CHAPTER I

INTRODUCTION

1.1 Background of The Study

Economics is the science that deals with the allocation of limited resources to satisfy unlimited human wants. Think of human wants as being all the goods and services that individuals desire, including food, clothing, shelter, and anything else that enhances the quality of life (Ronald 2010). Broadly speaking, economics is composed of two branches, micro-economics and macro-economics. The prefix micro is derived from the Greek word mikros, which means "small." Micro-economics therefore studies the economic behavior of individual economic decision makers, such as a consumer, a worker, a firm, or a manager. It also analyzes the behavior of individual households, industries, markets, labor unions, or trade associations. By contrast, the prefix macro comes from the Greek word makros, which means "large." Macroeconomics thus analyzes how an entire national economy performs. A course in macroeconomics would examine aggregate levels of income and employment, the levels of interest rates and prices, the rate of inflation, and the nature of business cycles in a national economy (T.R. Jain, 2006–07). For example, in macroeconomics we would see that a society with full employment could produce more goods for national defense, but it would then have to produce fewer civilian goods. Regardless of its market system, every society must answer these questions: What goods and services were produced, and in what quantities? Who were produce the goods and services, and how? Who were receive the goods and services?

Microeconomic analysis attempts to answer these questions by studying the behavior of individual economic units. By answering questions about how consumers and producers behave, microeconomics helps us understand the pieces that collectively make up a model of an entire economy. Microeconomic analysis also provides the foundation for examining the role of the government in the economy and the effects of government actions. Microeconomic tools are commonly used to address some of the most important issues in contemporary society (Humphrey, 1992).

The global population currently stands at 7.3 billion, expected to reach 8.5 billion by 2030 and 9.7 billion by 2050 (UN, 2015). Food security is a major challenge under this rapid gr owth of the human population.As a global population of 9 billion in the coming decades, it is often emphasized by the United Nations and the Food and Agriculture Organization (FAO) that 70-100 percent more food is needed to feed humanity (Godfrey et al., 2010).The ability of agriculture to support growing population has been a concern for generations. With the rising demand for food all around the world, there have been various interventions and technological advancements from plouging to harvesting of crops in agriculture. (Evenson & Gollin, 2003) discussed the impacts of green revolution from 1960 to 2000 in developing countries.

Growing out off-season crops in controlled atmosphere inside polythene tunnel is called Tunnel farming. If we talk about tunnel farming it is more than just intervention, we can say it is alternative to conventional agriculture and merges various agricultural interventions in it and provide superior and more efficient farming system. Specialty crop growers are using high tunnels to increase output yields and efficiency, prolong growing seasons and protect crops from extreme weather conditions. The tunnels are unheated, plastic-covered structures under which crops are planted directly into the soil, providing greater protection and control of the environment than open-field production. This study uses experiments at the field level to evaluate the production of tunnels. The results suggest that investment in tunnels can provide higher profits and better protection against adverse crop insurance risks (Belasco et.al 2016). Tunnel Vegetable farming has become important part of agriculture in the surrounding of cities (De Zeeuw, Van Veenhuizen, & Dubbeling, 2011). It has supported the livelihood of farmers through household subsistence farming to commercial scale (Van Veenhuizen & Danso, 2007). Vegetable farming in the surrounding of city areas has been increased due to continuous rural to urban migration (Bryld, 2003) This technique is more productive than traditional agriculture. Muhammad Shaukat, who introduced tunnel farming in 1995 he said this while speaking at a seminar titled “New Trends in Tunnel Farming.” The event was held at Muhammad Nawaz Sharif University of Agriculture (MNSUA).Tunnels may also be called hoop houses, high hoops, high tunnels or poly-tunnels. Tunnels are sometimes confused with greenhouses. The key difference is that tunnels are not

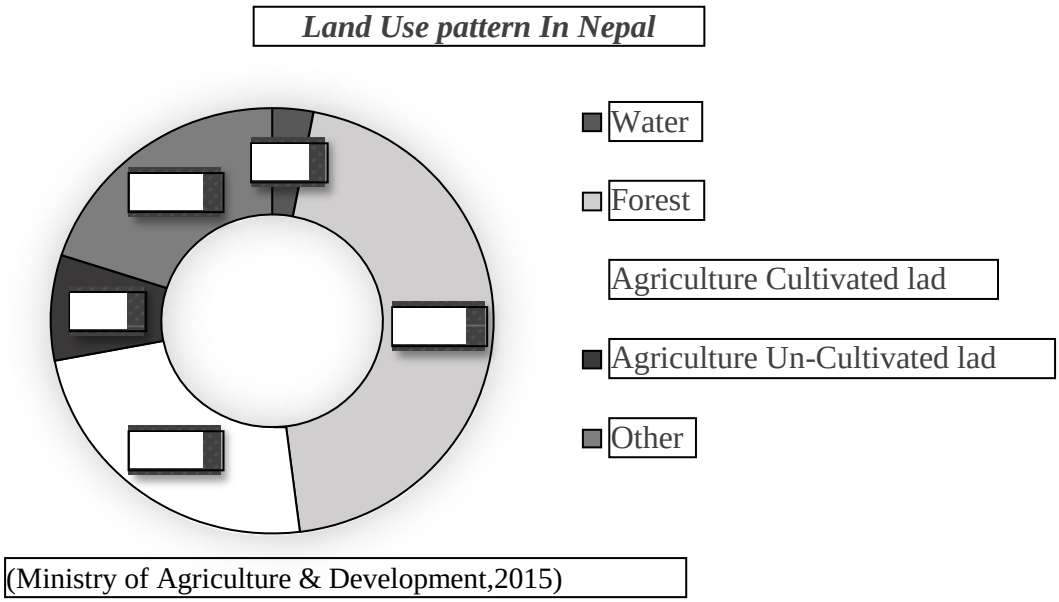
heated and provide less climate control and are less expensive.

Extending the growing season by protecting plants from cold temperatures can drastically improve productivity in the early and late season. Tunnels are one way that has been shown to effectively and profitably extend the growing season for warm and cool season vegetables in certain climates (Wells & Loy, 1993). Crops grown out of season command a price premium when sold in direct markets (Foord, 2004).Tunnels look and

operate like greenhouses, but the temperature is maintained only by passive heating and cooling unlike standard greenhouses. The primary advantage of tunnel farming is profitability. Tunnels increase net returns per acre by protecting quality, increasing yields, and providing the opportunity to obtain off season price premiums.

It was found out that farmers using tunnel technology are more efficient as they possess higher technical, allocative and economic efficiencies compare to conventional farmers (*Toba Tek Singh 2009*).

Figure 1*: *Agriculture Growth rate in last 12 year



(Ministry of Agriculture & Development,2015)

Nepal is predominantly an agricultural country it consist one third of its GDP and

employs approximately two thirds of the population. However, only about 20% of the total land in Nepal is arable and of which only 40% is irrigated with modern means of technology. The major portion of the arable land i.e. 60% is still rainfall whose productivity is dependent on the monsoonal activities. The variable monsoon, fragile-geology, agriculture-based economy, poorly ' use of modern means of technology and at the same time poor coping capacity have been contributing the poor production and productivity. Agriculture is the most important sector in Nepal's economy in terms of income generation, employment and food security. Rice, wheat and maize account for about 35% of agricultural GDP (AGDP) and other crops contribute l5% livestock 26%o, horticulture l8% (.including fruits and vegetables) and fisheries 2% (NARC. 2010) and rest by the forests and other minor products. Rice is the main staple food in Nepal followed by wheat" The periodic approach

of development in Nepal has made a tremendous progress in reducing poverty in the last decade. The share of population below poverty line (with income less than l$/day) has dropped down from 42% in 1995/96 and to 16% in 2010/l1 (CBS, 2011). However, population living under poverty line could still be estimated as approximately 55% if the basis of the international poverty tine (US$ 1.25lday) is calculated.

Vegetables have a great importance in agriculture sector. These crops share a great contribution to agriculture in national economy. There are many vegetables which can be grown in Nepalese climate and soil. Tunnel farming is a new technology for growing vegetables due to increase in population and small land for agricultural use. Government of Nepal is doing its effort to disseminate this technology among the farmers to enhance their vegetable production.

The vegetable sector has different opportunities and constrains like other agricultural sectors in Nepal even though it is a good source of income (Gurung et al., 2016). Identification of constraints and opportunities in tunnel vegetable farming is very crucial for the growth and development of the vegetable farming. Constraints indicate the hindering issues related to the vegetable farming and suggest the designing and implementation of appropriate interventions that address the constraints (Ruel and Levin, 2002). Vegetable production and marketing have growing contribution to the

national GDP by generating employment opportunities and poverty reduction to some extent (Sapkota D and S.Pokhrel, 2010). Commercial vegetable farming has become an important asset of livelihood as it presumably support through food provision, income generation and employment (Bhatta & Doppler, 2010; Asongwe, Yerima, & Tening, 2014). Commercial vegetable farming can be a good method for poverty reduction in Nepal (Gurung et al., 2016)

Historically, agriculture was the main occupation of the people in Taplejung District . Recently, people residing in the peripheries of Phungling are engaged in commercial vegetable farming as their main source of earning. The numbers of commercial vegetable farming has regularly been increasing due to the proximity to market center and its production potentiality. Most of the commercial vegetable farmers are own land and some of the farmer has leaseholders, who have been migrated from different parts of the Taplejung district.

Agriculture is the main economic activity in Nepal, and vegetable farming is one of the major agricultural practices of peri-urban farmers in Phungling Municipality. Nepal is a developing country with an agricultural economy. Farming is the main economic activity, where two third of the total population are engaged in agriculture. Agriculture sector accounts 31% of gross domestic product (GDP) in Nepal. A high proportion of households in Nepal depend on agriculture for the generation of livelihood. As an important sector of the economy, vegetable production plays a significant role in determining the economic conditions for farmers (MoAD 2016–17.)

In Nepal, the economy is dominated by agriculture. In the late 1980s, it was the livelihood for more than 90 percent of the population, although only approximately 20 percent of the total land area was cultivable, it accounted for, on average, about 60 percent of the GDP and approximately 75 percent of exports. Since the formulation of the Fifth Five-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 source of food, income, and employment for the majority. It provides about 33% of the gross domestic product

(GDP).Vegetable is one of the basic forms of livelihood of rural people to generate income. The current vegetable growing area in Nepal is 165,638 ha.The productivity of vegetables has increased from 8 metric tons mt/hectors to 10.85 mt/ha within 10 years. (MOA 2012)

1.2 Statement of the Problem

Agricultural practices are inefficient in developing countries and with the use of such inefficient farming methods it is very hard to keep up with the growing demand of food (Thiam et al., 2001; Bakhsh et al. 2006; Khan & Saeed 2012; Iqbal et al., 2014). Agricultural interventions like plastic tunnel farming is very important to fulfill rising food demands, but before adopting any new technology it is very important to answer

"Whether new farming techniques are better than the old one? This study is an effort to answer this question with the help of comparative efficiency analysis of conventional and tunnel farmers.

Tunnel vegetable farming is the main occupation of the majority of population in study area. The farmers of the study area rely heavily on vegetable for earning their livelihood. The development of agriculture depends on various aspects such as type of soil, relief, vegetation, climatic conditions, attitudes of different social groups of farmers to agriculture, use of irrigation, hybrid seeds, fertilizer, pesticides and insecticides, use of mechanical tools and implements, as well as proper scientific rotation of crops by which production be enhanced. The impact of these aspects of agriculture varies in different areas of the Phungling Municipality Ward N 7 and 8 ,Taplejung District.

Much research works have so far not been done to study the different s social group variation in tunnel vegetable farming at a micro-level in the Phungling . So, for the adoption of appropriate planning strategies for agricultural development, an in-depth study of the nter social group variation in respect of tunnel vegetable farming in the Phungling is highly necessary.

Thus keeping these points in view, the researcher considers it important to undertake an analytical study of the socio-spatial variation of agricultural development in Phungling area from the microeconomic point of view.

1.3 Objectives

This study was flowing objectives.

- To analyze the economic condition of tunnel vegetable farmers.
- To analyze the livelihood status of farmer after involve in tunnel vegetable farming.
- To find out major problem faced by tunnel vegetable farmers.

1.4 Significance of the study

This study is an addition in the restricted literature of efficiency analysis in agriculture of Nepal, as most of the efficiency related studies on agriculture is limited to conventional agriculture. Comparative analysis of tunnel and conventional farming on the basis of their efficiency analysis were help to figure out which farming system is more efficient and beneficial for farmers. Thus encourage farmers to adopt efficient agriculture technology, may result in increase in the production of fruits and vegetables and also increase farmers profit margins which would improve overall efficiency of agriculture in Nepal.

1.5 Limitation of the study

Due to the lack of sufficient time, financial constraints, the rigorous time schedule and researcher capacity the study will be limite in the following points

- This study were conducted in Phungling Municipality of Ward No. 7 & 8.
- The study were delimit to small size therefore the findings cannot be generalized as national indicator
- Only 20 household were select on the basis of purposive and simple random sampling method.
- Primary data were collect from those farmer households who were directly involved in tunnel vegetable farming, therefore the results may not be generalized for other similar area.
- The study were base in Primary and secondary source of information. Primary

data will be collect through key informant interview and questionnaire survey method.

1.6 Organization of the Study

The study was organize into five chapters. First chapter deals about the introduction, background of the study, statement of the problem, objectives of the study, significance of the study, limitation of the study Second chapter was literature review; theoretical review, empirical review, and policy review. Chapter three was deal research methodology that involves research design, study area choice, nature and origin of information, data collection techniques, data processing, evaluation and presentation to complete the study. Chapter four was includes a part of the research that is at the core of the study. It included commercial vegetable farmers ' socio-economic backgrounds. Where, including household family size, composition of age & gender, ethnic group, employment, pattern of land holding, etc. Similarly, significant impact of vegetable farming has been identified on the livelihood and tunnel vegetable farming issues. The study was synthesize in chapter five, covering summaries and findings of the work with some effective suggestions for improving the welfare of farmers and future research work

.CHAPTER II

REVIEW OF LITERATURE

2.1 Introduction

Many studies have been proposed on tunnel farming and agricultural interventions in order to analyze their impact on food security and sustainable agriculture. In this review, focus were on how agricultural interventions specially tunnel farming can increase food production and have tried to answer the question “Whether tunnel farming is more efficient compare to conventional farming or not? With the help of previous studies. The review of literature is a critical evaluation, analysis and synthesis of existing knowledge relevant to our own research problem. It is useful to develop new ideas and analytical methods in research. Through the review of related literature, the researcher gains different kinds of information and experiences from the works of others. To conduct this research some relevant literatures have been reviewed which help researcher to address research issue systematically. For this research study, following relevant studies have been reviewed.

2.2 Theoretical Review

2.2.1 Von Thunen - A Model of Agricultural Land Use

The Von Thunen model of agricultural land use was created by farmer and amateur economist J.H. Von Thunen (1783-1850) Von Thunen's model was created before industrialization and is based on the following limiting assumptions:

The city is centrally located within a self-sufficient "isolated system" that has no external influences. An unoccupied wilderness surrounds the Isolated System (Hall, 1966). The state's land is completely flat and there are no rivers or mountains to break the ground. Soil quality and climate throughout the state are consistent. Farmers in the Isolated State carry their own goods directly to the central city via oxcart, across the land. Therefore, there are no roads. Farmers act to maximize profits (Chisholm 1962). Von Thunen hypothesized in an isolated state with the above statements being true that a pattern of rings would develop around the city. The city is surrounded by four rings of agricultural production. Dairy and intensive farming take place in the cities nearest ring. Since vegetables, fruit, milk and other dairy products

need to be quickly placed on the market, they would be produced near the city. In the second area, timber and firewood will be created for fuel and construction materials. Wood was a very necessary fuel for heating and cooking prior to industrialization (and nuclear power). Wood is very heavy and hard to transport, so it's as close as possible to the city (Jasbir Singh and S.S. Dhillon, 2005).
The third area is made up of extensive crops such as bread grains. Because grains last longer than dairy products and are much lighter than oil, they can be located further from the city, reducing transportation costs.

Ranching is situated in the central city's final triangle. Animals can be brought up far away from the city because they are treated by themselves. Animals can go for sale or butcher to the central city.

Uses of Von Thunens Model

- Von Thunen model useful generalizing agriculture patterns
- Opens up discussion to merits and changes in agriculture
- Displays connection of city and agricultural patterns
- Displays balance between land costs and transportation costs

Even though the Von Thunen model was created in a time before factories, highways, and even railroads, it is still an important model for the study of land use pattern. The Von Thunen model is an excellent illustration of the balance between land cost and transportation costs. As one gets closer to a city, the price of land increased. The farmers of the Isolated State balance the cost of transportation, land, and profit and produce the most cost-effective product for market (Abler et.al, 1971). Of course, in the real world, things don't happen as they would in a model. However, this model still works in the sub- urban and peri-urban vegetable growing areas of developing countries like Nepal.

2.1.2 Schultz theory of Transforming Traditional Agriculture:

Schultz (1964) Explains that most of the factors that influence production i.e. Thrift, attitude to work, industriousness etc. are not affected by the culture traits of a society. These are in-fact economic variable. People do not save for investment simply because the method of production does not give a high return. Again people do not

work much because the return to labor is rather low. Accumulation of more capital or use of more labor are thus governed by economic factors and not by the cultural factor. Schultz described that the man who is bound traditional agriculture cannot produce much food no matter how rich land. Thrift and hard work are not enough to overcome the niggardliness of this type of agriculture. Traditional agriculture can transform into a relatively cheap source of economic growth. He tries to show what such transformations entails end what means are required to accomplish it efficiently. Whereas the past practices have to be discarded, on the one hand, new strategies have to be developed, on the other to meet the new situation arising out of risk and uncertainness involved in agriculture transformation (Alston & Pardey 2014). It is therefore not, not only significant to introduce new factors of production and reap richer harvest, but learning from experience, what risk and uncertainness are involve is also there. Schultz asserts that transformation of agriculture predominantly depends upon the availability and price of non-traditional (modern) agricultural inputs. He says that "The supplies of these factors in a very real sense hold key to such growth." Producing and distributing these factors cheaply makes investment in agriculture profitable and farmer accept these modern inputs and learn how to best to use them. This also stimulates the saving and builds up institution to finance investment in agriculture. (Schultz 1964).

Schultz's Suggestions for Transforming Traditional Agriculture:

There are three ways of increasing production. These are as:

(1) Make use of un-utilized resources

(2) Optimally reallocate the resources so as to take the production on to the production frontier and Change the nature of factors namely replace all or some of the old factor by new ones with higher output-input ratios.

Intentionally or otherwise, Schultz"s ruled out the adoption of first two methods meant for increasing agricultural production. For instance, by his very definition of traditional agriculture, he has concluded that there is no factor of production lying unused in traditional agriculture. Land and labor and other capital assets are fully utilized in traditional agriculture (Hayami and Ruttan 1971).

In the same way he has concluded that resources in agriculture are always perfectly

allocated. There is no misallocation of resources and therefore there is no possibility to increase production in a traditional agriculture, by further improving the resource allocation Hayami, Y., & Ruttan, V. W. (1970).So Schultz is left with only one way to increase production in a traditional agriculture i.e. by changing the nature of the factors of production. Before we talk about it in detail. It is necessary to discuss the approach to be followed for such adoption in Schultz's scheme of adopting new production factors (Schultz, 1961, p.2).

Market Approach V/S Command Approach:

According to Schultz, by market approach, no production factor should be imposed on far mers. Farmers should be left free to decide whether or not to use a particular production fa ctor. Let them see the profitability of a given factor for themselves and decide on its adopti on.

In other words, the adoption should be guided by market forces. In this case, the government's sole responsibility should be to ensure that the production factor is readily available and there is good publicity about it and that the necessary skills are properly developed for the use of new inputs. By the approach of order, Schultz means a scheme on which the government supplies farmers with a new variable output and which orders them to use it regardless of their profitability (Alston and Pardey, 2014).

Schultz prefers market approach to order approach, he feels that if the farmer willingly ad opts a factor of growth, his acceptance will be widespread and enthusiastic. On the other hand forced adoption not only, in many cases, ignores the problems faced by the farmers at the local level, but also at times, spoils the skills and enthusiasm of the farmer, Schultz feels that the situation in a command approach can be compared to an absentee landlordism where the land lord knows nothing about the problems and difficulties of the actual cultivators but insists upon a good harvest (Pardey and Beddow 2013).

Process of Transformation:

In a market approach, the actual use will ultimately be governed by supply and demand for the production factors. So Schultz discusses the factors affecting the

supply and demand for such factors in detail. First of all, we can discuss the issues facing the supply of new factors and the suggestion that Schultz is making to overcome these problems. (Schultz 1964).

A. Supply of New Factors

According to Schultz three important steps are involved in the supply of new factors. **These are:**

1. Research and Development of new factors.

According to Schultz, science and technology play a very important role in the transformation of traditional farming. Since the art of cultivation has been static for a long time in a traditional agriculture, it may not be possible to develop technologically superior production factors from within the country (Pardey et al. 2016).

So what he suggests is that these factors can be imported from some foreign country in the first instance and then this factor should be subjected to further scientific analysis so that it is finally adapted to the importing country's physical environments. This will be the least expensive way to develop a new production factor. Secondly, the benefits of a successful research are not going to accrue solely to the private person. Other members of the community will also benefit from this research. This may make the private person hesitate to take up the research work. On the other hand, the concept of benefit or profit is totally different for the government (Golan et al. 2002 and Herrendorf et al. 2013). It is rather very broad when compared with that of a private individual. The Govt. feels benefitted if any member of the society benefits from its actions (Alston 2002; Pardey et al. 2006).

2. Distribution of inputs to the cultivators

Following the development of new inputs and the perfection of technology for their mass production, a question arises: Who should produce and distribute these inputs? This question is answered by Schultz himself. No private person will take the risk of producing and distributing these inputs at the beginning when the new inputs are still untested by the farmers. There is a cost of entry into the market and this may be quite high in the beginning.

Ester Boserup's counter-Malthusian theory of growth of primitive agriculture is formalized in a continuous time framework that permits investigation of the long-run properties of such a closed economy. It is discovered that two asymmetric results are possible from any initial conditions (Boserup, 1981, page 3). The theory's implications are further extended to the now classic argument of Karl Polanyi about structural transformation as an economic system that makes the transition from feudalism to capitalism and to the claims of Walter Rodney about the origins of African underdevelopment Ester Boserup focuses on dynamic use of land. These are as follows.

1) Forest-fallow cultivation. Under this system of land use, plots of land are cleared in the forests each year and sown or planted for a year or two, after which the land is left fallow for a number of years sufficient for the forest to regain the land. This means that the period of fallow must be at least some twenty to twenty-five years. The type of forest which grows up in territories which are regularly used for forest fallow is known as secondary forest, as distinguished from the primary or virgin forest, which was never cultivated or was left uncultivated for a century or more

2) Bush-fallow cultivation. Under this system the fallow is much shorter, usually somewhere between six and ten years. No true forest can grow up in so short a period, but the land left fallow is gradually covered with bush and sometimes also with small trees. The periods of uninterrupted cultivation under bush-fallow systems varies considerably. It may be as short as one to two years (similar to conditions under forest fallow) and it may be as long as the fallow period, i.e. six to eight years. Many authors do not distinguish between forest and bush fallow systems, but group them together under the label of long- fallow cultivation, or shifting cultivation

3) Short-fallow cultivation. The fallow lasts one year or a couple of years only. In such a short fallow period, nothing but wild grasses can invade the fallow, before the cultivator returns to the same plot or field. The system could therefore also be described as grass- fallow cultivation, but the term short fallow is to be preferred since under certain conditions land may lay fallow for very long periods without

being invaded by anything but wild grasses. It is important, therefore, to distinguish between grass areas used in long- fallow systems and grass areas used in short-fallow rotations,

4) Annual cropping. This is usually not considered a fallow system, but may be classified as such, because the land is left uncultivated, usually for several months, between the harvest of one crop and the planting of the next. This group is meant to include systems of annual rotation, in which one or more of the successive crops are sown grass or other produced fodder.

(5) Multi-cropping. This is the most intensive system of land use, since the same plot bears two or more successive crops every year. The planting of a new crop must therefore take place shortly after the harvesting of the preceding one and the fallow period is short or even negligible.

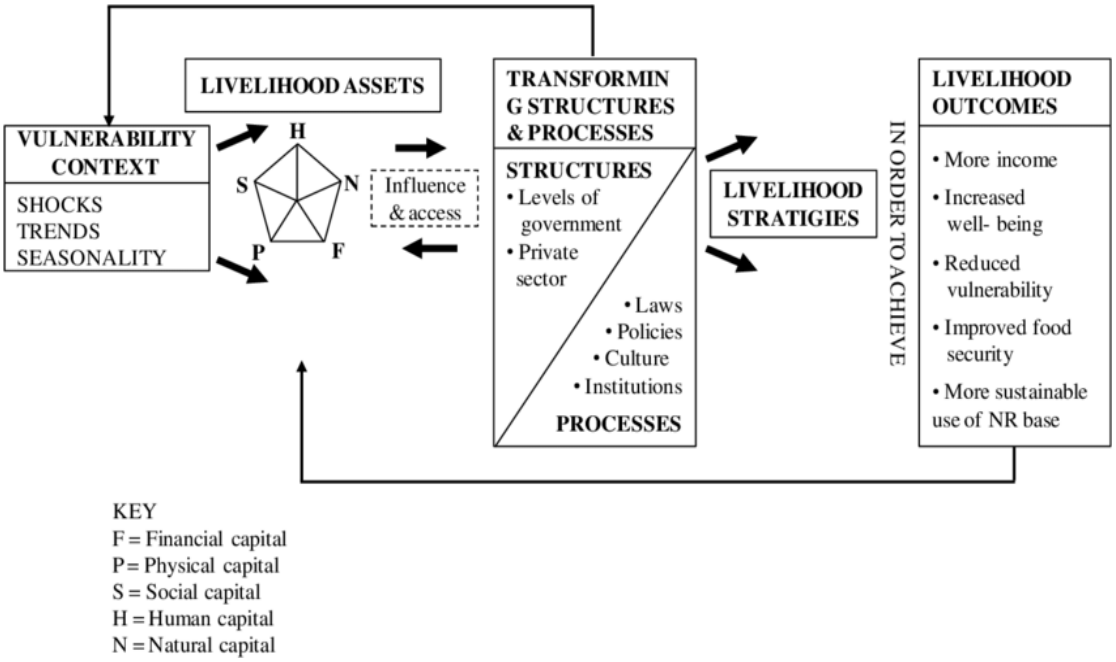
Under the pressure of increasing population, there has been a shift in recent decades from more extensive to more intensive systems of land use in virtually every part of the underdeveloped regions. In some parts of the world, cultivators under the forest-fallow system have been unable to find sufficient secondary forest. They have then had to re- cultivate areas not yet bearing fully grown forest. In this way, the forest has receded and been replaced by bush. Again, in regions of bush fallow the cultivators have changed to short-fallow systems or annual cropping and many short-fallow cultivators have changed to systems of annual cropping with or without irrigation. In the densely populated regions of the Far East, the growth of population during this century has caused a rapid spread of multi cropping.

2.1.3 Sustainable livelihood Approach (UNDP)

The sustainable livelihoods idea was first introduced by the Brundtland Commission on Environment and Development as a way of linking socioeconomic and ecological considerations in a cohesive, policy-relevant structure. The 1992 United Nations Conference on Environment and Development (UNCED) expanded the concept, especially in the context of Agenda 21, and advocated for the achievement of sustainable livelihoods as a broad goal for poverty eradication. It stated that sustainable livelihoods could serve as „an integrating factor that allows policies to address „development, sustainable resource management, and poverty eradication simultaneously.

A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term. Robert Chambers and Gordon Conway, 1992)

Figure 2: Sustainable livelihood Framework of UNDP



The sustainable livelihoods approach is a way of thinking about the objectives, scope, and priorities for development activities. It is based on evolving thinking about the way the poor and vulnerable live their lives and the importance of policies and institutions. It helps formulate development activities that are.

- People-centered
- Responsive and participatory
- Multilevel
- Conducted in partnership with the public and private sectors.

UNDP the SL approach serves primarily as a programming framework to devise a set of integrated support activities to improve the sustainability of livelihoods among poor and vulnerable groups by strengthening the resilience of their coping and adaptive strategies. Although this is in principle an open-ended process, certain emphasis is given to the introduction of improved technologies as well as social and

economic investments. Krantz, L. (2001).

2.2 Empirical Review

2.2.1 International Context

Hessayan (1985) analyzed that commercial vegetables require adopting of cultivation methods and techniques for season adjustment of planting time. For instance, some summer vegetables can be planted in the hill pocket areas about two months earlier in cold winter season than the normal season of planting, which is possible by raising seedlings under polythene tunnels, where temperature is raised for seed germination of tomato, brinjal, sweet pepper, beans and cucumber and harvested for consumption during winter season. Greenhouse farming technique is effective to avoid frost, excessive winter cold, and strong wind and raise temperature even during winter season. Plastic tunnel, polythene house and glasshouse are generally used as greenhouse farming techniques for controlling environment. It is reported that plastic film technology enables vegetable crops to mature 5 to 20 days earlier than normal, increases yield by 30 to 50 percent, increases output value by 40 to 50 percent and prolongs harvesting period of vegetables by 40-60 days. It has always positive effect on controlling diseases, insects, weeds, soil moisture etc.

S.A. Muhammad et.al 2015 Vegetables have a great importance in agriculture sector. These crops share a great contribution to agriculture in national economy. In Pakistan among 23.40 million hectare cropped area vegetables conclude 0.41 million hectares to produce 13.67 million tons of fresh produce annually, divided into vegetables 54% and fruits 46%. Pakistan export 150.2 million kg of vegetables and earned $180.2 million in fiscal year 2011-12.

Sharma 1985 to ensure food and nutritional security for the growing population and to increase farmers' income, there is an urgent need to enhance resource use efficiency, reduce input costs and improve crop yields. According to the International Food Policy Research Institute, the world needs to double food production per unit area/day. This calls for an urgent need to identify potential alternative farming strategies to achieve long-term sustainable food production and food security.

Edward (2009) high tunnels are becoming an increasingly important production tool for vegetable, small fruit, and cut flower growers in many parts of the United States. They provide a protected environment relative to the open field, allowing for earlier

or later production of many crops, and they typically improve yield and quality as well as disease and pest management. Producers, ranging from small-scale market gardens to larger scale farms, are using high tunnels of various forms to produce for early markets.

FAO (2013) during the last 20 years countries in the Mediterranean climate area have become increasingly competitive producers of greenhouse vegetables. During this time there has been a revolution in greenhouse production technology in terms of greenhouse design, type and quality of the plastic covering material, fertigation, mulch, use of high- yielding hybrids and cultivars, plant training and pruning techniques, integrated pest management, the use of pollinator insects, climate control, soil solarization etc. Only a few years ago, a yield of 100 tons per hectare of tomato in a greenhouse was considered a good performance. Today, for growers in Mediterranean climate areas, a harvest of 300 tones per hectare is not unusual.

Saghir and Kousar (2015) Vegetables have a great importance in agriculture sector. These crops share a great contribution to agriculture in national economy. There are many vegetables which can be grown in Pakistani climate and soil. Tunnel farming is a new technology for growing vegetables due to increase in population and small land for agricultural use. Government of Punjab is doing its effort to disseminate this technology among the farmers to enhance their vegetable production.

Ghimire and Huang, (2015) Technological advances in agriculture seem to offer an opportunity to rural farmers to increase production and improve their livelihood sustainably. Adopting such technologies have contributed greatly toward the financial success of farmers through the efficient use of resources and scaling up the production at lower per unit cost. However, a majority of farmers in developing countries have not been able to adopt newly developed technologies because of their limited resources (cash, labor, time) and limited access to relevant information regarding the technology.

Mobushir Iqbal 2016 The agricultural sector is one of the largest sectors of Pakistan‟s economy, having the share of about 23.1% of the Gross Domestic Product (GDP) and

provides employment to 45% of the total workforce of the country. More than 70% of Pakistani population directly or indirectly depends on agriculture for their existence. Agriculture sector of the country occupies a prime position in its economy (Govt. of Pak., 2010) by providing different employment opportunities Riasat et al., (2014)

Muhammad Asif 2016 Presently in Pakistan 0.69 million ha area is cultivated with vegetable with an annual production of 8.5 million tones. It is estimated that by 2030, the vegetable demand of the country would be around 25 million tones. To achieve this target, attention must be focused on the vertical expansion, strengthened with the boom of the technology instead of horizontal expansion just by increasing the crop area Government of Punjab has launched Punjab Irrigated Agriculture Productivity Improvement Project (PIPIP), which recommended the deployment of hi-tech drip irrigation system for precision farming to achieve vertical growth in crop production FAO (2017) Greenhouse crop production is now a growing reality throughout the world with an estimated 405 000 ha of greenhouses spread throughout Europe, of which some 105 000 ha are located in the South Eastern European (SEE) countries. The degree of sophistication and the technologies applied depend on local climatic conditions and the socio-economic environment. Jaime C Pinero 2018 based on the income criterion by the United States Department of Agriculture (USDA), more than 90% of farms in the United States are classified as small, with a gross cash farm income of $250,000 or less. Missouri‟s agriculture similarly encompasses many small farms (USDA-NASS 2014). In terms of farm size, while average farm size in the United States is 442 acres, the average farm size in Missouri is 285 acres and 26% of all farms in the state are less than 50 acres in size (USDA-NASS 2014). Of the total number of Missouri farms (1241) that reported to produce and sell vegetables, melons, potatoes, and sweet potatoes, nearly half produce crops on less than 50 acres.

2.2.2 National Context

NPC (2004) on average, over the 1990s, agricultural exports represented only 3.4% of agricultural gross domestic product, whereas total exports represented 10.31 % of the gross domestic product, an indication of relatively little trade orientation of Nepali agriculture. Similarly, agricultural imports were 7.7% of agricultural gross domestic product in the same period. It also indicates that agricultural exports are less than the

imports. Nepal has introduced a policy of liberalization. However, to benefit from the changing policy environment and ensure high level of agricultural growth it needs to create a conducive environment for shifting of incentives to support production of non- traditional crops for export rather than supporting the production of commodities that are mainly for imports substitution.

USAID-NEPAL (2005) Nearly 75 %, 90% and 80 % of the off-season vegetables production was marketed by the producers and the rest consumed at household level in Baglung, Kaski and Palpa districts respectively whereas the farmers in Bharatpokhari, Kaski sold their total produce at Pokhara market, farmers from Hemja pocket sold only 95% of it. In Palpa, nearly half (49%) of the marketed volume was sold at the distant market of Butwal and about one-third (30.75%) was sold at collection center to the collectors, who in turn, supplied both to the domestic and export markets.

Shrestha (2007) evaluated particularly the pocket areas along the roads and surrounding of large cities such as Kathmandu urban region, Pokhara, etc. have got benefits from growing commercial vegetables, where there is high demand due to their hub centre of business, beaurocratic and tourism. Panchkhal (Kabhre), Tistung, Palung and Daman (Makawanpur), Ranipauwa (Nuwakot), Basantpur, Hile and Sidhuwa (Dhankuta) and many pockets along the east-west highway are important locations where farmers have successfully grown commercial and-seasonal vegetables. In addition, many large Terai center and Indian border cities are also demanding center of seasonal vegetables.

UNDP (2008) contributed that 65% employment of the economically active population. The share of agriculture in GDP is about 38%; more than 80% of the rural population depends heavily on agriculture sector for their employment and about 65% of the total income of rural households comes from agriculture. As more than 80% rural population depending on agriculture and they are mostly fall below poverty line, poverty alleviation without agricultural development is not possible in Nepal. Realizing this fact, the government of Nepal has set a principal development objective of poverty reduction through agricultural development for the Tenth Plan (2002-2007). To achieve the objectives, APP has identified livestock, high value

crops, agribusiness and forestry as its priority outputs. Commercialization of agriculture is essential for alleviating poverty in Nepal and it is realized that agriculture can only be commercialized by effective uses of information and communication technologies, giving the farmers a commercial orientation. Shah *et al.* (2004) has described According to the Horticultural Research Center, commercial vegetable system and production technologies for tomato, onion, cucumber, cabbage, cauliflowers etc. have been developed and recommended for farmers.

Joshi (2010) examined Agriculture plays a vital role in evolution of agrarian culture in Nepal from ancient times. It has always been a major sector of economy of the country from ancient time to date. The total area of land available for agricultural activities is estimated as 25, 98,970 ha. This is second biggest type of land use after forest in the country. Gross Domestic Product (GDP) of the nation contributed by the agricultural sector is NRS 1, 83,357 million in FY 2060/61. Agriculture sector was contributing 39% of GDP in 2060/061 reducing from 51.22% in 2042/043. This reduction was because of development of other non-agricultural sector of production of the country.

Pandey (2011) Weather variability comprising of intermittent drought, submergence, flood, intensive, hot and cold waves and irregular pattern of precipitation are considered as major parameters of changing climate having by and large adverse impacts in various aspects of agricultural system, its productivity and food security in different agro-ecological zones of the country. In the late 1980s, it was the livelihood for more than 90 percent of the population, although only approximately 20 percent of the total land area was cultivable, it accounted for, on average, about 60 percent of the GDP and approximately 75 percent of exports.

FAO (2013) Vegetables are a required source of vitamins, proteins, essential nutrients and carbohydrates for a balanced diet. In the mid-hill region in Nepal, farmers are limited to grow seasonal vegetables and are dependent on marketing mechanism of demand and supply. Growing off-season vegetables and fruits means improving the diet and increasing the household income. In the absence of storage infrastructure and vegetable processing industries, off-season vegetable farming is the only viable option that can add value to the farmers‟ produce.

Ojha (2014), Agriculture and rural development are intrinsically interrelated elsewhere in the developing countries, especially true for a country like Nepal. It is claimed by the scholar that for Nepal, agriculture is and will remain a major contributor to the sustenance, employment and development of the poor as well as the better off sections of the population for a long time. (Even in Japan, which is ow a well-known as an industrialized developed country, the number of people relying on agricultural sector did not reduce during long period between 1870 and 1940. Such number did not decline even until the 1960s, although non decline employment grew substantially by that time. In countries and areas such as Taiwan, Kenya, Thailand, Costarika, Columbia, and Punjab (India). It was the development of agricultural sector that chiefly led to economic growth and overall prosperity among the people.

Sharma (2015) Nepal is a mountainous country with plenty of natural beauties and an Agriculture-based economy with about 75% of the population being dependent upon agriculture. About 70% of the Nepali people are in the rural areas of the country where the main occupation is agriculture. A significant part of the population is dependent upon this sector, which remains a backbone of the country‟s economy, where as 36 percent GDP is covered by agriculture production. In this situation it cannot be taken for granted that the overall development of the country is possible without the development of this sector.

Adhikari (2015) Agriculture, which consisted of one-third of the global GDP in 2014, is pivotal for economic growth. According to the World Bank, agricultural growth can be one of the powerful measures to streamline development, end absolute poverty and feed an estimated 10 billion people by 2050. It is four times successful in increasing household income of the poorest compared to other sectors. For LDCs, agriculture is vital for development.

Rai (2017) stated about the vegetable farming in Kirtipur area which showed that the vegetable farming has positive impact on the livelihood and socio-economic condition of the farmer fulfilling the growing demand of local market and commercial scale. They concluded that farm households can take benefits from the vegetable farming by creating more opportunities and manage the constraints. In this context, this paper seeks to analyze the constraints and opportunities of commercial vegetable

farming in Kirtipur.

Chaudhary (2018) Nepal had exported paddy before 1975 but it is importing food grains beginning in 1980 (Mishra, 1987). Despite a large contribution of the agricultural sector in national GDP, agriculture growth rate seems to be fluctuating. Since the agriculture- growth is lower with respect to the population increment. The amount produced from agriculture is not satisfactory. The data of CBS 2011 reveals that 60 percent of farmers are unable to produce enough agricultural production in order to sustain their livelihood. Many western hill districts of the country have been facing food-deficit. Food and Agriculture Organization (FAO) has been working to ensure the food and nutrition security of farmers and herders (FAO, 2017). To cope with this, poor rural people mostly used to go to India in search of works in the off-farming season.

DOAL (2018) (Department of Agriculture and Livestock) Agriculture is Nepalese economy's biggest market. This provides 66% of the total population with job opportunities and contributes about 36% of GDP. Therefore, the growth of the agricultural sector is crucial to the national economy's success.

FAO 2018 Nepal is richly endowed with agro-biodiversity. Rice, maize, millet, wheat, barley and buckwheat are the major staple food crops. Similarly, oilseeds, potato, tobacco, sugarcane, jute and cotton are the important cash crops whereas lentil, gram, pigeon pea, blackgram, horsegram and soybean are the important pulse crops. Nepal is also famous for orthodox tea, large cardamom, turmeric and zinger too. Most Nepalese farmers grow diversified crops in order to hedge against erratic and uncertain weather and other unfavorable agronomic conditions.

UNDP (2019) A quick survey carried out by the Value Chain Development of Fruit and Vegetables Project under the Ministry of Agriculture and Livestock Development reveals that almost none of the 33 municipalities selected as having potential for fruit and vegetable production have any strategic plan for agriculture development. Few municipalities have developed their strategic p lans, but agriculture sector has gained least attention. Which means the agriculture sector will continue to be left out in budget allocation.

2.3 Policy Review

National Agriculture Policy, 2004 focuses on creating a rural development-led climate. Farmers are divided into two categories–small and large. Those who own less than 4 hectares of land are known as resource-poor farmers and government has managed to provide assistance to improve their productivity. The plan aims to achieve strong and sustainable economic growth by contributing to food security and poverty reduction through the process of commercial agriculture.

CBS (2011) Nepal's government conducts annual agricultural censuses. For the planning of agricultural action plans, agricultural research and policy perspectives, economists, farmers and environmentalists are consulted. Extensive research papers in agriculture have shown that the APP varies from previous plans by concentrating on a small number of priorities in order to produce. Historically, Nepal's agricultural research has harbored a misconception of what constitutes agricultural research. Research has been viewed to include genetic, physical and mechanical sciences in a limited context as they refer to plants and animals.

MOD (2014) The Agriculture Development Strategy (ADS) 2014 has the following vision: “A self-reliant, sustainable, competitive, and inclusive agricultural sector that drives economic growth and contributes to improved livelihoods and food and nutrition security.” In order to achieve its vision the ADS will accelerate agricultural sector growth through four strategic components related to governance, productivity, profitable commercialization, and competitiveness while promoting inclusiveness (both social and geographic), sustainability (both natural resources and economic), development of private sector and cooperative sector, and connectivity to market infrastructure (e.g agricultural roads, collection centers, packing houses, market centers), information infrastructure and ICT, and power infrastructure (eg rural electrification, renewable and alternative energy sources). The acceleration of inclusive, sustainable, multi-sector, and connectivity-based growth is expected to result in increased food and nutrition security, poverty reduction, agricultural trade competitiveness, higher and more equitable income of rural households, and strengthened farmers rights.

APP (2014) APP strategy is to accelerate the agricultural growth rate sufficiently to obtain strong multiplier effects on growth and employment, in both the agricultural and non- agricultural sectors. This growth would occur through technological change to be achieved through investment in research and extension. The APP aims for a broad-based participatory growth across regions and income classes and emphasizes sub-sectors particularly important to women.

The following six strategic thrusts are identified as essential to achieve APP objectives:

I. A technology-based green revolution in agriculture which becomes the initial engine of accelerated growth;

II. Accelerated agricultural growth which creates a demand-pull for the production of high value commodities in agriculture, as well as for non-agricultural commodities, with consequent large multiplier effects on other sectors of the economy;

III. Broadly based high employment growth, which then becomes the mechanism for achieving societal objectives;

IV. Public policy and investment focus on a small number of priorities, building on past investment in human capital and physical and institutional infrastructure;

V. A package approach to development, which would be different for the Terai, Hills and Mountains and would recognize the powerful complementation between public and private investment and priorities, and would ensure their co-ordination; and

VI. A regionally balanced and gender-balanced approach that explicitly ensures the participation of women and therefore achieves broad participation.

ADS (2015-2035) over the 20-year period 2015-2035, one possible scenario is for GDP/capita of Nepal to increase substantially and Nepal move towards middle income country status. This scenario is consistent with the potential of the country and given an improvement in policies and institutions that will result in accelerated

growth. During this movement towards middle income country status, Nepal will go through the process of agricultural transformation, a process whereby the economic structure of a society changes from one based on agriculture to one based on industry and services. Four lessons from the process of agricultural transformation are relevant to the formulation of ADS‟s vision. The lessons can be summarized as follows.

a) Total Factor Productivity (TFP) growth is the main source of future agricultural growth. TFP requires not only land, labor and capital, but also such things as technology, innovation, efficiency, human resource capacity, and governance. TFP growth contributed between 40% and 70% of agricultural output growth in Asia over the last 50 years 40 .

b) At early stage of development, agricultural growth is the main engine of poverty reduction because most of the poor are in rural areas. Lower inequality enhances the impact of growth on poverty reduction. c) Increasing urbanization presents challenges that traditional food systems are not well prepared for. Integration of smallholder farmers with modern value chains is a feasible response to these urbanization challenges.

c) As the economy moves closer to middle income status, the development of the rural nonfarm sector (including agro-food manufacturing, services, marketing and logistics), becomes increasingly important in closing the gap between rural and urban areas.

SDGS (2015) Sustainable development goals focus on food security and poverty eradication the goal no.2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

14^{th} plan focus (PMAMP) "Prime Minister Agriculture Modernization Project" implemented under the Ministry of Agriculture and Livestock Development2016 for the period of l0 years is in the line of motivation of right to food in the constitution of Nepal and promulgation of the long term strategy of agriculture sector "Agriculture Development Strategy-2015-35,' (ADS) with aiming to commercialize. Sustainable and sell-reliant agriculture sector. This project is designed to expand the agricultural

sector as the most profitable and commercialized sector through the development of specialized regions for major agriculture commodities by enhancing the competitiveness of agriculture.

3. Extension of new knowledge.

It is not enough for new information to be available. It is also necessary to develop the necessary skills for its use. This can be achieved by means of well-developed extension services. Even when new agricultural practices are to be introduced, extension services are essential (Schultz, 1964, p. 206).

Here again, Schultz believes that the cost of extension services is rather high and the gover nment should therefore provide such services. Thus, overall, Schultz suggests that the Government t is concerned with the supply of new inputs. It should take on the task of researching and developing new inputs, producing and distributing them and providing them with extensive education. However, at a later stage the government can offer the task of producing and distributing new inputs to private agencies (Balogh, 1964, p. 996.

4. The Economics of Agrarian Change under Population Pressure:

Ester Boserup (18 May 1910 – 24 September 1999) was a Danish and French economist. She studied economic and agricultural development, worked at the United Nations as well as other international organizations, Ester Boserup which posits that population change drives the intensity of agricultural production. Her position countered the Malthusian theory that agricultural methods determine population via limits on food supply. Her best- known book on this subject, *The Conditions of Agricultural Growth*, presents a "dynamic analysis embracing all types of primitive agriculture." (Boserup, E. 1965. p 13) A major point of her book is that "necessity is the mother of invention". Boserup argued that when population density is low enough to allow it, land tends to be used intermittently, with heavy reliance on fire to clear fields, and fallowing to restore fertility (often called slash and burn farming). Numerous studies have shown such methods to be favorable in total workload and also efficiency (Ruttan, 1968). In Boserup's theory, it is only when rising population density curtails the use of fallowing (and therefore the use of fire) that fields are

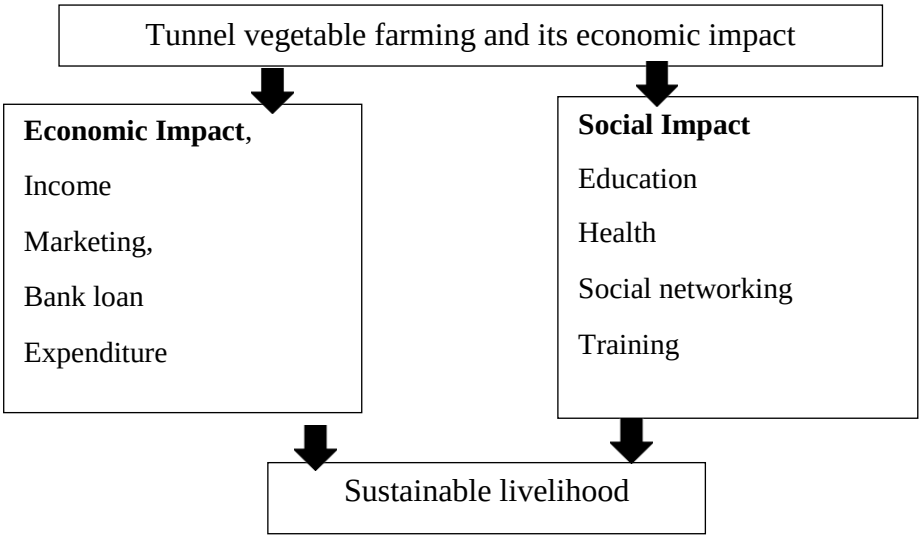
moved towards annual cultivation. Contending with insufficiently fallowed and less fertile plots, covered with grass or bushes rather than the forest, mandates expanded efforts at fertilizing, field preparation, weed control, and irrigation. These changes often induce agricultural innovation, but increase marginal labor cost to the farmer as well. The higher the rural population density, the more hours the farmer must work for the same amount of produce. Therefore, workloads tend to rise while efficiency drops. This process of raising production at the cost of more work at lower efficiency is what Boserup describes as "agricultural intensification" (Boserup, 1965).

commodities through value addition chain. It aims in downing the trade deficit, slow growth in agriculture production as a result of labor deficit/labor drain, discouraging the fallowness of potential agriculture land. This project is designed to create employment opportunities for effective service delivery through functional coordination among the multi stakeholders directly and indirectly involved in the agricultural value chain. During first year of implementation, and industrial centers (Super zones) it was implemented in 7 specialized agriculture production in seven districts one from each province, 30 commercial agriculture production and processing centers (Zones) in 30 different districts, 150 commercial agriculture production centers (Block) across the country with 2 blocks in each districts and 2100 small agriculture production centers (Pockets)' across the country. In the current fiscal year (2074-2075) the project is being executed in 39 zones, 10 super- zones, 281 blocks and 3,34g pockets throughout the country. The project targets the number of super zones, zones, blocks and pockets will be 21,300, 1,500 and 10,000 respectively by the end of project

2.4 Conceptual Framework

The main focus of study is to analyze Microeconomic analysis of tunnel vegetable farming through involving in tunnel vegetable farming and its impact to them. To fulfill this study is concentrated on the following variables, in short the conceptual framework of this study is as follow.

Figure 3: Conceptual Framework



2.5 Research Gap

The previous research cannot explain the microeconomic analysis, they only focus on commercial and subsistence farming but this research focus on tunnel farming and its microeconomic impact on livelihood of farmers and the main problem face by farmers, marketing channel, how price policy effect the farmers. Is tunnel farmer were getting training, Fertilizer, seed, farming tool, government subsidy, from governmental/Non-governmental agencies. Similarly, previous study can't explore about livelihood impact, economic condition, family expenditure, and family income of farmer. Likewise previous study can't justify impact of climate change on livelihood, microeconomic impact of tunnel farming. Based on above empirical review this study found following research or knowledge gaps that tried to address by this study.

Table 1. Literature or Knowledge Gaps:

Categories	Focus	Gaps
Knowledge	Tunnel farming as a source of income and employment	Sustainable farming practice soil conservation and development
Methodology	Explanatory, and qualitative method	Qualitative and Descriptive, source of data is primary and secondary.
Relationship	Farming, organic farming employment and environment conservation	Tunnel vegetable farming and sustainable livelihood
Analytical	Analysis among Environment conservation and changing technology, Agriculture and Nepalese economy	Tunnel vegetable farming and its impact on local people, sustainable livelihood i.e. income generating from tunnel vegetable farming Vocational training, investment cost and organic farming.
Theoretical	Schultz theory transformation of agriculture, Boserup's Dyanimic use of land and Von Thunen's urban land use model	Organic farming, Tunnel farming impact, social and economic.

(Developed by Researcher, 2023)

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

This chapter explains the research design of this study which directs that how to proceed this study to achieve the targeted objectives. The methodology of the study will be design in such away which includes the data collection, organization, analysis and finally presentation of outcomes. To simplify the analysis process systematical approach has been selected for presenting the study.

3.1 Research design

The information was collect to achieve the objectives; data gathering was conduct using the structured questionnaire. The study needs the sets of data from both primary and secondary sources. Different techniques including household's surveys were conduct for generating the data. Farm size of the farmers, location of the land holdings and type of farmers will be consider the main focused area, as it shows differences during analysis. The location is a major factor influencing the irrigation performance. Farmers at heat region receiving more water on regular basis will be privilege comparing to the farmers living at the tail regions means the farmers at the tail end are facing scarcity of water for irrigating their fields.

The descriptive and exploratory type requires quantitative and qualitative data of research is suit better while consider the topic under study. The sets of data and information collected from the primary sources of data, survey research method, and observation of participants were base for this study.

3.2 Introduction of the Study Area:

The study was conduct in ward no. 7 & 8, Phungling Municipality, Taplejung district of Nepal. The Ward No. 7 & 8 of Phungling Municipality, area in Taplejung District in the Koshi Province of eastern Nepal and part of Phungling Municipality, Taplejung. Phungling municipality is situated at 27.35 North latitude and 87.66 East longitude and 1,441 m (4,730 ft) elevation above the sea level. The climate of the area is generally warm and temperate. In winter, there is much less rainfall and is dry. The

average annual temperature in Phungling is 15.1C. In the year, the average rainfall is 395.72 mm. Precipitation is the lowest in November, with an average of 13.60 mm.

3.3 Nature and sources of Data:

This research is descriptive and exploratory in nature. The research was base on primary source of information collected from the field. The secondary source of data also used in this report, book Journal and Published and unpublished reports etc.

3.3.1 Primary Data:

Primary source of information was collect by interviewing with the selected participants, using structured questionnaire. Before starting the field works, the questionnaire was pre-taste to reduce the errors and verify the set questions in regards to the research objectives and issues of the research. The field observation information from the formal and informal discussion with facilitator, extension worker and community leader is another source of primary data.

3.3.2 Secondary Data:

The secondary information were collect from the books, publications of Plant Protection Directorate and District Agriculture Development Office, Publications of different NGOs, related leaflets, magazines and grey documents of farmers groups have been used. The literature available in the internet is another source of secondary data and other some relevant materials regarding Nepal.

3.4 Data Collection tools and techniques:

Following techniques and tool was apply to collect data from the field.

3.4.1 Household Survey:

The household survey was conduct in order to collect qualitative and quantitative facts about socio-economic status of people living in the study area, income situation and the contribution of tunnel vegetable farming in upliftment. For that the researcher used household survey form as the tool.

3.4.2 Observation

Certain information was collect through observation method. Photographs of the area was taken to be important observed information is note for study. Researcher observe

vegetable farming activities such as, collection, selling goods, house pattern etc. and guess the situation of economic status. The researcher was use observation checklist as the tool to observe vegetable farming in the study area.

3.4.3 Key informant interviews:

Key informant interviews are qualitative in-depth interviews with people who know what is going on in the community. The purpose of key informant interviews is to collect information from a wide range of people including community leaders, professionals, or residents who have first-hand knowledge about the community. These community experts, with their particular knowledge and understanding, can provide insight on the nature of problems and give recommendations for solutions.

3.5 Universe & Sample Size

The universe of the study is the people of Phungling Municipality Ward no 7 & 8 of Taplejung district. The size of the Universe is the 35 households. For collecting the reliable data the random sampling method is applied. The households from different wards of Phungling municipality was selected randomly in order to conduct household survey. The respondents were selected from those who have been settled there for a long period and whose primary occupation is vegetable farming. Altogether 20 respondents from different households related randomly was taken be as sample size of the study.

CHAPTER IV

DATA ANALYSIS AND PRESENTATION

The data were processed by editing, classifying and tabulating. In this research descriptive as well as analytical methods were used to analyze the data and information. The simple statistical tools and techniques were used to present the information and data. Necessary tables, chart, diagrams were used whenever appropriate in the presentation of data. This chapter is focused on objectives of the study and divided on different sub topics. In this chapter researcher has tried to present the Socioeconomic aspect of vegetable farmer like age and sex composition, family size, income and expenditure, educational status, health status etc. Moreover livelihood aspect of the farmer has included in different topics. Generally major finding of the study has presented at the end of the chapter in bullets. Quantitative analysis is much more frequently pursued than qualitative.

4.1 Socio-economic Condition of Vegetable Farmers

Socio-economic aspect is related with capability and awareness of the people of any area. In other word it is software part o the development which we can feel not to touch and see. Major social condition in this section includes age and sex composition, family size and household population, marital status; religion of respondents, caste/ethnic status, level of education, occupation etc., of the study area has given below:

4.1.1 Age group of the Respondents:

Age determines the participation of the people in any work and so does in farming. The respondents were found as different age group. The age structure of respondents presented given below.

Table 1:Age group of the respondents

Age	Frequency	Percent
20-30	4	20.0
30-40	8	40.0
40-50	3	15.0
50-60	5	25.0
Total	20	100.0

Source :(Field Survey, 2023)

The above table explains age group of respondents the highest 40.0% respondents belong to age group 30-40, lowest 15.0% respondents belongs to age group 40-50 and 25.0% respondents from age group 50-60 and 20.0 % respondents from age group 20-30.

4.1.2 Respondents caste group

Caste group is a social phenomenon which distinguishes one person from one another on the basis of caste based variable. Different castes of respondents are involved in tunnel farming in the study area. The caste structure of the respondents on study area can be presented given below.

Table 2. Respondents Caste group

Case	Frequency	Percent
Bhramn/Chetri	9	45
Jananati	8	40
Dalits	3	15
Total	20	100

Source :(Field Survey, 2023)

The above table shows respondents caste group the highest 45% respondents was Bhraman/Chettri, lowest 3.0% respondents was Dalit, 40.0% respondents was 40.0% respondent was Janjati.

4.1.3 Respondents sex group

Sex is a biological variable. Sex determines the certain characteristics of the people as men and women. In the cases of tunnel vegetable farming we can see the involvement of male and female in percent the sex composition of study area can be presented below.

Table 3. Sex group of the respondents

Sex	Frequency	Percent
Male	13	65
Female	7	35
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about involvement of sex group in tunnel farming the data shows that 65.0% Male and 35% female are involve in tunnel farming.

4.1.4 Respondents Marital status

Marital status presents whether a person is single or married. It is also a variable that determines socio- economic structure of the respondents marital status of the respondents is given in the table below.

Table 4. Respondents marital status

Status	Frequency	Percent
Married	16	80
Unmarried	4	20
Total	20	100

Source :(Field Survey, 2023)

The above table shows that respondents marital status the highest 80% married respondents was involve in tunnel vegetable farming mainly from house hold level both male and female equally works in farming and lowest 20% unmarried respondents was involved in tunnel farming.

4.1.5 Respondents Religion group

Religion is a social-cultural system of designated behaviors and practices, morals, worldviews, texts, sanctified places, prophecies, ethics, or organizations that relates. Humanity to supernatural, transcendental, or spiritual elements. The survey from study area collect the following information about respondent's religion group.

Table 5 Respondents Religion group

Religion	Frequency	Percent
Hindu	8	40
Buddhist	4	20
Kirat	8	40
Total	20	100

Source :(Field Survey, 2023)

The above table shows that respondents religion group the 40% Hindu and Kirat farmer respondents was involved in tunnel farming and 20% are Buddhist religion.

4.1.6 Respondents educational level

Education plays key role to the developmental aspect of human life including farming. Educated people do better in agriculture than the uneducated. The educational status of selected respondents can be presented below.

Table 6. Respondents educational level

Level	Frequency	Precent
Primary Level	4	20
Lower Secondary Level	5	25
Secondary Level	3	15
Higher Education	4	20
Illiterate	4	20
Total	20	100

Source :(Field Survey, 2023)

The above table shows that respondents educational level the heights 25% lower secondary educated respondents was involved in tunnel farming, lowest 15% lower secondary level respondents, 20% primary level education and 20% Illiterate,

Family size refers to the number of family members in a family. It also determines socio- economic life of people. The survey of family size in the selected respondents in the study area is presented below**.**

Table 7. family size of respondents

Family Size	Frequency	Percent
1-3	5	25
4-8	12	60
9-12	3	15
Total	20	100

Source :(Field Survey, 2023)

The above table shows that family size of the respondents the heights 60% respondent have family size 4-8 member in family and lowest 15% respondents have 9-12 family

member and 25% respondents have 1-3 family member.

4.1.7 Involve Family member in farming.

It refers to the number of family member involved in tunnel farming. The survey from study area find the given information shows in table.

Table 8. Involve Family member in farming.

Household	Frequency	Percent
2	5	25
3	8	50
4	3	15
5	2	10
Total	20	100

Source :(Field Survey, 2023)

The above table shows that information about the respondent's family member in tunnel vegetable farming the highest 50% respondents says their 3 family member involve in tunnel farming, lowest 10% respondents says 5 member from their family involve, 25% respondents says 2 member of their family involve in tunnel vegetable farming.

4.2 Practice of tunnel vegetable Farming in the study Area

4.2.1: Tunnel and use by farmer:

The study area Phungling Municipality ward n. 7 & 8 of Taplejung practice of tunnel vegetable farming. It shows that most of the respondents taking 1-3 Ropani land. The given table shows that Tunnel land status of farmer.

Table 9. Leasehold land by farmer

Area	Frequency	Percent
<1-3 Ropani	12	60
<3-5 Ropani	4	20
<5-7 Ropani	3	15
<7-8 Ropani	1	5
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about respondents lease land the highest 60% respondents have <1-3 Ropani,, and lowest 5% respondents have their 7-8 Ropani

and 20% have 3-5 Ropani and remaing 15% have there 5-7 Ropani land use respondents taking 3-5 ropani land, 15% respondents taking 5-7 Ropani land.

4.2.2 Initial investment by respondents

It states the initial investment of respondents during tunnel farming. The survey from study area find the information of tunnel respondents how much money they invest the initial step. The following table explains it.

Table 10. Initial investment by respondents.

Investment in (NPR)	Frequency	Percent
<20000	5	25
20000-80000	4	20
50000-1 lakh	8	40
above 1 lakh	3	15
Total	20	100

Source :(Field Survey, 2023)

In the above table show that minimum 40% household are investment 50000-100000 money and lowest 15% are investment above 100000 (1 lakh) money. Similarly 25% are below 20000 thousand and 20% are investment 20000-50000 thousand money.

4.2.3 Respondents Source of investment:

The respondents of study area burrowed money from different sources the given table shows the major source of investment of respondents of study area.

Table 11. Initial investment by respondents.

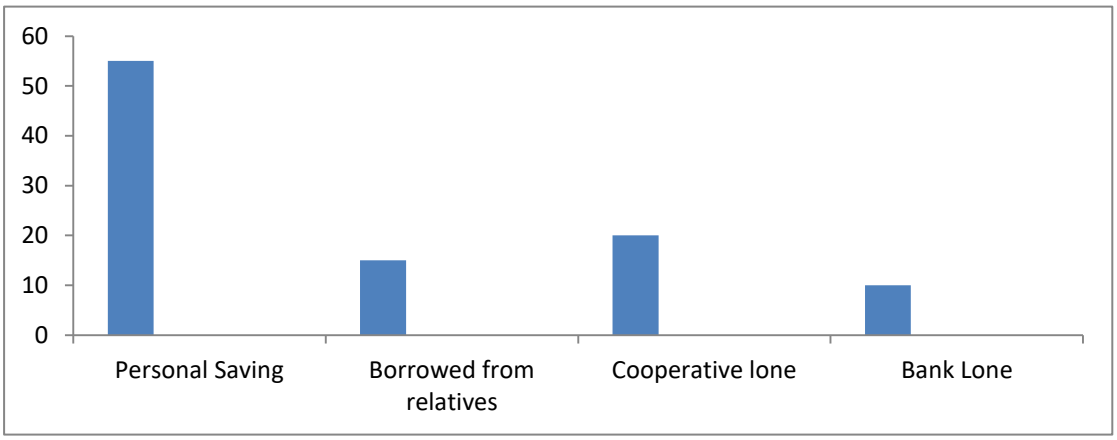
Sources	Frequency	Percent
Personal Saving	11	55
Borrowed from relatives	3	15
Cooperative lone	4	20
Bank Lone	2	10
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about source of investment of respondents the highest 55% respondents invest from their personal saving, lowest 10% respondents

invest from Bank loan, 20% respondents have invest from cooperative and 15% respondents have invest burrowing from relatives.

Figure 4: Relationship between leasehold land and initial investment



The above figure shows relationship between leasehold land and their initial investment the respondent who take 5-10 Ropani lease land they invest according to their occupation minimum 1 lakh to maximum 16 lakh. According to one of my respondents.

4.2.4 Respondents Participated in Capacity Building Training.

Training is important factor for doing any work. Training enhance farmer's knowledge and skill, the survey from study area find status of farmers training how many farmer get training.

Table 12. Respondents Participated in Capacity Building Training.

Response	Frequency	Percent
Yes	6	30
No yet	9	45
On plan	5	25
Total	20	100

Source :(Field Survey, 2023)

The above table shows that Respondents Participated In training, the highest farmer of this area is not involved any training, lowest 37.7% respondents involve in agriculture related different training and 16% respondents are planning to involved in training.

4.2.5 Respondents involve in Types of Training

Training refers to farming specification of the respondents. Training helps to modify their farming practice. The survey from study area find the following data about respondents training types.

Table 13. Respondents involve in Types of Training

Training	Frequency	Percent
Vegetable farming	4	40
Interred farming	3	30
Mushroom farming	2	20
Floriculture	1	10
Not involved in training	10	100

Source :(Field Survey, 2023)

The above table gives the information about respondents training type the highest 50% respondents have not involve in Vegetable farming training, 10% respondents are involve in floriculture, 20% involve in Mushroom farming and 30% respondents involve in integrated farming.

4.2.6 Respondents Farming Specification

Farming specification refers to the major area of farming in which is respondents doing. The survey from study area find the following information about respondent's major farming that is presented given below.

Table 14. Farming Specification

Specification	Frequency	Percent
Cabbage	5	25
Cauliflower	6	30
Tomato	4	20
Mushroom	2	10
Floriculture	1	5
Integrated farming	2	10
Total	20	100

Source :(Field Survey, 2023)

respondents have involved in cauliflower farming, lowest 5% respondents involve in floriculture, 10% respondents in integrated farming 10% respondents in Mushroom farming, and 25% respondents engaged in cabbage farming.

4.2.7 Respondents Social status fter farming

Table 15. Social status after farming

Response	Frequency	Percent
Strongly Agree	7	35
Agree	5	25
Nutral	6	30
Disagree	2	10
Total	20	100

Source :(Field Survey, 2023)

The above table shows that social status of respondents after tunnel farmer the highest 35% respondents strongly agree, after tunnel vegetable farming their social relationship increase, 25% respondents agree and 10% respondents are disagree.

4.2.8 Categories of profession of respondents

A profession is an occupation founded upon specialized manner he purpose of which is to supply disinterested objective counsel and service to others, for a direct and definite compensation. The survey from the study area find the following occupational status of respondents.

Table 16. Categories of profession of respondents

Categories	Frequency	Percent
Small Farmer	4	20
Commercial Farmer	12	60
Role Model Farmer	2	10
Leader of Farmer	2	10
Total	20	100

Source :(Field Survey, 2023)

The above table shows that the categories of respondent's profession there is 60% respondents are commercial farmer, 20% respondents are small farmer, 10% respondents are role model farmer leader of the farmer.

Table 17. Relationship of respondents with local farmer

Categories	Frequency	Percent
Strongly agree	16	80
Agree	4	20
Total	20	100

Source :(Field Survey, 2023)

The above table shows that the perception of respondents perceptions on relationship with local farmer the highest 80% respondents are strongly agree their relation is good with local farmers, and 20% respondents are agree they says their relation with local farmer is good.

Table 18. Trend of commercial farming Increasing

Categories	Frequency	Percent
Strongly agree	15	75
Agree	5	25
Total	20	100

Source :(Field Survey, 2023)

The above table shows that the information about trend of commercial farming the highest 75% respondents strongly agree the trend of tunnel vegetable farming increasing and 25% respondents agree.

4.2.9 Respondents compost Prepare status

Compost fertilize is the most important input in the farming it help to increase the production and productivity. It is organic in nature and not harmed for human health like chemical fertilizer. The survey from the study area find the following information about compost prepare and using respondents.

Table 19. Respondents compost Prepare status

Response	Frequency	Percent
Yes	14	70
No Yet	4	20
On plan	2	10
Total	20	100

Source :(Field Survey, 2023)

The above table shows that farmer's compost manual preparing status the highest 70% respondents says they prepare compost manual, lowest 10% respondents says they are on plan for preparing compost manual, and the 20% respondents says they are not prepare compost manual.

4.2.10 Respondents Use pesticide

It is the most important factor for the production. Pesticide increase the crop production by kill the harmful pest of the crop. Most of the professional farmers are very much knowledgeable in the matter of vegetable production.

Table 20. Respondents Use pesticide

Categories	Frequency	Percent
Yes	18	90
No	2	10
Total	20	100

Source :(Field Survey, 2023)

The above table shows respondents pesticide use status the highest 90% respondent's says they use pesticide and 10% respondents says they do not use pesticide.

4.3 Contribution of vegetable farming in economy Generation:

Nepalese economy is based on agriculture 38% GDP is occupied by agriculture (CBS 2011). Among them vegetables covers 12% in GDP including Cash crops. Vegetable farming has contributed in a great extent for income generation of the farmers. The information about it is discussed in a given ways.

Table 21. Respondents by monthly saving

Categories	Frequency	Percent
Yes	17	85
No	3	15
Total	20	100

Source :(Field Survey, 2023)

The above table shows that respondent's monthly saving status the highest 85% respondents saving monthly and 15% respondents does not save monthly.

4.3.1. Average monthly income of the respondents.

The income structure of the respondents is different due to various aspects. The general monthly income of the respondents is present in the given below.

Table 22. Average monthly income of the respondents.

Income (NPR)	Frequency	Percent
<15000	8	40
15000-30000	6	30
30000-60000	4	20
>60000	2	10
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about monthly income of the respondents the highest 40% respondents earn 15000 Rs. monthly, the lowest 10% respondents earn >60000Rs monthly, 30% respondents earn 15000-30000 Rs monthly and 20% respondents earn 30000-60000 Rs monthly.

4.3.2 Annual expenditure of the respondents.

The expenditure structure of the respondents is different due to various aspects. The general annual expenditure of the respondents is presented in the table below.

Table 23. Annual expenditure of the respondents

Expenditure	Frequency	Percent
<500000	8	40
500000-700000	6	30
700000-1000000	5	25
>1000000	1	5
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about annual expenditure of the farmer the

highest 40% respondents expends **<500000** lakh annually, the lowest 5% respondents expends **>1000000** lakh annually, 30% respondents expends 5-7 lakh annually, and 20% respondents expends 7-10 lakh annually.

4.3.3 Financial support from Governmental agencies.

The farmer require support and aid in their farming. They are supported by government organization. The description of financial and technical support getting by government showing in following table.

Table 24. Financial support from Governmental agencies

Support	Frequency	Percent
Subsity	8	40
Soft lone	6	30
Hard Cash	2	10
Not yet	4	20
Total	20	100

Source :(Field Survey, 2023)

The above table shows that farmer get training from government agencies the highest 78.3% respondents says they are not get any training from governments, 15.1% respondents get subsidy from government, and 5.7% respondents says they get soft loan from government.

4.3.4 Technical support by Governmental agencies.

Farmer require technical support for improving vegetable farming. These support is provided by government and non-governmental organizations. The survey from study area find the following information about technical assistance.

Table 25. Technical support by Governmental agencies

Support	Frequency	Percent
Training opportunity	2	10
Exposure Visit	2	10
Appreciation letter	1	5
Farming tools	3	15
No	12	60
Total	20	100

Source :(Field Survey, 2023)

The above table give the information about farmer getting technical support from governmental agencies the highest 60% respondents says they do not get any technical support from governmental agencies and 10% respondents get Training opportunity, 10% respondents says the get exposure visit, 5% respondents says they get appreciation letter, last 15% respondents get farming tool from governmental agencies.

4.3.5 Economic status of respondents after farming.

It states economic earning from tunnel vegetable farming, is there farmers economic status increase after involve in tunnel vegetable farming. The survey from study area find the farmers perception about that.

Table 26: Economic status of respondents after farming

Response	Frequency	Percent
Strongly Agree	8	40
Agree	7	35
Neutral Disagree	5	25
Total	20	100

Source :(Field Survey, 2023)

The above table shows that the respondents economic status the highest 40% respondents are strongly agree their economic status is increase after farming, 35% respondents are neutral, and 25% respondents are disagree.

4.4 Farming and Marketing Related Variable.

The Framing and Marketing process is an important factor. It includes the production

and distribution of agricultural production. The detail of it is discussed in following sections.

4.4.1 Problem face by farmers.

The tunnel farmers face different types of problem in farming. In this study the researcher surveyed the types of the problems that the farmer face in their farming, the presentation of which is given problems related to marketing, policy, irrigation and so on. The major problem found in study area is given in the following table.

Table 27.Problem facing by respondents

Problems	Frequency	Percent
Marketing	4	20
Irrigation	3	15
Fertilizer	6	30
Price fluctuation	7	35
Total	20	100

Source :(Field Survey, 2023)

The above table shows that the different problem facing by respondents the highest 35% respondents says they are more suffer from price fluctuation, lowest 15% respondents says they facing irrigation problem, 20% respondents says marketing problem, and 30% respondents says they are facing problem of fertilizer.

4.4.2 Good marketing network.

Marketing is an essential factors in commercial farming. Good marketing network and stable price attract the the farmer in commercial farming. The survey study from study area find the respondents perceptions on good marketing network that is presented below.

Table 28. Good marketing network

Response	Frequency	Percent
Strongly Agree	17	85
Agree	3	15
Total	20	100

Source :(Field Survey, 2023)

The above table shows the respondents perceptions on marketing network the highest 85% respondent are strongly agree there is good marketing network and 15% are agree.

4.4.3 Farmers Satisfied with price policy.

Price policy is another important factor in agriculture. Stable price policy motivated the farmer to do the commercial farming in effective way market and government policy affect the pricy policy. The survey find the respondents perceptions about price policy is presented below.

Table 29. Farmers Satisfied with price policy

Response	Frequency	Percent
Agree	6	30
Netral	4	20
Disagree	10	50
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about respondents perception on price policy the highest 50% respondents says they are disagree with price policy, the lowest 20% respondents are neutral with price policy, 30% respondents are agree.

4.4.4 Quality life increase after farming

Quality life is an overarching term for the quality of the various domains in life. It is a standard level that consists of the expectations of an individual or society for a good life. The Survey from study area the respondents the following information about nutrients food.

Table 30 Quality life increase after farming

Response	Frequency	Percent
Agree	13	65
Neutral	6	15
Disagree	4	20
Total	20	100

(Source :(Field Survey, 2023)

The above table shows the information about after involve in commercial farming is farmer's life change the highest 65% respondents says they are agree after involve in tunnel vegetable farming their living style upgraded, lowest 15% respondents are neutral, 20% respondents are disagree with this they say their life is not change.

4.4.5 Farming skill increase after tunnel farming.

Skill is important factor for agriculture production. The respondents of tunnel vegetable farmer are more skillful after tunnel vegetable farming. Following table shows the respondents perceptions on training.

Table 31.Farming skill increase after tunnel farming.

Response	Frequency	Percent
Agree	18	90
Neutral	2	10
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about respondents perception after tunnel farming is their farming skill increase the highest 90% respondents say they are strongly agree their farming skill is increases, and 10% respondents say they are agree.

4.4.6 Confidence level of respondents increase after tunnel farming

This describes the confidence level of tunnel farmer is there the cooing capacity of farmer increase. The survey from study area find the respondent's perception presented below.

Table 32 Confidence level of respondents increase after tunnel farming

Response	Frequency	Percent
Agree	17	85
Neutral	3	15
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about is their confidence level increase after

involving in tunnel vegetable farming the highest 85% respondents say they are strongly agree after involving un tunnel vegetable farming their confidence level increases, and 15% respondents says they are agree.

4.4.7 Earn more in Season or off-season

This explains the farmers of study area is earn more in season or off-season. The respondents from survey area gives the information about this either they earn more in season or off-season.

Table 33 Earned more in Season or off-season

Response	Frequency	Percent
Season	12	60
Off-season	8	40
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about in which season farmer earn more money the highest 60% respondents says they earn more in season of vegetable, but 40% respondents earn more in off-season of vegetable farming

4.4.8 Marketing process

Marketing is important factor in agriculture production. It describes the availability of marketing network in study area, the information is presented below.

Table 34 Marketing process

Marketing	Frequency	Percent
Self	13	65
Middle man	5	25
Shopkeeper come to collect	2	10
Total	20	100

Source :(Field Survey, 2023)

The above table gives the information about market process in study area the highest 65% respondents says they sell their production in market self, 10% respondents says Shopkeeper Come to collect their production and 25% respondents says they sell their product through middle man

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Finding

This is the study on economic Study of Tunnel Vegetable farming in Phungling Municipality ward n. 7 & 8, Taplejung, District. The study is focused on its three major objectives. After the systematic analysis and interpretation of collected data, this study came to in conclusion that there is a good practice of tunnel vegetable farming in Ward No. 7 and 8. The farmers of study area also give also give seasonal employment to youth. It is found that there is many youth are also involve in tunnel farmer, Most of them are higher educated, one youth farmer get master degree in economics. The most of tunnel farmer do integrated farming the two tunnel are established in 1-3 Ropani land and the main vegetable are Tomato, Cabbage, Cauliflower, Radish, Coriander, Brainjal, Capsicum, Chilly, potato, Pumpkin, cucumber, and floriculture, etc. According to local people the practice of tunnel farming is increase year by year. The local farmer says there is a good income from tunnel farming.

This study is also concludes that tunnel vegetable farming had contributed in a great extent for income generation of the farmers. The average of the farmers owned 15 to 30 thousands rupees monthly from their farming. The big tunnel farmer earn >60000 Rs monthly. Farming tended them to sustain their life as well as to save few amount for future savings as well. The total of 74.3% a respondents only involve in tunnel farming they are not engage in other occupation and 25.7% respondents are also involve in other Governmental and private job, some of them are open their own local shop . The farmers of this area build an farmers group Mechi Mahakali collection center that is open in Hanuman Ghat Near to the Nayabajar and they bring their product self in evening time to sell.

The major Finding was listed below.

i) 35 Respondents are selected for Research.

ii) Highest 50.9% respondents have not involve in any training, the 38.6%

respondents are involve in tunnel vegetable farming, 0.9% respondents are involve in floriculture, 5.7% involve in Mushroom farming and 3.8% respondents involve in integrated farming.

iii) The all total respondents from study area 67% Male and 33% female are involve in tunnel farming.

iv) The Educational status of tunnel farmers in study area was found that heights 29.2% higher educated respondents are involved in tunnel farming, lowest 14.2% lower secondary level respondents, 16% respondents secondary level education and 20.8% Illiterate respondents was involved in tunnel vegetable farming.

v) The heights 67.9% respondent have family size 4-8 member in family and lowest 9.4% respondents have 9-12 family member and 22.6% respondents have 1-3 family member in study area.

vi) 42.2% respondents have <5 Ropani,, and lowest 2.8% respondents have their own land, 24.5% respondents taking 5-10 ropani lease land, 19.8% respondents taking 10-15 Ropani lease land,6.6% respondents take 15-20 ropani lease land and 3.8% respondents take 20-25 Ropani lease land.

vii) 53.8% respondents pay 50000-1000000 per year, and lowest 2.8% respondents have their own land so they are not paying rent of land, 28.3% respondents pay >100000 annual rent and 15.1% respondents are paying <50000 annually.

viii) Highest 56.6% respondents invest from their personal saving, lowest 5.7% respondents invest from Bank loan, 18.9% respondents have invest from cooperative and 18.9% respondents have invest burrowing from relatives.

ix) Highest 66.0% respondents have involved in tomato farming, lowest 4.7% respondents involve in floriculture, 6.6% respondents in integrated farming 15.1% respondents in Mushroom farming, and 7.5% respondents engaged in cabbage and cauliflower farming.

x) 45.3% respondents earn 20000-40000Rs monthly, the lowest 9.4% respondents earn >60000Rs monthly, 17.9% respondents earn 40000-60000Rs monthly and 27.4% respondents earn <20000 Rs monthly.

xi) 31.1% respondents earning 9-12 lakh annually, and lowest 6.6% respondents earning 1-3 lakh annually, the 12.3% respondents earning

more than 15 lakh annually, 28.3% respondents earning 3-6 lakh annually, and 10.4% respondents arming 12-15 lakh annually.

xii) 61.3% respondents spends 3-4 lakh annually, the lowest 4.7% respondents spends 5-8 lakh annually, and 34.0% respondents spends 1-2 lakh annually.

xiii) The 64.2% respondents says they are more suffer from price fluctuation, lowest 8.5% respondents says they facing marketing problem, 14.2% respondents says irrigation problem, and 13.2% respondents says they are facing problem of fertilizer.

xiv) The highest 74.3% respondents says they have no other job they only involved in tunnel farming, and the lowest 1% respondents are Entrepreneur, 5.7% respondents family member are going foreign country, 8.6% respondents have private job, 5.7% respondents are also involve in government job, and 4.8% respondents are also involve in local shop.

5.2 Conclusion

The farmers have great attention due to the increasing urban demand, its profitability and accessibility of road and growing market demand. Commercial vegetable farming in Phungling has both opportunities and constraints in production and marketing phase. Tunnel vegetable farming has more opportunities than the constraints in local area. Most of the constraints are related to the post- harvest process like marketing of vegetables where the frequent price fluctuation. Therefore, further steps on the basis of constraints and opportunities identified by this study could prove more effective in order to preserve commercial vegetable farming as an important agricultural sector in the study area. With proper management of marketing segment could greatly contribute for development of commercial vegetable sector. Furthermore, commercial vegetable farming could be a module of socio-economic development. So, further study could be focus to portray possible options to promote opportunities and overcome the existing constraints to retained commercial vegetable farming as a sustainable source for farm households in Phungling area.

There have been various technological advancements in the field of agriculture like hybrid seeds, advance fertilizers, drip irrigation etc. But adopting just one or two such technological improvements is not enough; there is a need for an alternative farming system which incorporates all latest technological interventions in it.

From last decade tunnel farming technology evolves as an alternative to conventional farming especially in the cultivation of vegetables and fruits. It integrates all the agriculture related technical interventions in it and most importantly provides farmer a control over heat and temperature of crops by which farmer can produce off-season vegetables and can earn more profit.

This study is an effort to provide evidence that farmers who are using tunnel technology for the production of vegetables are more efficient compare to conventional farmers.

5.3 Recommendations

Farmer should involve in training and skill development program, Make good relationship among farmer and adopt new way of production of technology and transform their traditional way of farming. Government should make effective program to attract skilled manpower who return from abroad, it helps to decrease labor shortage.

The government has to make further policy research and developmental studies to cultivate the vegetable through the development of commercialized agriculture in study area. So, the farmers will have more opportunities and practices in vegetable farming.

Local Governmental Institutions (Municipality/Rural Municipality) should also implement policies and programs for promoting sustainable vegetable farming towards market oriented organic production systems in coordination with concerned institutions. As a result of which, the local level developments become sustainable through constant farming.

Government should be provided loan in zero percent for the construction of cold store though farmers can store their products and sell the product in off season. So that the farmers will have economic efficiency in their.

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ANNEX I

QUESTIONNAIRE

Economic Effect of Tunnel Vegetable Farming

(A Study of Phungling, Municipality,Taplejung,Nepal)

Dear respondent,

I would like to share that this is completely a thesis work and it does not carry any official record. You are requested to answer the question friendly and honestly. The importance of this study depends on your valuable answer. Your privacy will always be secured and information you provide does not effect on it. So, please answer the following questions on your knowledge and practice as far as possible.

Research Questionnaire:

Name of Interviewer…… **Date:**

Name of Respondents

…… Cell

Number……..

A. Socio-Demographic Variable

1. Permanent Address?

District…….

2. How old are you (age) ?

…….

3. Caste/Ethnicity?

1. Bhramin/Chetri 2. Janajati

4. Dalit, 5. Other

4. Religion:

1. Hindu 2. Budhhist 3. Isai

4. Kirat 5. Other

5. What is your marital Status?

1. Married 2. Unmarried 3. Separated 4. Divorced

6. What is your formal educational status?

1. Primary, 2. Lower secondary, 3. Secondary,
4. Higher education, 5. Illiterate

7. What is your subject specification in higher education?

1. Management, 2. Education, 3. Arts,
4. Natural sciences, 5. Health 6. Engineering,
7. JT/JTA, 8. Agriculture,
9. Forestry and animal science

8. Have you participated in any capacity and skill development trainings?

1. Yes 2. Not yet 3. On plan

9. What types of farming related training you have completed then?

1. Tunnel vegetal farming 2. Integrated pest management
3. Goat farming
4. Mushroom cultivation 5.Bee keeping
6.Floriculture 7. Other

10. How many members are there in your family?

Female	**Male**	**Total**

11. How much was your initial investment to start commercial farming?

NPR…….

12.. Have you registered your farm?

1. Yes 2. No 3. On plan

13. How much lease hold land you have?

1. <5 Ropani 2. 5-10 Ropani 3. >10 Ropani
4. No leasehold land

14. What were the sources of that investment?

1. Personal saving 2. Borrowed from relatives
3. Cooperative loan 4. Bank loan

15. Annual rent for lease hold land?

NPR ……

16. How you sell your product in market?

1. Self 2.Through Madman 3. Shopkeeper come to collect

4. Through Collection center

17. What types of financial supports you got from government and non -government institutions?

1. Subsidy 2. Soft loan 3. Daily allowances 4. Hard cash prize

18. Farming skills of the farmers have been increasing due to practical knowledge

1. Strongly agree 2. Agree 3. Neutral
4. Disagree 5. Strongly disagree

19. Self confidence level of the farmers also have been increased due to commercial farming

1. Strongly agree 2. Agree 3. Neutral 4. Disagree
5. Strongly disagree

20. How full time employees are working in your farmland?

Female	Male	Total

21. Do you prepare compost fertilizer with farming purpose?

1. Yes 2. Not yet 3. On plan

22. What is the main problem for farmer here?

1. Marketing 2. Irrigation. 3. Fertilizer
4. Price fluctuation

23. What is the level of your farming practice?

1. Inorganic 2. Organic red 3. Organic yellow
4.Organic green

Respondents Signature

…….

Thank you for your better cooperation!

ANNEX II

Photographs:

Mushroom farm tunnel Phungling-7,Taplejung

Mushroom tunnel farm visit with farmer Phungling-7,Taplejung

Tomato tunnel farm visit with farmer Phungling-7,Taplejung

Preparing to plant tomato plants Phungling-7, Taplejung

Ghodechwor Tonnel farm Phungling-7,Taplejung

Tonnel fam along with cow fam

Corn storage at tunnel .