

# **CHAPTER - I**

## **INTRODUCTION**

### **1.1 Background of the Study**

Nepal is a landlocked country that lies between India and China. It has 147,181 square kilometer area located between 80<sup>0</sup>.15' to 88<sup>0</sup>.15' E. longitude and 26<sup>0</sup>.20' to 30<sup>0</sup>.10' N. latitude. Topographically, the country is divided into three geographical areas i.e. Terai, Hill and Mountain. The total population of Nepal is 2,31,51,423. Among them population of male and female is 1,15,63,921 and 1,15,87,502 respectively (Census 2058). The annual population growth rate is 2.25 percent (Census 2058). Nepal is an agricultural country. 81.3 percent people of the total population depend on agriculture sector. Annual rate of growth in agricultural production is very low as compared to annual population growth rate. The population growth rate is 2.25 percent per annual while growth rate of agricultural production is 1.4 percent per annum (Census 2058). It indicates that existing agricultural production is not sufficient to balance the rapidly increasing population in the country.

In spite of the huge investment of resources in agricultural sector, the country is not able to accelerate this sector smoothly. The underlying poverty in the country can be alleviated and the economy can be boosted up by increasing agricultural production. Socio-economic position of the country is heavily based on agricultural sector and agricultural progress is a prerequisite for national development. Irrigation depends on rainfall, however, only some of the lands are irrigated by canal.

Irrigation plays a vital role in the field of agricultural development as well as economic development of an agrarian based society. Nepal has abundant water resources. In Nepal, it is estimated that only 22 percent of the total land can be cultivated (CBS 1997). Irrigation facilities in Nepal have been provided to 17, 66,000 hectares of land among the current 26,

41,000 hectares of current cultivable land, which is 66.87 percent of the total irrigation potential for cultivable land of the country (Ninth Plan 2055) . Geographical situation of specific location affects the irrigation facilities. Irrigation in the Terai relatively occupies more areas than Hills and Mountains.

Most of the crops depend on monsoon rain. So, farmers are facing uncertainty and risk of low productivity. Nepal has emphasized on irrigation for the last five decades with the hope of uplift of the agricultural sector as well as economic development of the people. Huge sum of money has been invested on irrigation sector but actual irrigated land areas are much less. Due to application of low efficient type of irrigation system anticipated results are not achieved. So, in recent years planners are attracted to various alternative irrigation systems such as:

- ) Flood or (Furrow) irrigation.
- ) Overhead (Sprinkle) irrigation.
- ) Centre pivot irrigation.
- ) Lateral move (side roll and wheel line) irrigation.
- ) Drip or trickle irrigation.
- ) Sub irrigation

Among them drip irrigation system is assumed to be highly efficiency and appropriate in the context of Nepal. Most parts of Nepal are hilly. Lack of dry season irrigation system, is one of the most important constraints for the production of dry season horticultural crops which are highly valuable and marketable.

Conventional drip irrigation system was originally developed on a commercial scale in Israel in early 1950s. It was later widely adopted in India, USA, Australia and European countries. Likewise, in early 1980 Government of Nepal entrusted Agricultural Development Bank, Nepal (ADB/N) to promote micro-irrigation programme. There after a micro-irrigation development cell was established to provide technical supports

where needed. For diffusion purpose, ADB/N demonstrated the eastern Nepal together with promise of subsidy for the adoption of technology.

In early 1990s IDE/Nepal, an international non-government organization (INGO), came in accord with ADB/N to promote micro irrigation, Since then, IDE/Nepal has been implemented the low cost drip irrigation programme in water scare regions of Nepal.

Larger state financed irrigation projects have generally tended to benefit relatively larger farmers. Small farmers cannot involve themselves in large scale capital intensive schemes due to lack of resources. Realizing this fact, drip irrigation technology is made available to the smallholder farmers through local dealers and IDE, in collaboration with local institutions the adoption of drip irrigation system by conducting various extension programmes to promote highly valueable crop cultivation.

Drip irrigation can be a great aid to the efficient use of water. A well designed drip irrigation system or subsurface drip irrigation system will lose practically no water to run off deep percolation or evaporation. Irrigation scheduling can be precisely managed to meet crop demands, holding the promise of increased crop yields and quality. (Dr Clinton C. shock. 2006)

Drip irrigation is a relatively new method that has developed mainly over the last decade. Water is applied by means of mains, manifolds and plastic liters usually laid on the ground surface. Equally spaced along the lateral are drippers from which water trickles into the soil and in to it to supply the water needs of plants. Trickles are sometimes replaced by hole in the walls of the plastic tubing. Plant main root-zones develop inside the cones and are therefore restricted in volume. Nevertheless, yields often exceed those obtained by other irrigation methods, which are sometimes even allowing a saving in water (" Irrigation engineering" Banks and often 1995) Drip irrigation is regarded as the most water saving irritation technology currently available in the hilly region of Nepal which was introduced by IDE (International Development Enterprises) Nepal.

In our country employment opportunities are not available everywhere and people are facing problems of current money in every sector. The people who are facing the problems of current money can adopt new types of cultivation system and adoption of new types of irrigation system i.e. drip irrigation. The adoption various cash crops, some families are getting to access of basic needs, i.e. educational sector, health sector and nutritional food. Adopting of new technology as well as cash crops production helps to uplift of economic status and to make self-reliance.

## **1.2 Statement of the Problem**

The past effort is concerned only with development and implement of large surface and ground water irrigation rather than micro irrigation method like sprinkle irrigation system, drip irrigation system and treadle pump irrigation system etc. Due to necessary of large area and requirement huge investment of the government, large surface and ground water irrigation system is not affordable for large scale of population of drip irrigation is increasing while it can be used for very small piece of land low investment and even hilly areas.

First of all, Israel introduces this drip irrigation system during the period of 60<sup>th</sup> decade and it gradually covered rest of the world. In Nepal International Development Enterprises (IDE) Nepal has been launching this project since it's establishment since 1992. In initial years of operation in Nepal, IDE Nepal focused on bringing low cost small scales irrigation technologies to small farmers in the Terai and Hills of Nepal. That irrigation technology combined with intensive agriculture support that has made it possible for more than 45,000 small farmers in Nepal to bringing or increase vegetable cultivation (IDE Report 1999). The vegetable produce is used both for home consumption and for sale to local markets. This overall outcome of the project has been increasing the income of small farmers as well as to improve their nutritional status, food security and upgrade financial status. That's why it can be said that it plays a crucial role for the

improvement of overall sector i.e. education, health, nutritional food and empowerment of rural and backward people. This study focuses to get the answer of following research questions.

- ) What is the present performance of drip irrigation system in the study area?
- ) What is the technical know-how of this system?
- ) What is the status of women participant in drip irrigation system?
- ) What change has been occurred in socio-economic condition of drip users?
- ) Is there any change in the living standard of drip users?
- ) What are the major problems of drip users?

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

The general objectives of this study are to examine the performance of the drip irrigation system and to assess the socio-economic impact to drip users with reference of Dhikurpokhari V.D.C. of Kaski district. The specific objectives of the study are as follows:

- ) To analyze the impact of drip irrigation on social sector (Education, health, gender relation, awareness) of drip users.
- ) To assess the impact of drip irrigation system on economic sector.

### **1.4 Significance of the Study**

Nepal is an under developed country. Most of the people depend on agriculture. Among them, majority people are poor and smallholders. They need low cost and small scale irrigation technology to improve their economic status by increasing agricultural productivity. Likewise, women in Nepal occupy more than 50 percent of the total population. Empowerment of women and men is compulsory for the national economic development as well as quality life for them.

Drip irrigation system uplifts economics status of women and men and it empowers them in socio-economic sectors. No much research has been made on this field. So, the study on drip irrigation with relevance to rural development or back-wards people has own significance. This study is useful to both governmental and non-governmental agencies which are working to alleviate rural poverty and empowerment.

### **1.5 Data Analysis and Presentation**

This study is concerned with socio-economic impact of drip users who have properly used drip irrigation. Thus, in this section data and information are analyzed and presented on the socio-economic and demographic background of the study area as well as respondents. This section includes analysis of social and economical structure. Cast/ethnic composition of respondents, occupational structure, gender structure, religion and language structure, age and sex structure, educational status, and holding structure are analysis under the social structure similarly.

### **1.6 Limitation of the Study**

This research has been undertaken within the boundaries of limited time, budget, area and other resources. So, it is not the study in wider perspectives. Similarly the following are the major limitations of the study.

- ) This study is based on Dhikurpokhari VDC Kaski.
- ) The nature of research is exploratory.
- ) Data and information provided by concern offices are assumed to be correct.
- ) Primary and secondary data are included in this research.
- ) Respondents who are basically involved in an agricultural profession are included in this research.
- ) This study has deal economic and empowerment issues of those people who have participated in drip irrigation system.

## **1.7 Organization of the Study**

This dissertation report is divided into six chapters. The first chapter introduction discusses the background of the study, statement of the problem, research objectives, significance of the study, conceptual framework, Introduction of the study area, limitation of the study and organization of the study.

Chapter Two - literature review deals with mainly theoretical review and previous research works on irrigation and drip irrigation in Nepal. Chapter three, research methodology explains the research methods used in the study including rationale for the selection of the study area, research design, nature and sources of data, universe and sample size, data collection techniques, data analysis and interpretation and limitation of the study. The fourth chapter presents social and demographic characteristics of the study area. This chapter also focused on analysis and presentation of data and information obtained from field summary.

Chapter Five deals with economic sector of drip irrigation including benefits and problems related to its social sector.

In the Six chapter, the summary, conclusion and recommendation are presented.

## **CHAPTER - II**

### **LITERATURE REVIEW**

This chapter deals with mainly theoretical review and review of previous research work on irrigation and drip irrigation in Nepal.

#### **2.1 Theoretical Review**

Modernization, social change, diffusion, introduction of irrigation, History of irrigation, types of irrigation, Introduction of drip irrigation and Advantage of drip irrigation are included under this topic.

##### **2.1.1 Modernization**

The term modernization is associated with improvement and development in border sense. It applies to change the socio-economic, political and cultural for betterment for the existing situation. Modernization helps to bring up positive change and development on a) Social value b) domestic production/economic status c) education d) political and e) living standard. Modernization theory was emerged in 1950 but it was introduced in 1960 in Nepal mainly there development concepts which were technology transfer or mechanic farming, capital transfer development and basic need development. These concepts brought some learning to the implementers (government agencies and non-government agencies) unless to active participation of both (male and female) in all aspects for the development to adopt these concepts and model for effective change in socio-economic aspects of Nepal.

##### **2.1.2 Social Change**

Social change means change of society consequently any alternation of behaviour patterns, social relationship or social structure over time. Social change is any significant alternation in the social conditions and



patterns of behaviour in a society. Such a change may be carried by fashions, inventions, revolution, wars, or their events and activities. Technologies developments have led to many social changes in education, social values and settlement patterns that occur in newly industrialized nations. (The world book encyclopedia)

Social change can come from many sources. Some of these sources originate outside the society, others develop from process is occurring within the society. These that come from outside the society are called exogenous sources, those that originate within the society are called endogenous. Functionalist theories focus on exogenous sources and how societies adopt to the resulting change. Conflict theories find to emphasis endogenous sources of change, focusing of how society itself creates change.

There are many factors to come social change. Out of them, economic is one of the significant factors for social change.

### **2.1.3 Diffusion**

The theory of diffusion emerged in the early years of this century. According to diffunists various culture complexes develop at various times in different parts of the world and later on diffuse over corresponding parts of the earth. According to the culture traits many also be carried by migrating people into an area where they carried by migrating people into an area they settle down temporarily and may be communicated as the local inhabitant living their. Thus, diffunists opinion that culture has growth in course of history not because of evolution but because of transmission of culture due to historical happenings and mutual contact. Such historical happening, which led to the transmission of culture are provided a theory to the study of culture growth and cultural parallels was called diffusion. (Makhas Jha chap. IV page-55)

#### **2.1.4 Introduction of Irrigation**

Irrigation (in agriculture) is the replacement a supplementation of rainfall with water from another source in order to grow crops. In contrast, agriculture that realizes only the direct rain-fall is sometimes referred to as dry land farming.

#### **2.1.5 History of Irrigation**

Evidence exists of irrigation in Mesopotamia and Egypt as far back as the 6<sup>th</sup> millennium/B.C. There also evidence of ancient Egyptian Pharaohs of the 12<sup>th</sup> dynasty using natural lake of the fayum as a reservoir of store surplus of water for use during the dry seasons as the lake swelled annually as caused by the annual flooding of the Nile.

Development in ancient Persia the Quant is among the oldest known irrigation method developed and still use today. Quanats are constructed as a series of well link vertical shifts, connected by gently sloping tunnels. The Indus valley civilization in Pakistan and North India (from civca 2600 B.S.) also had an early cannel irrigation system. By the middle of the 20<sup>th</sup> century the advert of dised and electric motors led for the first time to system that could pump ground water out of major aquifers faster than it was recharge. This can lead to permanent loss of aquifer capacity, decreased water quality ground subsidence and other problems.

#### **2.1.6 Types of Surface Irrigation**

##### **a. Flood or (furrow irrigation)**

Ditches can be dug with hand tools, turned with a plow pulled by animal or tractor, or precisely fashion using user-guided instrument depending on economic factors such as the size of the filed, the types of technology available and the cost of manpower: Plants are grown in raised beds or rows. Water is distributed through out the field via cannels, online ditches, or furrows plastic lined ditches or unlined ditches.

**b. Over-head (Sprinkle) Irrigation**

Overhead or sprinkle irrigation water is pipe to one or more central location within the field and distributed by overhead high pressure sprinkles or by lower pressure sprays.

**c. Central Pivot Irrigation**

Central pivot irrigation is a overhead irrigation consisting of several segments of pipe (usually galvanized, still or aluminum) joint together and supported by trusses, mounted on wheeled towers with sprinklers positional along with it's length. The system moves in a circular pattern and it's fade water from the pivot point at the centre of the arc.

**d. Lateral Move (Side roll, wheel line)**

A series of pipes each with a wheel of about 1.5m diameter permanently affected to it's midpoint and sprinkles along with its length are coupled together at one edge of a field, water is supplied at one end using a large hose.

**e. Drip or trickle Irrigation**

Water is delivered at near the root zone of plants drop by drop. This types of system can be the most water efficient method of irrigation, if managed properly. Since evaporation and run off are minimized. In modern agricultural, drip irrigation is often combined with plastic mulch. Further reducing evaporation and is also the means of delivery of fertilizer. Drop irrigation method range from very high-tech, computerized to low-tech and relatively labor intensive.

**f. Sub-irrigation**

Sub irrigation also sometimes called seepage irrigation, has been used for many years in field crops in areas with high water cables it is methods of artificially raising the water table to allow the soft to the moistened from below the plants root zones.

### **2.1.7 Irrigation Development in Nepal**

Attempts for increasing irrigation facilities in Nepal date back to quite a long time. However, Nepal, inspire of agricultural country, with an abundance of water resources does not have a long history of canal irrigation system. In the past 'Kulos' (indigenous traditional system) were famous around the capital city and were operated by government subsidy to irrigation the land. Kathmandu and its periphery were irrigated during the Malla dynasty. By the middle of the 12<sup>th</sup> century, king Shivadev had built a dam at Balkhu khola near Kritipur for irrigation (Shrestha: 2045 B.S., p-46, Nepal Parichaya) Fedual lords Anshuvarma and Jaya Sing Gupta had made a number of Raj Kulos. Several other Raj Kulos were constructed during Malla regime (curriculum development centre, 2041 B.S. P.6)

In the 17<sup>th</sup> and 18<sup>th</sup> centuries, Europe had brought drastic changes in the irrigational system of western Hemisphere. After the restoration of national integration of Nepal, its rules and states men had devoted their time, energy and national resources only to have and internal crisis move than to reforms and development activities. However, no remarkable works were long towards irrigation up to the Rana Priminister Chandra Shamsher. Until those days, small scale, relatively short length and run-of-river were the main irrigation systems. International agreement concerning irrigation development in Nepal took place first in 1920 during the regime of Rana priminister Chandra Shamsher (master plan for Irrigation Development in Nepal, Development of Irrigations, 1990 p. 37)

Before the implementation of the periodic development plan in 1956, only three canals Chandra canal in 1926. Jagadish canal in 1942, and Juddha canal in 1946 were constructed in Saptari, Kapilbastu and Rautahat district respectively. (Shrestha: 1981, 8, 63)After the implementation of the planning several irrigational projects were undertaken is different parts of Nepal. In Nepal surface irrigation is the main system used in various parts of the country. And, of course traditional methods of irrigations like pynes, terrace, well and canal irrigation came also in practice (Shrestha: 1966, p.

72). Now days, in the hills of Nepal various irrigation projects have been introduced for the development of canal irrigation. Similarly various types of hill irrigations projects have been introduced in the Nepal. Some of them, drip irrigation system is one of the important irrigation project of the hilly region.

### **2.1.8 Introduction to Drip Irrigation**

Drip irrigation can be a aid to the efficient use of water. A well designed drip irrigation system or sub-surface drip irrigation system will lose the practically no water run of, deep percolation or evaporation. Irrigation scheduling can be precisely managed to meet crop demands holding to promise in creased crop yields and quality.

Agricultural chemicals can be used more efficiently with drip irrigation. Since only the crop root-zone is irrigated, Nitrogen already soil is less object to leaking losses.

Fertilizer N that is added can be used more efficiently when insecticides are labeled for application through drip irrigation, less insecticide may be require to control pests.

With the potential benefits of drip irrigation conversation to drip irrigation can increases production cost specially when another pre-existing irrigation system is already in place. Ultimately, there most be an economic advantage to growers for them to consider drip irrigation.

### **2.1.9 Advantage of Drip Irrigation**

- a. Drip irrigation is adaptable of field with odd shape or uneven topography and to the parts of field have excessive in-filtration, water puddling or run off.
- b. Drip irrigation can be helpful if water is scare or expensive and very expensive to pump.
- c. Fertilizer cost and Nitrate losses can be reduce by adoption of drip irrigation.

- d. Proven yield crop quality have been observed in vegetables through drip irrigation i.e. onion, brocauli, cauliflowers, melon, tomato and cucumber etc.
- e. A drip irrigation system can be automated.

### **2.1.10 Irrigation Facility**

Irrigation is mainly a device to supply the necessary amount of water required to the plants of cultivated land. The best way of meeting such kinds of requirements is by constructing irrigation canal from the source of water. Irrigation has played an important role for increasing the agricultural production, irrigated area as well as cultivated area. In present, various types of irrigation systems are exist. Among them drip irrigation is one of the effective system, which has provided the irrigation facilities in the cultivated area.

### **2.1.11 Promotion**

In the field of irrigation, various agencies mainly agricultural development bank Nepal (ADB/Nepal), International development Enterprise (IDE-Nepal), District Agriculture Development Office (DAO) and other NGOs are working for the promotion of drip irrigation in Nepal including the study area. All of them, IDE Nepal is presently actively engaged in the development and promotion of drip kits present.

IDE do the advertising of drip irrigation kits and demonstrates its functioning in a small area in selected village. After showing its action, then IDE coordinated with Dhikurpokhari Community Development organization and started to install the drip kits and make follow up service effective. Generally there were already other informal and formal groups of the villagers of other purpose like women empowerment, poverty alleviation, micro credit cooperative, women association, socially disadvantaged caste uplift groups etc from such earlier formed groups DCDO coordinated to them and motivation about drip kits and method of

drip installation. DCDO select one of the active members as the leader of the each group. In this way, this system is promoted in the study area.

#### **2.1.12 Group Activity**

The user group collection of people are interested to procure drip system, install and raise seeding in the nursery and produce marketing. The group is informal, but when there is any problem issued they solved by the discussion of the groups i.e. seeding of the nursery, vegetable planting and occur the other problems. IDE & DCDO generally trains to grow vegetable to entire users group in relevant training.

Drip farmers are adopting small size of drip kit so, involvement of group to raise seeding in common nursery, collecting marketing, cure of diseases are good points of the group, In the group work, participation is activated them non group. When the meeting and training will be run, group leader informs to user member in particular location. Who attends training first and she/he then teaches knowledge gained to general member farmers or drip users.

#### **2.1.13 Motivation**

Especially motivation who adopt the drip system is to grow vegetable for home consumption and to sell surplus in the markets. Most farmers, respondents have both their objectives. Subsistence farmers in Nepal naturally wish to produce for home consumption need and sell in surplus produce. According to IDE's backstopping services to grow vegetables is a major attraction for most farmers to adopt the drip irrigation system. Also now it has become a matter of pride for the farmers to have drip kit and grow vegetable through the year. (In Dhikurpokharai market both government and non-government employees are also adopting drip system for vegetable production in the kitchen garden.)

#### **2.1.14 Crops Grown**

After the adoption drip system, farmers become able to distribute limited water to large area, hence there increase in the vegetables crop area. Before the introduction of drip system, millet, maize low value leafy vegetables were grown in small area for home consumption by nominal farmers. After the introduction of drip system, farmers have started to grow cauliflower, cabbage, cucumber, tomato, bitter guard is season and as well as off-season vegetables.

#### **2.1.15 Water Management**

Drip irrigation system has helped former to distribute less water to large area through drip system. Drip system can allow distribution of small amount of water to many plants even in deficit amount. It thus allows deficit irrigation when water is scare which is not possible by other means as it save time to apply water (Sharma, 2000). Most formers started to grow vegetable in large area then before is revealed by some farmers upgrading of drip kit.

### **2.2 Review of Previous Research Work**

Very few research works have been done in the field of drip irrigation, whatever research have been done for academic and non-academic purpose, that are reviewed in this topic. Some other studies that are conducted on irrigation system will also be reviewed as follows:

Shrestha (2001) performance of drip system and women empowerment of Household level a case study of Bhimad VDC, Tanahun rigorously presented drip irrigation as most suitable irrigation method for the dry areas in the hills of Nepal. She has also found increased use of fertilizer improved seed after installation of drips and increase in the production of vegetable. She has found change in the quality of women's life and empowerment by drip installation. As most of the women operate the drip kit, they have access to the resources and are making the decisions.



Muktan (2002) has studied on the topic "Women participation in Drip irrigation and its impact on socio-economic aspect: He found the vegetable production programme has increased significantly the health status of the farm families and the awareness and decision making power of the women. It has created employment opportunities for men and women in the villages. The programme has also created awareness of environmental and sanitation, drip irrigation system being a cheap appliance that permits to grow high value vegetables even with normal investment by carrying water in a bucket, is an attractive technology to help alleviated poverty of rural mass. This has given them or drip user employment and providing fresh vegetables as food. This has increased the nutrition in take and improved farmers health status. He has focus that to adopting the drip, because of to handle, low cost, appropriate small irrigation system than other irrigation system, low investment and low need of physical energy, time saving, economic use of water. Finally, positive impact of the drip system and its popularity is high in adoption.

Parajuli (1990) has studied on the topic "An Impact Evaluation of Pokhara Water Conservation and Irrigation Project" and has concluded that because of irrigation facilities crop production, cropping pattern, irrigated area and socio-economic activities have increased in Pokhara valley.

Panta (2002) Impact study of vegetable programme of LISP in Palpa has found that drip irrigation system is affordable, more simple and benefit, time saving for irrigation and suited to small, women, poor and dalit farmers for the vegetable production especially in dry areas and seasons of hilly regins. He presents his report of income ratio 1:3 in addition, this system is more comfort and environment friendly to the sustainable development of high value vegetable production.

Gurung (1999) in their study "Socio-economic profiles, situation of high value crops (vegetable) and baseline information of IDE's propose sites for research on low-cost water storage tanks," have described the need of small water storage structures to compliment the drip or sprinkler system

for growing high value vegetable crops and other irrigated agricultural crops. Their study is focus on socio economic profiles and general baseline information on the potential sites. In addition the study report also presents information on the current of high value vegetable in this sites.

Shrestha (1982) has shown that in the well irrigation project in Parsa district, land ownership who tilled their own land had a net return over 40 percent higher than tenants using the same technology. It means, even using the same technology. Farmers with same amount of land under different forms of tenure are likely to be positively objected.

Pageni (1987) According to the irrigation facilities crop production, cropping pattern and socio-economic activities have increased. But there was also negative impact of irrigation that the pumping scheme lifted sand with water drinking the irrigation period and pumping tools had been adversely affected by sandy water. Due to this sandy soil pumping scheme may not be durable for long time.

Killer and Bliesner, (1990) Drip irrigation is widely recognize as one of the most efficient methods of watering crops. Drip irrigation delivers water under low pressure atmost directly to the roots of plants through small holes or emitters. Israeli engineers initially developed drip system for commercial application.

Sharma (2000) in the dissertation has evaluated the impact of drip irrigation in Kahun VDC of Kaski district He observed drip irrigation as most suitable irrigation method for the dry areas in the hills of Nepal. He has also found increased use for fertilizer and improved seed after installation of drips and increase in the production of vegetable. Most farmers were using drinking water. He found changes in the quality of women's life by drip installation. As most of the women operate the drip kit, they have access to the resources and are making the decisions although some of them had to work little more work to bring and apply water. Most women have achieved some sort of control and satisfaction in terms of

food, clothes and education of children. Also they are successful to overcome shyness in dealing with other people of their locality and visitors.

IDE-Nepal (1999) in its publication, "Simple Low Cost Drip Irrigation Technology" has described the importance of drip irrigation technology. Drip irrigation is regarded as the most water saving irrigation technology currently available. There are several other advantages of drip irrigation over other commonly used irrigation methods.

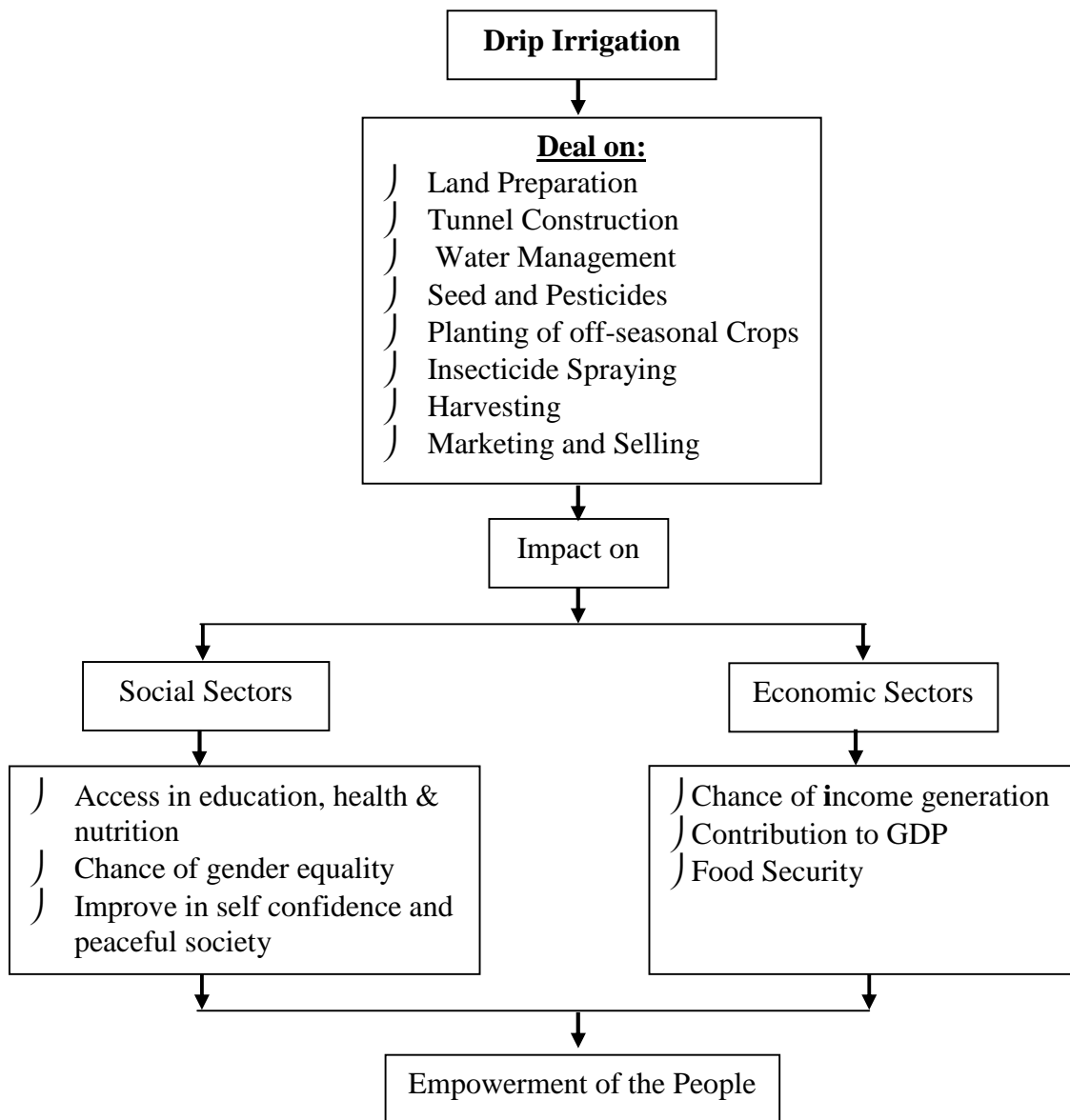
For the past four years, IDE/Nepal has been implementing the low-cost, Drip irrigation programme in some hill districts of Nepal targeting rural, small and marginal farmers. NGOs and private entrepreneurs are the main collaborating organizations on the programme. Technology is made available to farmers through local dealers who purchase technology from assembler/distributors IDE and NGO partners help develop marketing system of technology. They also provide technical support that includes drip installation/management and training on agricultural know low and produce marketing. Drip irrigation has been applied mostly for high value vegetable crops in dry period.

### **2.3 Conceptual Framework**

The main focus of this study is to analyze the women and men or back-ward people involvement in vegetable cultivation using the drip irrigation and its impact to them. To obtain this, the study emphasizes the following variables.

This study is concerned with land preparation, tunnel construction, water management, seed and pesticides, planting of off-seasonal crops, insecticide spraying, harvesting, marketing and selling. These activities improve user's household's economy. When farmer actively involve in this work, they become income generate from off-seasonal vegetables selling. The study concerned with the social, economic and gender context of farmer's life style as a whole. Farmer who involvement on these activities increased their education, health, nutrition and improve gender equality as

well as self confidence. On the other hand economic sector also have increased and effects on income generation, GDP growth and food security. These programme also improve power and awareness, training and capacity building, political awareness and bargaining power, which ultimately lead them to empowerment. The following figure shows these variables relationship.



**Figure 2.1: Conceptual Framework**

## **CHAPTER - III**

### **RESEARCH METHODS**

This chapter includes the research methods adopted in this study. This chapter mainly focused on the study on selection area and rational for the selection of the area, research design, nature and source of data, universe and the sample size, data collection techniques (i.e. observation, interview schedule, key informants interview, households survey, focus group discussion, case study) secondary information, data analysis and interpretation, reliability and validity of the data and limitation of the study. This section mainly discusses research methods and employed to accomplish the study objectives.

#### **3.1 Research Design**

The major emphasis in this study is to analyze and explore the socio economic status of drip users who are involving in the drip irrigation system. It has set objectives to analyze the farmers who are adopting the drip irrigation. Considering this fact, both exploratory as well as descriptive research designs are chosen in the work. It is exploratory because it has explored the issues concerned with the users and implementers' role and perspective in present drip irrigation system. It is descriptive because it mainly describes the performance of drip irrigation system in a qualitative way.

#### **3.2 Universe and the Sample Size**

234 households of the Dhikurpokhari VDC have directly benefited from this drip irrigation system, out of 234 households, 50 (i.e. 21%) HHs were selected as sample.

Accordingly 50 sample households have been targeted and studied in detail to meet the research requirement. Thus, the sample size taken for this study is believed rationally.

### **3.3 Nature and Sources of Data**

Both primary as well as secondary data are employed in this study. Primary as well as secondary types of information are included in this study on socio-economic impact of drip irrigation. The primary data have been collected from field level household survey as well as direct observation.

The primary data are both quantitative as well as qualitative. Equal importance have been given to both quantitative and qualitative data. Quantitative data have been collected mainly from interview schedule and qualitative data from focus group discussions, key informant interview and case studies method.

Secondary data and information have been obtained from different published and unpublished sources such as journals, books, articles, projects reports dissertations, websites and government and non-government offices working in drip irrigation sector.

### **3.4 Rationale for the Selection of the Study Area**

Drip irrigation programme implemented in Tanahun, Gorkha and Kaski districts by IDE since 2000 AD. After succession of drip irrigation, the programme has been spread in various districts of Nepal. Most of the drip irrigated districts are in the hilly region. This system is being top most popular for the surface irrigation technology to grow high valueable vegetable crops especially in dry season. DCDO with support of IDE-Nepal has lunched the programme in Dhikurpokhari VDC which is located at the western part of Kaski district along Pokhara Baglung highway. The demand of the drip system is increasing year by year. This type of research has not been conducted in this area yet. Thus, the VDC is proposed as the study area in all aspects.

Now there are 234 households using drip system in Dhikurpokhari VDC of Kaski district. All the drips are being used to irrigate vegetable crops DCDO (Local NGOs) and IDE Nepal as a facilitator is providing

technical support on vegetable production, marketing and guide to the user farmers. The farmers of this area are managing the system themselves. Users are experiencing impacts on various aspects of drip irrigation i.e. economic aspects, social aspects, educational aspect, gender aspect at household level. Thus, the site is potential for study on social economic impact of drip users.

### **3.5 Data Collection Techniques/Instruments**

In order to gather reliable information, it is very much essential that techniques/instruments used for data collection be precise and accurate. Therefore different tools and techniques such as interview schedule, focus group discussions, key informant interview and case studies method have been used to collect the required information.

#### **3.5.1 Interview**

Structured interview schedule has been used to explore household information such as when, how and why they installed drip irrigation system as known as beneficiaries group of drip irrigation, what change brought by the irrigation system. Both open and close ended questions have been used in the ingenious but mostly closed ended questions (47 questions out of 52 Annex-1) were used.

#### **3.5.2 Focus Group Discussion**

General information about the performance of the drip kits in the area, market opportunity, water availability, other socio-economic settings have been explored through focus group discussion (FGDs). Both the users and non users who involved in the FGDs, the reason behind their not adopting the technology have been learnt from the discussion. Also the criteria imposed by IDE and DCDO for access to drip system and incentives to users.

### **3.5.3 Key-Informant Interview**

To gain a depth knowledge about drip irrigation and impact on socio-economic aspects, interviewed from some key persons. These are IDE motivator supporting promotion of drip irrigation, three leaders of drip irrigation groups, chair person of mother group, representative of saving and credit group, representative of DCDO, JTA of Dhikurpokhari agriculture centre. Generally information regarding the effect of drip irrigation was obtained by interview with key informants.

### **3.5.4 Observation**

Field visit to the drip irrigation sites has been done and the general physical and socio-economic setting was observed Vegetable crops stand, drip irrigation practices and cultural practices were closely observed during the research study period.

### **3.5.5 Case Study**

Three drip users have been interviewed in depth to study the impact of drip irrigation system on the level of socio-economic status. And the important issue and information has been noted in the relevant section of this thesis.

### **3.5.6 Secondary Information**

Other supporting information were obtained from SIMI-Nepal, IDE/Nepal, DCDO- Kaski, district irrigation office, district agriculture office, web-sites and related research reports and publications.

## **3.6 Data Analysis and Interpretation**

All the collected data from the field are analyzed both qualitatively as well as quantitatively as per their nature. The data collected through various techniques and tools have been systematically processed using suitable software as well as manual methods percent, ratio, pie-chart, bar gram etc. used required photographs, maps, etc have been incorporated in relevant chapters and sub-chapters of the report. This has further helped in



analyzing and interpreting the report in a systematic way. As result, the collected data were analyzed in the form of more practical system.

### **3.7 Reliability and Validity of Data**

Twenty percent of drip users population interview was held and required information was collected. The reported information was also substantiated by information obtained from the focus group discussion, and the direct observation of the field plots and crops there in. Hence, data reported are found satisfactorily. Similarly, the respondents who had provided the information were spontaneously. Thus, the information obtained using different techniques and tools and spontaneously provided by the respondents is believed fairly consistent.

Information obtained can be categorized into two parts. Relatively fixed information related to case studies education, health status, economic status, family members size, land holding, crops types, drip size and another brief information related to crops yield, crops price, income perception on benefits etc which may vary depending on the recent incidence. In this study both types of information were collected. Information of first category is relatively more valued and fixed than that of the second type of nature. For the analyzes purpose since same approach is used interview information is considered adequately valid.

### **3.8 Limitations of the Study**

This is an academic research, so it has been undertaken within the boundaries of limited time, budget, area and other resources. So, it hasn't been studied in wider perspectives. Some underlying and acknowledged limitations of this case study type research can be presented as follows.

- ) The study is confined to drip users in the Dhikurpokhari V.D.C. of Kaski Districts. So, the findings of it may not be applicable in case of other micro irrigation systems in other parts of Nepal.

## **CHAPTER - IV**

### **DATA ANALYSIS AND PRESENTATION**

Chapter four simply describes the social and demographic characteristics of the study area. This chapter also focus on the analysis and presentation of data obtained from field summery in social sector. Likewise, impact of drip irrigation in social sector is also presenting here.

#### **4.1 Introduction of the Study Area**

Dhikurpokhari V.D.C. lies in Kaski district of western part of Nepal. It is located between 83<sup>0</sup>47' to 83<sup>0</sup>57' longitude and 28<sup>0</sup> 15' to 28<sup>0</sup> 22' N latitude. Total area of the Dhikurpokhari V.D.C. is 35345 ropanies. Kaskicoat VDC Salyian VDC, Lumley VDC, Dhampus VDC, Dhital VDC and Bhadure Tamagi VDC are located east, west, north and south part of the Dhikurpokhari VDC respectively.

Total population of the Dhikurpokhari VDC is 9075 (Village profile 2059). Among them 4541 are males and 4534 are female. Total cultivatable land existing in Dhikurpokhari VDC is 1341 hector. The VDC is suffering adequate irrigation facilities for agricultural production farmers are mostly depend on monsoon rains for cultivate crops. However, drip irrigation system has been implemented to selected household of the VDC is assistance of Dhikurpokhari Community Development organization (Local NGO) since 2004.

Under this section general description socio-economic conditions and demographic status of the study area will be mentioned. Dhikurpokhari VDC lies in western part of Kaski district of Ganaki Zone. It is bounded in the east by Kaskkikot VDC, in the north by Dhampus VDC, in the south by Bhadure Tamagi VD and in the west by Lumle VDC respectively. Pokhara Baglung highway has crossed the VDC. Main market centre lies in the middle parts of the VDC called Nagdanda. Due to the assibility of the road

it is attached to Pokhara regional market centre in easier way for marketing, Pokhara is one of the major city of Nepal and head quarter of Kaski District as well as western development region.

Dhikurpokhari VDC is located between 83<sup>0</sup>47' to 83<sup>0</sup>57' eastern longitude and 28<sup>0</sup>15' to 28<sup>0</sup>22' northern latitude. Total area of VDC is 35345 Ropanies. (Village profile 2059). The total population of entire Kaski district is 380527 out of them 9075 people live at Dhikurpokhari VDC among them male and female are 4541 and 4534 respectively. There are 1630 households in the Dhikurpokhari VDC. Among them 234 households are presently applying drip irrigation. The main caste/ethnic compositions are Brahmin, Chhetri, Gurung, Newar, Magar and Dalits including Kami, Dami, Sarki. Hindu, Buddhism, Muslim are the among religion followed by the people of Dhikurpokhari VDC.

Area is located near about 1000 to 2000 meter from the sea level. the study site represents low hill and middle climate environment in the western hilly region.

Major settlements of the VDC are Serachaur, Pamdhur,, Nagdanda, Simpli Adhikaridanda & Kande)

It has fertile land especially on sera, Pamdhur, Serachaur and Simpali though it is a hilly area, Marince is the most rainfall area of the Kaski district as well as Nepal which is located west north part of VDC.

Total cultivated land of Dhikurpokhari VDC is about 1341 hectares (10000m<sup>2</sup>). Most of the land is used for paddy plantation and few land are used to build house. The land which is located near to the home called 'Bari' is used for vegetable plantation. Lumle agricultural centre supported villagers to plant different kinds of vegetable applying modern methods and techniques till 2000 A.D. This areas is developing as a vegetable commercial pocket area that is credited IDE Nepal and DCDO. DCDO lunched drip irrigation programme under micro irrigation project by the support of IDE-Nepal. Aandheri Khola, Marainche Khola and other some small streams are the main water resources of this VDC.

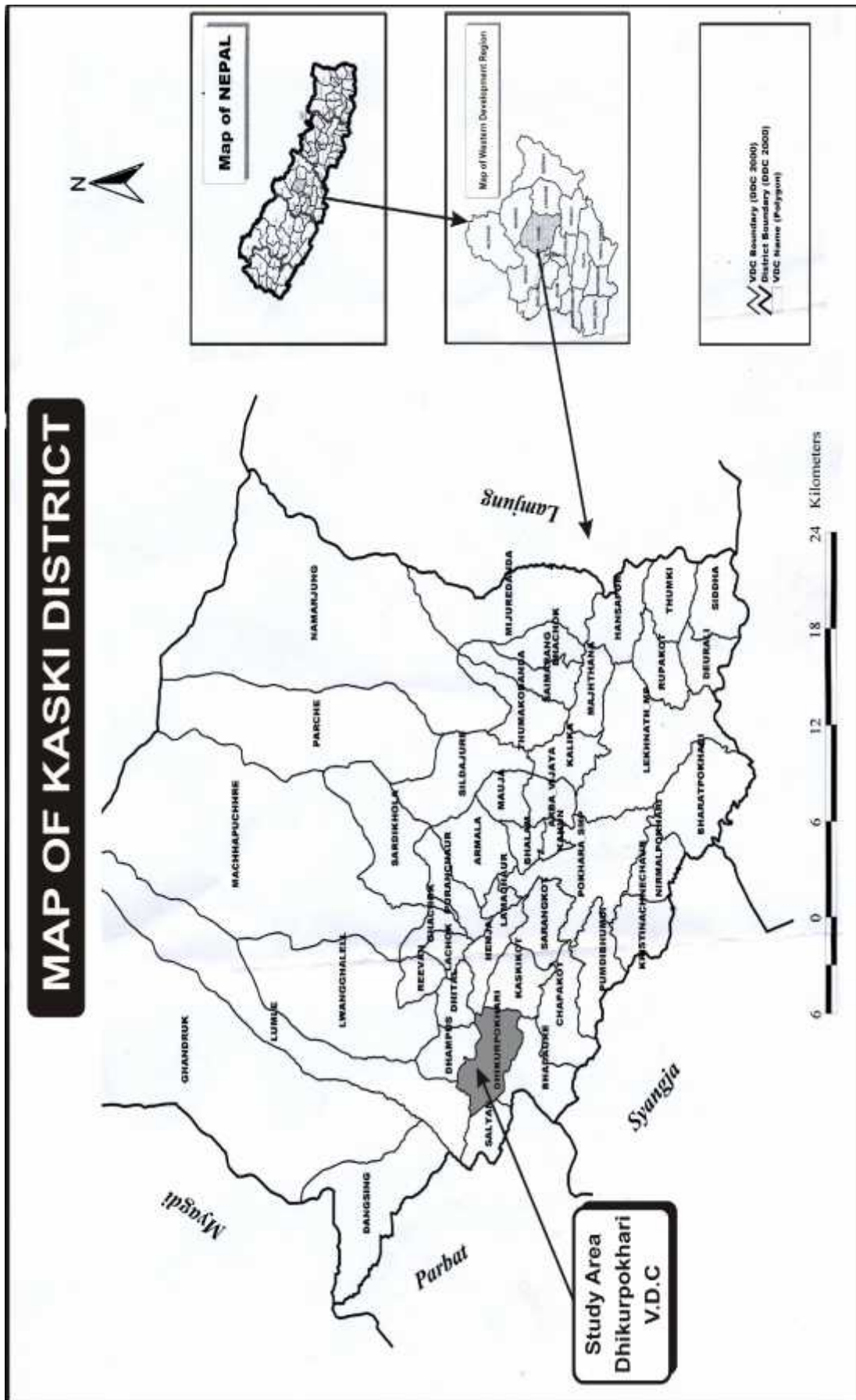


Figure 4.1 : Map of Kaski District Showing Study Area

#### 4.1.1 Caste/Ethnicity Composition of Respondents

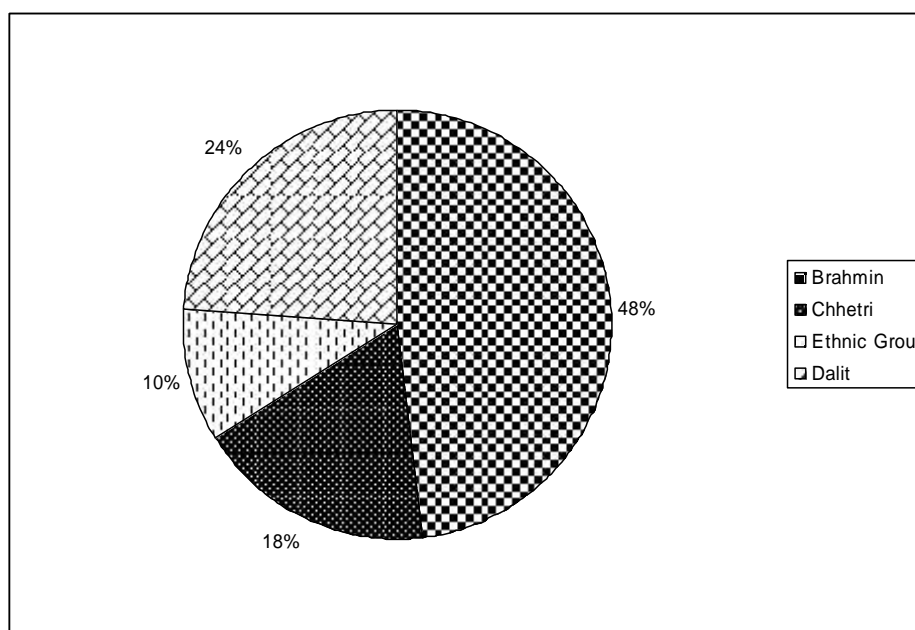
Dhikurpokhari is a mixed caste ethnic society. Brahmin, Cheetri, Magar, Gurung, Thakali, Newar and socially disadvantage caste ie. Kami, Dami and Sarki are main ethnic group which is given in Table 4.1.

**Table 4.1: Cast/Ethnic Group-wise Population Distribution of Sampled Respondents**

<b>Particular</b>	<b>Male Respondents</b>	<b>Female Headed HHs</b>	<b>Total Respondents</b>	<b>Percentage</b>
Brahmin	6	18	24	48
Chhetri	3	6	9	18
Ethnic Grou	2	3	5	10
Dalit	5	7	12	24
<b>Total</b>	<b>16</b>	<b>34</b>	<b>50</b>	<b>100</b>

*Source : Field Survey, 2007.*

Table 4.1 shows that Brahmin are the majority group than other groups. The percentage of Brahmin is 48. percentage of Chhetri, ethnic group and Dalit are 18, 10, and 24 respectively. Table also indicates that ethnic group with the sample HHs are in minority. Gurung, Magar, Thakali are catoragised under ethnic groups. About fact further can be shown in pie-chart as figure 4.1.



**Figure 4.2 : Cast/Ethnic Group-wise Population Distribution of Sampled Respondents**

Figure 4.2 shows that Brahmin, Chhetri, Ethnic groups and Dalit are taken as the respondent which are involved in drip irrigation and their percentage are given like 48%, 18%, 10% and 24% respectively.

#### 4.1.2 Occupational Structure of the Respondents

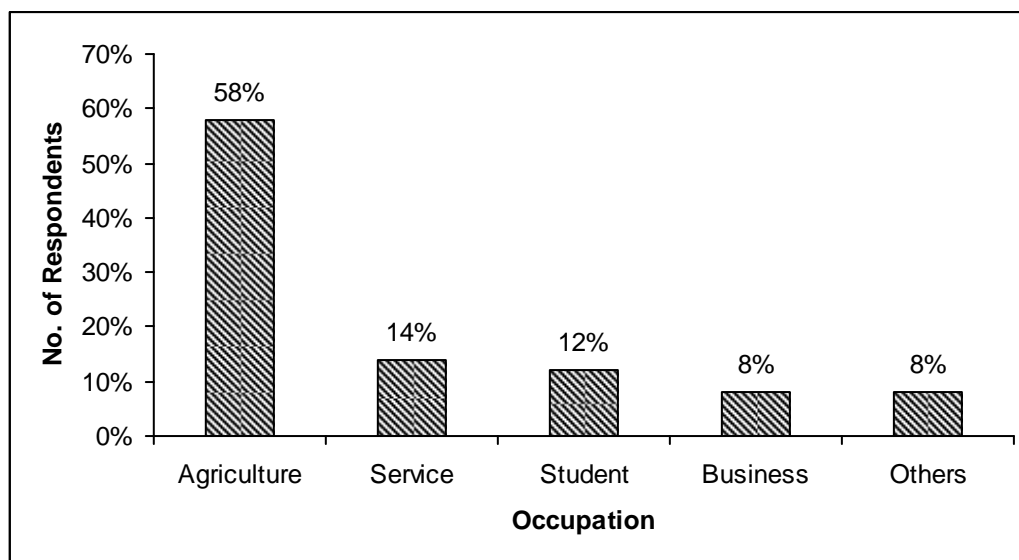
Major occupation held by the respondents is categorized in agriculture, service, student, business and other preparation of these occupation of the respondents is shown in table No. 2.

**Table 4.2 : Occupational Structure of Respondents**

Occupation	Frequency	Percentage
Agriculture	29	58
Service	7	14
Student	6	12
Business	4	8
Others	4	8
<b>Total</b>	<b>50</b>	<b>100</b>

*Source: Field Survey, 2007*

Majority of the respondent's occupation is agriculture i.e. 58 percent, some respondents are involved in service i.e. 14 percent, 12 percent respondents are involved in business and 8 percent are holding other occupation. Occupational structure of the respondents can be shown as following diagram.



**Figure 4.3 : Occupational Structure of Respondents**

Bar diagram shows that respondents are involved in different sectors such as agriculture, service, student, business and others. Respondents who are involved in agriculture are more in percentage i.e. 58 percent and least in business and others, i.e.8 percent each. Respondents who are involved in agriculture, service, student, business and others are 58 percent, 14 percent, 12 percent, 8 percent and 8 percent respectively.

#### **4.1.3 Gender Structure of Respondents**

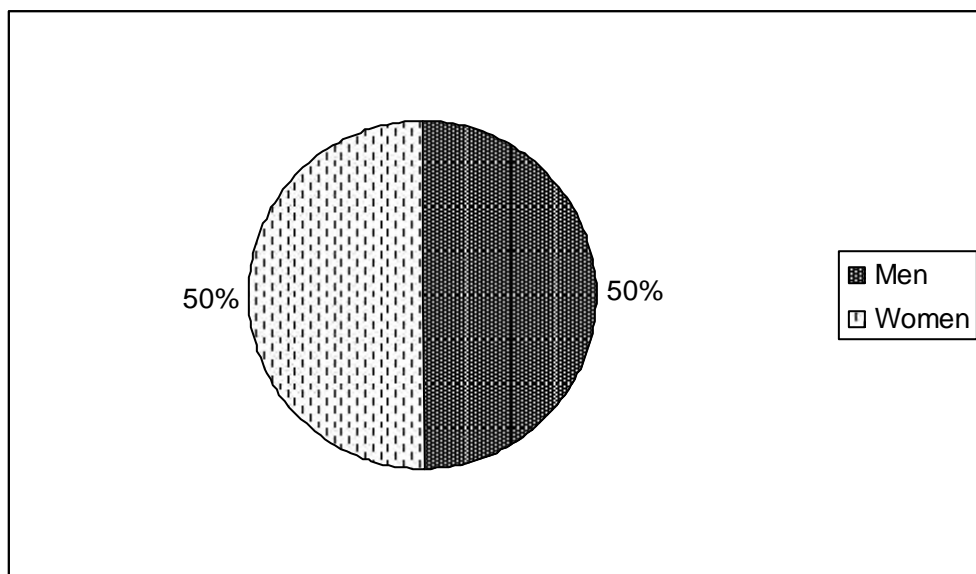
Simply gender consist men and women table. 3, describes that composition of number and percentage of men and women of sample households below:

**Table 4.3: Gender Structure of Sampled HHs**

<b>Gender Type</b>	<b>No.</b>	<b>Percentage</b>
Men	150	49.67
Women	152	50.33
<b>Total</b>	<b>302</b>	<b>100</b>

Source: Field Survey, 2007.

Researcher has taken the data from 50 HHs in Dhikurpokhari V.D.C. of Kaski district out of 234 HHs. Total populations on 50 HHs are 302 family members, out of them the number of men and women are 150, i.e. 49.67 percent and 152, i.e. 50.33 percent respectively.



**Figure : 4.4 Gender Structure of Sampled HHs**

Figure 4.4 shows that 50 percent women and 50 percent men are the family members of the sampled HHs.

#### **4.1.4 Religion and Language**

Nepal has two major religions, Hinduism and Buddhism, among them majority of people 86.51 percent are Hindus and only 7.78 percent are Buddhists. In the Dhikurpokhari V.D.C., according to sampled survey 86 percent are Hindus and 14 percent are Buddhists. But not other religions are



found and all of them are speaking Nepali language. Likewise, 91 percent Hindus and 9 percent Buddhist are found in sample respondents.

#### 4.1.5 Age and Sex Composition of Sample Households

##### (Demographics Status)

In this study the demographic status has been observed in terms of age sex composition of the drip practitioners and the average family size. Family members in the sampled household are classed into six groups i.e. below 5 years, 6 to 10 years, 11 to 20 years, 21 to 35 years, 36 to 50 years and 51 to above respectively on the role and task, less than 5 years is classed child, 6-15 schooling, 15-45 extremely active worker is considered active worker and over than 60 years old is classed old and as respectively. During the period of schooling, they are considered partly helpful to support parents. Table 4 given the distribution of family member's number by age and sex.

**Table 4.4: Age and Sex Composition of Sample Households**

Age Group	Years Range	Male		Female		Total	
		No.	Percent	No.	Percent	No.	Percent
Old Child	<5 yrs	26	16.35	25	16.44	51	16.89
Schools	6-15 yrs	31	20.66	30	19.73	61	20.19
Young	15-45 yrs	52	34.66	53	34.86	105	34.76
Adult	45-60 yrs	29	19.33	30	19.73	59	19.55
Old	> 60	12	8.00	14	9.21	26	8.61
<b>Total</b>		<b>150</b>	<b>100%</b>	<b>152</b>	<b>100%</b>	<b>302</b>	<b>100%</b>

*Source : Field Survey, 2007*

Table 4. 4 shows that young age, i.e. 15.45 years age group are more in number, i.e. 34.76 percent where as old age. i.e. 60 years age group are the least in number i.e. 8.61 percent. Similarly, schools age, adult age, old age are 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> in position, i.e. 20.19 percent. 19.55 percent and 16.89 percent respectively.

#### 4.1.6 Educational Status

In the study area, there are a significant number of school in which, 15,05, 1 and 1 are respectively primary school, lower secondary school, secondary school, higher secondary school and B. Ed. Campus. Most of them are run by the government and some are run by community and private sector. It suggest us that there is a high literacy rate in comparison to the average percentage of Nepal. The literacy rate of the study area is higher in the context of rural society. 19 government school and private schools have contributed for the output of such literacy rate. The literacy rate of the sampled households' population is above 3 years age, illustrated by the following table.

**Table 4.5: Educational Status**

<b>Level of Education</b>	<b>Frequency</b>	<b>Percentage</b>
Illiterate	18	5.96
Literate	27	8.94
Primary Pass	114	37.75
Secondary Pass	56	18.54
I.A. Pass	38	12.50
Bachelor Pass	36	11.92
Master or above	13	4.30
<b>Total</b>	<b>302</b>	<b>100</b>

*Source : Field Survey, 2007*

Table 4.5 shows the clear number of population according to their acquired level of education. According to it, approximately 6 percent are illiterate in expect below 3 years and only literate population is approximately 8.90 percent. Those who are schooling in primary level are 37.30 percent, in secondary level is 18.50 percent, 12.60 percent of the people have passed intermediate level, 11.90 percent have passed bachelors level and only 4.30 percent of people have acquired to master Degree level or equivalent and above.

#### 4.1.7 Respondents Received in Various Training

Due to different types of training they receive, they have more knowledge and enhanced capacities and skills.

**Table 4.6: Respondents Received in Various Training**

Respondents Training	Frequency	Percentage
Yes	41	82
No	9	18
Total	50	100

Source : Field Survey, 2007

Table 4.6 shows that 82 percent of respondents has received agriculture related and training 18 percent has not got any types of training. It is also can shown in pie-chart.

**Figurer : 4.5**

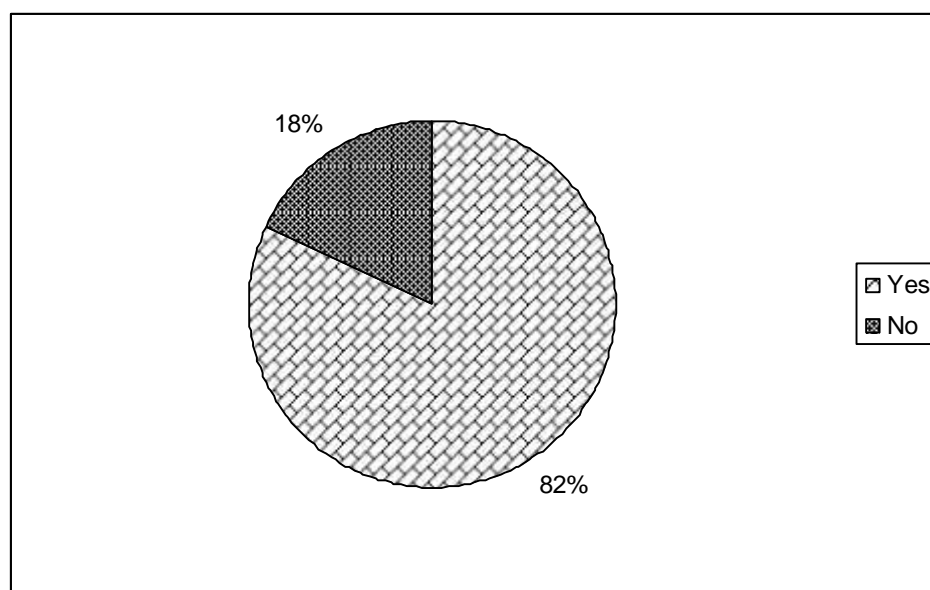


Figure 4.5 has shown that 82 percent respondents have got agriculture related training and 18 percent respondents have not got any type of training.

#### 4.1.8 Improvement in Family Health

Consumption of homegrown fresh vegetable is taken as the proxy for the improvement in the nutrition and health of the farmers. In aggregate, the increase in vegetable production with drip as well as without drip increase

significantly in vegetable consumption by the farmers. Increase in vegetable production with drip increases the consumption vegetables. In other pockets, the relations are affected more by the non-drip production of vegetables than by production.

A remarkable increase in vegetable consumption in the family and vegetable selling in majority of the households was found during the study. The installation of drip irrigation system also increased the use of fertilizer and higher yield seeds resulting in increased expenditure as compared to the previous situation. The most remarkable benefit, in this context, is the increase in vegetable consumption and selling, which has contributed to improved health status of the farmers and to some extent decrease in borrowings regarding improvement in health status, the farmers mentioned that after drip installation their vegetable consumption is increased resulting to better health of themselves and their children. Although the farmers could not drift exactly state how their health is improved, they simply mentioned about their belief that vegetable consumption is good for health. They are sure that consumption of vegetable is contributing to make them healthy. The treatment system from the traditional has been changed which basis on blind faith to medical treatment at hospital. The trend of morality rate of child and women are very low as compare to past decades which was expressed by community leader during the period of information gathering.

#### **4.1.9 Sanitation**

This sub-section is devoted to the impact of vegetable production program on sanitation of the farm households. Personal sanitation is one of the major indicators of living standards. Similar relationships are observed with the off farm income in medium and non-drip pockets. Education is a strong force to affect the personal sanitation.

#### 4.1.10 Decisions on Drip Related Issues

Since drip system is used basically for irrigating very small size of land especially for vegetable production. The decisions related to purchase of drip and other tools have been made mostly by the women in the households.

**Table 4.7: Involvement in Decision Making Activities related to Drip Irrigation by Gender**

Decision on	Key Actor			Total
	Man	Woman	Joint (by Man & Woman)	
Buy Drip System	30	10	10	50
Crop Choice	7	11	32	50
Use Fertilizer	23	12	15	50
Sale of Crops	13	28	9	50
Use of Income	29	11	10	50
Control over income	29	11	10	50
Work Load	17	22	11	50

*Source: Field Survey, 2007*

Table 4.7 shows involvement in decision making activities related to drip irrigation by gender. 30 men are involved to by drip system where as 10 women and 10 joint (by man and female) are involved to buy it out of 50 people for decision making. More men are involved to make decision on use fertilizer, use of income and control over income, i.e. 23, and 29 respectively than women. Where as more women are involved while making decision in the crop choice. Sale of crops and work load activities are 28 and 22 respectively.

By the joint venture of man and woman are involved while making decision in the crop choice use fertilizer, sale of crops, use of income, control over income and work load activities i.e. 10,32, 15, 9, 10 and 11 respectively.

## CHAPTER - V

### PREFORMANCE OF DRIP IRRIGATION IN ECONOMIC SECTOR

This chapter describes the performance of drip irrigation system in economic sector and also deals with general problems of drip irrigation.

#### 5.1 Occupational Structure of the People

The large number of population of the Dhikurpokharai VDC is affiliated with agriculture. Almost the sample household's population is more or less related with agriculture. According to economically active population is divided into five types of occupational groups in the study area on the basis of their primary occupation, such as agriculture, services, students, business foreign employment and others.

**Table 5.1: Occupational Structure of the People**

<b>Main Occupation</b>	<b>No. of Persons</b>	<b>Percentage</b>
Agriculture	79	26.16
Services	21	6.95
Students	128	42.38
Business	16	5.33
Foreign employment	33	10.92
Others.	25	8.28
<b>Total</b>	<b>302</b>	<b>100</b>

*Source : Field Survey, 2007*

Table 5.1 shows the highest number of population i.e. 42.4 percent which is engaged in study. Agriculture has covered the second highest number of population i.e. 26.26 percent. Business has covered 5.3 percent

of population. And 10.9 percent of population has involved in foreign employment. 8.3 percent of population is involved in other activities which are housewife, tailoring, carpenter, labors etc. Among the remaining other economically dependent population on others some are children and some are unemployed. A remarkable number of retired population from service are involved in the agriculture and other activities of the household works.

## 5.2 Size of Land Holding and Land used in Drip Irrigation

The present land holding size is quite unfavorable in the country from the point of view of equal distribution of land. Approximately 70 percent of the total households have less than 30 percent of total cultivated land and 30 percent households have 70 percent of land of the total land area of the cultivation (CSS Statistical pocket Book, Nepal 1994. P. 36).

The number of small land holders is expected to be higher in the study area because of the fragmentation of land and existing land holding system of our country. The size of land holding is smaller in the study area than the Terai because of being a hill area than the Terai because of being a hill area. The size of land holding of the study area can be illustrated by the following table.

**Table 5.2: Respondents Classified According to Landsite and Total Land Holding**

Land Size (Ropani)	Holdings H.H.		Area of Holding	
	Frequency	Percentage	Area (Ropani)	Percentage
Below 10	9	18	72	7.08
11 - 20	17	34	274	26.94
21-30	16	32	384	37.76
31 above	8	16	287	28.22
Total	50	100.00%	1017	100.00%

Source : Field Survey, 2007

Table 5.2 indicates that 18 percent households have very marginal cultivated land i.e. below 10 ropanis, they are holding only 7.07 percent (area of the total land holding of the sample households. Average holding of them is 8 ropanis. 34 percent households hold 26.17 percent area of land, who have 11 to 20 ropanis, 32 percent households have 37.75 percent area of land who have 21 to 30 ropanies and 16 percent house holds have more than 29 percent of the land area which is average holding of them 13.36 ropanis. It show that the 84 percent house holds have occupied 71 percent area of the total holding are and rest of 16 percent households have owned 28.22 percent area of the total holding. This is the average size of land holding 20.34 ropanis per household in the study area.

In our agrarian society, the land property determines the level of income among the farmers. Likewise the level of income depends on the land holding size of farmers is the context of rural agrarian society. Generally the greater size of land holding people has the higher level of income. But, in our society, the changing trend of family structure as from joint family to disintegrate or nuclear family has promoted the fragmentation of land and increased the number of small land holders. The level of income is also decreasing in the agrarian society.

### **5.3 Agricultural Practices**

In the study area, land has divided into two forms, one is lowland (khet) and other one is upland (bari). In lowland, paddy is the main crop plant in monsoon, followed by wheat and mustard in the winter. Some farmers supply land grows potato and vegetables in small plots in the winter. In upland (bari) maize are grown mixed with millet, in the summer season. At few places ginger, potato and various types of vegetables are also grown as cash crop to an extent. Many crops can be grown in turn in the sample area where irrigation can be provided, three crops can be grown. common cropping pattern are:



Khet : paddy, wheat/potato/pulse, early paddy.

Bari : Mize, wheat/mustard/millet/potato

Vegetable : Radish, Cauliflower, cabbage, chilly, rayo, carrot, format etc.

Introduction of drip irrigation technology has promoted use of hybrid vegetable varieties. The variety of vegetables grown in the study area, i.e., tomato, bitter-guard, cucumber, cauliflower, cabbage, etc.

The land preparation technology is still primitive labour and animal power based, mechanical power like tractors and power tillers are not introduced due to lack of roads to field and sloppy land. Most farmers use only animals to plough land other activities are done manually.

#### 5.4 Benefits

When the adoption of drip irrigation, farmers were benefited various aspects. All respondents replied there is improved food intake after drip use due to availability of fresh vegetables regularly. Many users said increase in income from sale of surplus vegetables. Similarly many farmers stated improvement in education, health, and overall living standard. According to the respondents, following improvement is given following table.

**Table 5.3: Respondent - Response to Benefits Received**

Description	Frequency	Percentage
Production increase	50	100
Income increased	50	100
Time saved	50	100
Water saved	50	100
Labour saved	50	100
Soil remained loose	50	100
Employment generated	36	72
Area irrigated increase	38	76

Source : Field survey, 2007

Introduction of drip has brought dynamic change in vegetable cultivation. Improved seeds of high value vegetables are introduced, recommended of fertilizer be applied along with local farmyard manure, and timely pesticide application. Irrigation provided reliability to farming and increased farmer's entrepreneurship at least at the household and the local level.

According to the table 5.3 by adopting drip irrigation system income has increased and time has saved of the respondents.

**Table 5.4: Increased Income by Adopting Drip Irrigation**

<b>Years income (Rs)</b>	<b>Frequency</b>	<b>Percentage</b>
5000 to 10000	18	36
10000 to 15000	17	34
1500 to 20000	9	18
20,000 to above	6	12
Total	50	100

*Source : Field Survey, 2007*

Table 5.4 clarifies that by adopting drip imitation farmers are success to generate significant income. They are able to earn additional income up to Rs. 20000 and above.

Likewise working time is also saved by using drip. This can be demonstrated in Table 5.5.

**Table 5.5: Saved Time By Drip Irrigation**

<b>Saving time (per day)</b>	<b>Frequency</b>	<b>Percentage</b>
1 to 1.5 hour	18	36
2 to 2.5 hour	23	46
3 to above	9	18
Total	50	100

*Source : Field Survey, 2007*

Table 5.5 shows that by using drip irrigation farmer can saved up to 3 working hours. This saved time, they can use for another income generating activities.

In addition to above mentioned benefits respondents are agree on following improvement also. Table 5.6 show the improvement/change brought by introduction of drip irrigations.

**Table 5.6 : Changes in Living Standard By Drip Irrigation**

Source	Change	No Change
Education	26 (52%)	24 (48%)
Living standard	30 (60%)	20 (40%)
Health	35 (70%)	15 (30%)
Home Consumption	50 (100%)	0 (0.0%)

Source : Field Survey, 2007

Note: Percentage is shown in parenthesis.

Table 5.6 has shown that drip irrigation has changed the living standard of farmers by drip irrigation.

It has changed the living standard of drip users in the following criteria such as education, living standard. Health and house consumption, Drip irrigation has enhanced its user such at 52 percent, 60 percent, 70 percents and 100 percent in different sectors like education, living standard, health and house consumption respectively.

## **5.5 Impact of Drip on Households Incomes**

### **5.5.1 Alternative means or Irrigation before the Installation of Drips**

Drip irrigation system is one of the major means of irrigation especially to the dry areas where the people were dependent on rain-fed irrigation. People of those areas did not produce vegetable for home consumption and use the fresh vegetable like cauliflower, cabbage as occasionally in few festivals. Before the introduction of drip, leafy

vegetables especially rayo and perennial local bean was produced by few farmers. In the other hand, they had no knowledge and skills to produce those vegetables and requirement of water for irrigation to those crops. Hence, they were not conscious about the irrigation system and significant. Irrigation to in each crops production takes vital role, which was not access due to the technological information. The consciousness was only on canal, river, rain-fed and wells irrigation system to cultivation farmers to irrigate for the cultivation of crops in dry period faced the obstacles.

### **5.5.2 Crops Production Before and After the Installation of Drip Irrigation System**

The quantity of winter crop production (vegetable) after the installation of drip has increased, as mentioned by many farmers. Before the drip installation the farmers were growing general varieties of vegetable (local breed), the yield of which was very low and nominal. But after the drip, the farmers started growing improved varieties, with higher yield. After drip installation the farmers mostly grow improved variety of which was very low and nominal. But after the drip, the farmers started growing improved varieties, with higher yield. After drip installation the farmers mostly grew improved variety of cauliflower, cabbage, cucumber, bitter-gourd and sponge-gourd. The production of vegetable was raised drastically after drip irrigation. Due to the large scale of farming, the problems for the sale of vegetable are facing by producers and the trends of the selling prices are declining in each year.

### **5.5.3 Cultivation Pattern after the Installation of Drip**

The cultivation practice of the farmers has changed after the installation of drip. Before installation of drips, the land was used to cultivate only summer crops like millet maize and other cereal crops. Very few farmers were producing limited winter season vegetables like broad leaf mustered, spinach mustard, radish and some wheat. But after installation of drip the cultivation pattern changed drastically. The farmers started using that land especially for vegetables giving high yield. Although

the farmers installed drip recently, only in one season they were able to harvest significant quantity of cauliflower, cabbage, cucumber, bitter gourd etc. The land use pattern has thus changed generating more production and income to the farmers.

#### **5.5.4 Purpose of Crops Production**

Before drip installation the selling of vegetable was very low. None of the farmers were sold of their product. Very few percent of their produced vegetable were on home consumption. This practice has changed after the installation of drip.

After drip installation, as the production of vegetable increased, many of the farmers reported that consumption as well as the sale of vegetable increased. After drip 80 percent of the farmers were found selling their vegetable and the rest 20 percent were consuming it. Those who were selling vegetables were also consuming some portion of the total production.

While comparing the situation before and after drip installation, the number of farmers consuming the overall production in the house has dramatically come down after drip installation. However, the number of households consuming more than ten percent of the production has increased. The reason of the increased quantity of consumption of vegetable is because of its increase in production. Consumption of more quantity was also stated during meetings with the farmers, as most of them mentioned that the consumption of vegetables has doubled after the installation of drip.

Likewise the selling of production as a regular practice has been established among the farmers. This is justified if a comparison is made between the number of the frames selling their products before and after installation of drip. This indicates the flow of cash to the households in the rural areas.

### 5.5.5 Time Saved by Installation of Drip

Time has been saved by the installation of drip of 100 percent the farmers. Sampled 50 farmers whose time is saved after drip installation, 70 percent mentioned that the saved time has been used in household works, 26 and in farm work and rest 4 percent of the farmers used their saved time in raising cattle, taking rest and shopping /business. Because of time saving in irrigation, the farmers, especially the worked could spare more time for marketing activities and interaction with outsiders resulting in more exposure for income generating activities.

### 5.5.6 Creating of Employment Opportunity

The program has created employment opportunities both for men and women in the village. Altogether 72 percent of the respondents reported that the employment for men as well as women has increased. Thus the vegetable cultivation with drip

**Table :5.7 Creation of Employment Opportunity**

<b>Particulars</b>	<b>Frequency</b>	<b>Percentage</b>
Increase	36	72
Not Increase	14	28
Total	50	100

*Source : Field Survey, 2007*

It confirms that the vegetable cultivation with drip irrigation is providing more employment opportunities as compared to the conventional vegetable cultivation and non-cultivation of vegetables. How and which types of employment is created from the introduction of the system? It is easy to answer that men are enjoying with their family by cultivating vegetable at their own farm rather than hard labour in India and other gulf countries. Similarly, women has got opportunities to increase their income on their own premises and reduced the way of income from daily wages in lower rate of pay. Hence, Table 5.7 shows that 36 respondents: i.e. 72 percent has improved their economic position by getting own employment.

### **5.5.7 Increase in the Production of other Agricultural Commodities**

The introduction of drip irrigation has effect on the production of vegetable with conventional methods as well. Income from drip irrigation increases the production of vegetable with conventional irrigation. It is indicated that the spill over effects of drip irrigation is nearly three times of the within drip effects on income generation.

Participation of the farmers into groups also causes to increase the production of vegetable. This is the impact of the technical know-how received by the farmers from the program. The introduction of drip irrigation is also found to effect production of livestock. The income from vegetable production with drip irrigation effects positively on the investment on improvements of cowsheds and goat-pens. This lead to concludes sienna baric that the drip program has increased the use value of the land by providing complementary input that is water.

### **A Case Study 1**

Sumitra Adhikari is 32 years and has two sons and one daughter. Her husband is businessman but not regular. She has more than 20 ropanies of land but, she cultivated vegetable in 2 ropanies. Out of 2 ropanies in 0.4 Aana, she installed drip kit and grew various seasonable and off-seasonable vegetables. i.e., cauliflower, cabbage, bitter guard, Jukeni, Cucumber, tomato etc. Before installation of drip kit she has many problem i.e. children education, household expenditure etc. When she earns more than Rs. 20000.00 per year by drip she felled easy to conduct household expenditure. She reported that they did not adopt this system in time they had face many problems and we would not success to invest for education, health and other expenditure. She has received three trainings. She also has become a member of mother group and saving credit group therefore, she has conduct family expenditure and social prestige from vegetable farming and marketing by drip system.

## **Case Study 2**

Mrs Hari KC is mid aged housewife of simpali ward no-2 Dhikurpokhari. She is also a member of drip users group. She installed small size drip irrigation system before two years. She grew cucumber, bitter gourd and tomato. She harvested near about 800 kg vegetables and sold the vegetables worth Rs. 15000 in one year. She got trains to grow vegetable nursery, to install drip irrigation system and to plant seedlings at line in proper locations. She bought two more drip irrigation system and grew cauliflowers and cabbages and she sold vegetables worth to Rs. 21000.

She spent her earning on education of children and house hold expenses. Some money she has saved for future. Now she is very happy she is currently working at social women activist also. She says that women should be involved in income generating activities then they with becoming independent and reputed in society as well as within own family.

## **Case Study 3**

Mr. Til Prasad Bhandari is residence of Daregaunda, ward no-4 of Dhikurpokhari VDC. Although he is 63 years old, he is still actively involved in agricultural ware. He is a member of Drip user group. Mr Bhandari has 10 family members. He is installed small size drip irrigation system in 2002 and cultivated vegetables in 3 aanas (93.99 m<sup>2</sup>). He grew cucumber, bitter ground, tomato, cauliflower, cabbage. He harvested 2400 kg per year. He earns Rs. 25000.00 from the sale of vegetables. He spent this amount on education expenses for children and treatment then before the using drip by producing more vegetable consumption of fresh vegetable has raised in his family that lead better family health and reduction of total expenses on treatment. Now he is very happy and willing to express his experience to the villagers. He also suggests to adopt drip system to them being it is very appropriate and beneficial system.

Before applying drip irrigation he had to face many problems to run his families. Sometime he had to take loan for his families' education and treatment. Now, he is able to run his family smoothly. He has become above to save some rupees as well.



## 5.6 General Problems on Drip Irrigation System

Farmers using Drip irrigation are not only benefited by various problem concerning tunnel construction, water supply technology, quality seed, market, finance, transportation, natural disaster follow-up service, disease pests and so on. Problems faced by farmers so sample households are listed in following table problems faced by respondents.

**Table 5.8: General Problems Faced by users on Drip Irrigation System**

<b>Problem</b>	<b>Number</b>	<b>Percentage</b>
Tunnel Construction	46	92
Water Supply	42	84
Technical	50	100
Quality Seed	43	86
Market	34	68
Finance	37	74
Transportation	26	52
Disease and Pesticides	47	94
Nature Disaster	48	96
None	-	-

*Source : Field Survey, 2007*

Table 5.8 indicates all the farmers of sample households are facing so many problems. Among them most farmers are facing technical problem. It means they all are lacking proper technical knowledge how about drip irrigation system. 92 Percent respondents feel water supply problem. Due to insufficient water resources adequate water is not available for irrigation using drip system though there is less water consumed in drip irrigation system as compare to other traditional irrigation system.

Similarly, 86 percent farmers are facing problem related to quality seed due to easy unavailability of quality seed, the germination rule of very low that leads to lower yields. Being not coverage of road network every

where of the Dhikurpokhari VDC farmers are also facing transportation problem, 52 percent farmers are facing such problem. Likewise, lack of capital for investment is another major problem. 84 percent of total respondents are currently facing financial problem.

## **5.7 Improvements of Drip Irrigation System**

During the field study, not only problems are identified relating to drip irrigation. Possible improvements to overcome there problem are also explored, 84 percent respondents who are facing financial problem to install drip irrigation system suggest that easy loan disbursement facility might be provided or some subsidy should be granted to them for that purpose.

Similarly, arrangement of sufficient water resources is another expectation of the drip irrigation using farmers. In absence of adequate water for drip irrigation can't be unlisted effectively. They wish government of Nepal and after donor agencies might invest in the water resource availability due to necessarily of huge capital investment in this field single effort of farmer is not sufficient.

86 percent requested that it is better to establish authorized dealer qualified seeds, and pesticides in Nagdanda which is centre market of entire Dhikurpokhari VDC. They also suggest that follow up service should be continued by governmental and non-governmental agencies, like District Agriculture Development Office IDE Nepal, DCDO, Agriculture service sub-centre Dhikurpokhari.

Field study also explain that there is also need to frequent training to provide technical know how overlaying to drip irrigation for farmers and for the adoption such irrigation system. Observation tours to the another region where drip irrigation system is successfully launched.

Collection center of produced vegetable in Nagdanda Should be established to make easier sales in Pokhara similarly most of respondents wishes linkage of rural agricultural motorable roads to Pokhara Baglung highway so that produced vegetable could be easily transport to Pokhara.

## **CHAPTER - VI**

### **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

These chapter summaries that whole study draws conclusion on the basis of analysis and provides necessary recommendation for improvement regarding to drip irrigation system in the study area.

#### **6.1 Summary**

Irrigation, in agriculture, is the replacement a supplementation of rainfall with water from another source in order to grow crops. Irrigation plays a vital role in the path of agricultural development as well as economic development of an agreed based society.

Irrigation is not a recent phenomenon in Nepal. Because, it has been practiced from ancient time by Nepalese people. They applied the traditional method, which depended on a enormous labour force such as terraced method. However, Nepal in spite of agricultural country, with an abundance of water resources does not have a long history of canal irrigation system. In recent times irrigation facilities has been provided by various methods. Such as surface irrigation, underground irrigation, overhead (sprinkle) irrigation, centre pivot irrigation, natural move irrigation, drip or trickle irrigation and sub irrigation.

Among them drip irrigation system is assumed to be high efficiency and appropriate in the context of Nepal. The most part of the Nepal is hill, lack of dry season irrigation system is one of the most important constraint for the production of dry season high valuable and marketable horticultural crops. Dhikurpokhari VDC, is suffering adequate irrigation facilities for agricultural production farmers are mostly depend on monsoon rains for cultivate crops. However, drip irrigation system has been implemented to

selected household of the VDC since 2004 AD. This study is concise to study of socio-economic impact of drip irrigation in Dhikurpokhari V.D.C.

There are 1630 total households existing in Dhikurpokhari VDC among them 234 households of Dhikurpokhari VDC are adopting drip irrigation system at present. For the study purpose 21 percent of the universe has taken as sample so, sample size of the study is fifty households.

Structured interview scheduled has been to explore the socio economic status, reason for adopting drip system, impact effect of drip irrigation and demographic structure, and other PRA techniques like key information. Interview, focus group discussion, and direct observation were also done to conduct the research. Dhikurpokhari is a mixed caste/ethnic society Brahmin, Chhetri, Magar, Gurung, Thakali, Newar and socially disadvantage caste i.e. Kami, Dami, Sarki are main ethnic groups. Among them Brahmin are the majority group, which occupies 48 percent and minority people are ethnic groups. i.e. Gurung, Magar, Thakali and Newar.

Hindus, Buddhist are the main religious community of the Dhikurpokhari which percentage are 86 and 14 respectively. Total cultivated land of Dhikurpokhari VDC is about 1241 hectares (12410000m<sup>2</sup>). Among the total sampled farmers there are 150 male and 152 female are engaged in drip system. Similarly, there are 5.96 percent illiterate, 8.94 percent literate, 37.75 percent primary level passed 18.54 percent secondary level passed 12.58 percent intermediate level passed, 11.92 percent bachelor level passed and 4.30 percent master or above level passed. Farmer and there families are directly or indirectly associated with drip irrigation system in Dhikurpokhari VDC's sampled households.

42.4 percent of the sample household's population is affiliated with student which is highest as compare to other professions like agriculture, business, service and foreign employment. Agriculture has covered the second highest number of population, i.e. 26.26 percent foreign employment and business have covered 10.9 and 5.3 percent respectively.

Besides this remarkable number so retired service holders are also involved in drip irrigation.

The size of land holding is smaller in the study area 18 percent households have very marginal cultivated land i.e. below 10 ropanies (5120m<sup>2</sup>). They are holding only 7.07 percent area of the sample households. Average holding of them is 8 ropanies (4096m<sup>2</sup>). 34 percent households have 11 to 20 ropanies (5632 to 10240m<sup>2</sup>). 32 percent have 21 to 30 ropanies (10752 to 15360m<sup>2</sup>) and only 16 percent have more than 30 ropanies (15360m<sup>2</sup>). In the field of irrigation, various agencies mainly agricultural development bank (ADBN) International Development Enterprises (IDE) Nepal, District Agriculture development office (DADO), DCDO and other NGOs are working in Nepal, including study area.

Earlier farmers used to grow local vegetables like rayo, radish turnip in small area using tap water to irrigate by housepipe. After the introduction of the drip farmers grew high valuable vegetable including cauliflower, tomato, cucumber in seasons and in off-season in the study area.

Drip irrigation promoted farmers to apply less water to large number of plants. Water is applied informally to all plants through holes in the lateral even permitting deficient irrigation. Therefore, the irrigated area has increased and water is saved. Time to apply water and labour effect has been saved. Soil remains loose in drip plots, hence, there is less weed problem. It has permitted vegetable cultivation and hence it increased farmer's income as well as employment with the drip. Many farmers have shifted to improve farming using quality hybrid seed, fertilization and pesticides most users sell surplus vegetable and eat fresh vegetable leading to improved health and family income thereby raising living standard also helping children's education.

Adopting drip irrigation farmers are successful to generate significant additional income by investing few amount. They are able to earn additional income more than twenty thousands early in the study areas during the study period.

Farmers face some problems with drip irrigation system and its adoption. They are facing various problems related to tunnel construction, water supply, technology quality seed, market, finance, transportation, natural disaster, follow up service, diseases and pests and so on.

Despite of facing above stated problems, due to possibility of overcome these problems by farmers applying different tools improvements are mostly satisfied to drip irrigation system. Arrangement of sufficient water resources, providing of easy and soft loan, subsidy, establishment of qualified seeds and pesticides store in local market.

## **6.2 Conclusion**

On the basis of analysis done following conclusions can be drawn:

Drip irrigation system is quite suitable for the study area that represents mid hill region of Nepal. It has permitted even small quantity of water to be used efficiently and effectively. Drip irrigation is useful for farmers to grow vegetable in the larger area than before and enriched food consumption by supplying fresh vegetable. This has improved nutrition and health and at the other side through sell of surplus vegetables family income is raised leading to improved living standard. Hence, drip irrigation is suitable to alleviate poverty of small farmers including ethnic and socially disadvantaged groups and possess potential to solve development efforts. Financial assistance as subsidy is own demand to solve poor farmers. Most farmers are able to generation additional income over investment in drip irrigation system. It also helps growing diverse vegetable crops preferably with less use up fertilizers and pesticides.

Some of the old users are planning to install another drip system and start vegetable farming in larger scale. The farmers of neighbouring communities who have not installed the system are taking interest in it by inquiring about it from other drip users, and institutions working in this field. There is mutual relationship between size of land holding and level of income. Due to the increased irrigation facilities the cropping pattern has

also been changing before the add option of drip irrigation system, the area of irrigated land was limited and level of production was very low but after the adoption this irrigation system the perpetration of total irrigated land is increased and scale of production is also increased.

The drip irrigation system among the rural farmers in the dry areas for the off-seasonal vegetable production is becoming one of the simple low cost appropriate small irrigation system then other irrigation system. Easy to handle, low investment, and low need of physical energy, time saving, economic use of water, simple in operation maintenance are its additional characterizes.

Some farmers of the study area however, are not found satisfied with the achievement after the installation and use of drip. These farmers expect that the drip irrigation system should be provided in subsidy. They also demand other various facilities to adopted drip irrigation. However, in aggregated it can be concluded that the socio-economic impact of drip irrigation in Dhikurpokhari VDC is positive, however, further improvements is needed.

### **6.3 Recommendations**

Based on the findings of the study following recommendations are made:

- ) Vegetable collection centre is to be established in Nagdanda to collect the diversified crops for the effective marketing and to collect the marketable volume from the scatters.
- ) JT, JTA and other field staffs of government and non government sectors should provide technical and pesticides suggestion. Especially these facilities should be provided more frequently to socially disadvantage groups i.e. Dami, Kami, Sarki and ethnic groups.
- ) Practical training and frequently observational tour programme should be lunched for the drip user so that they can learn more information and practical knowledge relating to drip irrigation system being, it is quite new concept is the study area.

- ) Sustainable and low cost water storage tank should be developed to collect waste water either from the roof or upland to be used later. The water collected after installing drip system to this water storage tank, can be used for long period on dry season.
- ) Effort to be made by the government of Nepal as well as NGOs and INGO to build infrastructure relating to rural motorable agricultural road and water supply for irrigation.
- ) Sub-sidy in drip irrigation system should be provided to low income and under privileged group of farmer at flat rate of Rs. 5000-.00.
- ) Short term interest free loan up to Rs. 20000.00 should be provided to the all interested user of drip system through ADBN.
- ) The study area is high risky natural disaster region, so it is recommended that government and non-governmental organization should introduce agricultural insurance policy.
- ) Information agriculture particularly the yield of vegetable quantity sold and price is varying widely. Hence, to be accurate continuous monitoring by staying at the site will be suggested. In addition to that local agriculture information centre should be established in the centre of the VDC.
- ) Social awareness programme should be launched to encourage vegetable production to the villagers which assists to adopt drip system.
- ) Follow up service should be provided frequently by the supporting institution especially IDE Nepal for the effective operation of drip system.
- ) Sustainable and qualitative aspects of drip system should be emphasized by the supporting institution rather than expectation quantities.
- ) Authorized selling centre qualified seeds and pesticides should be opened on proper place within the VDC.



## REFERENCES

- APROSC, 1989 - *Socio-economic Impact Evaluation of Sunsary Morang Irrigation Project*, Kathmandu.
- APROSC, 1995- *Agriculture Perspective Plan* Nepal.
- Bhasin, Kamala, 2003- *Understanding Gender*. New Delhi: Women unlimited
- Bhatta, K.N., 2002 - *Impact of Irrigation System and Changed in Livelihood*,  
A Study of Bhaluli Farmers Managed Surface Irrigation System in  
Nawalparasi District, M.A. Dissertation in Sociology, T.U. Nepal.
- CBS, 2004 - *Statistical Pocket Book Nepal*. Kathmandu.
- CBS / UNFPA, 2001- *Population of Nepal: Village Development Committee*,  
Municipalities, Nepal.
- Dhikurpokhari, VDC., 2003 - *Dhikurpokhari Village Profile Kaski*, Nepal.
- Eshel, Braseler, 1985- *Drip Irrigation Manual*, International Irrigation  
Information Centre (IIIC) Israel.
- Gurung, J.B., 1999 - *Socio-economic Profiles*, Situation of High Value Crops  
(Vegetables) and Baseline Information on IDE's Purposed Sites for  
Research on Low-cost Water Storage Tanks. IDE, Lalitpur, Nepal.
- Gurung, J.B., 2000 - *Preliminary Impact Assessment of Low-cost Water*  
Storage Structure in Tanahun and Kaski Districts. IDE, Lalitpur, Nepal.
- HURDEC, 1999- *Impact Assessment of Drip Irrigation System* Report  
Submitted to IDE, Kathmandu.
- IDE, 1999- *Simple Low-cost (SLC) Drip Irrigation Technology*. IDE Country  
Office, Lalitpur, Nepal.
- Joshi, K.R., Nepali M.B., S. Paudel Lumle and P.K. Jha, 2000 - *Site ascription*  
*Survey of Outreach Research Site* Hyanja VDC of Kaski District  
Represent R.L. Shetha, Low Hills in Western Nepal, Lumle Working  
Paper No. 2001/2, NARC, Nepal, RARS, Kaski
- Magill, Frank N., 2003- *International Encyclopedia of Sociology*, Vol.1 New  
Delhi: Bhavana Books and Prints.
- Michael, A.M., 1985- *Irrigation Theory and Practices*. Vani Educational  
Books, New Delhi.

- N.P.C, 2002- ***Tenth Plan*** (2059-2064 BS) Kathmandu,Nepal.
- N.P.C and ADB, 1995- ***Agricultural Perspective Plan*** (1995/96-2014/15 AD) Summary Document, Kathmandu, Nepal.
- Polk. P, Nances- ***A Low-cost Drip Irrigation System for Small Farmers in Developing Countries***. Water R, Adhikari. D, 1998 Resources Bulletin 33:119/124.
- Parajuli, B.K.,1990- ***An Impact of Pokhara Water Conservation and Irrigation Project***. An Unpublished Dissertation Submitted to the Department of Sociology / Anthropology, T.U., Kathmandu.
- Regmi, Rishikeshb Raj, 2003- ***The Essentials of Sociology***. Kathmandu, Buddha Academic Publisher.
- Ritzer, George, 1996 - ***Sociological Theory***. MC Graw-Hill International Editions.
- Roy, Singh, 2001- ***Social Development and the Empowerment of Marginalized Groups*** : Perspective and Strategies.
- Sharma, P.K, 2000- ***Impact of Drip Irrigation on High Value Vegetable Crops at Household Level***. A Case Study of Kahun VDC of Kaski District. A dissertation submitted to the Department of Sociology / Anthropology, Tri-Chandra Campus, Tribhuvan University for the Partial Fulfillment of the Requirements of Master Degree in Sociology.
- Shrestha, Reena, 2001- ***Performance of Drip System and Women Empowerment at Household Level***, A Case Study of Bhimad VDC, Tanahun District, MA Dissertation Paper, T.U., Nepal.
- Shah. T, Keller. J, 2003- ***Micro Irrigation and the Poor***: A Marketing Challenging in Small- Holder Irrigation Development Paper Presented in IWMI-TATA Work Shop 2003.
- UNDP, 2004- ***Nepal Human Development Report 2004***-: Empowerment and Poverty Reduction Kathmandu: UNDP.
- Upadhya, Bhawana, 2004 - ***Gender Aspects of Small-holder Irrigation Technology***: Insight from Nepal In Journal of Applied Irrigation Science, Vol.39.

## ANNEX-I

### SOCIO-ECONOMIC IMPACT OF DRIP IRRIGATION SYSTEM

(A Case Study of Dhikurpokhari V.D.C., Kaski)

#### Interview Schedule

Researcher : K.P. Bhandari

Prithwi Narayan Campus

Pokhara

Date : 2063 / /

Sampling House No. : .....

#### 1. General Introduction:

House owner's name: \_\_\_\_\_

Profession: \_\_\_\_\_ Religion: \_\_\_\_\_

Respondent's name: \_\_\_\_\_

Caste/Ethnic group: \_\_\_\_\_ Total Family Number : \_\_\_\_\_

Family Background: \_\_\_\_\_

S.N	Name/Caste	Sex	Age	Marital Status	Edu.	Profession	Remarks
1							
2							
3							
4							
5							
6							
7							

#### 2. How many Ropani do you planted?

\_\_\_\_\_ Ropani

S.N.	Land where cultivate Paddy	Land where cultivate crops	Total land
1	_____ Ropani	_____ Ropani	
2			
3			

**3. How many land you use to plant crops and vegetables.**

\_\_\_\_\_ Ropani

S.N.	Crops Plantation in Ropani	Vegetable Plant in Ropani	Total Ropani
1			
2			
3			

	Question	Answer
4	Which irrigation technology do you apply to plant vegetable?	1. Cannal 2. Pipeline    3. Drip irrigation 4. All 5. Other
5	How many area do you use for vegetables by drip irrigation?	1. .... Aana 2. .... Ropani
6.	How many time did you used drip irrigation technology?	1. One years 2. Two years  3. Three yearsd. All 4. Other
7.	Which vegetable plantation is done by drip irrigation?	1. Cauliflower 2. Cabbage 3. Cucumber 4. Bitter Guard 5. Jukeni 6. Tomato
8.	Do you produce unseasonable vegetables by this technology?	1. 2.
9.	Is their any development growth in drip irrigation then general irrigation?	1. Yes 2. No
10.	How many income do you up-grade accordance with this improvement?	1. Yes 2. No.
11.	How many income do you progress by drip irrigation corporately than before?	1. Yes 2. No
12.	If there time save to plant by this technology?	1. Yes 2. No
13.	If it is save, how many?	1. .... hour
14.	How many money do you invest for vegetables plantation by this technology?	1. Rs. .... (monthly)
15.	What are the sectors for input?	1. Construction of tank 2. Fusing the pipe 3. Construction of Tunnel 4. Other
16.	Do you take any kind of help from anywhere?	1. Yes 2. No.
17.	If you have taken help from any where, where is it?	1. Neighbours 2.
18	Who Technically supports in this technology ?	1. DDO 2. Private Technician 3. Agricultural Develop 4. Other
19.	What is the source of water ?	1. Tap 2. Rainy water 3. Kuwa 4. Thebe

**20. What is the role of family members in drip irrigation technology programme?**

S.N.	Particulars	Women	Men	Both	Remarks
1	Formation of tunnel				
2	Preparation for land				
3	Supply to the water				
4	Cultivation				
5	Use of fertilizer				
6	Seed choice and collection of seed				
7	Plantation process				
8	Control of diseases				
9	To entry				
10	Sale process				

**21. What is the role of family members of this following task?**

S.N.	Particulars	Women	Men	Both	Remarks
1	Cost determination				
2	Sale and income				
3	Buying to homely used goods				
4	Education				
5	Possession on saving Bank				
6	Buying and selling of land				
7.	Tale ivy deletion with vegetables irrigated				

<b>22</b>	Do you take any training under drip irrigation?	1. Yes 2. No			
<b>23</b>	If you have taken, how many do you take?	1.                    2. 3.                    4.			
<b>24.</b>	Do you have any group?	1. Yes 2. No			
<b>25.</b>	If it is, how it is?	1. Saving & credit 2. Women Organization 3. Drip users group 4. Others....			
<b>26.</b>	Do you visit any place related to drip irrigation system?	1. Yes 2. No			

<b>27.</b>	If you visit who helps you to visit?	1. Self 3. Nepal SIMI 5. District age office	2. DCDO 4. IDE 6. Others
<b>28.</b>	Please tell the place where you visit.	1. 2. 3. 4.	
<b>29.</b>	In which subject do you impress by your visit?	1. Cultural 3. Economical 5. other	2. Serial 4. All
<b>30.</b>	Which fertilizer do you use in vegetables?	1. Chemical Fertilizer 2. 3. 4.	
<b>31.</b>	If you use poison, how many days do you wait to use vegetables after poison?	1. After one day 2. After 3 day 3. After 7 day 4. After 10 day	
<b>32.</b>	Do you use poisonous chemical in your vegetables?	1. Yes 2. No	
<b>33.</b>	How much do you and your family use your product?	1. Daily 2. Little bit 3. Nill	
<b>34.</b>	Use of green and seasonable vegetable, is their reduce any rate or frequently frequency of sickness?	1. Yes 2. No	
<b>35.</b>	At what time do you and your family check up your health?	1. Monthly 2. 3. 4.	
<b>36.</b>	Do you participate your child at required vaccine programme?	1. Yes 2. No	
<b>37.</b>	Do you have a toilet at your home?	1. Yes 2. No	
<b>38.</b>	If it is, how is it?	1. Permanent 2. Temporary	
<b>39.</b>	What type of hospital does your family use to check up their health?		

**40. What type of school and college is you child admitted for education?**

S.N.	Particular	Before Program		After Program	
		Govern.	Private	Govern.	Private
1	Daughter				
2	Son				
3	Daughter of law				

42.		1. Yes 2. No
43.	If you have, how many son and how many daughter.	1. Daughter 2. Son
44.	What is the major cause that child does not go to the school?	1. Economical Problem 2. Lack of awareness 3. Doesn't need to study for daughter 4. Others
45.	Do you admit your child at school who does not go school at earlier after having the way of income?	1. Yes 2. No
46.	If you have admit how do you admit?	1. 2.

**Subjective Answer**

47. Is their any difference between drip irrigation and general irrigation?
48. What are the problems that have come while producing vegetable by drip irrigation?
49. What are the steps to make drip irrigation strong and effective?
50. Do you want to thank to anybody or any institutions on the development to of this technology on the basis of your comprehension?
51. Do you have any suggestion to the user of drip irrigation?
52. Do you want to say anything at last?

## ANNEX-II

### Checklist for Focus Group Participants and Key Informants

1. Brief description about drip irrigation
2. Causes of using drip irrigation or motivating factors
3. Change brought by drip irrigation on social status i.e. Education, Health, Gender relation.
4. Effects of drip irrigation on unseasonable vegetables.
5. Change of their economic status
6. Brief description about its effects on user's position such as family, relative and community level position.
7. User access and control over income and freedom to spend earned income.
8. Positives and negatives effects of drip irrigation on farming.
9. Marketing activities such as buying and selling.
10. Major problems of drip irrigation
11. Suggestion for betterment by using the drip irrigation.
12. Suggestion for betterment to the NGO / INGO and related sectors.
13. Others (main cereal crops livestock effects on food habits, labour rate, agricultural tools, improved seeds, pesticides, agricultural tours and observation, etc).



## **ANNEX-III**

### **Name list of FGD Participants**

#### **Focus group discussion 'Group 1'**

1. Mr. Himlal Adhikari
2. Mr. Nawaraj Adhikari
3. Mrs. Kalika Adhikari
4. Mrs. Sumitra Adhikari
5. Mr. Dilnath Adhikari

#### **Focus group discussion 'Group'2**

1. Mr. Til Prasad Bhandari
2. Mrs Him Maya Bhandari
3. Mrs Rekha Pariyar
4. Mrs Sanimaya Nepali
5. Mr. Krishna Bhandari

#### **Focus group discussion 'Group'3**

1. Mr. Netra Prasad Subedi
2. Mrs. Shanti Subedi
3. Mrs. Hari K.C.
4. Mr. Tulsi Prasad Adhikari
5. Mrs. Dilmaya K.C.

## ANNEX – IV

### Name List of Key Informants

S.N.	Name	Institution	Designation
1.	Mr. Dharma Datta Subedi	Dhikurpokhari V.D.C	Secretary
2.	Mr. Punne Prd. Bhandari	D.C.D.O. Dhikurpokhari	Chairperson
3.	Miss. Him Maya Bhandari	D.C.D.O. Dhikurpokhari	Motivator
4.	Mr. Guru Datta Dahal	Agriculture Research Centre, Dhikurpokhari	JTA
5.	Mrs. Hari K.C.	Women Organization Dhikurpokhari – 2	Auguwa Kishan