

# CHAPTER I

## INTRODUCTION

### 1.1 Background of the Study

Economic development is the backbone of the development of a nation. In Nepal, the economy is dominated by agriculture, it was the livelihood for more than 65% of the population, although only approximately 20% of the total land area was cultivable, it accounted for an average about 60% of the GDP and approximately 75% of exports. Since the formulation of the fifth 5 year plan (1975-80), agriculture has been the highest priority because economic growth was dependent on both increasing the productivity of existing crops and diversifying the agricultural base for use as industrial inputs.

According to the World Bank 'Agriculture is the main sources of food, income and employment for the majority'. In Nepal, the outcome from the agriculture is limited and employment opportunities are rare in the rural areas. Although vegetable farming is one of the most important part of the agriculture. Most of the farmers depend upon the vegetables production within the agriculture which help to increase status of all Nepalese. Besides other vegetables farming, tomato production within plastic house is also most important income source and employment of all farmers.

The tomato has been originated early Aztecs around 700 A.D, therefore it is believed that the tomato is native to the Americas, it was not until around the 16<sup>th</sup> century that Europeans were introduced to this fruit when the early explores set soil to discover new lands. Thought out Southern Europe, the British, admired the tomato for its beauty. Most Europeans thought that the tomato was poisonous because of the way plated and flatware were made in the 1500. It was not regarded as a kitchen vegetable until the times preceding the Civil war period in the United States. From this point forward, tomatoes have become a stable item in the kitchen through out the world. Each area of the world has its own tomato history and hot it is used in everyday dining. It appears though that tomatoes have the largest impact on American eating habits, as they are responsible for enjoying over 12 million tons of tomatoes each

year. The Aztec language word tomato gave rise to the Spanish word 'tomate', where the English word tomato comes from. Tomato is the world's largest vegetable crop and known as productive food both because of its special nutritive value and also because of its wide spread production. Tomato is one of the most important vegetable crops cultivated fleshy fruit. Tomato is considered as important commercial and dietary vegetable. Botanical name of tomato is *Lycopersicon*. It is protective supplementary food.

As it is short duration crop and give high yield, it is important from economic point of view and hence its cultivation is increasing day by day. Tomato is used in preserved products like sauce, chutney, soup, paste etc.

According to Cambridge English Dictionary-Tomato meaning a round red fruit with a lot of seeds eaten cooked or uncooked as a vegetable such as salad, sauce.

In Nepal, for commercial purpose Srijana variety tomato farming is popular. Tomato production can be grown in between 10 to 30 degree centigrade in Nepal, tomatoes are considered to be summer vegetables. This vegetable requires an adequate amount of nitrogen during the majority part of their growth. However, the same in large quantities can harm the health of tomatoes.

There are various rural municipalities in Nepal, Annapurna Rural Municipality is one of them. It lies on Kaski district Gandaki zone. Especially ward no. 2 about 23-35 km far from headquarter Pokhara. The main occupation of this ward of municipality is agriculture. They used to cultivate both cash crop and food crop. Maximum numbers of people used to cultivate cash crops. One of the major cash crop is tomato in this area.

As tomato production with the plastic house become the major income source of the farmer of this village. They are growing tomato annually to uplift their lifestyle. For cultivation of tomato in order to raise the lifestyle of people different social organizations like Dhikurpokhari Community Development Organization (DCDO), Karitas Nepal etc provides different types of seeds of tomato for farmer of this area. They produce tomatoes such as Unsari, Srijanam Manita, Kabita, Dalila, Amita etc among them Srijana is famous. Plastic house is most important for production of

tomato which absorb radiation of light and supports to grow the plant. In this way the farmers can produce more product and generate more income. Nearly, 300 household produce tomato within plastic house in this area. According to DCDO, the size of plastic house is 12x7m but according to the farmer the size will be 12x10m which is better in their experiences. Hence, the study of the tomato production and its economic impact need to study and analyse.

## **1.2 Statements of the Problem**

Majority of Nepalese people depend on agriculture for their livelihood. This sector alone contributed about 35% of nation's GDP in year 2011/12. Government has prioritized agriculture sector and expended NRs. 9,136.5 million in year fiscal year 2010/2011 which was 38% higher than the previous year. Traditional conventional subsistence farming system, lack of rural infrastructure facilities, lack of market information system, unavailability of sufficient quantity of production inputs and weak linkages among the stakeholders.

The agriculture perspective plan (APP) designed vegetables crops as one of the priority crops in Nepal agriculture development. The commercial production of vegetables has been initial by government as well as private sector to increase the income of farmers and generation of employment opportunities of rural areas of the country resulting into significant increment of vegetables crops was 245037 hectares.

Agriculture is a leading sector in Nepalese economy. The development of different aspect of an agriculture is essential for national development. The role of agriculture sector on GDP is very important. The major problems facing by the economy of developing country due to backward agriculture sector, low productivity, unemployment, food scarcity, very slow industrial development and limited market etc.

In Nepalese context most of the people depend upon the agriculture but the agriculture production is not increasing sufficiently in comparison with other country. Nepal is rich natural resources, but people living in Nepal still poor by the economic aspects and facing with many problems due to low productivity as well as low per capita income the balance of trade is unfavourable. Other problems are to identify the role of tomato production in income generation and poverty reduction. Tomato

production also important for all Nepalese farmers which also increase income but for many of the farmers in Nepal face problems that the tomato production such as lack of transportation, lack of skilful farmers, contain traditional concept of tomato production, use more artificial chemical etc. This economic analysis to tomato production within plastic house basically solve the following problems.

- i. What is the present situation of the tomato production in Annapurna Rural Municipality?
- ii. What is the general pattern of tomato production?
- iii. What are the problems and prospect of tomato production?

### **1.3 Objectives of the Study**

The main objectives of the study are to analyse economic analysis of tomato production in plastic house. The main objectives of this study are as follows

- i. To analyse the present situation of the tomato plantation.
- ii. To determine the general pattern of tomato production.
- iii. To assess the problems and prospect of tomato production.

### **1.4 Hypothesis of the Study**

The crucial starting point for research is to have an issue to investigate. In the scientific tradition, this issue is normally expressed in the form of hypothesis. Hence the next logical step after theory formulation is to develop hypothesis. The hypotheses of this study are as follows.

- i.  $H_0$ : There is no significant relationship between the income of respondent and academic qualification.  
 $H_1$ : There is significant relationship between the income of respondent and academic qualification.
- ii.  $H_0$ : There is no significant relationship between the income of respondent and age of the respondent.  
There is significant relationship between the income and age of the respondent.  
 $H_1$ : There is significant relationship between the income of respondent and age of the respondents.

## **1.5 Significance of the Study**

Nepal is a developing country where the economy is dependent on the agriculture. In Nepal more than 85% of people depend upon the agriculture and 68% of total area is covered by mountains region where vegetable production is major branch of agriculture. Tomato production in a plastic house has contributed a lot to the local farmers in improving their socio-economic life. This research is try to study the condition of the tomato farmers who are facing numerous problems like unsystematic market, lack of transportation facility, lack of irrigation, available of seeds and chemical fertilizer etc.

The climate and soil in this region is fits for tomato plantation. It will be helpful to reduce the income inequality in this area which has long term positive impact in migration reduction. This study is also helpful for various national and international institutions, agencies, governmental and non-governmental organization, future scholars, researchers and students those who want to know about tomato plantation under plastic house. Moreover, it is equally helpful for the policymaker and other interested ones to make plan for budget allocation in rural area.

## **1.6 Limitation of the Study**

The present study is not free from limitations. This study is focus to tomato production within Annapurna Rural Municipality of Kaski district. This is micro level study which has the following limitations.

- i. This study focused on economic impact of tunnel based tomato production of household economy.
- ii. The study mainly based on primary data. Data households, questionnaires and interview.
- iii. This study focused on the tomato plantation condition of ward number 2 of Annapurna Rural Municipality.
- iv. This study does not cover whole Nepalese context.
- v. This study does not cover whole agriculture part such as cash crop and food crop.

## **1.7 Organization of the Study**

This study consists of five chapters, which includes:

Chapter I denotes Introduction which deals with general background of the study, statement of the problems, objectives of the study, hypothesis, and significance of the study, limitation and organization of the study. Chapter II denotes Review of the Literature: The second chapter deals with the review of the literature which includes theoretical literature and review of past study, research gap.

Chapter III denotes Methodology This chapter deals with the research methodology which contains research design, data resources, method of data collection, data analysis, etc.

Chapter IV denotes Data Analysis The fourth chapter deals about data presentation and analysis including chart, figure, table and correlation.

Chapter V denotes Summary, Conclusions and Suggestions The fifth chapter includes summary and conclusions , suggestions for further improvements of farming.

## CHAPTER II

### REVIEW OF THE LITERATURE

#### 2.1 Introduction

Agriculture is one of the oldest occupations in the world. The historical background of this occupation may be traced back like human civilization. Through agriculture is the main occupation of Nepalese economy. In developing countries, the major challenges are how to meet the food and nutrition requirements for growing population, and how to reduce the rural poverty incidence of smallholder resource poor farmers. In Nepalese context, the majority of the farmers (more than 80 %) are smallholders, and they are frequently constrained with resources in terms of improved seeds, fertilizers and poor access to agriculture credits to the farmers (Shrestha et al., 2014). Further, they are handicapped with less adoption of technologies, less access to markets, and low levels of education (MOAD, 2014a). USAID (2011) reported that the major constraints in vegetable farming are: lack of knowledge among the producers of proper usage of fertilizers and pesticides; lack of irrigation facilities; labor shortage; and higher rate of post-harvest losses. Pokhrel (2010) reported that vegetable farmers are highly constraints with road networks, market structures and cold storages.

#### 2.2 Vegetable Production Systems in Nepal

Vegetable farming in Nepal is one of the major components for generating income, and supplying nutrients to the farmers in rural communities in Nepal. It is broadly classified into two seasons, winter and summer, where 72.1 % and 68.8 % of households grow vegetables in these seasons, respectively (CBS, 2011). The winter season vegetable farming is characterized by dry and cold weather, less rain, and lack of irrigation facilities, while the summer season vegetables exist with sufficient rain water, irrigation facilities, and relatively hot weather. The common winter season vegetable crops are cauliflower, tomato, cabbage, radish, bean, cowpea, and eggplant, while summer season vegetable crops are gourds (bitter, bottle, pointed and sponge), pumpkin, cucumber, cowpea, tomato, and cabbage (CBS, 2010). The majority of the farmers cultivate vegetables in their own land, they use both manual and animal

power intensively, most of them purchase seeds from nearby markets, majority of them apply compost instead of fertilizer, and most of the farmers work with farmers' group or cooperatives.

Pudasaini (1983) conducted a study on impacts of education on agriculture, and reported that higher levels of education had a significant role in modernizing agriculture and higher payoff. Further, Pudasaini (1984) revealed that levels of education, labor, bullocks and fertilizers had positively impact on crop production (rice, wheat, maize, and sugarcane) in both terai and hill regions. Adhikari and Bjørndal (2009) conducted a study on the technical efficiency in agriculture (Cereal, pulses, and other crops) using stochastic distance function and data envelopment analysis, and reported two main results: one, medium sized farms achieved a higher level of technical efficiency than large and small-farm; second, production frontier was increased by land ownership, land quality, education levels of farmers, and irrigation facilities. Paudel and Matsuoka (2009) estimated the cost efficiency using stochastic frontier cost function on maize, revealed that the cost efficiency was positively determined by cost of tractor, animal power, labour, fertilizers, manure, seeds and outputs of maize. Tiwari et al. (2008) compared the vegetable crops with traditional cereal crops, and revealed that the farmers significantly improved their household economy and reduced the levels of poverty through vegetable farming than those that of cereal crops.

### **2.3 Vegetable Marketing Systems in Nepal**

Efficient marketing system stabilizes the price of commodities that help to improve the efficiency in production. Market access to the smallholder farmers is one of the major constraints in developing countries because of limited numbers of vegetable markets available nearby the production areas, and lack of farmer's friendly rule and regulations (Minten et al., 2010; Shrestha et al., 2014a) that hindered farmers to increase the levels of vegetable production. Mishra and Kumar (2005) found that there was inverse relationship between perishability of vegetable products and market cointegration; as higher the perishability, the lesser the cointegration among markets. The market cointegration has positive relationship with production efficiency; as the market is cointegrated that help to improve the efficiency in production.



In developing countries, vegetable marketing system is complicated because of greater market power exists with limited traders and involves larger numbers of marketing intermediaries. A lengthy marketing channel adds more marketing costs that increase the price of commodities (Shrestha and Pandey, 2010). There are mainly three types of vegetable markets in Nepal such as vegetable collection centers, wholesale markets, and retail markets (MOAD, 1996; USAID, 2011). The most of the collection centers and wholesale markets are managed by agriculture produce market management committee represented by farmers, traders, and local government offices (MOAD, 1996), while retail markets (vegetable shops along the road side, daily and weekly markets, and Riksa/bicycle markets) are operated by private sectors. In general, collection centers are located nearby the vegetable production areas and wholesale markets (about 16 numbers in the country) situated at different market hubs, which are linked with production areas or collection centers, and retail markets. The smallholder farmers, who produce less quantity of vegetable, sell in local markets, while commercial farmers who produce larger quantity sell in distance wholesale markets through lengthy marketing channels.

#### **2.4 Status of Tomato Production in Nepal**

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 ton 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. The major tomato growing districts with area and production are Kavre and Sarlahi districts rank first and second both in area and production, respectively.

## 2.5 Cobb-Douglas Production Function

The Cobb-Douglas production function is based on the empirical study of the American manufacturing industry made by Paul H. Douglas and C.W. Cobb. It is a linear homogeneous production function of degree one which takes into account two inputs, labour and capital, for the entire output of the manufacturing industry.

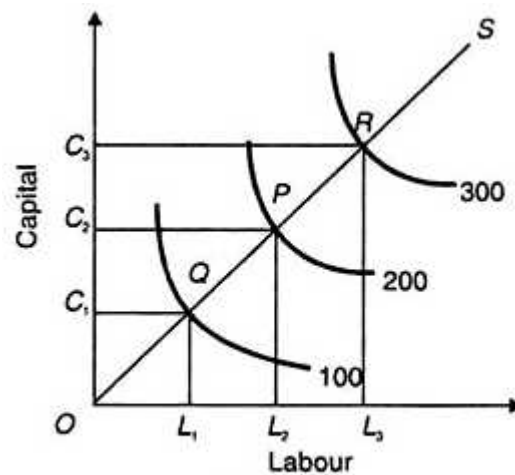


Figure 2.1 Cobb-Douglas Production Function

$$Q = AL^{\alpha}C^{\beta}$$

where  $Q$  is output and  $L$  and  $C$  are inputs of labour and capital respectively.  $A$ ,  $\alpha$  and  $\beta$  are positive parameters where  $\alpha > 0$ ,  $\beta > 0$ .

The equation tells that output depends directly on  $L$  and  $C$ , and that part of output which cannot be explained by  $L$  and  $C$  is explained by  $A$  which is the 'residual' variables (i.e. inputs), often called technical change.

The production function solved by Cobb-Douglas had 1/4 contribution of capital to the increase in manufacturing industry and 3/4 of labour so that the C-D production function is

$$Q = AL^{3/4}C^{1/4}$$

Which shows constant returns to scale because the total of the values of L and C is equal to one:  $(3/4 + 1/4)$ , i.e.,  $(L + C = 1)$ . The coefficient of labourer in the C-D function measures the percentage increase in Q that would result from one percent increase in L, while holding C as constant.

Similarly, C is the percentage increase in Q that would result from one percent increase in C, while holding L as constant. The C-D production function showing constant returns to scale is depicted in Figure 2.1. Labour input is taken on the horizontal axis and capital on the vertical axis.

To produce 100 units of output,  $OL_1$  units of capital and  $OL_2$  units of labour are used. If the output were to be doubled to 200, the inputs of labour and capital would have to be doubled.  $OL_2$  is exactly double of  $OL_1$  and of  $OL_2$  is double of  $OL_1$ .

Similarly, if the output is to be raised three-fold to 300, the units of labour and capital will have to be increased three-fold.  $OC_3$  and  $OL_3$  are three times larger than  $OC_1$ , and  $OL_1$ , respectively. Another method is to take the scale line or expansion path connecting the equilibrium points Q, P and R. OS is the scale line or expansion path joining these points.

It shows that the isoquants 100, 200 and 300 are equidistant. Thus, on the OS scale line  $OQ = QP = PR$  which shows that when capital and labour are increased in equal proportions, the output also increases in the same proportion.

Thus the practicability of the C-D production function in the manufacturing industry is a doubtful proposition. This is not applicable to agriculture where for intensive cultivation, increasing the quantities of inputs will not raise output proportionately. Even then, it cannot be denied that constant returns to scale are a stage in the life of a firm, industry or economy. It is another thing that this stage may come after some time and for a short while.

Oladeebo & Fajuyigbe (2007) examined the technical efficiency of upland rice production by men and women farmers in Nigeria using the stochastic frontier Cobb-Douglas production function. The results showed that women farmers were more efficient than men farmers. The age and years of education of farmers had positive influence on the level of technical efficiency.

Bozoglu & Ceyhan (2007) estimated that the technical efficiency of the vegetable farms using one-step procedure of stochastic frontier Cobb-Douglas production analysis. The mean of technical efficiency was 0.82, and identified the explanatory variables such as schooling of farm household, experience of farmers, credit availed in vegetable farming, women participation index, and information index positively affected the technical efficiency, while age, family size, off-farm income and farm size showed a negative relationship with efficiency. Similarly, Ojo et al. (2009) examined the implication of resource productivity and farm level technical inefficiency in yam production in Nigeria using the stochastic frontier Cobb-Douglas production function. Results showed that farmers' educational level, years of farming experience, and access to extension service significantly positive influenced the farmers' efficiency. Obare et al. (2010) estimated Irish potato production efficiency in Nyandarua using stochastic frontier Cobb-Douglas production function. The results revealed that there was decreasing returns to scale, and the mean of the allocative efficiency was 0.57. The explanatory variables such as experience, access to extension, access to credit, and membership in a farmers' association positively determined the allocative efficiency.

Ukpong & Idiong (2013) estimated the technical efficiency of leafy vegetables in Southern Nigeria using stochastic Cobb-Douglas production function with one-step procedure. The results of maximum likelihood estimates of the Cobb-Douglas stochastic production frontier function indicated that age of vegetable producers have a negative influence, while educational level, farming experience, farm size, household size and soil quality have positive effects on the technical efficiency.

## **2.6 Status of Tomato Production in Annapurna Rural Municipality (Dhikurpokhari VDC)**

A research has been done by DCDO, Kaski on economic analysis of tomato production with in plastic house, show the relationship between farmers and economic status of Annapurna Rural Municipality. They explained about the size of plastic house and production process of tomato, they said plastic house should be 12mx7m and within this house tomato production is more sufficient. According to Maya Bhandari- The size of plastic house should be 12mx10m, for this size tomato production is more sufficient than other size of plastic house. Tomato production is more at first year than other next years. She also said tomato production is better occupation for our village farmer because it increases economic status of all farmers of Annapurna Rural Municipality.

## **2.7 Review of Related Studies**

Different research projects were carried out with the help of production function in agriculture field in the past. In 1958 agricultural economists began to investigate the economic benefit of scientific research in agriculture. With the joint collaboration of the Ministry of Economic Planning and the Development of Economic and Commerce production function was first used in 1965/66 in Nepal.

A study on 'Fruit Production in Kaski and Syangja' was conducted by Food and Agriculture Development/HMG in 1976. This study has focused on the production, cost existing marketing channels of major fruits in these two districts. The objectives of the study are : to estimate the cost of cultivation of major fruits grown in these two district, to estimate the total production and existing number of different fruits in genera and those of citrus trees in particular, to study the existing marketing channels and methods of marketing as followed by the fruit growers in particular. The study confirmed that the favourable climate and soil condition of the hilly areas have attracted the farmers towards fruits production and also suggested that various support service programmers are necessary for providing supplementary means of increasing and additional income of farmers. The main barriers pointed out by this study, for producing fruits in these two districts are: lack of administrative efficiency, lack of coordination among government and private agencies and farmers, lack of knowledge

about imported cultivation practices for fruit production on the part of the farmers, effect of pest and disease, specially viral diseases in citrus plants, lack of systematic marketing system as well as facilities of transportation.

Kanel (1978) made a study on the input-output relationship in the content of wheat farming in Baktapur district. He used C-D production function with three independent variables namely farmyard manure, nitrogen and labour. Different models of production function were estimated by overall data for irrigation facility, cost and dose of nitrogen. The data were cross-sectional for the year 1976 and the sample area of the study was Bageshwory Panchayat. The major findings of the study were, coefficient of multiple correlation was high enough to show the relationship between inputs and outputs of wheat, the effect of farmyard manure was found significant, the use of chemical fertilizer revealed that the actual dose of nitrogen was smaller than what was required technologically.

Gubhaju (1991) has studied about paddy production which gives the input-output relationship in paddy production of Bhalam VDC of Kaski district. The data were cross sectional and the sample size taken by him was 48 households. Which are taken randomly by stratifying the whole VDC into nine wards. Fitting the data into C-D production function, he had found that, the farm-yard manure and nitrogen are significant at 0.10 level with positive and negative coefficient respectively.

Bhattarai (1988) has made a study. A Cobb-Douglas production function was estimated to establish the relationship between inputs and output of paddy. He has considered different models of C-D production function. F-values in all models were highly significant at 0.05 level of significance. The value of  $R^2$  and  $R^{-2}$  were not less than 75%. The cultivated land, chemical fertilizer and animal labour are found significant in all models whereas the marginal productivity of human labour was found negative due to excessive use of manpower. Output is better in size of land holding of two hectares and also better input-output relation in irrigated land.

Chapagain (1987) has conducted a study on orange marketing in Bhojpur district. The objective of this study was mainly concerned with the problems of production and marketing of orange farming. In this research 81 households out of 300 households were selected randomly to collect information and some simple statistical

tools and techniques like measure of central tendency, percentage, bar-diagrams; pie-chart were used to analyse the information.

Some of the main problems of the study area identified by this study are unequal distribution of income, a low level of employment opportunities, a high population pressure on land, ecological misbalance etc. The extent of these problems the farmers to farm where orange in the study area. However, the study has shown that the cost of marketing is very high. Hence, to improve the situation, the study has recommended to develop market information system, storage facilities and to provide credit facilities to orange growers from the organized sector.

Shrestha (2001) has conducted a study on 'A diagnostic study on sweet orange marketing in Ramechhap' in 2001. The study is focused on the production and supply situation of sweet orange. The main objectives were to account the area under cultivation, to estimate the area quantity of production and estimate marketable surplus and to analysis the exiting marketing system and its problems. The research has conducted by using both primary and secondary data and find the major problems as transportation, custom/check points, cold storage, and damage of fruits during transportation and unnecessary burden to customs clearance.

Chhetri (2002) has conducted a study on 'Orange cultivation in Sikkim'. The study states that the cash crops play a significant role in increasing economic welfare of the state. According to this study, orange is considered as nutritive as well as commercial cash crops in the study area. So many people of the study area are attracted towards orange farming. The specific objectives study are, to investigate the farm size and production of orange, to examine the socio-economic status of orange growers, to explore the marketing system, to study the production trend, problems and prospects of orange cultivation. This study has concluded that the orange farming in the study area has been a successful profession. It is because it has helped to enhance the socio-economic condition of the farmers. The study has identified some problems such as traditional cultivation system, inadequate use of modern input like chemical fertilizers, agro-chemical and insecticides, lack of irrigation, facility and lack of accessibility to main markets because market centres are far from the study area. To solve the above mentioned problems, some recommendation have been done, which are as follows: sufficient literature and references should be provided in the state

library published by Sikkim government and government should take immediate steps to overcome the above mention problems.

Acharya (2002) has conducted a study on ' Citrus cultivation on Kaski District. The study has focused on citrus cultivation. Citrus cultivation plays significant role for improving environment through playing new fruit trees in marginal land. The study states that since the last decade, farmers are more optimistic towards citrus fruit cultivation. In this study, the researcher has set some objectives which are: to analyse the general pictures of citrus fruits farming, to examine the current production situation of citrus fruit, to search out prevailing problems of citrus farming, to examine future prospect. Bharat Pokhari VDC of Kaski district was the study area. Primary as well as secondary data both were collected from farming households, local leaders of VDC, relevant and agriculture development bank. Descriptive research design has been used in this study. Quantitative tools and techniques such as percentage, average, tables and diagrams have been used to analyse the data. This study has concluded that citrus fruit production has increased slightly, the study also concludes that the production quantity has been in increasing trend. The study has identified some problems such as rugged topography extremes sleep shop, hail stone, unnerve rainfall, wind storm, insufficient service of J.T/J.T.A lack of chemical fertilizer and pets.To solve the problems mentioned in this study has made some recommendations which are as follows: to establish the sufficient nurseries, to provide training and to encourage the orange farmers, to plant sapling grown from nuclear seedling and grafting in their orchard from the concerned agricultural techniques.

Rai (2003) has conducted a research on 'Orange marketing in Sikkim'. In this study the researcher has determined some specific objectives which are : to study the orange production and its productivity, to estimate the extent of marketing of orange by the farmers, to identify the marketing agencies, to study the pricing system, to suggest policy measures to encourage the orange growers. Out of 150 households of commercial orange farmers, 36 households were growers. Out of 150 households of commercial orange farmers, 36 households were taken as sample according to the size of orange orchards from five Gram Panchyat units of Melli constituency in south Sikkim. Primary as well as secondary data have been used in this study collected from structured questionnaire, informal interview and various publication of horticulture



department and government offices. The study concluded that orange cultivation is very important and is a more profitable crop which can be cultivated as intercropping with other cereal crops. Moreover, the production trend is good and the productivity of orange is at an increasing trend in the study area. The study has also identified some problems which are; problems of market, problems of credit facility, problem of cold storage and processing, problem of technical knowledge about orange cultivation. He also recommended that develop the link between production and marketing center, establish co-operative organization for marketing, provide technical support to the farmers and make media effective for the marketing system.

Thapa (2005) has conducted a study of orange cultivation in western hill region of Nepal. The main objectives of this study: to analyse the main determinants of orange cultivation, to explain the access to the market and factors influencing to it, to compare the socio-economic status of orange cultivation. Out of 540 households of Sankar Pokhari, 135 households(25%) were selected using random sampling technique. The study has identified some major problems which are: transportation problems, technical problems, market, irrigation, diseases and pests, low productivity and price etc. The study has concluded that socio-economic status of orange growers is higher than non-growers. It has also concluded that there is no systematic care and management in orange cultivation, modern inputs as well as irrigation facilities are not available. Furthermore, the orange production in Sankar Pokhari VDC has slightly increased, however, it is not proportional to the increasing rate of cultivation. To solve the problems mentioned above, the study has made some recommendations which are to use modern technology, to provide training facility, to develop irrigation facility, to manage transportation and marketing facility, to provide modern tools and agrochemicals, to provide loan to orange growers from organized financial sector at normal rate of interest.

Haji (2008) did a study on economic efficiency and marketing performance of vegetable production in the Eastern and Central Parts of Ethiopia. He found that there was the existence of considerable economic inefficiency in production, poor contract enforcement and imperfect competition in the marketing of vegetables, and indicated the need of intervention from the governmental and/or private institutions to improve

the production and marketing performances of vegetables by providing the necessary supports to the smallholder farmers.

Chaudhary (2010) has carried out a research to analyse the marketing system of tomato in Lalitpur district of Nepal. Specifically, this study was intended to identify marketing channels, to estimate gross margin, marketing margin and producer share, to find out the situation of market information and to identify constraints related to production and marketing of vegetables, especially tomato. Accordingly, a representative sample size of 20 tomato growers comprising 10 each from Lamatar and Lubhu village development committees were purposively selected. Similarly, 10 wholesalers from Kalimati fruits and vegetables wholesale market and 10 retailers from Lagankhel 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 ropani was higher in Lamatar than in Lubhu. Likewise, gross margin was higher in Lubhu than in Lamatar due to lower cost of production and higher yield in former case. In addition, the benefit cost ratio was also found to higher in Lubhu. 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 Lamatar than in Lubhu where farmers sold tomato by bargaining. However, there was not significant difference in mode of selling. 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.

Suleiman, Bhat and Jacob (2009) have conducted a case study on Cost of Cultivation of Tomato in Kuwait in Uncooled Plastic Tunnel System. This study shows the Tomato is one of the main vegetable crops in Kuwait with a total greenhouse production of 39,218.3 tonnes and with a value of \$ 9.58 million in 2004. This study

is aimed to estimate the cost of production of tomato in Kuwait in uncooled plastic tunnels. Al-Faisal farm in Al-Wafra was taken for case study. Tomato (super sweet 100) was grown in uncooled plastic tunnel green house (30 x 9 m) and the costs incurred were categorized into initial investment costs, fixed costs and variable costs. The productivity in the case farm was 4.96 kg/m. The total cost to produce one kilogram of 2 tomato was estimated to be \$ 1.03. The net profit per square meter and net profit per kilogram were \$ 1.41 and \$ 0.28 respectively. The study shows that tomato production can be profitable in Kuwait if the available resources are managed efficiently with proper marketing.

Kafle and Shrestha (2009) have conducted a research on 'economics of tomato cultivation using plastic house: a case study of Hemja, Kaski. A questionnaire based survey using purposive sampling technique was carried out to explore the economics of production problems on the tomato production. Twenty five farmers were surveyed to get the necessary information. Per ropani cost of cultivation in the first year was Rs114,507 . Cost of cultivation from the second year onwards was Rs 40,827. The gross average income was Rs1, 08,275. Thus the benefit- cost ratio in first year was negative and it was 1.65 from the second year onward. Most of the farmers sold tomato to middlemen. FM radio and daily magazines were the major source for daily price information. Market price of tomato was higher between August and October. The lack of quality seed was the major production problem and blight followed by nematode was the major disease and the pest affecting the production.

GC and Ghimire ( 2017) have conducted a research on 'Determinants of Pesticide Application in Nepalese Vegetable Farming: An Empirical Analysis using Multivariate Probit Model'. To identify and evaluate determinants of pesticides application in Nepal, a household survey of 300 households was carried-out and an empirical analysis was done using multivariate probit model. Moreover, powder and liquid forms of pesticides were considered for summer and winter season in vegetable farming, which was assigned as outcome variables. Likewise, socio-economic, demographic, farm-level and perception data were considered as explanatory variables. Use of chemical fertilizers, age and gender of head of household, household size and access to weather information were found the most influencing factors. Moreover, forms of pesticides and growing seasons were found complementary to

each other. Therefore, devising the policy options accordingly should balance needs of farmers and health of consumers. A research on Performance of Tomato with Organic Manures in Plastic has been published 28 April 2018. A field experiment in plastic tunnel was carried out in Horticulture Research Division, Khumaltar in two consecutive years (2014 and 2015). Srijana, a popular tomato hybrid among commercial producers, was purposively selected. Eight treatments (control, recommended doses of chemical fertilizers, compost 15 t ha<sup>-1</sup> + cattle urine, compost 10 t ha<sup>-1</sup> + cattle urine, compost 12.5 t ha<sup>-1</sup> + cattle urine, compost 15 t ha<sup>-1</sup> + 1/4 recommended dose of chemical fertilizers, compost 10 t ha<sup>-1</sup> + 3/4 recommended dose of chemical fertilizer and compost 12.5 t ha<sup>-1</sup> + 1/2 recommended dose of chemical fertilizer) were laid out in randomized complete block design and replicated thrice. The result showed significant ( $p < 0.05$ ) positive correlation between the plant height and yield of tomato. The treatment with compost dose of 12.5 t ha<sup>-1</sup> with half dose of recommended dose of chemical fertilizers produced the highest incremental yield (85% increment) over other treatments followed by compost 15 t ha<sup>-1</sup> with cattle urine. Addition of soil organic carbon, soil nitrogen, soil potassium by the increasing level of compost though not significant, but increment in carbon content, nitrogen content and potassium content of soil observed in successive years. A research on the topic Increase the Productivity of Tomato by Changing the Greenhouse Environment has been done in 2017. This report is based on scientific literature researches, which aims to find the effect of environmental factors on tomato productivity increase. Tomato is one of the most popular vegetables worldwide. With the increasing demand of tomatoes, the higher productivity is needed. The result shows the productivity of tomatoes is affected by temperature, the amount and quality of water, the radiation, length and intensity of lighting, the level of carbon dioxide. The productivity of tomato can be increased by keeping the temperature of greenhouse in the optimal temperature that is between 20°C and 28°C. Watering frequency in perlite systems is watered three to four times a day.

## **2.8 Research Gap**

The gap, also considered the missing piece or pieces in the research literature, is the area that has not yet been explored or is under-explored. This could be a population or sample (size, type, location, etc.), research method, data collection

and/or analysis, or other research variables or conditions. Review of literature reflects the research that has been done in the past and their findings. In this connection the researcher gone through the articles, journals and other published and unpublished dissertation of different level. Few research has been done under potato production, orange production; wheat production and others but no single research has been done in MA level Economics in Prithvi Narayan Campus in tomato production. Few tomato related articles and journals has found in different parts of our country but they do not find the impact of tomato production under plastic tunnel. As a researcher could not find any research that has been done under tomato production in the plastic tunnel of Kaski district especially in Annapurna Rural Municipality. It is claimed that this is a really innovative and novice research topic in the research field.

## CHAPTER III

### METHODOLOGY

Various but appropriate methods and techniques which have been used to carry out this study are presented as follows. This chapter includes the brief discrimination about research methodology used to fulfil the objectives of this research study. It includes research design, source of data collection, and statistical tools used in the study. This chapter is concerned with detail discussion of the methodology used in this study by covering the procedure of getting research problems answers as per the objectives.

#### 3.1 Research Design

Survey, analytic and descriptive method has been adopted to conduct the study for convenience. This investigation covers collection of reliable primary data with the help of questionnaire and interview. Using the method more items were asked and more flexible but factual information were gathered. While needed secondary data has been used.

#### 3.2 Population and Sample

There are 277 households in Annapurna Rural Municipality ward no 2 who have been producing tomato using plastic house is the population of the study. Out of 277 households 64 households are selected for the study using the technique of simple random sampling method.

Therefore, to find the sample size, the following formula is used.

$$n = \frac{z^2 pqN}{e^2(N-1) + z^2 pq}$$

Where,

n = size of sample;

$z$  = The value of standard variate at a given confidence level and to be worked out from table showing area under Normal curve.

$p$  = sample proportion,  $q = 1-p$

$N$  = Population of the study;

$e$  = acceptable error,

$N = 277$  no of farmers producing tomato, confidence level 95%

$z = 1.96$

$e = 0.03$  (Since estimate should be within 3 % true)

$p = 0.02$  (The tomato growers are around 2 percent of total population of the farmers of Annapurna Rural Municipality)

$q = 1-0.02$

$$n = \frac{1.96^2 \times 0.02 \times 0.98 \times 277}{0.03^2(277 - 1) + 1.96^2 \times 0.02 \times 0.98}$$

$$= 64.43 \quad = 64$$

This was done by assuming that sample size will represent almost all the phenomena of the study area.

### 3.3 Instruments

For the collection of the data the researcher herself developed a questionnaire with the help of supervisor. The questionnaire was constructed after the detail survey of related literature such as articles, documents, and thesis and consulted with experienced teacher.

### 3.4 Validation of the Study

Before finalizing the instrument, the item were piloted on seven farmers to check the appropriateness of items. After piloting some questions were modified,

some were rejected and some were corrected. Finally, the researcher showed to her supervisor, expertise for validation and then the questionnaire was prepared for final administration.

### 3.5 Nature and Source of Data

This study is mainly based on primary data. These primary data were collected both quantitative and qualitative in nature.

### 3.6 Data Collection Procedure

For the data collection, the researcher visited each house along with the questionnaire and request letter from P.N Campus, Pokhara to render any help needed to the researcher. After explaining the purpose of the visiting the researcher, respondent were filled up the questionnaire honestly and the researcher explained and clarified any confusion that arose in understanding the statements.

### 3.7 Data Processing and Analysis

The available data have been edited, classified and tabulated in appropriate form. Processing of data have been done by the computer using Microsoft Excel. Various analysis tools were used. Data were tested in frequency table, bar graph, line graph etc. to find the result of different variables. The final result was further preceded by using Microsoft Office Word 2008.

### 3.8 Coefficient of Correlation

The coefficient of correlation between two variables calculated by using

formula: 
$$r = \left[ \frac{N \sum XY - \sum X \cdot \sum Y}{\sqrt{N \sum X^2 - (\sum X)^2} \cdot \sqrt{N \sum Y^2 - (\sum Y)^2}} \right]$$

### 3.9 Trend Line

The equation of trend line is  $Y = aX + b$

For a and b, two normal equations have been assumed,

$$\sum Y = Na + b \sum X$$

$$\sum XY = a \sum X + b \sum X^2$$



## CHAPTER IV

### DATA ANALYSIS

#### 4.1 Introduction

This chapter contains two major sections. First section deals about data presentation and analysis which is placed over the respective tables. Second section contains major findings derived from the first section.

#### 4.2 Demographic Characteristics

In research, demographic characteristics like gender, family size, education etc. plays an important role. These characteristics affect the economic activities and other activities of the people as well as nation.

##### 4.2.1 Gender

Out of 277 household only 23% of the total population that is 64 households are taken for gender wise distribution.

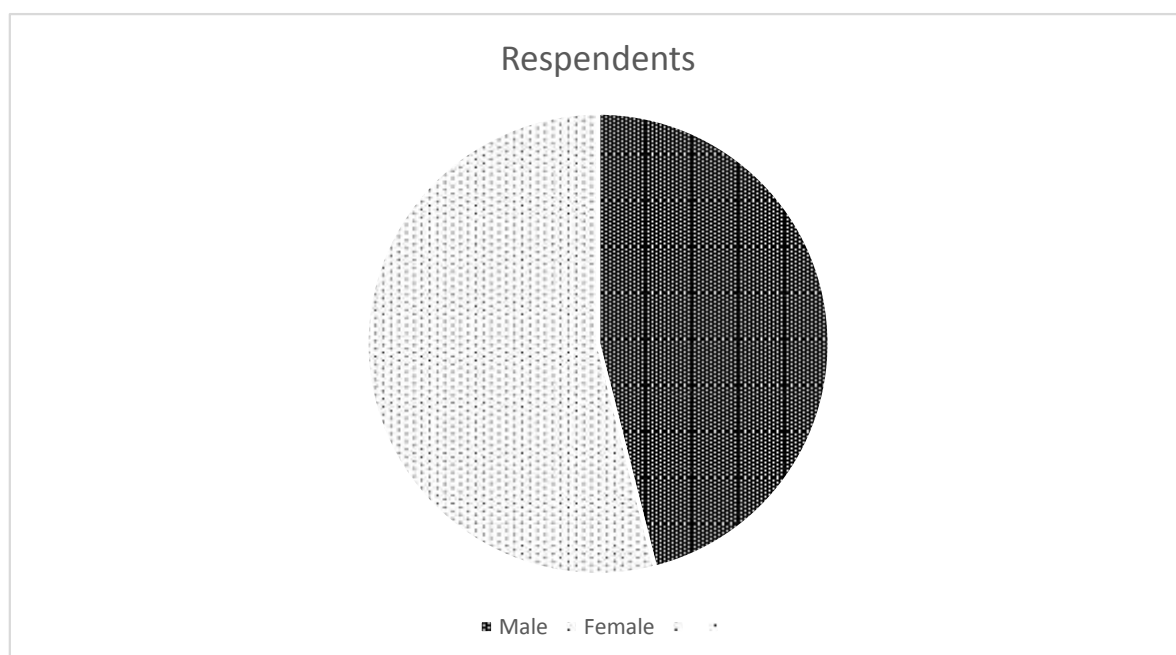
Table 4.1  
Gender

Gender	Frequency	Percentage
Male	29	45.3
Female	35	54.7
Total	64	100

Source: Field Survey Report, 2019

Table 4.1 shows that 45.3% of male and 54.7% of female respondents are taken in the survey from the total household. It reflects that the more number of females are involved in this tomato plantation than in area. The details is mention in the figure as well.

Figure 4.1  
Gender



#### 4.2.2 Age Group

Age plays the role in innovation and active work. Most of the people has more efficiency in their work in the active age. The table shows the composition of respondents according to their age.

Table 4.2

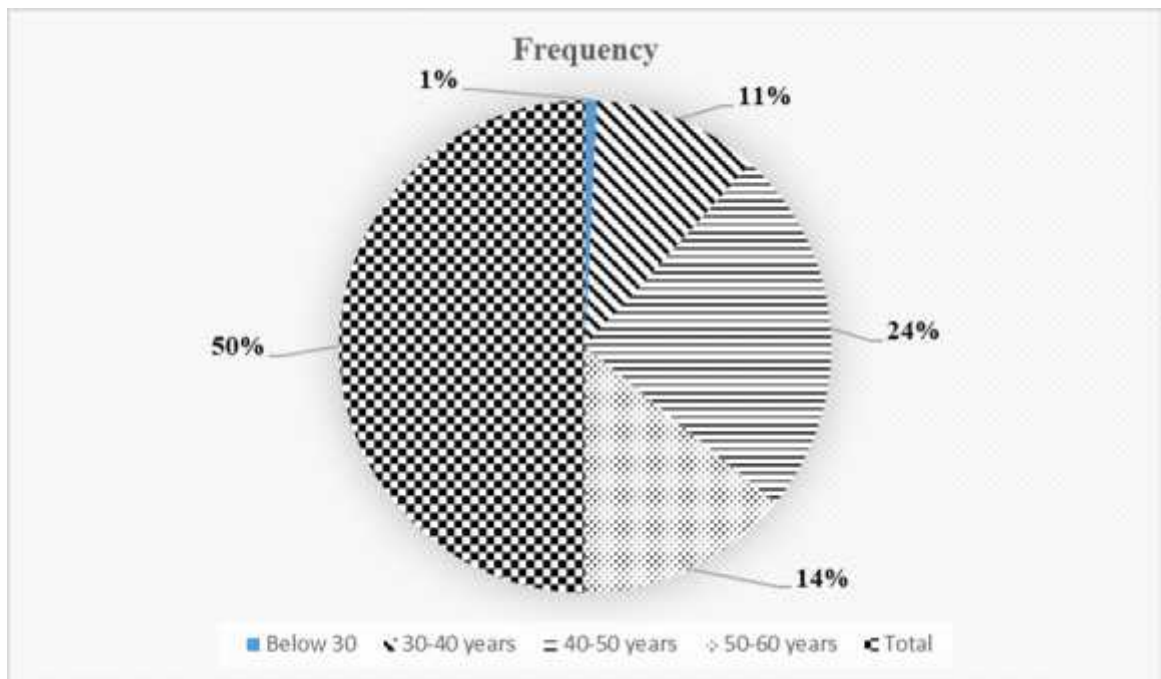
#### Age Group

Age	Frequency	Percentage
Below 30	1	1.57
30-40 years	14	21.88
40-50 years	31	48.43
50-60 years	18	28.12
Total	64	100

Source: Field Survey Report, 2019

Table 4.2 shows that 1.57% of respondents are below 30 years, 21.88 %, 48.43% and 28.12 are in 30-40, 40 – 50 and 50-60 years group respectively. It shows that maximum percent i.e. 48.43% of people are involved from 40-50 years group. It reveals that 40 years and more age people are more attractive in this tomato plantation which also shows that they are motivated in light physical work. The details is shown in the figure as well.

Figure 4.2  
Age Group



### 4.2.3 Educational Status

Education plays the crucial role to uplift the economic status of the family. It helps to generate the living status, income opportunity and innovative ideas. Similarly, academic qualification matters for the better technique of agricultural production. The condition of educational status of respondents is presented in the following table.

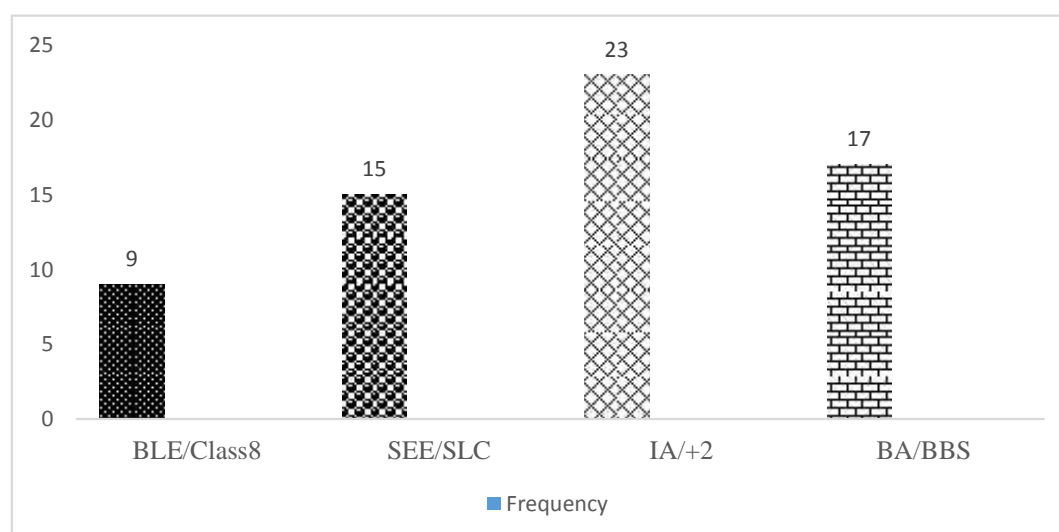
Table 4.3  
Educational Status

Education	Frequency	Percent
BLE/Class8	9	14.06
SEE/SLC	15	23.44
IA/+2	23	35.94
BA/BBS	17	26.56
Total	64	100

Source: Field Survey Report, 2019

Table 4.3 shows that maximum percent i.e. 35.94% of total respondents have plus two level qualification whereas less percent i.e. 14.16% having Basic Level Qualification. This result reflects that about 86% of respondents have SLC and above qualification. Which also shows that academically qualified people are motivated in modern agriculture production to generate the income. The details is shown in the figure as well.

Figure 4.3  
Educational Status



### 4.3 Current Status of Tomato Plantation

#### 4.3.1 Own Land for Farming

For the purpose of tomato plantation land is needed. According to the information given by the respondents the land pattern is given in the table.

Table 4.4  
Own Land for Farming

Own Land	Frequency	Percentage
Yes	62	96.9
No	2	3.1
Total	64	100

Source: Field Survey Report, 2019

Table 4.4 shows maximum percent i.e. 98.6% of the respondents have their own land for farming. It reveals that maximum people are not farming in lease in the study area.

#### 4.3.2 Types of Land and Their uses in Tomato Plantation

According to the local understanding the land producing mainly rice is called Khet, producing other cereals is Bari. The classification of land and their uses is given in the table.

Table 4.5  
Types of Land and Use

Types	Types of Land		Use	
	Frequency	Percent	Frequency	Percent
Khet	16	25.0	17	26.6
Bari	35	54.7	33	51.6
Both	13	20.3	14	21.9
Total	64	100	64	100

Source: Field Survey Report, 2019

Table 4.5 shows that the ratio of types of land and their uses in tomato plantation looks similar. It shows those who have both Khet and Bari, their location is near so that they have utilized both lands.

### 4.3.3 Number of Tunnels

According to the available land and human resources the number of tunnels made by the people. The available number of tunnels informed by the respondents mention in the table.

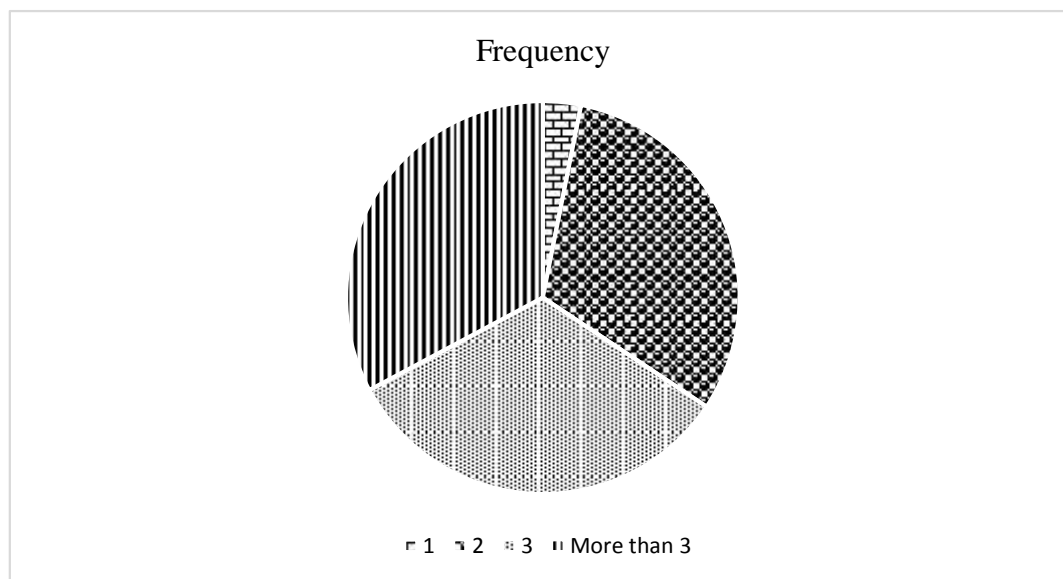
Table 4.6  
Number of Tunnels

Number of Tunnels	Frequency	Percentage
1	2	3.1
2	20	31.3
3	21	32.8
More than 3	21	32.8
Total	64	100

Source: Field Survey Report, 2019

Table 4.6 shows that the respondents which have two tunnels, three tunnels and more than three numbers are 20, 21 and 21 which is nearly equal. Only 2 respondents have only one tunnel it reflects that they do not have their own land for farming. The details is shown in the figure as well.

Figure 4.4  
Number of Tunnels



#### 4.3.4 Involvement of Family Members

Family members' involvement shows the support and cooperation in the family and their business. The involvement of the family of the respondent is given in the table.

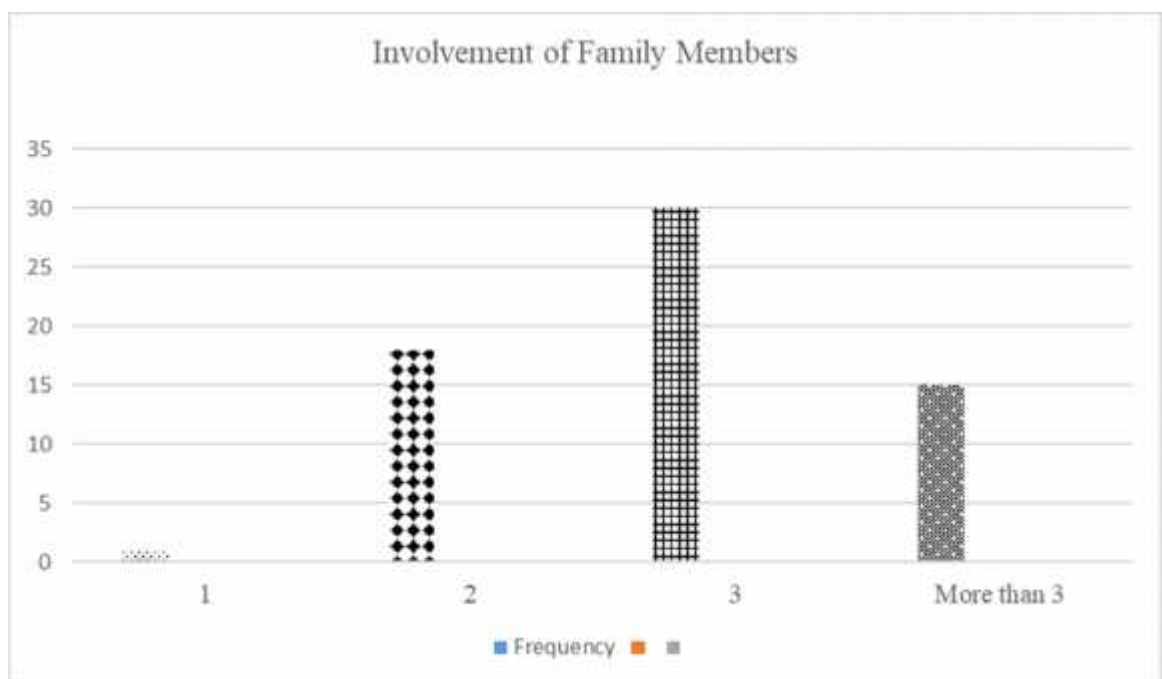
Table 4.7  
Involvement of Family Members

Number of family members	Frequency	Percentage
1	1	1.6
2	18	28.1
3	30	46.9
More than 3	15	23.4
Total	64	100

Source: Field Survey Report, 2019

Table 4.7 shows the involvement of the family members in the tomato plantation. Maximum percent i.e. 46.9% reported that, three members are involved in the support of tomato plantation. Similarly 23.4% more than 3 members and 28.1% only two members are involved in the farming. Very less i.e. 1.6 % of supporter from a single member. The result shows that the main owner and household head has got support and cooperation from their family members. The details is given in the figure as well.

Figure 4.5:  
Involvement of Family  
Members



#### 4.3.5 Main Purpose of Tomato Plantation

Researcher asked the respondent about the main purpose of the tomato plantation they have reported according to their general understanding which is shown in the table.



Table 4.8  
Main Purpose of Tomato Planation

Purpose	Frequency	Percentage
Self-consumption	12	18.8
Occupation	52	81.2
Total	64	100

Source: Field Survey Report, 2019

Table 4.8 shows the main purpose of the tomato planation. Out of two main purposes 18.8% of the respondent reported their main purpose is self-consumption whereas 81.2% of respondent reported that their main purpose is to develop occupation. The result reveals that the household head are motivated to convert their traditional work into income generation through this work.

#### 4.3.6 Information Sources

It is saying that information is power. Information for the new innovation, production and income generation is crucial. Regarding the information of tomato plantation by the respondent of this study area were asked and the answer given by them is tabulated in the table.

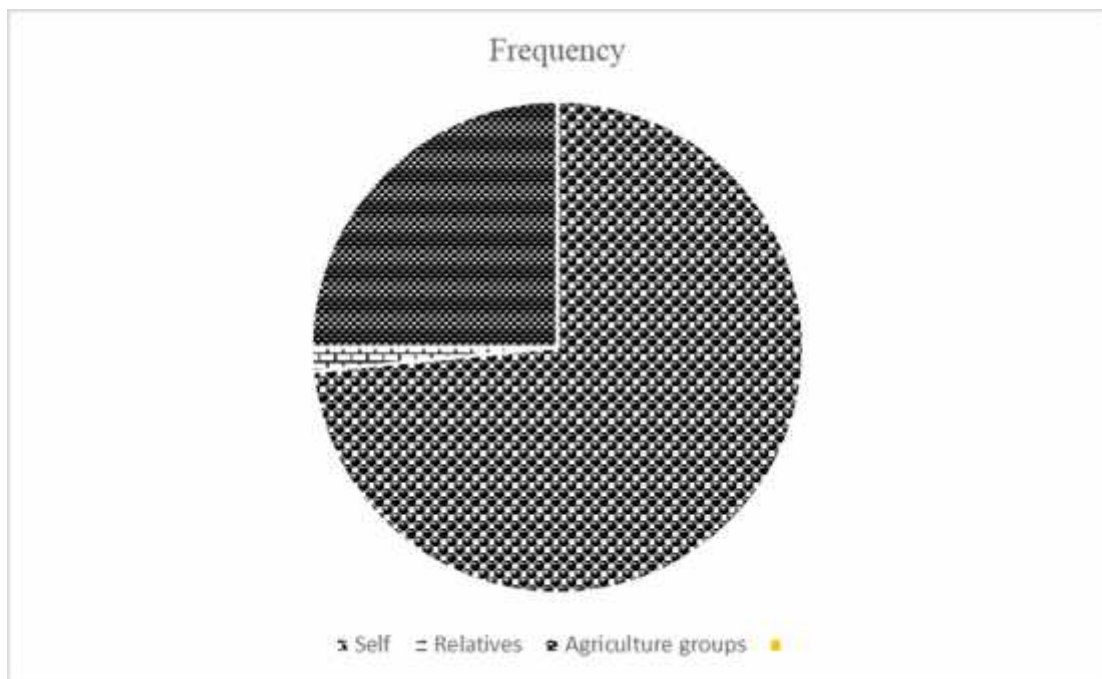
Table 4.9  
First Information Sources

Particulars	Frequency	Percentage
Self	47	73.4
Relatives	1	1.6
Agriculture groups	16	25.0
Total	64	100

Source: Field Survey Report, 2019

Table 4.9 shows that maximum percent 73.4% of respondent obtained the information themselves, similarly 25% of them obtained from agriculture group and only 1.6% from relatives. It shows that the respondents are aware about the changes of the society and new trends. The details is shown in the figure as well.

Figure 4.6: First Information Sources



#### 4.3.7 Main Motivation Factor of Tomato Production

Motivation helps to do a work in a better way. Farmers are doing their work in a traditional way and they have less income from their farm. Tomato plantation is a new way of income generation and more production in a same field. In this situation the main motivation factor were asked they have given multiple responses in this question which is mention in the table and the figure.

Table 4.10

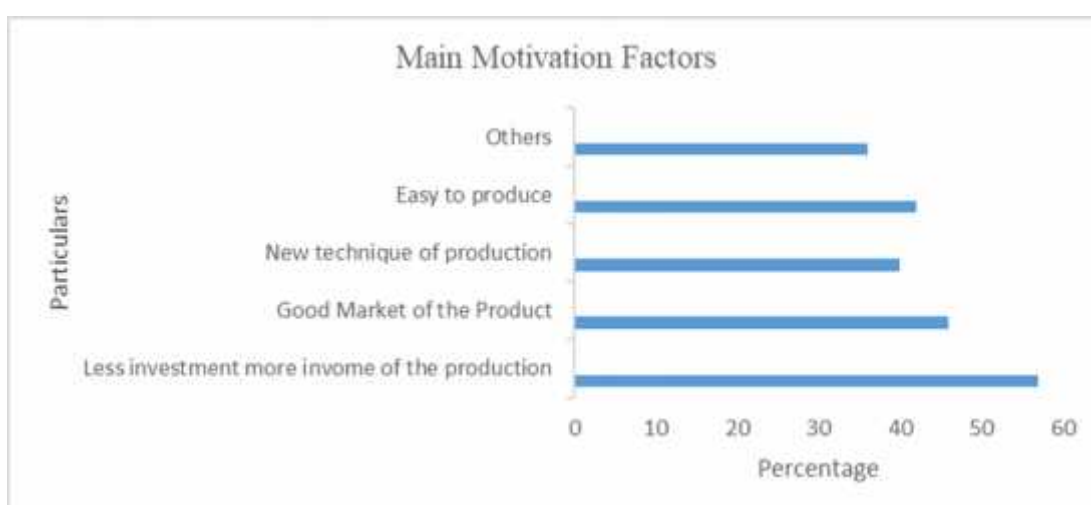
## Main Motivation Factor

Particulars	Frequency	Percentage
Less investment more income of the production	57	89.06
Good Market of the production	46	71.87
New technique of production	40	62.50
Easy to produce	42	65.62
Others	36	56.25

Source: Field Survey Report, 2019. (\*percent=frequency/total respondent)

Table 4.10 shows that the respondents have multiple motivating factors out of them the main factor is less investment more income of the production which is 89.06%. Similarly, 71.87% of them were motivated due to good market of the product, 62.5% of them motivated due to new techniques of production, 65.62 % due to easy production method and 56.25% of them have many other reasons. This result reveals the respondents are motivated towards more income in less investment in the study area. It is shown in the figure 4.1.

Figure 4.7 : Main Motivation Factor



## 4.4 Economic Status

### 4.4.1 Income Trends

The income from selling the tomato of the recent five years from FY 2070 to FY 2074 are collected and mentioned in total in the table.

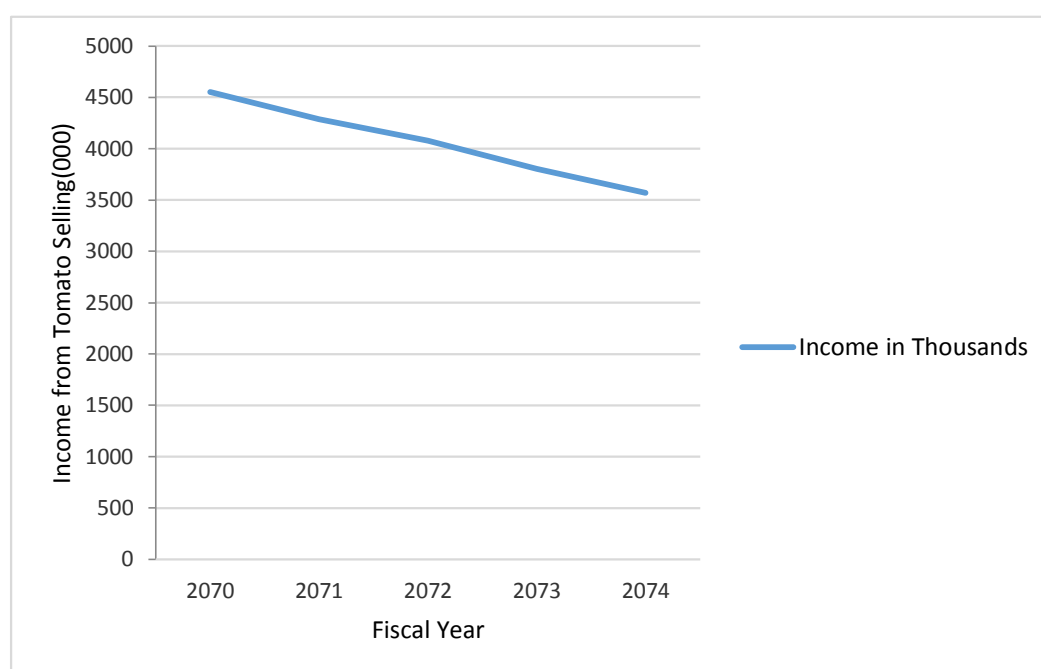
Table 4.11  
Income Trends

Fiscal Year	2070	2071	2072	2073	2074
Income Rs. in Thousands	4550	4289	4051	3806	3573

Source: Field Survey Report, 2019.

The Table 4.11 shows the income trends of Fiscal year 2070 to Fiscal Year 2074 are shown. It shows that the income trends is in decreasing order. It reveals that the production is defective due the same land use by the farmers for the tomato production. They further explained that they need to replace the plastic house after two three years then only the production will be more than last years.

Figure 4.8: Income from Tomato Selling (000Rs.)



#### 4.4.2 Regression Equation of the Trend of Tomato Production

The equation  $Y = a + bX$  where,  $a = y$ -intercept,  $b =$  slope of the regression (It means the change in  $Y$  per unit change in  $X$ ).

With the help of the regression line also we can find the trend of the tomato production and its income from selling can be calculated.

Years	Total Income (Y)	X	$X^2$	XY
2070/71	4550	1	1	4550
2071/72	4289	2	4	8578
2072/73	4051	3	9	12153
2073/74	3806	4	16	15224
2074/75	3563	5	25	17815
Total	20259	15	55	58320

Source: Appendix II

Here,

$$\sum Y = Na + b \sum X$$

$$20259 = 5a + 15b \dots\dots (i)$$

$$\sum XY = a \sum X + b \sum X^2$$

$$58320 = 15a + 55b \dots\dots\dots (ii)$$

By solving the equations,

$$b = -245.7 \text{ and } a = 4788.9$$

Regression equation is  $Y = 4788.9a - 245.7X$

The value of  $b$  shows the negative slope of the trend line. This results also reveals that there is decreasing trend of the income from tomato production.

### 4.4.3 Utilization of the Income

All respondents have not utilized the income entirely in the tomato plantation. They use the amount in different sectors. Multiple responses have been collected and shown in the given table.

Table 4.12  
Utilization of the Income

Particulars	Frequency	Percentage
Education	62	96.87
Medicine	60	93.75
Cloths	64	100
To fulfil the scarcity of food	60	93.75
Festivals	4	6.25
Others	2	3.12

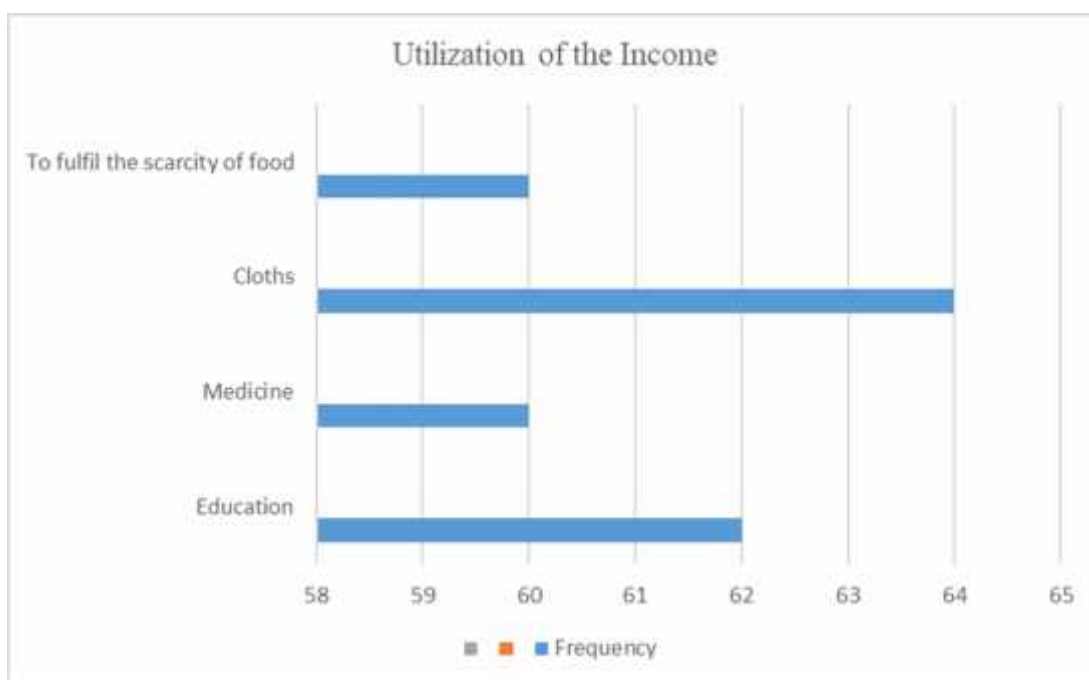
Source: Field Survey Report, 2019.

(\*percent=frequency/total

respondent)

Table 4.12 shows the utilization of the income getting from tomato selling. All the respondents agreed that they have not use it in tomato plantation itself. It reflects that they have more income than investment. From the table it is shown that cent percent respondent use their income in cloths where as 96.87% of them use in education. Same percent 93.75% of the respondent reported that they use the amount in medicine and food. Very few percent in festivals celebration and others. From the given table it is reflected that the income generated from tomato is properly utilized in productive sectors. The details is shown is figure as well.

Figure 4.9: Utilization of the Income



#### 4.5 Production and Treatment

##### 4.5.1 Major Insects/Pests and Diseases

Disease and insects/pests are the major limiting the production of plastic house tomato. According to the respondents the major insect/pest are listed in the table.

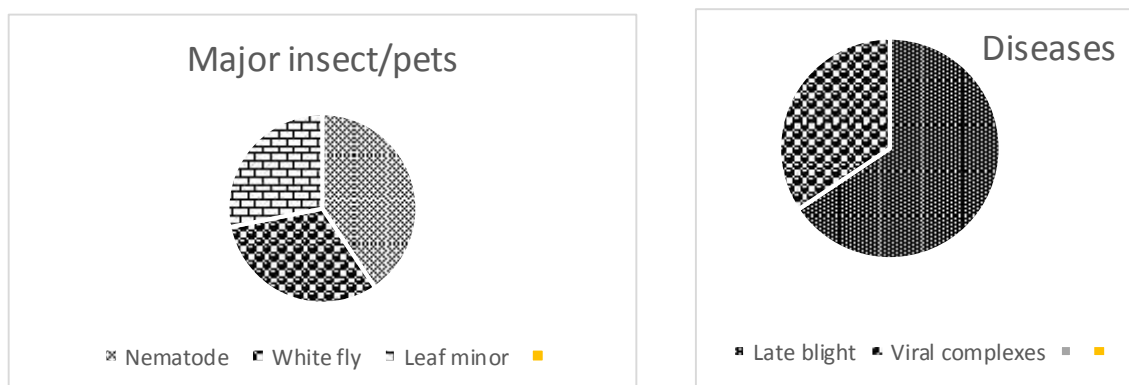
Table 4.13  
Use of Insecticides

Major insect/pest	Frequency	Percent	Major Diseases	Frequency	Percentage
Nematode	26	40.62	Late blight	42	65.62
White fly	20	31.25	Viral complexes	22	34.38
Leaf minor	18	28.13			
Total	64	100	Total	64	100

Source: Field Survey Report, 2019

Table 4.13 shows that Nematode are the major pest problem (40.62%), followed by white fly (31.25%), and leaf minor (28.13%) whereas late blight (65.62%) and viral complexes (34.38%) are the major diseases of tomato in the study area. The details of insect/pest and diseases is shown in the figure.

**Figure 4.10: Major insects/pets and diseases**



#### 4.5.2 Use of Insecticide

To protect from different diseases insecticides need to use in tomato plants. The quantity of insecticides is mentioned in the given table.

Table 4.14  
Use of Insecticides

Particulars	Frequency	Percentage
Less than 5 gram	60	93.75
5 to 10 gram	4	6.25
Total	64	100

Source: Field Survey Report, 2019

Table 4.14 shows that the maximum percent i.e. 93.75% of respondent uses less than 5 grams of insecticide in tomato plantation. Very less i.e. 6.25% respondent uses 5 to 10 grams of insecticide in tomato. The result reveals that insecticide is not much needed in the tomato plantation.



### 4.5.3 Types of Fertilizer

To increase the production of the tomato different types of fertilizer can be used in the plastic house. Mainly compost and chemical fertilizer are used by the farmers in the study area which is shown in the table.

Table 4.15

Types of Fertilizer

Particulars	Frequency	Percentage
Compost	5	7.8
Chemical Fertilizer	8	12.5
Both Compost and Chemical Fertilizer	51	79.7
Total	64	100

Source: Field Survey Report, 2019

Table 4.15 shows that maximum percent i.e. 79.7% of respondents use both compost and chemical fertilizer in the field of the plastic house to grow more tomato. The result reveals that both fertilizer compost and chemical are equally required in the production of tomato plantation.

Figure 4.11: Types of Fertilizer

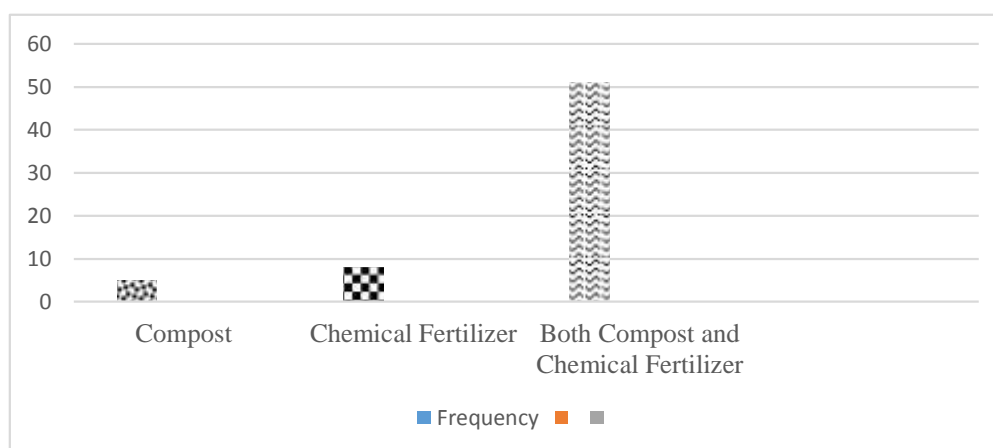


Table 4.16

## Production in the Land before Tomato Farming

Particulars	Frequency	Percentage
Cereal crop	60	93.74
Grass	2	3.13
Others	2	3.13
Total	64	100

Source: Field Survey Report, 2019

Table 4.16 shows that out of 64 respondents' maximum number i.e. 60 reported that before the tomato plantation they use the land planting cereal crops. Only two each of them use the land by grass and others. It shows that there was cereal crops in the land before the tomato plantation.. The details is shown in the figure as well.

Figure 4. 12: Production in the Land before Tomato Farming

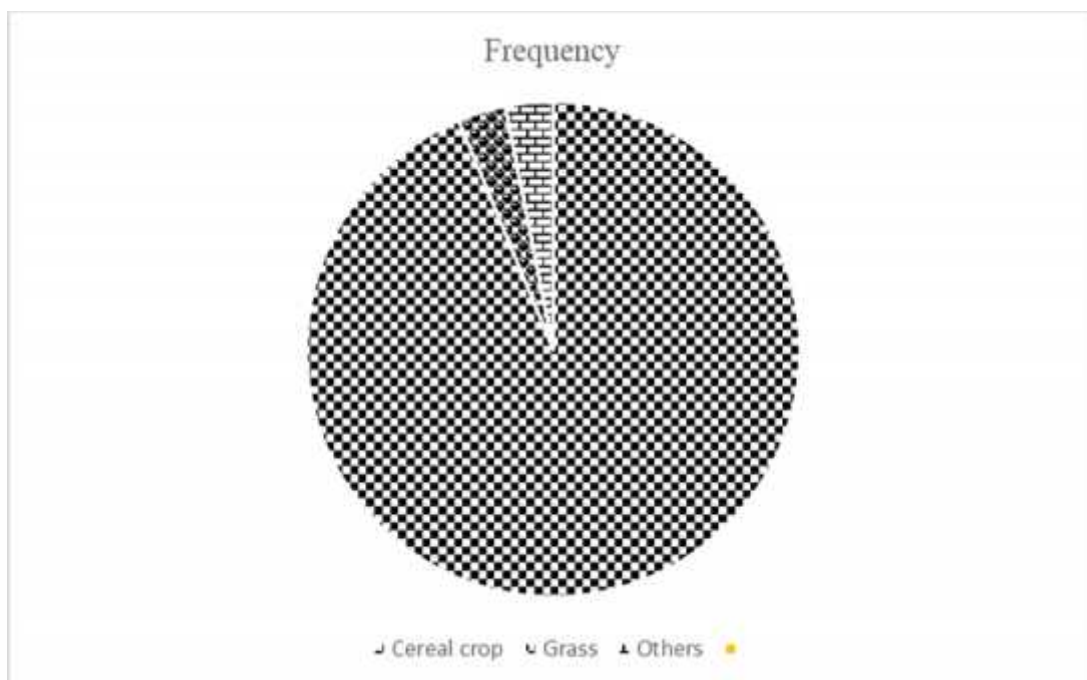


Table 4.17  
More Income Generation

Particulars	Frequency	Percentage
From Before crops	0	0
From Tomato Farming	64	100
Total	64	100

Table 4.17 shows that the income of the production from the land. All the respondents reported that they have more income from the tomato plantation than in that previous crops. It reveals that tomato production generates more income in the same land than others crops.

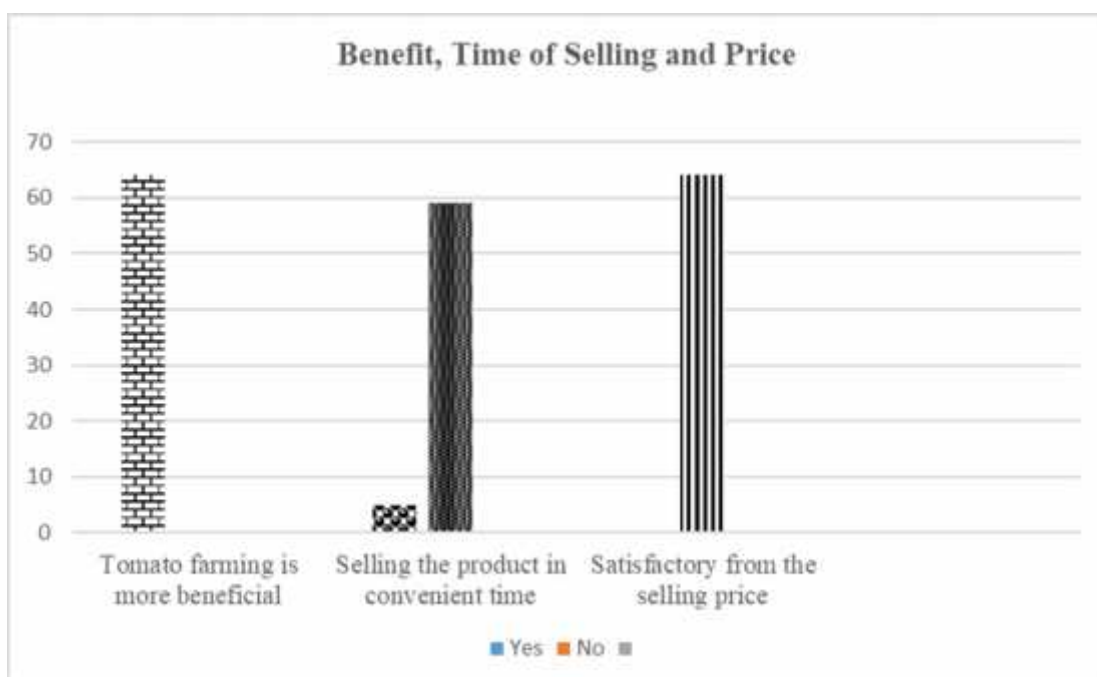
Table 4.18  
Benefit, Time of Selling and Price

Particulars	Yes	No
Tomato farming is more beneficial	64	0
Selling the product in convenient time	5	59
Satisfactory from the selling price	0	64
Total	69	113

Source: Field Survey Report, 2019

Table 4.18 shows that out of 64 respondents, all of them agreed with tomato production is more beneficial than cereal crops. Similarly, maximum number i.e. 59 reported that they can't sell the product in their convenient time and all 64 respondents are not satisfactory from the selling price of the product. The details shows that farmers are benefited from the tomato plantation but flexible time schedule and price of selling is not satisfactory.

Figure 4.13: Benefit, Time of Selling and Price



#### 4.5.4 Technical Support

For the promotion and effective plantation training, seeds on time and technical help is required. On the basis of these questions the respondents have given the following response which is tabulated in the table.

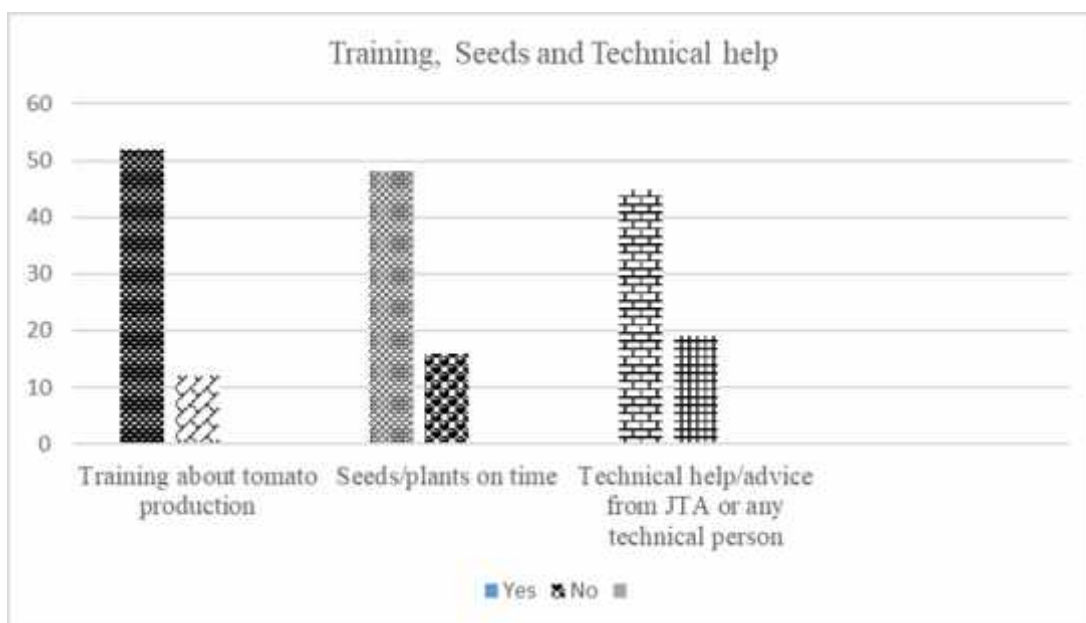
Table 4.19  
Training, Seeds and Technical help

Particulars	Yes	No
Training about tomato production	52	12
Seeds/plants on time	48	16
Technical help/advice from JTA or any technical person	45	19
Total	145	47

Source: Field Survey Report, 2019

Table 4.19 shows that out of 64 respondents' maximum number i.e. 52 are benefited from training of tomato plantation, 48 reported that they got the seeds and plants on time and another 45 respondents got technical help from the JTA or technician. The results shows that respondents are getting help and knowledge about tomato plantation from the authorized person and seeds and plants on time. The details is shown in the figure as well.

Figure 4.14: Training, Seeds and Technical help



#### 4.6 Correlation between Academic Qualification and Income

Basically, the higher the education level, the higher the income. Specifically in the case of tomato plantation of this area the correlation between academic qualification and the income generated from the tomato plantation has been analysed.

Table 4.20  
Correlation between Academic Qualification and Income  
Correlations

		Academic Qualification of the Respondent	Total Income
Academic Qualification of the Respondent	Pearson Correlation	1	.553**
	Sig. (2-tailed)		.000
	N	64	64
Total Income	Pearson Correlation	.553**	1
	Sig. (2-tailed)	.000	
	N	64	64

\*\* . Correlation is significant at the 0.01 level (2-tailed).

From the Table 4.20 it shows that there is moderate level positive correlation (= 0.553) between academic qualification and the total income of the five consecutive years. It reveals that the qualification supports for the tomato plantation in planning, use of fertilizer, selling and every concern.

#### 4.7 Correlation between Age and Income

For younger people, there seems to be hardly any relationship between income and wealth. Later on, in the late-30s, the relationship seems to peak. During this age period, income is actually a very good predictor of someone's net worth. Actually the correlation between age and income has been measured in this study area and given in the Table.

Table 4.21  
Correlation between Age and Income  
Correlations

		Total Income	Age of respondents
Total Income	Pearson Correlation	1	-.094
	Sig. (2-tailed)		.458
	N	64	64
Age of respondents	Pearson Correlation	-.094	1
	Sig. (2-tailed)	.458	
	N	64	64

Table 4.21 shows that there is minimum level negative correlation (= -0.094) between total income and age of the respondents. It reflects that age and income are inversely proposal. In a young age people earn more than the old one. It is seen in the tomato plantation in this area.

#### 4.8 Problems and Prospects of Tomato Production

Tomato production plays a significant role in the development of rural economy of hilly region people. It provides employment opportunities and additional cash income which will uplift the poor economy of the farmers. Many new practices are implemented in agriculture field but there are various problem faced by the farmers. The main problems of the study area faced by the farmer are presented here.

##### 4.8.1 Lack of transportation facilities

Among the major problems of tomato production in the study area, lack of transportation is dominant one. The Pokhara to Baglung highways runs from the study area but to meet the highway there are no good feeder road form the villages for the

study area. They need to use labor for transportation which is very costly. Due to the lack of road network, local farmers have faced difficulties for selling their product in the market properly.

#### **4.8.2 Lack of technicians**

Tomato plantation appears to be more technical than other field crops with respect to their particularity in the factorial requirement such as soil, climate and farming practices. JTA and other technical person are helping them but there are so many diseases in tomato plant but they do not recognize them and the life period of tomato is going to be low and the product is minimum. So, qualified technician is required in the study area.

#### **4.8.3 Low Price Level**

The farmers are not selling to the customer directly. The mediators are not giving more price to the farmers. 50% of the customer price will be received by the farmers.

#### **4.8.4 Problems of market**

Lack of marketing facility is another vital problem faced by the tomato producer in the study area. There is no special type of marketing facilities and organized co-operative bodies. Main market center is Pokhara which is 25KM far from the study area. Due to the lack of experience about marketing system middle man and brokers will not give more price to the farmers.

#### **4.8.5 Lack of Irrigation Facilities**

Lack of irrigation facilities is another problem in the study area as being hilly region. Due to this reason they will not receive more production and their income will be less.

#### **4.8.6 Solution of the Particular Problems**

There are various problem faced by the farmers during the tomato plantation. After few years experienced they are planning to minimize the problem that they faced. Few strategies are listed here. Main way of solving the problem they mentioned



is asking with experienced farmers because they explained that experience in their field is more important than the bookish knowledge. Few of them explained visiting specialist is another way of solving the problem. Some of them reported internet search is also the method of solving the problems and applying traditional method also help to solve the problems.

#### **4.9 Prospect of Tomato Production in the Study area**

Generally all the prospects have some problems. Tomato production too, has the above mentioned problems; however it has bright prospects in the study area. Economically, it is more profitable than the other traditional farming of cereal crops. Topographically and climatically the study area is suitable for tomato production. Tomato plantation creates employment opportunities and better income helps them to improve their economic status and other educational, health and social status. In long run it helps to solve migration problem and unnecessary tea talk of the study area. The study area has been connected with the district headquarter and all the district level support services can be provided to the farmers which have encouraged to the further expansion of the tomato plantation.

In this way, if the problems faced by tomato growers are solved, tomato production will have better prospects in the future from the point of view of economic development in the study area as well as hilly region of Nepal which are naturally suitable for tomato production.

#### **4.10 Major Findings**

On the basis of data presentation and analysis the major findings of the study are:

- i. More number of females are involved in this tomato plantation than in area.
- ii. Forty years and more age people are more attractive in this tomato plantation which also shows that they are motivated in light physical work.
- iii. Academically qualified people are motivated in modern agriculture production to generate the income.
- iv. Maximum people are not farming in lease in the study area.
- v. There was cereal crops in the land before the tomato plantation
- vi. Tomato production generates more income in the same land than others crops.

- vii. Two tunnels, three tunnels and more than three numbers are 20, 21 and 21 which is nearly equal.
- viii. Main owner and household head has got support and cooperation from their family members.
- ix. Household head are motivated to convert their traditional work into income generation through this work.
- x. Respondents are aware about the changes of the society and new trends.
- xi. This result reveals the respondents are motivated towards more income in less investment in the study area.
- xii. The production is defective due the same land use by the farmers for the tomato production. They further explained that they need to replace the plastic house after two three years then only the production will be more than last years.
- xiii. The income generated from tomato is properly utilized in productive sectors.
- xiv. Nematode, white fly and leaf minor are major pest and late blight, viral complexes are the major diseases of tomato in the study area.
- xv. Insecticide is not much needed in the tomato plantation.
- xvi. Both fertilizers, compost and chemical are equally required in the production of tomato plantation.
- xvii. Respondents are getting help and knowledge about tomato plantation from the authorized person and seeds and plants on time.
- xviii. Farmers are benefited from the tomato plantation but flexible time schedule and price of selling is not satisfactory.
- xix. There is moderate level positive correlation ( $= 0.553$ ) between academic qualification and the total income of the five consecutive years.
- xx. There is minimum level negative correlation ( $= -0.094$ ) between total income and age of the respondents. It reflects that age and income are inversely proposal.
- xxi. Lack of transportation, lack of technician, low price level, problem of markets and lack of irrigation are the main problems of tomato plantation in the study area.
- xxii. Economically, it is more profitable than the other traditional farming of cereal crops.

- xxiii. Topographically and climatically the study area is suitable for tomato production.
- xxiv. Tomato plantation creates employment opportunities and better income helps them to improve their economic status and other educational, health and social status.
- xxv. In long run it helps to solve migration problem and unnecessary tea talk of the study area.

## **CHAPTER V**

# **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

This chapter summarizes the whole study, sketches the conclusions and makes some recommendations for future improvements and advancement about the tomato production of Annapurna Rural Municipality. From the analysis and discussion of above information the summary, conclusion and recommendations are presented as follows:

### **5.1 Summary**

This part of the study summarizes the whole study in a nutshell. Chapter one helps to understand the basic requirement of the research work. It contains background of the study, statements of the problems, objectives, hypothesis, significance, limitations and organization of the study.

According to the World Bank 'Agriculture is the main sources of food, income and employment for the majority'. Although vegetable farming is one of the most important part of the agriculture. Besides other vegetables farming, tomato production within plastic house is also most important income source and employment of all farmers. In Nepal, for commercial purpose Srijana variety tomato farming is popular. Tomato production can be grown in between 10 to 30 degree centigrade in Nepal, tomatoes are considered to be summer vegetables. In this Dhikurpokhari VDC the farmers produce tomatoes such as Unsari, Srijinam Manita, Kabita, Dalila, Amita etc. The main objectives of the study are to analyse economic analysis of tomato production in plastic house. The hypothesis are set to find the correlation between ages, academic qualification with income from the tomato plantation.

Chapter two deals with the review of literature, on the topic it is mainly sub-divided into two parts- Theoretical review and Review the past studies. Theory related to tomato production and its theory, tomato production in Nepal, tomato production in Dhikurpokhari VDC etc are included. Second part included past studies of dissertation and other research paper on the related topic.

Chapter three presents the methodology adopted in this study. In this chapter, the descriptive and analytic research design has been set. There are 277 households having plastic tunnels. Out of them 64 were selected for the study by random sampling method. Questionnaire is the main tool of data collection and computer programming SPSS were used to find the sample size as well as correlation between ages, academic qualification and income.

Chapter four has three sections. The first section is introduction, second is data presentation and analysis and third section is major findings. More number of females are involved in this tomato plantation than in area. 40 years and more age people are more attractive in this tomato plantation which also shows that they are motivated in light physical work. Academically qualified people are motivated in modern agriculture production to generate the income. There is moderate level positive correlation (= 0.553) between academic qualification and the total income of the five consecutive years. There is minimum level negative correlation (= -0.094) between total income and age of the respondents. It reflects that age and income are inversely proposal. Lack of transportation, lack of technician, low price level, problem of markets and lack of irrigation are the main problems of tomato plantation in the study area. Tomato plantation creates employment opportunities and better income helps them to improve their economic status and other educational, health and social status. In long run it helps to solve migration problem and unnecessary tea talk of the study area.

## **5.2 Conclusions**

Based on the findings of the study following conclusions have been drawn.

- i. Annapurna Rural Municipality ward no. 2 is also male dominant society due to that reason more number of females are involved in this tomato plantation than in area.
- ii. There is not more employment opportunities so that 40 years and more age people are more attractive in this tomato plantation which also shows that they are motivated in light physical work. And academically qualified people are also motivated in modern agriculture production.

- iii. Most of the people of this area have their own land for tomato plantation so that they have two tunnels, three tunnels and more than three numbers of tunnels.
- iv. Respondents are aware about the modern techniques of vegetables production but they do not change the plastic house rapidly and their production is in decreasing order.
- v. They do not have more income source so they have fully utilized the income in different productive sectors.
- vi. The main pest of these area are Nematode, white fly and leaf minor and late blight, viral complexes are the major diseases of tomato in the study area.
- vii. Both fertilizers, compost and chemical are equally required in the production of tomato plantation. So no more insecticide is required to the tomato.
- viii. There is good family relationship so that the respondents are getting help and knowledge about tomato plantation from the authorized person and seeds and plants on time.
- ix. The higher the education level, the higher the income is also satisfied in this area because there is moderate level positive correlation ( $= 0.553$ ) between academic qualification and the total income of the five consecutive years but there is minimum level negative correlation ( $= -0.094$ ) between total income and age of the respondents so age and income are inversely proposal.
- x. This village is 25 to 35 km far from head quarter and connected from Pokhara-Baglung highway but the people are facing numerous problems like Lack of transportation, lack of technician, low price level, problem of markets and lack of irrigation which shows that our village are not fully developed and facilities oriented.
- xi. Finally, this tomato plantation is more profitable than traditional farming so that farmers are attractive to this product and in long run it helps to solve migration problem and unnecessary tea talk and better income helps them to improve their economic status and other educational, health and social status. of the study area.

### 5.3 Recommendations

On the basis of the conclusion of the study, the following recommendations are forwarded.

- i. Male need to be encouraged to join in this type of vegetables production.
- ii. Few farmers are leasing the land so the government should provide the land in reasonable price.
- iii. According to the farmers of the study area, modern inputs such as chemical fertilizer, plant protection chemicals, tools and equipment are not easily available on time and at reasonable price, so modern technology and method should be launched. Training facilities should be provided to the local farmers time to time.
- iv. The existing system of marketing is not systematic. Most of the growers are being exploited by middle man/brokers. So emphasis must be given for the development of organized marketing system.
- v. The government needs to provide the economical, technological and other necessary support to the farmers to encourage them for the better production and more income.
- vi. More number of farmers need to encourage in this type of vegetables production.
- vii. For the novice farmer it is suggested that they need to use local technologies, hybrid seeds, take suggestion from JTA, DCDO, checked the soil, use organic fertilizer, take tomato farming as a main occupation and share the problems and solution among the co-ordinators.
- viii. Similar studied and research should be conducted and research outcomes should be implemented.

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- 27. How did you solve your problems of tomato farming?
  - a. Visiting specialist
  - b. Solving by traditional method
  - c. Asking with experienced farmers
  - d. Searching in internet
  - e. Others
- 28. What do you think about the future of tomato farming?
  - a. Good
  - b. Bad
  - c. Normal
- 29. What benefits do you feel after tomato plantation?
  - a. Utilization of time
  - b. Good income
  - c. Enough work
  - d. Utilization of unused land
- 30. Have you got any visits or tour and empowerment training after the tomato plantation?
  - a. Yes
  - b. No
- 31. What policy will be adopted by the government to improve tomato farming?  
.....  
.....  
.....  
.....
- 32. What suggestion do you want to provide for the novice farmers in this field?  
.....  
.....  
.....  
.....
- 33. What are the main problems and prospects for tomato farming in this area?  
.....  
.....  
.....
- 34. Do you have any suggestion and advice regarding tomato plantation?  
.....  
.....  
.....  
.....

Thank you

## APPENDIX II

## Data Sheet used in Correlation Analysis

S.No of Sample HHS	Age	Education	Gender	Income in Thousands Rupees					Total Income
				2070	2071	2072	2073	2074	
1	45	SLC/SEE	Female	60	55	50	45	40	250
2	35	IA/+2	Male	25	22	20	18	15	100
3	32	IA/+2	Female	75	70	65	60	55	325
4	60	BBS	Male	45	40	35	30	25	175
5	55	BED	Male	20	18	15	12	10	75
6	50	IA/+2	Male	70	68	65	62	60	325
7	28	BED	Female	100	95	90	85	80	450
8	46	BBS	Male	103	100	98	95	92	488
9	49	SLC/SEE	Male	35	32	30	28	25	150
10	32	IA/+2	Female	80	75	70	65	60	350
11	36	SLC/SEE	Female	50	45	40	35	30	200
12	52	SLC/SEE	Male	55	52	50	48	45	250
13	40	SLC/SEE	Female	52	50	48	46	43	239
14	42	IA/+2	Male	65	62	60	58	55	300
15	43	IA/+2	Male	95	92	90	88	85	450
16	38	BED	Male	105	100	95	90	85	475
17	45	BBS	Female	100	98	95	90	88	471
18	30	IA/+2	Female	98	95	92	90	85	460
19	32	BED	Male	110	108	106	105	100	529
20	45	SLC/SEE	Female	100	95	92	90	85	462
21	52	DLE/BLE	Male	70	68	65	62	60	325
22	56	DLE/BLE	Female	75	70	65	60	55	325
23	55	class 10	Female	65	60	58	55	52	290
24	60	class 10	Female	60	55	50	45	40	250
25	45	DLE/BLE	Female	35	30	28	25	22	140
26	35	class10	Female	40	35	30	25	20	150
27	47	IA/+2	Male	30	28	25	22	20	125
28	48	IA/+2	Male	35	32	30	28	25	150
29	49	DLE/BLE	Male	25	22	20	18	15	100
30	50	SLC/SEE	Female	40	35	32	30	25	162
31	55	BBS	Female	90	85	82	80	75	412
32	55	BBS	Female	95	90	85	80	75	425
33	59	BED	Male	100	98	95	92	90	475
34	42	BBS	Female	102	95	90	85	80	452
35	45	IA/+2	Male	95	90	85	80	75	425
36	38	IA/+2	Female	65	60	55	50	45	275
37	48	SLC/SEE	Female	60	55	50	45	40	250

38	32	SLC/SEE	Female	70	65	62	60	55	312
39	36	SLC/SEE	Female	60	55	50	45	40	250
40	48	DLE/BLE	Female	75	70	68	65	60	338
41	45	IA/+2	Female	70	68	65	60	55	318
42	52	DLE/BLE	Female	65	62	60	55	52	294
43	56	DLE/BLE	Male	55	50	45	40	35	225
44	54	IA/+2	Female	95	92	90	85	82	444
45	52	IA/+2	Female	92	90	85	82	90	439
46	55	IA/+2	Female	45	40	35	30	28	178
47	48	SLC/SEE	Male	40	38	35	32	30	175
48	45	SLC/SEE	Male	45	43	40	35	30	193
49	42	DLE/BLE	Female	40	36	30	28	25	159
50	45	DLE/BLE	Female	35	30	25	20	18	128
51	47	IA/+2	Female	50	45	40	35	30	200
52	48	IA/+2	Female	75	70	65	60	55	325
53	41	BED	Male	80	70	65	60	55	330
54	40	BED	Female	70	68	65	62	60	325
55	40	IA/+2	Male	75	70	65	60	55	325
56	42	IA/+2	Male	65	62	60	55	50	292
57	45	BED	Male	115	110	105	100	98	528
58	43	BBS	Male	120	115	110	105	100	550
59	50	BBS	Male	105	100	98	95	90	488
60	51	BED	Female	108	105	100	95	90	498
61	48	IA/+2	Male	100	95	90	85	80	450
62	46	IA/+2	Female	110	105	102	100	98	515
63	56	IA/+2	Male	80	75	70	65	60	350
64	54	IA/+2	Male	85	80	75	70	65	375
Total				4550	4289	4051	3806	3563	4550