fast food chain, has widened the demand potential for Tomato ketchup and soups. Experiments have shown that advertisement and publicity have influenced the pattern of consumption of Tomato products. Besides, Tomato products have good export potential especially in the Middle East.

Using food as medicine is an ancient tradition in China that dates back to more than three thousand years ago. In China, food therapy is known as Shi Liao. In fact, there are restaurants in China that specialize in serving medicinal foods, which are called, "Yao Shan" (medicated diet). The Tomato has the properties of being sweet, sour, and slightly cold. It builds the yin, strengthens the stomach, promotes digestion, and cleans the liver. It is used in cases of diminished appetite, indigestion, food retention, anorexia, and constipation. Due to its cooling nature and affinity for

the liver, the Tomato relieves liver heat, thus helping to alleviate high blood pressure, red eyes, and headache.

Hippocrates' famous saying holds truer today than ever before in history. The idea of prescribing food is a foreign concept to most healthcare providers, a disappointing fact in view of the rising cost of health care and prescription drugs. The foods regularly offered and consumed devoid of nutrition, full of dyes and chemicals, offering little in the way of bioactive medicinal compounds and even if you walk the aisles of many local health food stores, you will be confronted with refined cereals and organic junk food. The fast paced, time-is-money society of our has precious little time to stop and think about what can be or cannot be found in food. Luckily for us, Tomatoes and their products are some of the world's oldest "fast foods" and can be quickly added to salads, soups and made into a sauce. Research shows that the inclusion of cooked and concentrated Tomato products consumed several times a week decreases incidence of disease providing old world medicine with new world convenience, in a way that would make Hippocrates smile.

The Tomato is now grown world-wide for its edible fruits, with thousands of cultivars having been selected with varying fruit types, and for optimum growth in differing growing conditions. Cultivated Tomatoes vary in size from cherry Tomatoes, about the same 1-2 cm size as the wild Tomato, up to 'beefsteak' Tomatoes 10 cm or more in diameter. The most widely grown commercial Tomatoes tend to be in the 5-6 cm diameter range. Most cultivars produce red fruit, but a number of cultivars with yellow or orange fruit are also available. Tomatoes grown for canning are often elongated, 7-9 cm long and 4-5 cm diameter: these are known as plum Tomatoes.

As in most sectors of agriculture, there is increasing demand in developed countries for organic Tomatoes, as well as heirloom Tomatoes to make up for perceived flavor and texture faults in commercial Tomatoes. Heirloom varieties are increasingly popular, particularly among home gardeners and organic producers, since they tend to produce more interesting and flavorful crops at the possible cost of some disease resistance. Quite a few seed merchants and banks provide a large selection of heirloom seeds, which are often organically produced as well. Hybrid plants remain common, however, since they tend to be heavier producers and

sometimes combine unusual characteristics of heirloom Tomatoes with the ruggedness of conventional commercial Tomatoes.

Tomatoes are commonly classified as determinate or indeterminate - Determinate, or bush, types bear a full crop all at once and top off at a specific height; they are often good choices for container growing. Indeterminate varieties develop into vines that never top off and continue producing until killed by frost.

Most modern Tomato varieties are smooth-surfaced, but older Tomato cultivars (and some modern beefsteaks) often show pronounced ribbing, a feature that may have been common to virtually all pre-Columbian varieties. In addition, Tomatoes come in colors other than red, including yellow, orange, pink, purple and nearly, though such Tomatoes are not widely available in markets.

There is also a considerable gap between commercial and home gardener varieties; home varieties are often bred for flavor to the exclusion of all other qualities, while commercial varieties are bred for such factors as consistent size and shape, disease and pest resistance, and suitability for mechanized picking and shipping. Tomato cultivars also vary widely in their resistance to disease. Modern hybrids focus on improving disease resistance over the heirloom plants. One common Tomato disease is tobacco mosaic virus, and for this reason smoking or use of tobacco products should be avoided around Tomatoes. Various forms of mildew and blight are also common Tomato afflictions, which is why Tomato varieties are usually marked with letters like VFN, which refers to disease resistance to verticillium wilt. fusarium fungus, and nematodes.

2.2 Review of Related Studies

Nepal is an agrarian country with agriculture as the broadest sector of the economy occupying a share of 32.4 percent of the Gross Domestic Product (GDP) in 2007/08. Within agriculture, the sub-sector shares are – food grains (34.9%), cash crops (8.5%), fruits and vegetables (13.6%), other crops (5.3%), livestock (29.8%), forestry (6.6%) and fishery (1.3%). In terms of population, around two-third of the population of Nepal is dependent on this sector for livelihood. However, the sector is performing poorly despite of the potential offered by the agro-climatic pockets that

allow the production of high value crops, many of them, off-seasonally. Up until the early 1960's, Nepal's agricultural productivity was the highest in the South Asian region. It is now one of the lowest (JMA/Winrock, 1997).

Nepal has not been able to harness a large latent potential of the sector. Because of the broadness of the sector, a large proportion of the poverty backlog in the country owes to the poor performance of this sector. A forward looking ambition of this newest Republic will hinge on the development of this sector.

The sector's lackluster performance owes to a host of causal factors. These include – dominance of traditional subsistence type farming, lack of production and marketing infrastructure, gaps and inconsistencies in policies, insecure land tenure, etc. The study looks at the price policy dimension to explore if the policy constraints have affected, and if so, suggest appropriate policy measures that would bring the sector back on the development track.

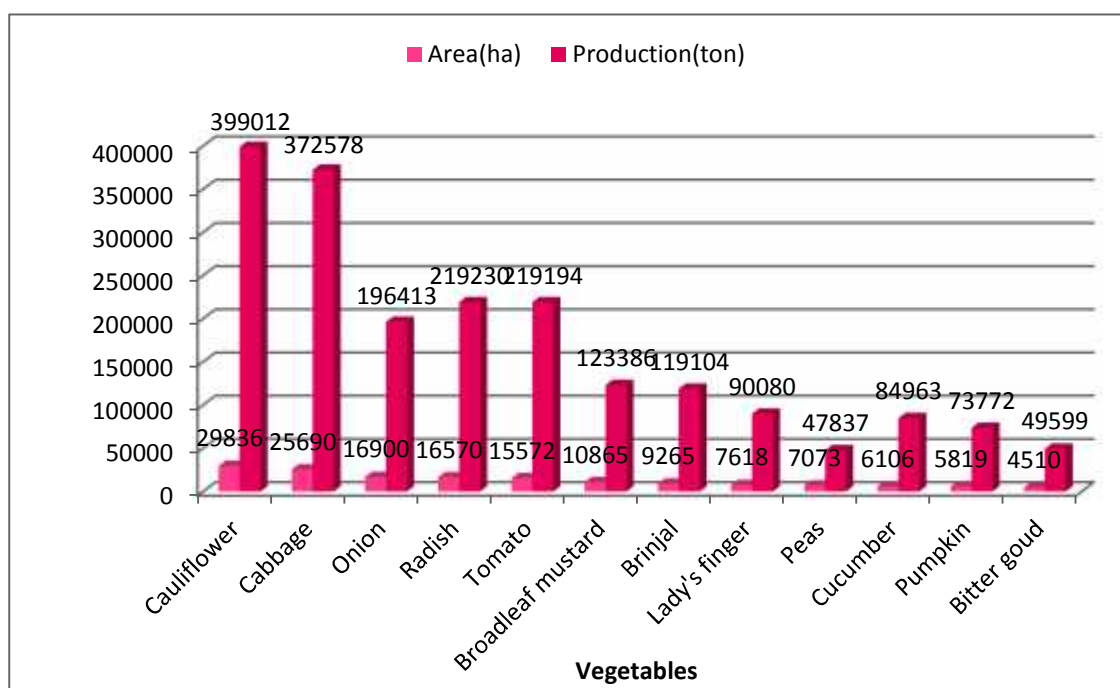
2.2.1 Vegetable Crops in Nepalese Agriculture

Vegetables include a group of specialized crops and are important economically from the health point of view. They are important sources of protein, vitamins, minerals, energy and integral constituents of Nepalese dish. The development of vegetables in Nepal started during early forties (Awasthi, 2007). 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 (Awasthi, 2007). 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

Due to urbanization and changes in food habit the domestic production is no longer fulfilling the increasing demand. Nepal imports 67 percent of vegetable consumption and 85 percent of its fruit consumption (Agriculture Project Services Centre and John Mellor Associates, 1995). Vegetable crops contribute 9.7 percent to AGDP (Ministry of Agriculture & Cooperatives, 2008). In 2008/09 the area and

production of vegetables is recorded to be 2225,154 hectare and 2754,406 ton with yield of 12.2 ton/hectare respectively (Vegetable Development Directorate, 2009). The trend of vegetable production with area is mentioned in table 1. Both area and production are in increasing order, but there is very little increment in yield. 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)

Figure 2.1: Status of Major Vegetable Crops in Terms of Area and Production



Source: Vegetable Development Directorate (2009)

Famous Arthur T. Mosher, in his book "Getting Agriculture Moving" said that the best price policy in a country is not to have the price policy at all. He meant that an ever vibrant forces of market, demand and supply, take care of the prices. General economic literature holds that this will be true in countries and areas where markets are near perfect. In a country like Nepal where markets are heavily distorted through monopolies, monopsonies and cartels; the above theoretical postulations may not work and Nepal may need a prudent price policy to get the agriculture moving in a

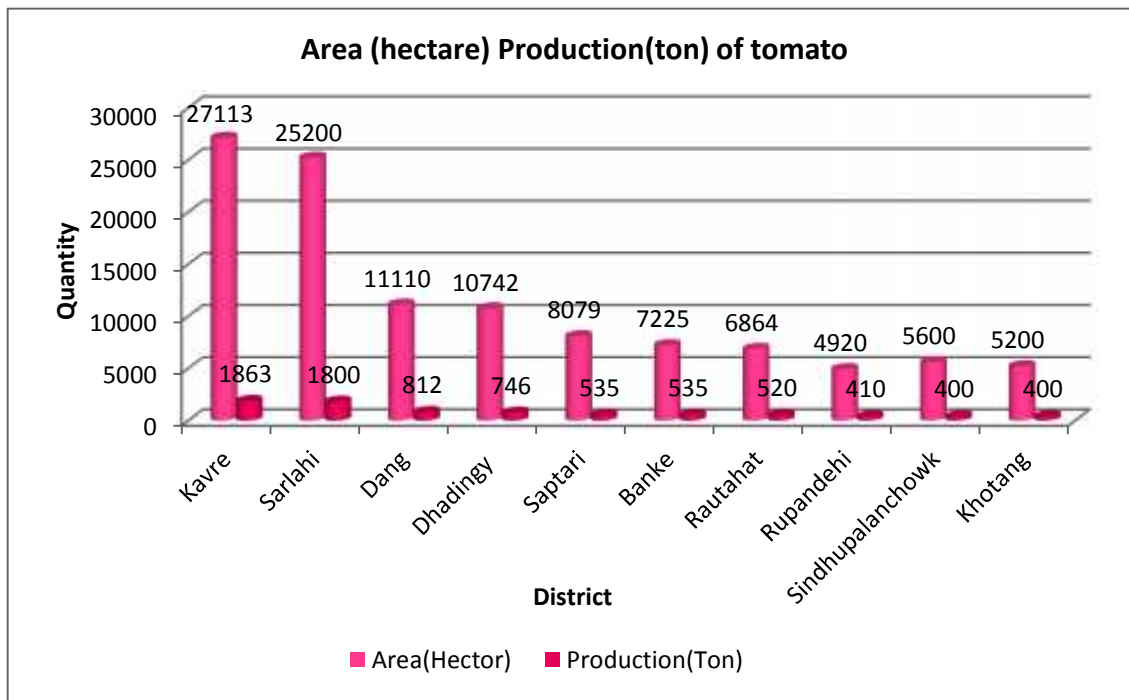
right direction. The policy suggestions to be made in this paper will be based on the analysis of this facet.

The cultivated Tomato (*Lycopersicon esculentum*, Mill) is the most important and widely grown vegetable in the world. It is widely accepted and commonly used in a variety of dishes as raw, cooked or processed products (Lemma, 2002 cited in Weldelessie, 2007). It is reported that it is originated in Peru, Ecuador and Andes range of Bolivia (Singh, 2010a). In Nepal, it is cultivated as winter crop in Terai and Inner Terai whereas in the mid hills of Nepal it can be produced successfully in two growing seasons-spring and rainy. Rainy season Tomato is quite remunerative enterprise to the hill farmers because the supply from the Terai districts is constrained by high temperature, low fruit set and flowering; and bacterial wilt etc (Pandey, et al., 2006). According to Singh (2010a), the most commonly grown areas of Tomato in Nepal are Ishworpur (Sarlahi), Dhalkebar (Dhanusha), Panchakhal Kavre), Namatar, Bajrabarahi and Handikhola (Makawanpur), Lamatar (Lalitpur), Hirapur (Mahottari), Harre (Surkhet). According to the Vegetable Development Directorate (2009), the area under Tomato is estimated to be 15, 572 hectare with a total production of 219,194 tons in the year 2008/09. If we compare Tomato crops with total vegetables in terms of area and production we will find that Tomato has constituted 7 percent in area and 8 percent in total production of vegetables. Tomato comes in fourth and fifth position in terms of production and acreage (figure 1). The major Tomato growing districts with area and production are presented in figure 2 where one can see that Kavre and Sarlahi districts rank first and second both in area and production, respectively.

Table 2.1 Area (Hector) and Production (ton) of Tomato in Different District

| Districts | Area(He.) | Production(Ton) |
|-----------------|-----------|-----------------|
| Kavre | 1863 | 27113 |
| Sarlahi | 1800 | 25200 |
| Dang | 812 | 11110 |
| Dhading | 746 | 10742 |
| Saptari | 535 | 8079 |
| Banke | 535 | 7225 |
| Rautahat | 520 | 6864 |
| Rupandehi | 410 | 4920 |
| Sindhupalancowk | 400 | 5600 |
| Khotang | 400 | 5200 |
| Morang | 400 | 4800 |
| Total | 8421 | 116853 |

Figure 2.2: Area (Hector) and Production (ton) of Tomato in Different Districts



According to the Khabar National Economy Daily, 2013, There have been some signs of changes in agriculture sector of Nepal in the past few years. Some youths are going abroad in lack of opportunities for income and jobs while others are trying to reap benefits from the opportunities in the country. Increasing involvement of the youths in commercial farming of vegetables must be mentioned while talking about those making efforts to capitalize on such opportunities. Land used for vegetable farming increased by 1,355 hectares to 246,392 hectares in the fiscal year 2069/70 with production rising by 2,868 tons to 33,000 tons, according to the Vegetable Development Directorate under the Department of Agriculture. Attraction of youths toward both seasonal and non-seasonal vegetables is rising now while the market is also expanding. Youths are now starting commercial farming of green vegetables by bringing in new technologies and methods. Commercial vegetable farming is growing in the rural areas of Kathmandu and surrounding Kavre and Dhading. Vegetables produced have also got the market and the farmers are also earning well. This trend is rising even outside Kathmandu Valley. Farmers in a few districts are even earning hundreds of thousands through riverbed farming.

But the middlemen still dominate vegetable market which means the farmers are not getting the right price for their products. The farmers, who have failed to establish direct relation with the market, are being cheated. Import of green vegetables is rising every year even though the government report is showing an increase in the area of land used for vegetable farming. Vegetables worth Rs 5.32 billion have been imported in the first 10 months of the current fiscal year, according to the Nepal Rastra Bank (NRB). Data shows that domestic production is meeting just 60 percent of the total demand for vegetables. This shows that proper inter-relation among production, consumption and market has not been established. Domestic production can meet the demand if the products were to get proper access to the market, farmers are provided better seeds, fertilizers and skills, and access to agricultural loans is increased. This can also help improve the income level of farmers.

There is a sort of revolution in production of Tomato in recent times. While Tomato has been produced in Kavre, Sarlahi, Dhanusha, Mahottari, Makwanpur, Surkhet and other districts, it is now commercially produced even in Kathmandu Valley. Attraction for farmers toward Tomato is increasing as Sirjana and Samjhana

strains developed by agricultural scientist Dr Kedar Budhathoki while at the Nepal Agricultural Research Council (NARC) can be cultivated in tunnels, and can provide yield across the year. Tomato farming has also brought about a massive change in the financial state of farmers. The number of farmers doing Tomato farming by leasing other's land has increased now after Budhathoki showed that up to 22 kilograms of Tomatoes can be produced in a single plant inside plastic tunnels. Over 10,000 families are estimated to be involved in tunnel farming of non-seasonal vegetables in the Valley. Farmers state that Tomato production has doubled in comparison to the last year when it had fallen. Over-production obviously has affected the market price. But the farmers have dumped around seven tons of Tomatoes on the road protesting lack of fair price. They demand that they be allowed to export Tomato. We should not take the demand to be allowed to export when production is more than domestic demand otherwise. The government must address the demand of farmers to remove the quarantine hassles while exporting to India. Farmers should also seriously think about the suggestion of government officials that they should pick raw Tomatoes and send to the market to Tomato sauce, Tomato juice and other products can also solve the current problem.

2.3 Summary of Review

There have been conducted many researches about agriculture in the world and Nepal too. Likewise many studies have been conducted about Tomato farming in Terai belt of Nepal. But there is no any research in our study area about Tomato production. Therefore we select this area for registering the first record of Tomato farming in Rajghat VDC of Sarlahi District.

Tomato is one of most important profitable vegetable commodities to small holding farmers. Conventional farming relies on chemical pesticides and fertilizer, which has horrendous negative effects where as organic farming relies on organic outputs. Per capita consumption of the agro-chemical by farmers is low. Due to ever increasing price of the importing chemical fertilizers, pesticides, their timely unavailability and the poor quality, farmers are compelled to move towards organic production.

Households survey would be conducted in 65 households of Rajghat VDC of Sarlahi District. The sample size would be taken from each wards N: 1 to 9 of households members of Rajghat DVC ^S farmers. In the research are: 65 people would be formed where each ward would be consisting about 7 members and researcher fund that all Cooperatives would be wanted to establish for sustainability of finance, production and marketing of commercial Tomato in future.

The farmers are 65 households where each member of each wards would be major responsible due to district involvement in research activities implementation. Other relevant stakeholders are traders, consumers and so on.

The major outputs of this research is analyzing the Tomato production system and find out the use of suitable varieties of bio-pesticides control measures of pest and fertilizers would be verified.

Proper management of the local resources is demanding for better production. Thus, the objective of the research is to verify and disseminate the participatory organic oriented and commercial Tomato production technologies. Organic production largely avoids use of inorganic fertilizers and pesticides, but organic production relying on organic manures, compost, FYM, green manure, bio-fertilizers and biological pest control a measure which contributions in human health, environment and socio-economic improvement.

The researcher fund that farmers would minimize and try to make chemical free Tomato production through integrated and organic management of the local inputs for the enlistment of farmers' socio-economic condition. The result would be disseminated through demonstration of technologies and organic farmers' group discussions, stakeholders meeting and through local as well as national media (TV, FM, news paper) and publication of booklets, brochure, pictorial posters and pamphlets in local language during the reseach period.

After viewed above literature reviews researcher understood, there have been many studies on Tomato production in the world and Nepal too. Some of them researcher have taken here in my study (thesis) for literature review. Many of them are based on productivity and production. They have tried to show production

system and role of use bio-pesticide on land productivity, crops production, poverty reduction and increasing in living standard of farmer. They have also discussed about marketing strategy how the marketing system is conducted from past to present. Here my study also tries to expose productivity and production of land and crops cause of new methods of farming system. But different from them my research is striving to explore how the crops diversification is, how they are stored the Tomato, which are the main sources of money for Tomato instalment, what they want for improvement on traditional farming system and they are satisfied or not from the existing modern agricultural system. Hence, this study find out the significance, impact on agriculture output by using chemical fertilizers or bio-pesticide of Tomato production system on study area.

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Design

Research design is the most important part of the study. The research study would be descriptive as well as exploratory approach. It is exploratory because the study aims at exploring the participation of women farmer, use of bio-pesticides and households income through tomato farming in Rajghat vdc of Sarlahi district.

The study is specially designed to examine the Tomato production of Rajghat vdc of Sarlahi district. It also attempts to analyze the problems and prospects of Tomato farming. Both qualitative and quantitative data would be collected. The socio-economic condition of farmers would be examined.

3.2 Rationale for Selection of Study Area

Rajghat VDC is comparatively the remote V.D.C of Sarlahi district and which is comparatively marginalized than other vdc. Though this VDC is arable and there is good facility of canal irrigation system also and the government has declaration to the Sarlahi district as pocket area for Tomato farming program. In Nepal Sarlahi district has taken second position on Tomato farming. Though it is arable, irrigated and second position in Tomato farming but there is only few project and program on organic Tomato farming by government, NGOs/INGOs and other related institutions. Organic Tomato farming; especially Tomato farming is highly accepted from villagers but it has not been studied its significance and socio economic impact so this title would select for the study.

3.3 Nature and Source of Data

Both qualitative and quantitative data would use in this study. Qualitative data would use to analyze the situation and quantitative data help to project the fact in number. In the same way both primary and secondary sources of data would use in this study which are as follows:

Primary Data were collected through field visit with different techniques such as focus group discussion and household questionnaire. Information related to Tomato production system of Tomato farming and it's use of chemical fertilizer or bio- pesticide of Tomato farming was collected through extensive field survey carried out between 2071/ 06/ 01 to 2071/ 07/ 15.

Secondary Data were collected from the journals, books, articles, newspaper, unpublished reports and documents, VDCs office and ministry of Agriculture, Government of Nepal.

3.4 Sampling Procedure

The study has only covered Rajghat VDC of Sarlahi district where 250 households (Field survey, 2071) are engaging in organic Tomato farming and among them 65 HHs has been selected as sample, which is approximately 25% of the total population. The sampled HHs were selected from each ward of the VDC. The samples HHs were chosen by baseline survey sampling.

At the beginning observation was done in the whole VDC and the household having organic Tomato farming were recorded .After preparing the list of the household in each ward, 25% household were selected. A total of 250 households were recorded during the observation. Among them 65 households were selected by using lottery method. The sampling framework is presented in the table below:

Table 3.1: Distribution of Tomato Production Having Household of the Study Area-2013

| Ward no | Total Tomato farming HHs | Sampled Household | % of sample household |
|---------|--------------------------|-------------------|-----------------------|
| 1 | 23 | 6 | 9.8 |
| 2 | 26 | 7 | 11.5 |
| 3 | 26 | 7 | 11.5 |
| 4 | 25 | 6 | 9.8 |
| 5 | 26 | 7 | 11.5 |
| 6 | 23 | 6 | 9.8 |
| 7 | 27 | 7 | 11.5 |
| 8 | 46 | 12 | 18.5 |
| 9 | 28 | 7 | 11.5 |
| 9 | 250 | 65 | 100 |

3.5 Tools and Techniques of Data Collection

There were many tools and techniques for data collection. Here in this study I have taken some tools and techniques that have been helpful for data collection. The tools and techniques for data collection in this study are as follows:

3.5.1 Household Survey

Structured questionnaire was prepared to collect necessary information by doing interview in selected households. The questions were filled up by taking interview with the household head or member of households to collect the required information on Tomato production system in Sarlahi VDC.

3.5.2 Focus Group Discussion

Focus group discussion is an important way to find out the actual picture of socio-economic impact of Tomato farming on agriculture. At first a group was formed comprising of village leaders, women activist, fight activist, teacher representative from Tomato farming household. This discussion has been very useful, not only in

measuring Tomato production system of Tomato farming but would also be helpful for the future projects on Tomato farming.

3.5.3 Observation

Socio-economic status such as health, education, food availability, animal possession and other socio-economic characteristics as housing, drinking water facility etc. has been considered through direct observation on field visit. The data were recorded while interviewing the households, doing focus group discussion and key informant interview.

3.5.4 Processing and Analysis of Data

After finishing the field survey, the collected data were first edited and coded and number was entered in computer, with the help of Microsoft Word and Excel, data were processed. The collected data analyzed by using simple statistical tools such as percentage, table, graph etc. charts and map have also been used to clear presentation of the findings. The quantitative data were analyzed using simple statistical tools such as percentage, average where as qualitative data have been analyzed through analyzing.

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

4.1.1 Population

The total number of households of the Rajghat VDC was 2040 and total population was 10186. Out of total population male number was 4866.k and female number was 5320 (CBS, 2011). The average household size in the VDC is 5.2 which is higher than the national average (4.3). The population density of the VDC is higher than national size and less than the Sarlahi district household size.

4.1.2 Age and Sex Composition

Age and sex composition are the basic demographic characteristics, which play vital role in the population analysis because those matters directly influence the incidence of birth, marriage and deaths. On the basis of economic activity, population distribution of sampled households has been classified into three age groups the age and sex composition is given in table.

Table 4.1: Sample Population Distribution by Age and Sex

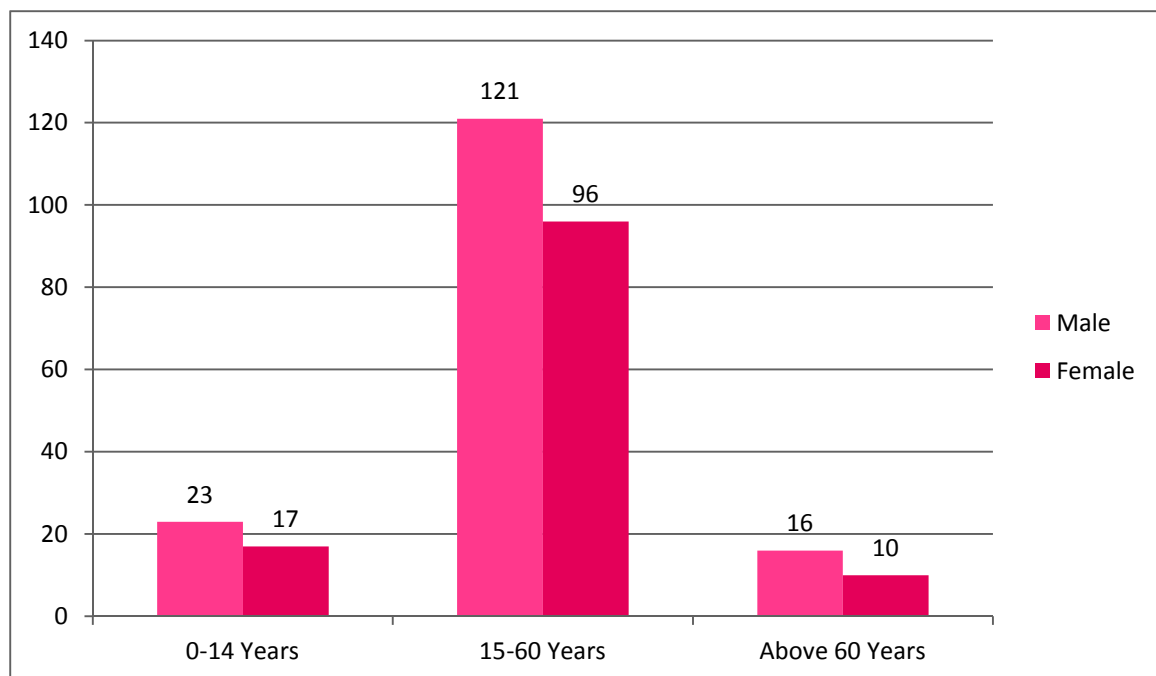
| Age Group | Male | | Female | | Total | |
|----------------|--------|---------|--------|---------|--------|---------|
| | Number | Percent | Number | Percent | Number | Percent |
| 0- 14 years | 23 | 14.38 | 17 | 13.8 | 40 | 14.13 |
| 15-60 years | 121 | 75.62 | 96 | 78.1 | 217 | 76.68 |
| Above 60 years | 16 | 10.00 | 10 | 8.1 | 26 | 9.19 |
| Total | 160 | 100.00 | 123 | 100.00 | 283 | 100.00 |

Source: Field Survey, 2013

Generally the age group of economically active man power is considered to be 15-60 years. Thus, the percentages of economically active population (working population) are estimated to be about 76.68 percent and the rest 24.38 percent of the population are dependent. Out of total population 75.62 percent males and 78.05 percent females are economically active population (table 4.1).

People below 15 years and above 60 years fall under dependent population. But in this area, due to rural agro-based economy, they are involved in various types of household works such as cattle rearing, looking after children, water collecting, cooking, grass cutting, wood collecting, poultry etc. Among the dependent population 14.38 percent are the children i.e. below 15 years and 9.19 percentage of old age group i.e. above 60 years. Here percentage of old age group is little small than below 15 years age group. It shows the birth rate per family is decreased and life expectancy is little increasing in the study area due to increased income, education excess to health facility etc.

Figure 4.1: Sample Population Distribution by Age and Sex



4.1.3 Occupation

Almost the entire population of the study area is more or less related with agriculture either as a primary or secondary occupation and agriculture is a living way of life. On the primary and secondary occupation, the economically active population (10-60 yrs) can be divided into five different categories such as agriculture, service, business, households and others. The occupational structures of economically active population of Tomato farming households are presented in following table.

Table 4.2: Occupational Distribution of Above 10 Years

| Occupations | Primary Occupation | | Secondary Occupation | |
|-------------|--------------------|-------------|----------------------|-------------|
| | Number | Percent (%) | Number | Percent (%) |
| Agriculture | 125 | 47.35 | 111 | 42.04 |
| Services | 24 | 9.09 | 03 | 1.14 |
| Business | 19 | 7.20 | 11 | 4.17 |
| Households | 66 | 25.00 | 96 | 36.36 |
| Others | 30 | 11.36 | 43 | 16.29 |
| Total | 264 | 100.00 | 264 | 100.00 |

Source: Field Survey, 2014

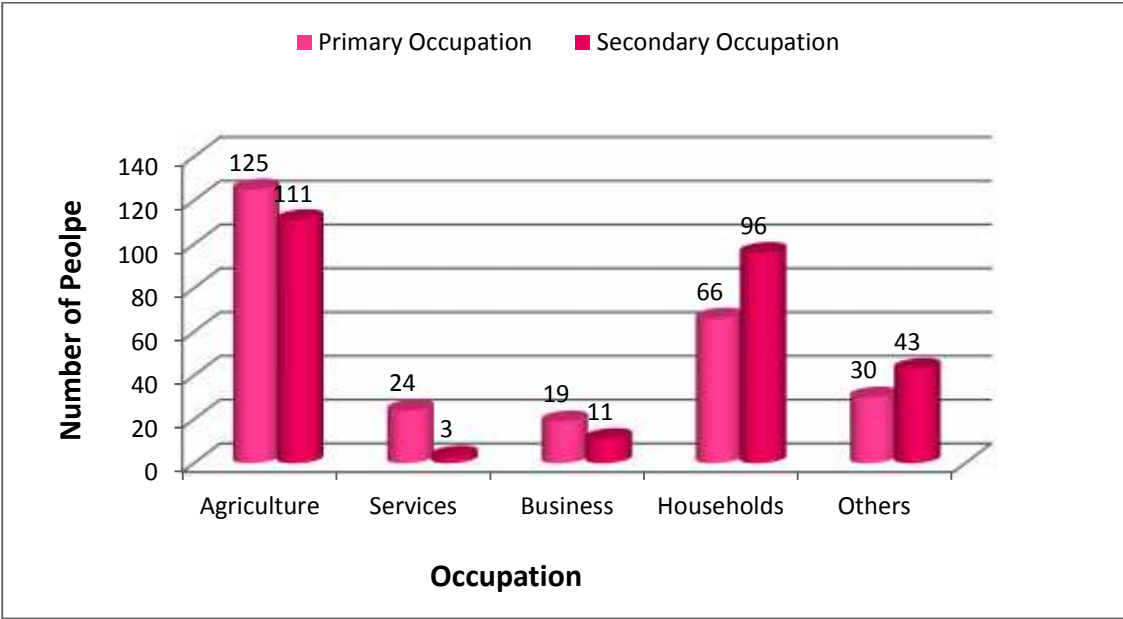
The above table shows that, out of total economically active population 47.35 percent people are adopted in agriculture as a primary occupation and 42.04 percent are adopted as secondary occupation. It shows that most people are engaged in agriculture primarily or secondarily. Its main cause is irrigation facility. In secondary occupation also agriculture has been main occupation because people return from any where such as business, services, abroad, etc. they have involved themselves in agriculture. It is cause irrigation facility which has given them the opportunity of crops diversity and crop density.

After agriculture most people are engaged in rest occupations as: in primary households (25.00%), others (11.36%), services (9.09%) and business (7.20%), like that in secondary occupation households (36.36%), others (16.29%), business (4.17%) and services (1.14%).

Primary and secondary in both sides, household has been second occupation because in Rajghat VDC (we can say all in Nepal) most female are engaged themselves in household works than others. Household occupation involves the economic and non economic activities like cattle rearing poultry, kitchen works, child bearing, livestock, vegetable farming around house and other works done in house. Other occupations have been third in both sides (pri 11.36%/ sec 16.29%). Population is increasing in other activities like pottering, tailoring, masonry, garmenting, daily laboring, foreign laboring, etc.

People’s participation in services and business is weak in both sides but increasing slowly. Because of irrigation facility agriculture works has been fixed as time table, it is not necessary to wait rainfall. So few works, people can and all year round works concept has been flowered in farmers mind. Then their whole family member is not being engaged in agricultural works only. Most people are engaged in agricultural occupation both primarily and secondarily, but its percent is less than national average 73.9% (CBS, 2011). So we can conclude that most people are engaged in agriculture, but it is decreasing even though the irrigation facility is available. Because of their concept “few works, few people and all year round work” only few people are trying to engage in agriculture for all year work, whereas other are being engaged in other works like business, services, foreign laboring etc.

Figure 4.2: Occupational Distribution above 10 Years



4.2 Tomato Production System in the Study Area

Tomato cultivation in Nepal is done mostly by traditional methods. The major components in production of Tomato include Input costs, labour cost and land preparation cost. Transport cost is also incorporated in production cost as farmers usually have to take their produce upto road-head. The cost of production is calculated on the basis of interview and focus group discussion made with farmers from Rampur, Tekani, Khalte, Sorghare and Laxmipur Tol of Rajghat VDC.

Table 4.3: Cost of Production of Tomato (Local Average)

| S N | Descriptions | Qty | Unit | Rate (Rs) | Total (Rs) |
|----------|----------------------------------|--------|-----------|-----------|----------------|
| A | Land Renting | 20 | Gaththa | 1000 | 20,000 |
| B | Inputs | | | | |
| 1 | Seed | 14 | package | 350 | 4900 |
| 2 | Manure/Fertilizer | 600 | doko/sack | | 15000 |
| 3 | Pesticide use | 260 | litre | 550 | 143000 |
| | Total (Production Input) | | | | 182,900 |
| C | Labour | | | | |
| 1 | Land preparation | 40 | man-days | 200 | 8000 |
| 2 | Ploughing | 2 hour | Tractor | 1000 | 2000 |
| 3 | Labour for FYM application | 40 | man-days | 200 | 8000 |
| 4 | Mulch collection | 40 | man-days | 200 | 8000 |
| 5 | Plantation | 40 | man-days | 200 | 8000 |
| 6 | Weeding | 60 | man-days | 200 | 12000 |
| 7 | Crop harvesting | 80 | man-days | 200 | 16000 |
| 8 | Cleaning | 40 | man-days | 200 | 8000 |
| | Total (Production Labour) | | | | 70,000 |
| D | Transportation cost | 12.5 | per tone | 1000 | 12,500 |
| | Grand total cost | | | | 285400 |

Source: Field Survey, 2014

Inputs Cost: As the cultivation practice is traditional, farmers usually use inputs that are locally available. The cost of machineries (plough, spade, sickle etc) for cultivation is very nominal. Similarly, home-made organic manure (Farm yard manure and Compost) is mostly used rather than chemical fertilizers. The use of improved seed is also very rare and most of farmers are using locally available seed varieties. Pesticides are used during seed treatment in some production pockets but there is slightly practice of Bio pesticide use in Tomato

In Tomato cultivation, the major part of the cost goes in seed with 46% of the total production cost. Usually, seed are being produced by farmers themselves and

keep for next season plantation. Farmers keep 20 to 25 % of their production as a purpose of seed. New growers purchase seeds from neighbouring farmers or from local market. In some cases, the seeds are brought from other areas for better productivity. The cost of seed is usually higher than the fresh Tomato.

Among the other inputs manure/fertilizer incur 4% of total cost of production. The use of organic manure is more common. The farmers of eastern region mainly study area uses chemical fertilizer but in less quantity whereas farmers from Rajghat mostly do not use any sort of chemical fertilizers.

Labour Cost: Tomato farming in Nepal is very labour intensive. Hence, the share of labour cost in total cost of production is around 35%. Labour is mainly used for land preparation, ploughing, plantation, FYM/fertilizer application, mulch collection and application, weeding, harvesting and post harvest handling activities. During ploughing, farmers usually use Tractor. The cost of tractor charges per hour is normally Rs. 1000. Mulch collection is done from surrounding area, farm or nearby forest and the cost mainly includes labour cost of transporting and laying it in field. In the post harvest handling, the Tomato is separated from the stem and collecting from farm. There is absence of storing and grading practice at farmers' level.

In most of the cases, the family members are involved in providing the labour. Use of outside labour is mostly done by farmers with medium and big farms. Normally, the service charge of labour per day ranges from Rs. 150 to Rs. 250 depending upon the area. Due to aggressive seasonal migration of labourers to overseas work, it is becoming scarce day by day.

Transportation Cost: This cost includes transportation of the product to local market or up to road-head where traders are located. The transportation is usually carried out by farmers themselves in backload.

Land renting Cost: Normally, farmers cultivate Tomato in their own land. If they have to rent the land, the cost would vary from places to places. The average land renting cost estimated is around Rs. 1000/gaththa and is included in the production cost.

4.2.1 Selection of Land

Land is very important natural resources for practicing agriculture. It is also the most important factor for employment and income generation. Due to the failure of land reform program, land is unequally distributed in the rural areas. The average size of agricultural land holding in Nepal was reported to be 1.08 hectares (CBS, 2002).

The size of land holding almost in the study area is unequally distributed. The sample households are divided into three classes according to their size of land holding. Small farmers are those who have own land up to one bigha (20 kattha), medium farmers are those who have own land between one-three bigha and those who have own land above three bigha comes under large farmers.

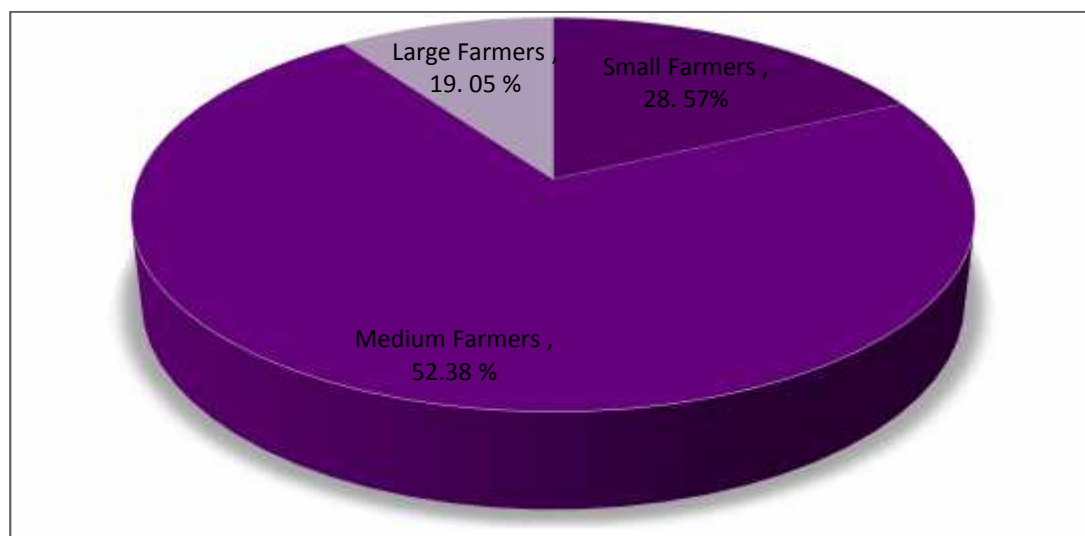
Table 4.4: Distribution of Sample Households by Size of Land

| Category of Farmers | Numbers | Percentage (%) |
|-----------------------------------|---------|----------------|
| Small Farmers (Up to One Bigha) | 11 | 16.92 |
| Medium Farmers (One-Three Bigha) | 45 | 69.23 |
| Large Farmers (Above Three Bigha) | 9 | 13.84 |
| Total | 65 | 100.00 |

Source: Field Survey, 2015.

In the study area, 16.92 percent of the households are small farmers, 69.23 percent households are medium farmers and 13.84 percent are large farmers. It shows that the medium class farmers are in large numbers in the study area. The total sample land holding is 134.5 bigha (2690 kattha). The average size of the land holding per households of the study area is 2.205 bigha (44.1 kattha)..

Figure 4.3: Distribution of Sample Households by Size of Land



4.2.2 Irrigation Management

Rainfall amounts are often erratic during the growing season, and Tomatoes are often grown in sandy soils with low water holding capacity. This combination of factors makes supplemental irrigation necessary for commercial Tomato production. Quality of irrigated Tomatoes is also much better. Irrigation eliminates disastrous crop losses resulting from severe drought.

Tomatoes are potentially deep rooted, with significant root densities up to 4 feet deep. In Rajghat soils, however, the effective rooting depth is generally much less. Actual root depths vary considerably depending upon soil conditions and cultural practices. The effective rooting depth is usually 12 to 18 inches with half of the roots in the top 6 inches. It is important not to allow these roots to dry out or root damage would occur.

Moisture stress in Tomatoes causes shedding of flowers and young fruit, sun scalding and dry rot of fruit. The most critical stages for watering are at transplanting, flowering and fruit development.

Several types of irrigation may be used successfully on Tomatoes in the study area. Ultimately, the type chosen would depend on one or more of the following factors:

-) Availability of existing equipment
-) Field shape and size
-) Amount and quality of water available
-) Labor requirements
-) Fuel requirements
-) Cos

i) Sprinkler Irrigation:-

These systems include center pivot, linear move, traveling gun, permanent set and portable aluminum pipe with sprinklers. Any of these systems are satisfactory if they are used correctly. There are, however, significant differences in initial cost, fuel cost and labor requirements.

Any sprinkler system used on Tomatoes should be able to deliver at least an inch of water every 4 days. In addition, the system should apply the water slowly enough to prevent run-off.

ii) Drip Irrigation: Drip irrigation has become the standard practice for Tomato production. Although it can be used with or without plastic mulch, its use is highly recommended with plastic mulch culture. One of the major advantages of drip irrigation is its water use efficiency.

Water used in a drip irrigation system should be well filtered to remove any particulate matter that might plug the tubing. Test the water for minerals that could precipitate and cause plugging problems.

iii) Scheduling Irrigation: Once a root system is established, maintain soil moisture to the 12-inch depth. The sandier soil in Rajghat has an available water holding capacity of about 1 inch per foot of soil depth. Drip irrigation systems need to be operated more frequently than sprinkler systems. Typically, they are operated every day or every other day. Do not saturate the soil with water, especially when using plastic mulch. Plastic mulch would tend to keep the soil from drying out and Tomatoes grow poorly in waterlogged soil.

4.2.3 Seed Selection

In the study area has different kinds of occupation but most of them are totally involve in agriculture sector. Although some are also engage in government and private sector in jobs even they partially contribute to develop increase product in farm. Thus nowadays people are very aware about the seed choosing they know well which the best of cultivation is farming due to the farmers view the largest amount of utilized seeds are presented in this table here below:-

Table 4.5: The Use of Seeds in Current Condition

| Cash Crops | Cropping land (kaththa) | Total used Seed (kg) | | | Plaguin g Tools | Harvesting Tools |
|-------------------|-------------------------|----------------------|----------|-----------------|--|------------------|
| | | Local | Improved | Amount | | |
| 1.Tomato | 310 | 0.5 | 7.5 | 63,000 | Halo, Power Tiller, Tractor etc. Kuto, Kodalo, Rope, Plastic, Hasiya, Kachiya, Hajari, Baskets etc. | |
| 2.Maize | 2362 | | 1181 | 6,64,312.5 | | |
| 3.Oil Seed | 443 | 240 | 42.9 | 23,235 | | |
| 4. Potato | 403 | | 20150 | 10,07,500 | | |
| 5.Sugercane | 975 | 3412.5 qntl | | 16,31,175 | | |
| 6.Sweet Potato | 44 | 4400 | | 2,20,000 | | |
| 7.Ginger | 53 | 2120 | | 2,12,000 | | |
| 8.Turmeric | 89 | 3560 | | 46,280 | | |
| 9.Cauliflowe r | 295 | | 7.38 | 88,560 | | |
| Total | 4974 | 13733 | 21381.45 | 39,56,062. 5 | | |

The table shows that, the coverage percent land by crops as maize 2362 kattha (47.48%), sugarcane 975 kattha (19.6%), oil seed 443 kattha (8.9%), potato 403 kattha (8.1%), Tomato 310 Kattha (6.23%), cauliflower 295 kattha (5.93%), turmeric 89 kattha (1.78%) ginger 53 kattha (1.06%) and sweet potato 44 kattha (0.88%). According to the table the largest number of land use by maize cultivation and small scale of land use by sweet potato.

Nowadays, people can use two types of seeds are local and hybrid and in this case study we can find 13733 kg (39.11%) used local seed and 21381.4 kg (60.89%) used by hybrid seed. According to the table, farmers are more attractive in hybrid seeds due to irrigation facility and it also gives large amount of product in comprising to local seeds.

4.2.4 Labor Management

According to survey of Rajghat VDC farmers reported that the Tomato has significant contribution in the household income of farmers. According to them, Tomato contributes up to 30% of family income for those who have been cultivating Tomato for commercial purpose.

Traditionally, Tomato farming and storing occurs at the farm level, the sector is very labour intensive. By promoting the export of processed products, as well as the infrastructure necessary for processing, this sector could generate large opportunities for employment. In the case of study area there are used to local manpower. And employment is also generated for post harvest handling, processing and marketing activities. Usually, the local traders employ 2-3 staffs where as the national level trader employs higher number of staffs. Labour is also used extensively for the weighing, packaging, load/unload and storage purposes. For 1 household of Tomato farming estimated labour required are 6 people (Field Survey report). At Rajghat, nearly 147 man days employment generated from a single trader during season. Similarly, there is huge demand of labourers for Tomato processing and it is used as for soup, salad, pickles, ketchup, puree, sauces and in many others ways. Therefore I mention here some important part of labor management and these are here below:-

i) Women Participation in Tinger Farming

Women play an important role in the production of Tomato. However, their involvement in market activity (especially in cash transactions) is very limited. They participate in plantation, weeding, harvesting and post-harvesting handling activities. In the study area, women are also employed to exporters for Collecting, Packaging and grading job. Similarly, there is dominancy of women participation in the value

addition enterprises such as Pickle and for product development activities in local level.

ii) Participation of Disadvantaged Groups (DAGs) and Poor

Tomato cultivation has become an attractive crop for poor farmers as the Tomato has comparatively high value and greater scope of trading. Traders (local to exporter) mostly use the poor and DAGs as labourer for Collecting, grading, packaging, loading and unloading activities.

iii) Labour Cost

Tomato farming in Rajghat is very labour intensive. Hence, the share of labour cost in total cost of production is around 35%. Labour is mainly used for land preparation, ploughing, plantation, Fertilizer application, mulch collection and application, weeding, harvesting and post harvest handling activities. During ploughing, farmers usually use bullocks. If the farmers do not have own bullocks or have shortage of it, they usually hire bullocks from others. The cost of a pair of bullock per day is normally Rs. 500. Mulch collection is done from surrounding area, farm or nearby forest and the cost mainly includes labour cost of transporting and laying it in field. In the post harvest handling, the Tomato has to be making separated packaging from the collecting areas. There is absence of collecting and grading practice at farmers' level.

In most of the cases, the family members are involved in providing the labour. Use of outside labour is mostly done by farmers with medium and big farms. Normally, the service charge of labour per day ranges from Rs. 250 to Rs. 400 depending upon the area. Due to aggressive seasonal migration of labourers to overseas work, it is becoming scarce day by day.

4.2.5 Plantation

- J) First of all, for planting seeds, farmers have to start their seeds indoor 6 to 8 weeks before the average.

- J Select a site with full sun and well-drained soil. It is very important that farmer's site receives at least 6 hours of sun. The light afternoon shade would help Tomatoes survive and thrive.
- J Two weeks before transplanting seedlings outdoors, till soil to about 1 foot and mix in aged manure, compost, or fertilizer.
- J Harden off transplants for a week before moving outdoors.
- J Transplant after last spring frost when the soil is warm.
- J Establish stakes or cages in the soil at the time of planting. Staking keeps developing fruit off the ground, while caging let's the plant hold itself upright. Some sort of support system is recommended, but sprawling can also produce fine crops if you have the space, and if the weather cooperates.
- J Plant seedlings two feet apart.
- J Pinch off a few of the lower branches on transplants, and plant the root ball deep enough so that the remaining lowest leaves are just above the surface of the soil.
- J Water well to reduce shock to the roots.

After do it Farmers have to Care Their Plant according to it:

- J Water generously for the first few days.
- J Water well throughout growing season, about 2 inches per week during the summer. Keep watering consistent!
- J Mulch five weeks after transplanting to retain moisture.
- J To help Tomatoes through periods of drought, find some flat rocks and place one next to each plant. The rocks pull up water from under the ground and keep it from evaporating into the atmosphere.
- J Fertilize two weeks prior to first picking and again two weeks after first picking.
- J If using stakes, prune plants by pinching off suckers so that only a couple stems are growing per stake.
- J Practice crop rotation from year to year to prevent diseases that may have overwintered.

4.2.6 Weed Control

In the study Area Effective weed management is one of many critical components of successful Tomato production. Weeds compete with Tomato plants for light, nutrients, water and space as well as interfere with harvesting practices. Additionally, weeds can harbor deleterious insects and diseases. If weeds are left uncontrolled, severe infestations can reduce yield at least 50 percent even when Tomatoes are produced on plasticulture.

Weeds that usually cause problems in Tomatoes are summer annual weeds including yellow and purple nutsedge, morningglory, purslane species, nightshade, pigweeds and annual grasses.

One of the most effective tools for suppressing weeds in Tomatoes is a healthy, vigorous crop. Good crop management practices that result in rapid Tomato canopy development help minimize the effects of weeds.

Weeds can be controlled effectively through cultural practices that result in rapid Tomato canopy establishment thus providing an undesirable environment for weed growth. Cultural practices may include the following:

- (1) Plant seeds or transplants free of weeds
- (2) Plant healthy and vigorously growing plants
- (3) Good seedbed preparation
- (4) Proper fertilization and watering
- (5) Follow recommended row spacing
- (6) Manage diseases and insects.

Site selection also can play a significant role in weed management. Rotation away from fields infested with troublesome weeds such as nutsedge may minimize the presence of these weeds and allow the use of alternative crops and control methods. Additionally, to prevent the spread of weeds from field to field during harvest, clean equipment and personnel when moving from heavily infested areas. This precaution can be of significant consequence in preventing or minimizing the introduction of new weed species into “clean areas.”

Mechanical control methods include field preparation by plowing or discing, cultivating, mowing, hoeing and hand pulling of weeds. Most of Hybrid's Tomatoes are produced on mulch, limiting the practicality of most mechanical control methods. Of course, hoeing and hand pulling of weeds are quite common.

For those growers producing Tomatoes on bare ground, mechanical control practices such as cultivation and primary tillage are very beneficial for managing weeds

4.2.7 Harvesting

The harvesting operation varies somewhat among growers. Mature-green harvested Tomatoes are placed into polyethylene picking buckets that are carried to a flatbed trailer where the fruit is dumped into plastic bulk bins. Each bin holds between 40 and 50 kg of fresh fruit, and the trailer is positioned in the field so pickers only have to walk a minimal distance to reach a bin. Once all bins are loaded, they are transported to a centralized packinghouse where the fruit is washed, sized and packed out. Some growers avoid use of bulk bins because of potential damage to the fruit and field pack Tomatoes into boxes. Some growers also combine the two approaches, with field packing of "pinks" (Tomatoes that have begun changing color) and bulk harvesting of mature green Tomatoes.

Good harvesting management is needed to pick high quality Tomatoes. Care must be taken when harvesting "breaker" stage fruit because the riper the Tomato, the more susceptible it is to bruising. Harvest crews should carefully place fruits into picking containers instead of dropping them.

External bruising would be caused if pickers hurl or dump Tomatoes too vigorously from the picking bucket into unpadded bulk bins. Bins should never be over-loaded because excessive Tomato weight would cause bruise damage due to compression. Harvested Tomatoes must be shaded to minimize heat-up while waiting for pallet bin dumping at the packinghouse.

Pickers should do preliminary grading to remove decayed fruit from the plants as they harvest the field. This would prevent crossover disease contamination

to otherwise healthy, sound fruit. Wet Tomatoes should never be harvested, because surface moisture increases field heat accumulations in the load and enhances disease development.

All picking buckets should be cleaned and sanitized at the end of each harvest day to prevent the potential accumulation of disease organisms from infecting sound fruit picked the next production day.

4.2.8 Agriculture Intensification

Before cash crops production like Tomato farmers used to cultivate only traditional crops like paddy, wheat, maize, oil seeds and pulses. Which were cultivated only in two seasons summer and winter but spring season were used to useless. But after modern technique cash crops like Tomato, potato, banana, sugarcane, spring maize etc some of the land has been used in all seasons. About 22.45 % of the total sample land has been used for only three cash crops, Tomato, turmeric and sweet potato then easily we can conclude about growth in land use.

4.2.9 Agricultural Diversification

The cropping pattern has been changed in the study area. Before trend of cash crops farming most farmers used to cultivate only traditional crops like paddy, wheat, maize, oil seeds, and pulses. But after starting the cash crops farming they have changed their cropping pattern, they are cultivating modern crops like Tomato, potato, sweet potato, turmeric, ginger, banana, sugarcane, spring maize and many others.

4.3 Use of Fertilizer and Pesticides in Tomato Production

4.3.1 Source of Fertilizer

The source of Fertilizer to Nepali fresh Tomato farmers can be broadly divided into three categories:

- i. **Traditional Source:** consisting for limited on farm retention of Fertilizer for select Tomatoes and farmers are often making Fertilizer themselves. However, as the commercial Tomato farming evolved over the years in the

country this practice has become limited and it's source could account for nearly 24.19%.

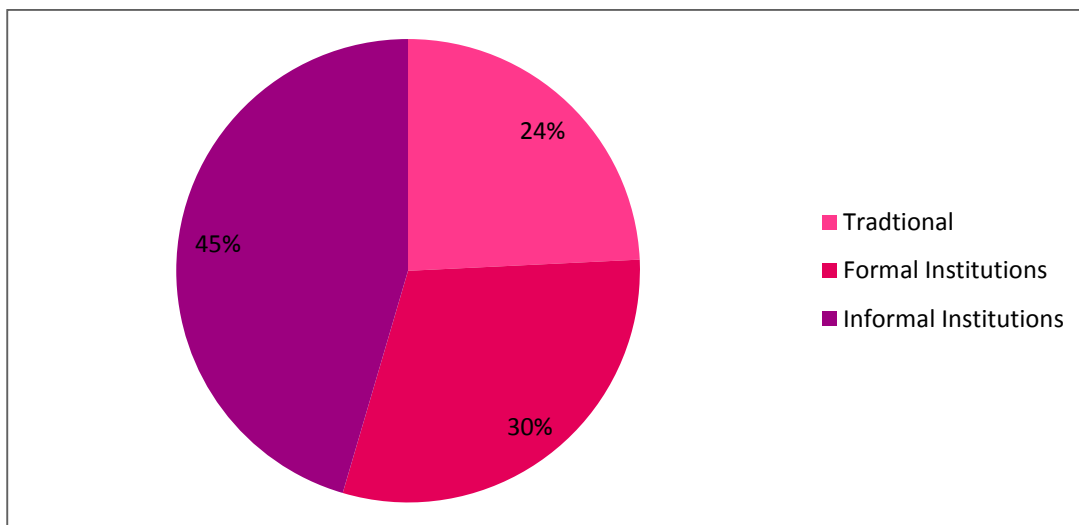
- ii. **Formal Source:** this includes Fertilizer supplied through government farms and agencies, fertilizer companies and suppliers, and retail shops. This includes both domestically produced fertilizer and imported ones also. With establishment of government farms and Agricultural Inputs Corporation the formal sector for fertilizers got established in Nepal and has been displacing the traditional source of fertilizer. The formal source of imports of fertilizers is seen to account for around 30.64% of the total demand in the country.
- iii. **Informal Source:** includes direct fertilizers trading among farmers and fertilizer producers, direct purchase from Indian border towns and other scheduled haat bazaars. Additionally, there are existences of many varieties of Indian brands of fertilizer in the country which are not imported through formal channels, rather distributed directly by agents or hawkers. Evidence of such was found in ample during the field visits. It is difficult to estimate how much of trade is involved in this form of sourcing of fertilizers. As India and Nepal share an open border, movement of people with fertilizers cannot be tracked. However, interactions indicated that this form of informal source could account for anywhere from about 45.16% of the total fertilizer consumed in Nepal. This can also be classified as unaccounted imports of fertilizer into Nepal, some of these could even have been accounted for domestic production. Similarly, I can show this data in table and figures accordingly:-

Table: 4.6: Source of Fertilizer

| Sources | Number | Percent (%) |
|----------------------|--------|-------------|
| Traditional | 15 | 24.19 |
| Formal Institution | 19 | 30.64 |
| Informal Institution | 28 | 45.16 |
| Total | 62 | 100.00 |

Source: Field Survey, 2015

Figure 4.4: Source of Fertilizer



4.3.2 The Fertilizers and Pesticides Use Patterns

In the current condition, chemical and bio both fertilizers and pesticide are most essential for modern farming and they are using them due to their accessibility and availability. People know better organic is the healthier for all so they are trying to continue by new organic technique but it's not sufficient for huge cultivation so farmers have to use chemical fertilizers and pesticides unlikely. In these condition most of the farmers using chemical fertilizers and pesticides in comparison to bio-fertilizers and pesticides in Rajghat VDC which is showing here below in table.

Table 4.7: Total Annual Use of Fertilizers and Pesticides in Per Kattha Tomato Cultivation

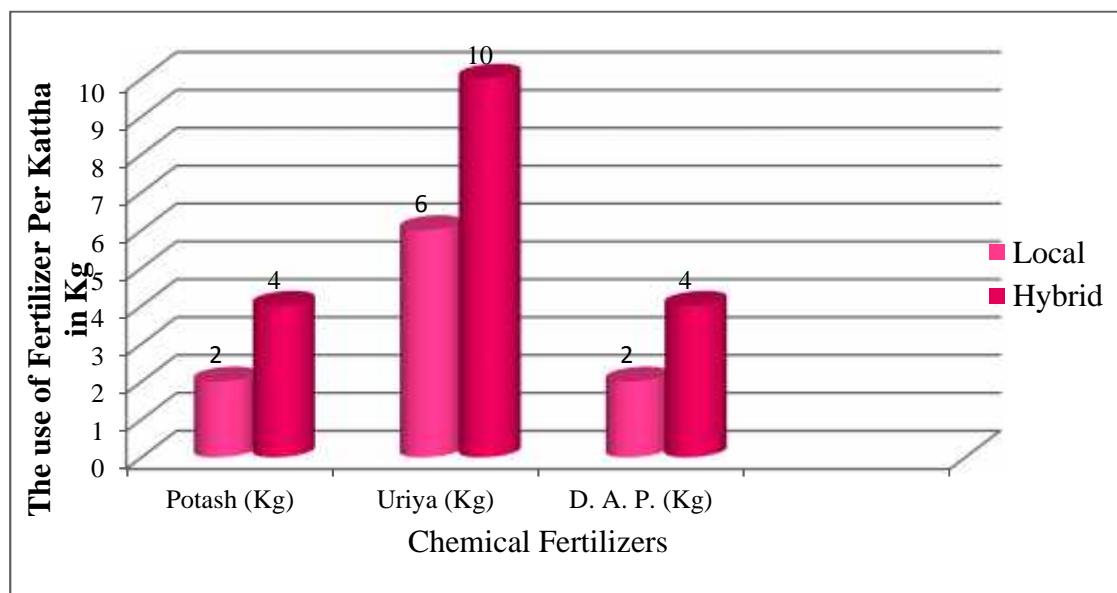
| Types of Tomato | Total use of Fertilizers/ Per Kattha (Kg) | | | | Total use of pesticides/ Per Kathha | | | |
|-----------------|---|-------------|------------------|--------|-------------------------------------|--------|-----------------------------------|--------|
| | Chemical | | Bio-fertilizers | | Chemical | | Bio-Pesticides. | |
| | Name (Kg) | Amount (Rs) | Name (Qntl) | Amount | Name (Ltr.) | Amount | Name (U) | Amount |
| 1.Local | 1. Potash - 2kg | 80 | 1. Compost – 10q | 1,000 | 1. Kim star-1 ltr | 2,000 | 1. Ulala-13 | 550 |
| | 2.Urea-6kg | 150 | 2. Khalde-2.5q | (HP) | 2. Calamity-1 ltr | 2,000 | ltr(with water) | |
| | 3.D.A.P-2kg | 80 | 3. Worm -2.5q | 8750 | | | 2. Nimbecidine-15ltr(w | 450 |
| | | | 4. Bio-gas-2.5q | (HP) | | | ith water) | |
| | | | | | | | 3. Titepati Jhol 25ltr | (HP) |
| | | | | | | | 4. Nimko Jhol 25ltr | „ |
| | | | | | | | | „ |
| Total | 5 kg | 310 | 17.5 q | 000 | | 4,000 | 78ltr | 1,000 |
| 2.Hybrid | 1. Potash - 4kg | 160 | 1.Compost – 10q | 1,000 | 1. Kim star-1.5 ltr | 3,000 | 1.Ulala-20 ltr | |
| | 2.Urea-10kg | 250 | 2.Khalde-4q | (HP) | 2. Calamity-1.5 ltr | 3,000 | (with water) | 550 |
| | 3.D.A.P-4kg | 160 | 3.Worm -3.5q | 8,750 | | | 2.Nimbecidine-25 ltr (with water) | 450 |
| | | | 4.Bio-gas-4q | (HP) | | | 3..Titepati Jhol 30ltr | (HP) |
| | | | | | | | 4..Nimko Jhol 30ltr | „ |
| | | | | | | | | „ |
| Total | | 570 | 17.5 | 000 | 3ltr | 6,000 | 105ltr | 1,000 |

The table highlights that how the per year per kattha total use of two different fertilizers items in two types of seeds like local and hybrid in the Rajghat VDC of Sarlahi over a period of one year.

The quantity of the chemical fertilizers and pesticide in local seeds using per year per kattha regularly had been using approximately potash 2 kg, Urea 6 kg, D.A.P. 2 kg and Kim star 1 liter as well as Calamity 1 liter. Likewise the amount of use bio-fertilizers and pesticides in local quintal seeds had been using compost 1 quintal, kalde 2.5 quintal, worm 2.5 quintal, bio-gas 2.5 and Gau mutra, Titepatiko jhol, Nimko jhol, Karani etc which made by farmers themselves.

Similarly, the use of chemical fertilizers and pesticides in hybrid seeds had been double quantity of fertilizers than local seeds and as same as in pesticide. However farmers have to invest in cultivation much more on hybrid then local.

Figure 4.5: The Use Of Chemical Fertilizers Per Katth a Per Kg in Tomato Production

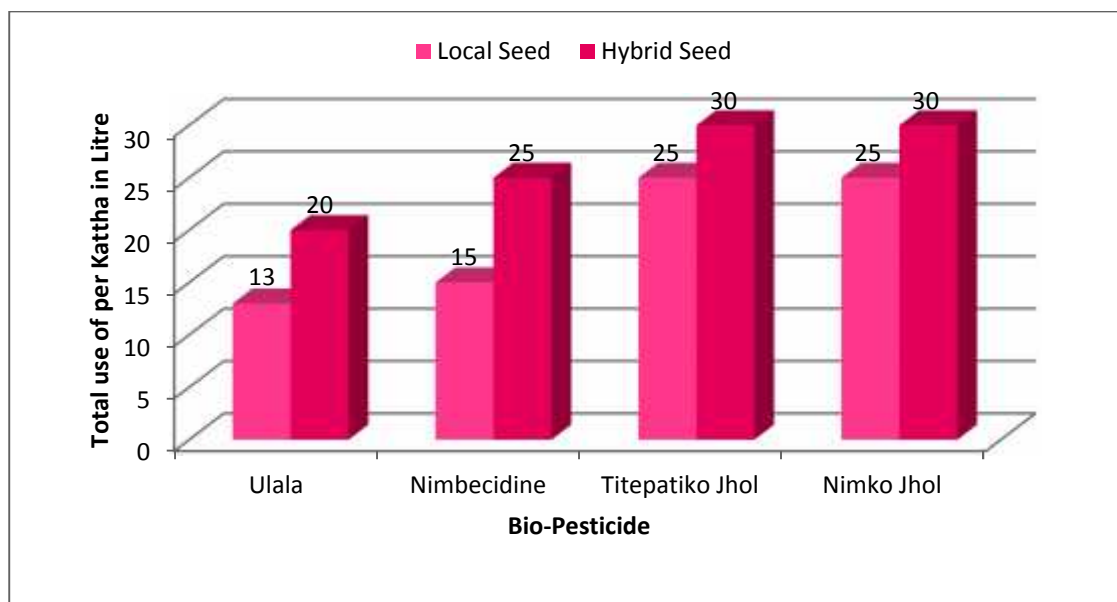


The figure highlights that how the per year per kattha total use of two different chemical fertilizers items in two types of seeds like local and hybrid in the Rajghat VDC of Sarlahi in a period of one year. The quantity of the chemical fertilizers in local seeds using per year per kattha regularly had been using approximately potash 2 kg, Urea 6 kg, and D.A.P. 2 kg and similarly, the use of chemical fertilizers in hybrid seeds had been double quantity, potash 4 kg, Urea 10 kg, and D.A.P. 4 kg, of fertilizers than local seeds.

We can conclude however the farmers have to invest in cultivation much more on hybrid then local.

4.3.3 Use of Bio-Pesticides

Figure 4.6: The Use Of Bio-Pesticide Per Kattha Per Liter in Tomato Production.



The bar graph highlights that how the total uses of bio-pesticide per Kattha in Tomato production in each season. According to the graph there are large amount of bio-pesticide use like Titepatiko jhol and Nimko jhol which don't have any cost because it is home production made by farmers themselves have to use about 25 liter in Local Seed and 30 liter in Hybrid seed once a time. Farmers can use it between 15 days latterly or due to necessity. Nest one is Ulala and Nimbecide which find in Aggravate it also bio- pesticide that costs nearly 550 Rs for Ulala and 450 Rs for Nimbecidine. It has to mixed by water before using. Farmers can use it roughly 13 liter in Local Seed and 15 liter in Hybrid Seed per Kattha each season once a time.

Basically, bio-pesticide is very Healthier for human life and cultivation too because there are not any side effect. Farmers can use it their necessity of farming. However, it is more expensive than others (chemical pesticide). So that, large farming have difficult to afford the bio-pesticide in everywhere.

4.4 Marketing Strategy of Tomato in the Study Area

Tomato farmers should adopt formal marketing strategies - (market research, segmentation, targeting, positioning, relationship marketing IMC tools: advertising, promotion, public relations, internet marketing etc).

They should also use modern farming technology - (modern farming implements and practices (fertilizers, weed killers irrigation facilities etc), haulage, processing and storage).

The farmers together with other stakeholders should consider innovating in to powdered Tomatoes as an antidote to their perishing goods during bumper seasons. This creation if spiced up with other spices would be well patronized if nicely packaged and marketed.

Irrigation Company of Upper East Region ICOUR can use its internally generated fund in the form of levies to support in the building of more dams. This would increase farmers' capacity and can engage up to 80% of the farmers during the dry seasons.

Tomato depots at concentrated centers of Tomato production area with agents (purchasing clerks) and furnished with storage refrigerators would benefit both the factories and the Tomato farmers. Tomatoes that would rot would be timely purchased and stored at the depot for safe haulage to the factories.

The Tomato farmers could consider forming active and functional cooperatives or unions to give them a stronger and unionized bargaining voice. It could help them to access financial aid from the government or in financial institutions. The cooperatives can arrest the problem of extortion of the hard earned products during bumper seasons, by acquiring for themselves, storage refrigerators and processor when they would have rooted financially. The farmers can enter in to a contract with NSTC to provide them with Tomatoes at an agreed price. The adoption and implementation of all the suggestions above would reduce immensely the challenges of the Tomato farmers if their total elimination may not be possible.

4.4.1 Production and Selling of Tomato in Different Years

The total sample land holding Tomato farming is 310 kattha (15.5 bigha) in the study area. In this land according to the season, Tomato farming is plays main on cash crop. This crop has played main role for income in the sample VDC. The production of Tomato is analyzed over a period of six years from 2065 to 2070. Definitely increment in the Tomato production can increase the income level of farmers even other things remaining the same. Income increment of farmers can raise their life or living standard. The production structure is presented in the following table:

Table 4.8: Total Annual Production and Selling of Tomato in Year 2065 to 2070

| Years | Total Annual Cropping Land (kattha) | Per Kattha production (Kg) | Total Annual Production (Kg) | Total Annual Selling (Kg) | Average Market Price (Rs) | Total Annual Income (Rs) |
|-------|-------------------------------------|----------------------------|------------------------------|---------------------------|---------------------------|--------------------------|
| 2065 | 240 | 450 | 108,000 | 107,100 | 20 | 2,142,000 |
| 2066 | 225 | 350 | 78,750 | 78,000 | 30 | 2,340,000 |
| 2067 | 250 | 500 | 125,000 | 124,000 | 35 | 4,340,000 |
| 2068 | 270 | 520 | 140,400 | 139,300 | 40 | 5,572,000 |
| 2069 | 290 | 520 | 150,800 | 150,000 | 45 | 6,750,000 |
| 2070 | 310 | 570 | 176,700 | 176,000 | 45 | 7,920,000 |
| Total | | | 779,650 | 774400 | | 29,064,000 |

The above table illustrates how much the total annual production and selling of Tomato in Rajghat VDC of Sarlahi changed over a period of six years from 2065 to 2070.

The use of total annual cropping land and production of Tomato farming had increased regularly by 70 kattha and 68700 kg in 2065 to 2070. Likewise per kattha production and average price of Tomato per kg had slowly grown by about 120 kattha and 25 Rs in same year.

Similarly the total annual selling and Income of Tomato cultivation had risen gradually by about 68900 kg and 5778000 Rs in 2065 to 2070.

On the whole, this table represented that all things total annual cropping land(Kattha), Per Kattha production (Kg), Total annual production (Kg), Selling, Average market price (Rs) and total annual Income are gradually increased by 2065 to 2070.

4.4.2 Packaging

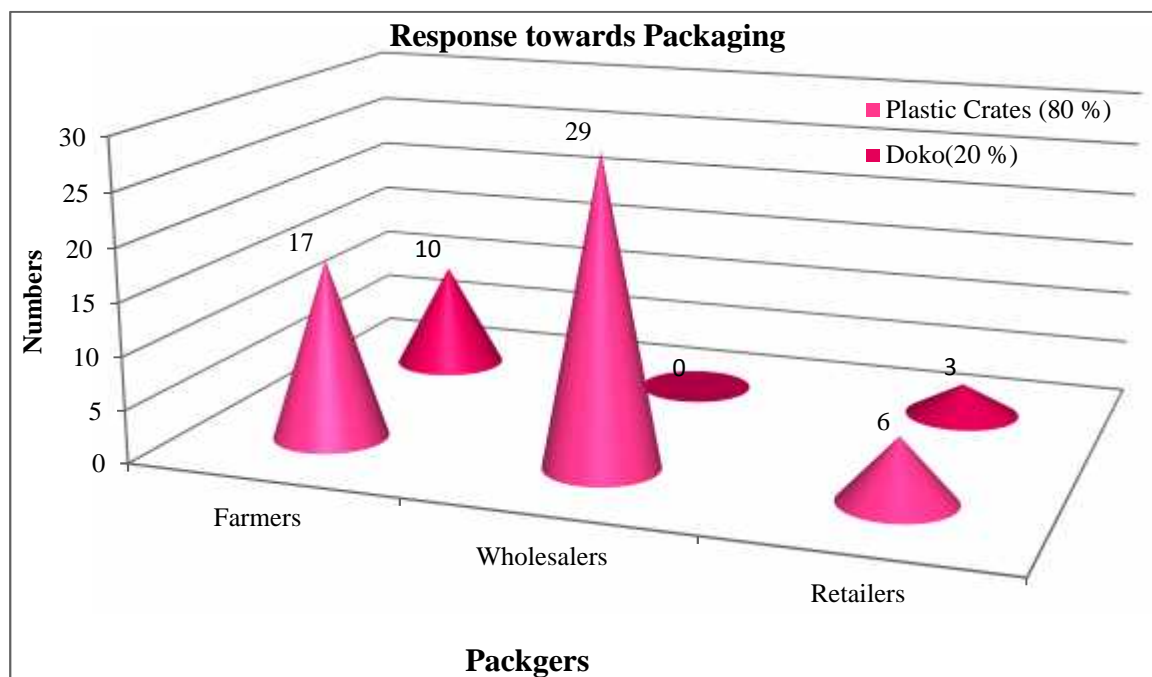
Proper packaging of Tomato is very important for keeping quality. Almost all respondents were found to use plastic crates for packaging. 80 percent farmers were found to use plastic crates for packaging during transportation. Producers still use traditional packagings such as doko (bamboo basket). This doko can be made with bamboo which is easily available in production areas. Although plastic crates are expensive all traders (wholesalers and retailers) were found to use plastic crates for packaging (figure 6). Plastic crate reduces the losses during handling (loading, unloading and transportation) because Agro Enterprise Centre (2005) has pointed out 5-10 percent spoilage during handling of Tomato.

Table 4.9: Packaging Use

| Packagers | Plastic Crates (80 %) | Doko (20 %) | Total |
|-------------|-----------------------|-------------|-------|
| Farmers | 17 | 10 | |
| Wholesalers | 29 | 0 | |
| Retailers | 6 | 3 | |
| Total | 52 | 13 | 65 |

Source: Field Survey (2013)

Figure 4.7: Response towards Packaging



4.4.3 Transportation

In Nepal vegetables are transported from production areas and collection centres to markets mainly on zeep, thele gada, two wheelers, truck and bus. No specialized vehicles are used for transportation of perishable vegetables. In research area, most of the farmers were selling Tomato at farm level because of good road network. Wholesalers were found to go to the farmer's field to buy Tomato with their own vehicle. Tomato was transported from farmers' field to the market centers with zeep, bus and pick-up van. Retailers were found to transport Tomato from wholesale market centers to the retail markets by zeep, pick-up van and auto rickshaw (tempo). Retailers were also found using bicycle, motorbike and mobile trading cart "thela" for transporting vegetables and Tomato in our case.

4.4.4 Pricing

Generally the price of Tomato fluctuates markedly not only seasonally, but also daily and hourly due largely to uncertainties in demand and supply (Adepetu, 2010). Table 6 presents the descriptive statistics of monthly wholesale prices of Tomato at Barthawa bazar wholesale market in Sarlahi district for the period from

Bhadra 2066 to Shrawan 2067. 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. According to the Annual Agriculture Development Programmed and Static from 2069/70, are different types of price in separate 12 months. They are showing here below in the table:

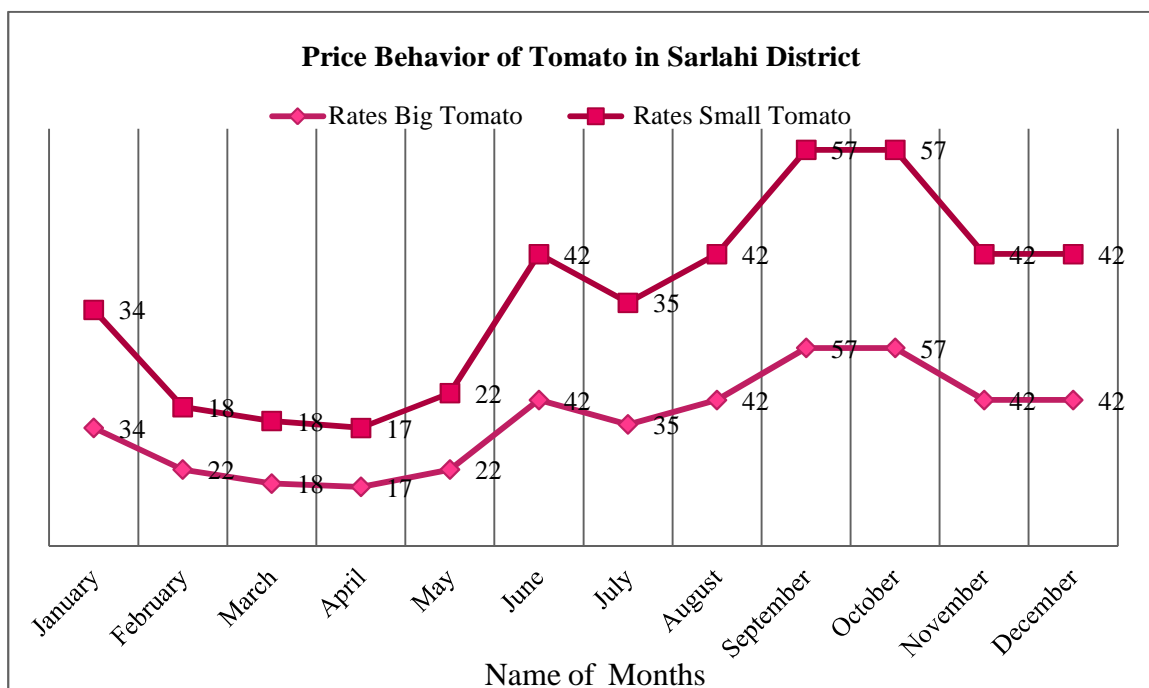
Table 4.10: Price Behavior of Tomato in Sarlahi District

| Months | Rates Big Tomato | Rates Small Tomato |
|-----------|------------------|--------------------|
| January | 34 | 34 |
| February | 22 | 18 |
| March | 18 | 18 |
| April | 17 | 17 |
| May | 22 | 22 |
| June | 42 | 42 |
| July | 35 | 35 |
| August | 42 | 42 |
| September | 57 | 57 |
| October | 57 | 57 |
| November | 42 | 42 |
| December | 42 | 42 |

Source: District AADP, 2014

The trend of price fluctuation has been shown in figure 12. It clearly depicted that the wholesale prices of both types of Tomato has 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.

Figure 4.8: Price Behavior of Tomato of Sarlahi District Year 2070



The line graph presented that how the price behavior of two different Tomato items in Sarlahi District changed over a period of 12 months from January to December. In this figure has two separate lines which of them blue line indicates price of big Tomato and red line determines small Tomato.

According to price behavior figure, the price of both small and big Tomato is roughly same price from starting to ending period. But in February there is a little bit different price between two Tomato where big Tomato is a bit in price (4 Rs) expensive than small Tomato. The price of both Tomatoes had decreased about 50% in amount of Rs 34 to 17 until January to April. From April both Tomato had grown slowly up to Rs 22 but it had dramatically increased doubled in June Rs 42. After June the rate of Tomato had with ups and downs till December.

On the whole, the figure shows the lowest price of both Tomato in April Rs 17 and the highest price of both Tomato among September and October in rate Rs 57. However, there are highlighting the vast different between price behavior of both Tomatoes almost Rs 40 in the whole where the lowest rate is Rs 17 and the highest rate is Rs 57.

4.4.5 Income from Tomato Selling

Farmers sell their Tomato to wholesaler and retailers by different prices on twelve months. The income from Tomato selling is various. According to the Tomato selling annual income of the farmers we have divided them in three groups: Rs 0-10,000 income having group, Rs 10,000-20,000 income having group and more than 20,000 per year income having group.

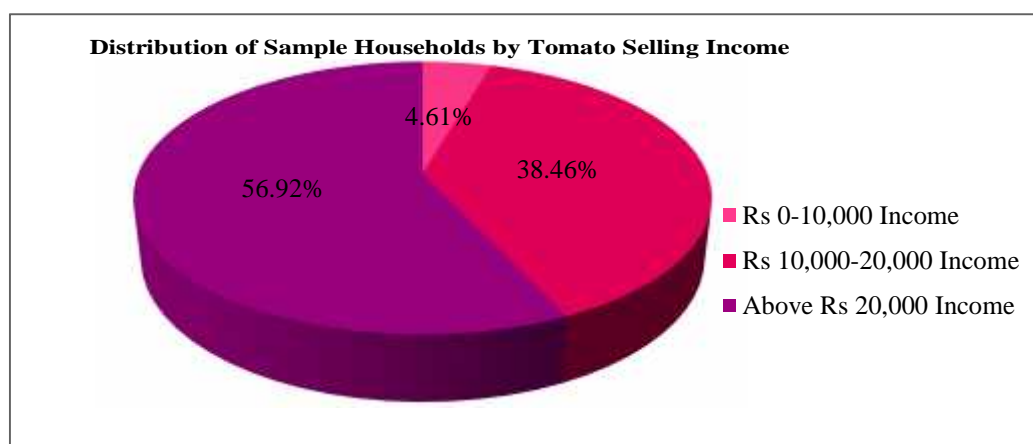
Table 4.11: Distribution of Sample Households by Tomato Selling Income

| Income | Number | Percent (%) |
|-------------------------|--------|-------------|
| Rs 0-10,000 Income | 3 | 4.61 |
| Rs 10,000-20,000 Income | 25 | 38.46 |
| Above Rs 20,000 Income | 37 | 56.92 |
| Total | 65 | 100.00 |

Source: Field Survey, 2013

The table shows that out of total sample households 37 (56.92 %) households earns more than Rs 20,000 amount per year, 25 (38.46 %) households earns Rs 10,000-20,000 amount per year and rest of them 3 (4.61 %) households earns only Rs 0-10,000 amount per year through the Tomato selling.

Figure 4.9: Distribution of Sample Households by Tomato Selling Income

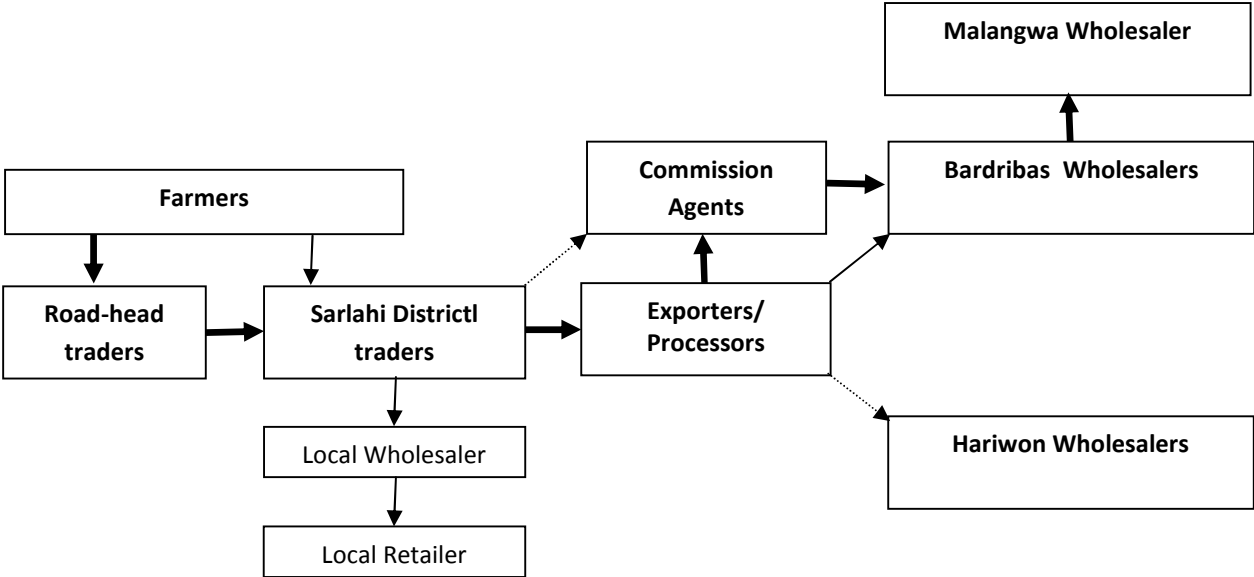


The above pie-chart presented that the distribution of sample households by Tomato selling income of three categories in Rajghat VDC of Sarlahi District. It shows only 4.61% farmers are in 1st Category Rs 0-10,000, 38.46% farmers in 2nd category Rs 10,000-20,000 and 56.92% farmers in last category above Rs 20,000.

In conclusion we can say that the low income households are in few number only 4.61% and high income households are in big number 56.92% it means most of them are big farmers, which indicates the farmers of Rajghat Vdc are increasing to use their land for Tomato farming

4.4.6 Marketing Chanel

Malangawa is a traditional market for local Tomato and is vast and dynamic. Most of the trading occurs in the Northern part of District. The major markets for the Tomato of Rajghat from eastern District of the sarlahi are Malangwa and Bardribas and Hariwon passes via Rajghat. Tomato from Sarlahi goes to Birganj, Janakpur, Bardriba, Hetuda and Narayanghat too except local market. Some quantity of Tomato is also exported to Kathmandu, Kalimati markets. Normally, Kalimati market prefers the fibreless variety and local markets have the demand of all types of Tomato product. Some market potentiality of Rajghat VDC is presented below:



Source Field study 2015

4.4.7 Marketing Center

D) Major market Canters (Local wise): The following table presents the major market Canters for the Tomato according to the HATT BAZAR.

Table 4.12: Major Market Centre According to Hatt Bazar

| S N | Local | Major Canters |
|-----|------------|------------------------|
| 1 | Rajghat | Soltee, Khalte, |
| 2 | Hajariya | Hajariya, Nayabajar |
| 3 | Barwathawa | Barthawa, Goraita |
| 4 | Karmaya | Bagmati, Naya road |
| 5 | Hariwan | Nabalpur lalbandibagar |

ii) Major market Centers (regional wise): The following table presents the major market Centers for the Tomato according to the Development Regions.

Table 4.13: Major Market Centre According to Development Regions

| S N | Development region | Major hubs |
|-----|--------------------|--|
| 1 | Eastern | Birtamod, Dharan, Biratnagar |
| 2 | Central | Hetauda, Birgunj, Kathmandu |
| 3 | Western | Butwal, Bhairahawa |
| 4 | Mid-western | Tulsipur, Nepalgunj |
| 5 | Far-western | Dhangadhi, Mahendranagar (Not accessible Tomato) |

According to the field survey, these marketing centers are much essential for Tomato selling and specially local markets plays vital role to deliver Tomato to cater different places around the nation due to necessity as well as Regional Market Centers also consume huge amount of Tomato from Sarlahi District of Rajghat DVC.

4.4.8 Problems of Tomato Farming

There are some problems on Tomato farming, which are following:

- Poor transportation facility
- Farmers of the areas more motivated toward hybrid maize production with negligible interested to grab new crops along with production technologies.
- Insufficient family labor inadequate diversified product industries.
- Poor adoption technologies achieve targeted yield.
- Investment: The farmers are investing themselves for Tomato farming by their own cash or loan.
- Inadequate irrigation facility
- Perishable and damage problem in transportation
- Poor availability of fertilizers and pesticides in rural areas.
- Low consumption and low selling problem in season and low price problem also.
- Lack of modern storage facility
- Frequent banda/ strikes in local level as well as national level.
- Lack of sufficient markets
- Problem of theft and wild animals.
- Limited life of Tomato
- Lack of agricultural technicians
- others

4.4.9 Suggestions to Improve Tomato Production

Some suggestions are given here, which were collected with respondents here given below:

- Farmers of the areas are more motivated toward hybrid
- Poor technological knowledge about diseases and insects and management need to develop farmer access to backward(seeds, fertilizers, pesticide and inputs) and forward training (markets) for improving profitability and sustainability
- Good linkage of farmers with agriculture resources institutions extension departments.
- Awareness training required on integrated crop management to obtain potential yield.

- Provision of good transportation and storage
- Trainings for farmers
- Provision of irrigation
- Provision of farmers co-operatives
- Provision of qualified technician
- Provision of good packaging
- Provision of loan without any deposition in low interes
- For all this they said that government should be responsible.

CHAPTER V

SUMMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

Among various cash crops, Tomato is one of the main cash crops. The Tomato is one of the most commercial fresh and edible fruit vegetables after cabbage and cauliflower and it has been mostly used as fruit, vegetable and medicine for thousand years. It gives special flavor and sharp taste. It can be mixed in various foods the delicious Tomato tastes for a long time.

In Nepal, the Tomato is cultivated in more than 60 districts. However, the main export oriented, professional Tomato producing districts are Sarlahi, Dhanusha, Bara, Dhading, Nuwakot, Kavre, Siraha, Dhankuta, Sunsari, Morang and Jhapa etc. According to the report published by agriculture information section, there is 1,800 hectares with 13.3 mt/ha (VDD, 2010) of total agricultural land of cultivating Tomato and its total production is 23940 metric tons out of total production it is increasing slowly, 60 percent fresh Tomato is consumed within the country and 40 percent is exported in the fresh form. The Tomato cultivation required 20.300C of temperature and 1500-3000mm rain in average. It's cultivated twice in years and Tomato is included in a different crop relation and also grown as a separate crop or inter crop with chilly and vegetables. A package of 50gm (dana) Tomato is used as a seed and is planted in Falgun-Baishak (February-April) in off seasonally and in Manshir-Magh (November-January) in seasonally. It is generally cultivated on upland (Bari). It absorbs too much nutrients from sole so to prevent it from diseases and increase its production it is better to cultivation the same land after two or three years to time. It is noted that mulching is necessary to prevent from heavy drought, rain and minimize weeds.

We can in conclusion say that on the basis of above mentioned things, Tomato is being an important cash crop, which is cultivated in both hilly and Tari region so now Terai regions it has produced Sarlahi district also belong to the same region where the Tomato farming has been launched since the few years as a cash crop. The

area under the Tomato cultivations increasing slowly and gradually due to attractive income detained from it.

Likewise, Insect pests can damage Tomato throughout the growing season, but severity varies with location and time of year. While many insects that feed on Tomato are only occasional pests in Sarlahi, a few species are common pests and occur every season. The severity of damage to Tomato by insect pests is largely due to abundance of the pests, which is related to environmental conditions. With most insects, outbreaks are difficult to predict, and it is even more difficult to predict if control measures would be required. Knowledge of insect habits, careful pest monitoring and timely use of effective control measures would enable growers to avoid or at least reduce the damage they suffer. Tomato is well suited for insect pest management.

Because a variety of insects may attack Tomato, scheduled sprays are frequently considered for insect management. Use pest two to three times per week, however, allowing for early detection of infestations and timely application of pest specific control measures, is the most cost-effective management strategy. Possible exceptions to this are the management of trips, which vector Tomato Spotted Wilt Virus, or fields with a history of specific pest problems that require preventive control or are difficult to manage with curative treatments

Similarly, the shorter marketing strategy, the lesser the marketing costs and cheaper the commodity to the consumer. When there are more intermediaries in the channel the prices of commodities would be higher and producer's share would be lesser. So we can say that long marketing channel is one of the main reasons for increased marketing costs and bring inefficiency in marketing. This results in the loss of consumers' welfare and producers' share. Presence of intermediaries makes the marketing system inefficient in the long channels as compared to the shorter ones (Hossain, *et al.*, 1996).

5.2 Conclusion

This research plays vital role for the identification of problems analysis of their research and findings measure/solution to problems solving of concerned area.

The main objective of the study is to find out the production of Tomato cultivation on local farmers. The study was survey of the study area.

The study was conducted at Rajghat VDC of Sarlahi district where Tomato farming made drastic change on the Tomato cultivators' life style. Despite the study area is very small in itself; it tries to find out present production situation economic effect Tomato cultivation on local farmers, method cultivation. The major findings of this study are presented below.

Most of the dwellers of Rajghat VDC (nearly 50%) were found depending on agriculture but few people (47.45%) are involved in services, (5.5%) business and (11.11%) other sectors expect students (36.40).

-) Education condition of the people of the study area is so satisfactory 94.5 percent people are literate and only 7.77 percent completely illiterate but on other hand, health status is better as compared to their educational level where 99.40 percent people are healthy.
-) As for the people of Rajghat VDC they are adapting different occupation. Most of them (50) are involving in agriculture, where cash crops and cereal crops are cultivated. But cereal crops provided them only bread, among cash crop, Tomato is being highly profitable which has created golden opportunity, to have income generation after starting Tomato cultivation.
-) Due to the unavailability of basic socio-economic service, the living standard in study area is low.
-) About 5 percent households can't maintain food for a year from their own production. So they have to buy it from the local market by selling Tomator and employment.
-) Most of the people (i.e. 97) want to change seed of Tomator and want to cultivate by modern way (specific approach) but the very few (3%) people were found in constant level because of lack of knowledge and unavailability of its production.
-) The first position is held by livestock/crops and agricultural product as the major source of income and income from other sector is very little as

compared to income from Tomato crops. But greater expenditure was found on education by them.

- J Thirty five percent of Tomato producer sell their Tomato self carrying and rest of sell to the retailers and wholesalers.
- J 94 percent of Tomato producer sell their production when price increases and rest of them (6%) sell their Tomato randomly.
- J 91 percent people are not satisfied with the present price of Tomato but rest them 9 percent is constant because of the price fluctuation, which makes them unsatisfied.
- J The average cost of Tomato production is lesser than non Tomato farming because the farmers grow two or three kinds of crops at per kattha land during year but Tomato is only one time at per kattha during a year as well as only at a few percent of total land is cultivated. Tomato but non Tomato crops are cultivated at large level. As a result there was found the effect of law of returns to scale and law of variable proportion. But the net profit of Tomato is higher then other.
- J Farmer had been commercially farming since more than five years in the study area. But according to them, the productivity has been decreasing slowly and gradually. The lower productivity is mainly due to lack of modern technology and another reason such as fatal disease like “bacteria, fungal, virus” rot and will. In some case it was found that the whole Tomato in the farm was damaged and rotten, price of Tomato has also played a vital role in change the total production, which is highly fluctuated each and every years.
- J The Tomato production is considered to be the top most income earning crop in the agricultural sector in the study area as compared to another agricultural production and business.
- J The living standard of people reside in the study area is observed increasing from the Tomato production. The Tomato farming has been effective on improving the living standard of low, modern and high level people in study area.
- J The cost of marketing various from one market place to another market place which was due to variation in distance.

-) The major problems existing in the Tomato production and marketing are absence of double cropping lack of sufficient transportation, facilities disease and pest, lack of credit facilities, JTA service, modern technology, specific market facilities high cost of labours, wage price fluctuation extension of services and unavailability's of virgin land etc.
-) Present pesticides fertilizer and qualitative seed and very few people want easy access to international market.

Despite suitable topology and high economic value, the production of Tomato faces many problems from its initial stage to marketing. The disease, pests and the major short-coming factors in the production of Tomato. Besides these absence of double cropping, unavailability of sufficient virgin land, lack of credit facilities, illiteracy and poorness of farmers, uncertain character of monsoon, quality of seed used lack of extension service, presence of middlemen, lack of grading and standard of weight, lack of transport, facilities, storage facilities, price fluctuation, lack of market information etc. are the another shortcomings in the process of Tomato production and marketing. Despite of these problems, the future of Tomato in the Rajghat VDC seems to be good.

Finally, overall, we found that Tomato farming have more positive benefits than negative for rural farmers. It has been a reason to change on their income, increasing living standard, intensify the use of agricultural land and diversification of crops. All of these finally improve the livelihood of rural farmers. The farmers also facing several problems such as Investment, Security, fertilizers and pesticides, transportation marketing price seeds etc. So, the governments either have to provide good irrigation facility some subsidies for the farmers to continue and increase production and inspiration for new farmers for Tomato farming etc.

5.3 Recommendation

Based on the findings of the study following recommendations were made, which are useful to 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 centers 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.
-) Need of agricultural marketing act.
-) There should be provision of pure seed of vegetables.
-) Field level extension staffs should be upgraded with latest technical knowhow.

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Tomato Production System in the Study Area

2.1 Can You Tell Me about Cost of Production System of Tomato (Local Average)

| S N | Descriptions | Qty | Unit | Rate (Rs) | Total (Rs) |
|----------|----------------------------------|-----|------|-----------|------------|
| A | Land Renting | | | | |
| B | Inputs | | | | |
| 1 | Seed | | | | |
| 2 | Manure/Fertilizer | | | | |
| 3 | Pesticide use | | | | |
| | Total (Production Input) | | | | |
| C | Labour | | | | |
| 1 | Land preparation | | | | |
| 2 | Ploughing | | | | |
| 3 | Labour for FYM application | | | | |
| 4 | Mulch collection | | | | |
| 5 | Plantation | | | | |
| 6 | Weeding | | | | |
| 7 | Crop harvesting | | | | |
| 8 | Cleaning | | | | |
| | Total (Production Labour) | | | | |
| D | Transportation cost | | | | |
| | Grand total cost | | | | |

2.2 How much Land do You have Separate for Tomato Farming?

| Category of Farmers | Numbers | Percentage (%) |
|------------------------------------|---------|----------------|
| Small Farmers (Up to One Bigaha) | | |
| Medium Farmers (One-Three Bigaha) | | |
| Large Farmers (Above Three Bigaha) | | |
| Total | | |

2.3 How many times you irrigate in Tomato farm every year?

2.4 Was any irrigation facility available?

i) Yes

ii) No

2.5 Can you tell me about irrigate system on Tomato Farming?

2.6 How kind of Seed do You Use and Which Agriculture Inputs used in Your Farm Please Mention Their Types and Annual Quantity?

| Crops | Cropping land (kaththa) | Total used Seed (kg) | | | Plaguin g Tools | Harvesting Tools |
|----------------|-------------------------|----------------------|----------|--------|-----------------|------------------|
| | | Local | Improved | Amount | | |
| Cash Crops | | | | | | |
| 1.Tomato | | | | | | |
| 2.Maize | | | | | | |
| 3.Oil Seeds | | | | | | |
| 4. Potato | | | | | | |
| 5.Sugercane | | | | | | |
| 6.Sweet Potato | | | | | | |
| 7.Ginger | | | | | | |
| 8.Turmeric | | | | | | |
| 9.Cauliflowe r | | | | | | |
| Total | | | | | | |

2.7 How is Condition of Labor Management:-

- How many family members are involved in this business?
- How many labourers are required per katta or bigha?
- What is the wage rate of labourers?
- Who involve in production activities? (Male, female, children?)
- Who involve in marketing activities? (Male, Female?)
- How is the participation of women and Dalit, Janjati in ginger production?
- Is there participation of landless in production? If yes, how?

| | | | | | | | | |
|--------------|--|--|--|--|--|--|--|--|
| 2. hybrid | | | | | | | | |
| Total | | | | | | | | |

Marketing Strategy of Tomato in the Study Area

3.3 How is your average annual income by Tomato selling?

3.4 What is the condition of average annual production, selling and income in per kaththa/ per year (2065-2070) of Tomato farming?

| Years | Total Annual Cropping Land (kattha) | Per Kaththa production (Kg) | Total Annual Production (Kg) | Total Annual Selling (Kg) | Average Market Price (Rs) | Total Annual Income (Rs) |
|-------|-------------------------------------|-----------------------------|------------------------------|---------------------------|---------------------------|--------------------------|
| 2065 | | | | | | |
| 2066 | | | | | | |
| 2067 | | | | | | |
| 2068 | | | | | | |
| 2069 | | | | | | |
| 2070 | | | | | | |
| Total | | | | | | |

3.5 Which Materials do You Use for Packaging ?

| Packagers | Plastic Crates (80 %) | Doko (20 %) | Total |
|-------------|-----------------------|-------------|-------|
| Farmers | | | |
| Wholesalers | | | |
| Retailers | | | |
| Total | | | |

3.6 How is Transportation Condition in Your Study Area?

3.7 How is Reasonable Price Behavior of Tomato in Sarlahi District among the Years?

| Months | Rates of Big Tomato | Rates of Small Tomato |
|-----------|---------------------|-----------------------|
| January | | |
| February | | |
| March | | |
| April | | |
| May | | |
| June | | |
| July | | |
| August | | |
| September | | |
| October | | |
| November | | |
| December | | |

3.9 How much Amount have You get by Tomato Selling Income

| Income | Number | Percent (%) |
|-------------------------|--------|-------------|
| Rs 0-10,000 Income | | |
| Rs 10,000-20,000 Income | | |
| Above Rs 20,000 Income | | |
| Total | | |

3.10 How many local markets in your area for Tomato selling?

- i) 2 ii) 4 iii) 6 iv) More than 8

3.12 Please Mention the Market Potentiality in Your Area as You Know?

i).....

ii).....

iii).....

iv).....

3.13 Can You Say Major Market Centers According to Hatt Bazar or Development Region?

| S N | Local | Major Canters |
|-----|-------|---------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

| S N | Development region | Major hubs |
|-----|--------------------|------------|
| 1 | Eastern | |
| 2 | Central | |
| 3 | Western | |
| 4 | Mid-western | |
| 5 | Far-western | |

4 How can do Community to Increase the Market for Tinger selling?

5 Are you satisfied by Tomato Farming?

) Yes

) No

6 If you are not satisfy then which will be good crop for better income 1st, 2nd, 3rd....?

- Banana ()
- Sugarcane ()
- Sweet Potato ()
- Turmeric ()
- Pulses ()
- Maize ()
- Paddy ()

7 Do you cultivate organic Tomato farming?

- i) Yes ii) NO

8 If you do it then which fertilizer used?

- i) Ghothe Mall ii) Kukhurako sotter iii) Composed Mall iv) Others

9 Which types of Tomato has been cultivate being?

- i).....
- ii).....
- iii).....
- iv).....

10 What types of problem in Tomato cultivation?

- i) High productive
- ii) Disease impact
- ii) Intolerable to high temperature
- iii) All of above

iv) Others

11 How is Tomato cultivation in current condition?

i) Increased

ii) Decreased

iii) Constant

12 How much amount can you investment for commercial Tomato farming in starting Period?

i) 0 to 5000 ii) 5000 to 10000 iii) 10000 to 20000 iv) 20000 to 50000

Difficulties/ Problem

13. What are the major problems of Tomato farming please answer me again number wisely 1st, 2nd, 3rd ...?

- Poor transportation facility.
- Insufficient family labor.
- Inadequate diversified product industries.
- Poor adoption technologies achieve targeted yield.
- Perishable and damage problem in transportation
- Poor availability of fertilizers and pesticides in rural areas.
- Lack of modern storage facility
- Lack of sufficient markets
- Problem of theft and wild animals.
- Lack of agricultural technicians
- others

14. Can you give any suggestions to improve Tomato production?

-
-
-
-
-
-
-
-
-
-

Thank You