



Purbanchal University



College of Development Studies

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**LINKING INFORMATION AND COMMUNICATION TECHNOLOGY WITH YOUTH  
FARMERS IN AGRICULTURE**

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Submitted in Partial Fulfillment of the Requirements for the Degree of  
Master in Development Studies (MDevS)

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# **Linking Information and Communication Technology with Youth Farmers for Agriculture Promotion**

A thesis submitted in partial fulfillment of the requirements for the degree of Master in Development Studies

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## CERTIFICATION

This is to certify that the thesis entitled "Linking Information and Communication Technology with Youth Farmers for Agriculture Promotion" submitted by Pasang Lama towards the partial fulfillment of the degree of Master in Development Studies (MDevS) is based on the original research and study under the guidance of Prof. Dr. Bharat Shrestha, Development Economist and Founder of College of Development Studies (CDS). The thesis in part or full is the property of College of Development Studies (CDS) and thereof should not be used for the purpose of awarding any academic degree in any other institutions.

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## **Abstract**

Development of ICT tools and techniques globally have intervened on various sectors that determined the growth of human life and its use has significant effect on national development by increasing the productivity in the agriculture sector as well. A study was conducted to find out access and usage of ICT tools among farmers of previously Thakre and Goganpani VDC then the Thakre Rural Municipality and Galchi Rural Municipality of Dhading district which helped in facilitating smallholder farmers to get benefits by accessing agricultural information for improvement in agriculture sectors. A total of 143 households were purposively selected for the study during field survey. The results showed that majority of the farmers owned and use mobile phones as well as television and radio while use of social media was also found in abundance. Mobile phones were widely used for social communication and contacting experts for agricultural advisories. Information services on disease and pest management, good agriculture practices, weather information and financial management were also used through ICT tools. Market linkage and prices information were least accessed for the purpose of contacting middle men for marketing of produce. However, the major constraint of effective use of ICT tools was basic ICT skills, ICT related facilities, awareness about benefits of ICTs and low literacy. It is prerequisite to have awareness about ICT tools and skills which brings significant benefits to smallholder farmers leading to increased agricultural productivity and make agricultural as profitable business. Therefore, there is a need to create enabling environment for ICT tools and services accessibility and market information to farmers of rural areas.

**Keywords:** Information and Communication Technology (ICT), Access, Use, Benefit, Agricultural Information

## सारंश

संसारमा सुचना तथा संचार प्रविधि (आईसिटि) को विकासले हरेक क्षेत्रलाई समेटेर मानविय विकासमा सहयोग पुऱ्याएको देखिन्छ र यसको प्रयोगबाट कृषि क्षेत्रको उत्पादकत्वमा समेत वृद्धि हुन गई राष्ट्रिय विकासमा महत्वपूर्ण भूमिका खेलेरहेको देखिन्छ। यो अध्ययन संचालन गर्नको उद्देश्य धादिङ्ग जिल्लाको थाके र गोगनपानी गा.वि.स. हालको थाके र गल्छी गाउँपालिकामा सुचना तथा संचार प्रविधिको पहुँच तथा प्रयोगबाट साना किसानहरुलाई कृषि सम्बन्धि सुचना उपलब्ध भई कृषि क्षेत्रमा सुधार भई लाभ पुग्ने देखिन्छ भनी पत्ता लगाउनु थियो। यो अध्ययनमा संरचनागत प्रश्नावली सुचनाहरु संकलनका लागि प्रयोग भएको छ भने कार्यस्थलको सर्वेक्षण अवधिभरि १४३ घरधुरी जानीबुझीकन छनौट गरिएको छ। अध्ययनको नतिजा अनुसार अत्याधिक कृषकहरुको पहुँचमा मोबाइल फोन रहेको र तत्पश्चात दुरदर्शन तथा रेडियोको पहुँच भएको देखिन्छ। त्यसै गरी सुचना तथा संचार प्रविधि सम्बन्धि उपकरण मध्ये कमश मोबाइल फोन, दुरदर्शन, रेडियो तथा समाजिक सञ्जालको अधिकांस प्रयोग हुने गरेको देखिएकोमा मोबाइल फोनको अत्याधिक प्रयोग सामाजिक सन्देश आदान प्रदान गर्न तथा विज्ञहरुसंग सम्पर्क गरी कृषि सम्बन्धि सुभावा सल्लाहका लागि भएको देखिन्छ। अन्य सुचना सेवामा किटाणु तथा रोग व्यवस्थापन, उत्कृष्ट कृषि अभ्यास, मौसम सम्बन्धि सुचना तथा आर्थिक व्यवस्थापनमा सुचना तथा संचार प्रविधिको प्रयोग हुने गरेका र धेरै कम मात्रामा विचौलीसंग सम्पर्क गरी कृषि उपजको बजारीकरण गर्ने गरेको पाईयो। तथापी सुचना तथा संचार प्रविधिको प्रभावकारी प्रयोगमा मुख्य रुपमा आधारभूत सिप, सुविधा सम्बन्धि तथा लाभ सम्बन्धि जागरुकतामा कमी र निम्न साक्षरताका कारण अवरोध पुगेको र अन्यमा अनिश्चित बिजुली आपूर्ति, सञ्जालमा कमी, पुर्वाधार तथा भाषामा अवरोधहरु रहेको छ। यसर्थ आवश्यक सुचना तथा संचार प्रविधिबाट हुने लाभ सम्बन्धि जागरुकता तथा प्रयोग गर्ने सिपको आवश्यकता रहेको जसको प्रयोगबाट साना किसानहरुको कृषि उत्पादकत्वमा वृद्धि तथा कृषि क्षेत्र नाफादायक व्यापारका रुपमा परिवर्तन हुने सुभाईन्छ। यसकारण सुचना तथा संचार प्रविधिको उपकरण तथा सेवामा पहुँच पुऱ्याउन आवश्यक वातावरणको सृजना गर्नका लागि आईसिटि सम्बन्धि पुर्वाधार र अन्य भौतिक पुर्वाधारहरुको विकास गर्नुका साथै ग्रामिण क्षेत्रमा कृषकहरुका लागि बजारिकरण सम्बन्धि सुचनाहरु उपलब्ध गराउनु पर्ने देखिन्छ।

कुंजी शब्द: सुचना तथा संचार प्रविधि, पहुँच, प्रयोग, लाभ, कृषि सुचना

སྒྲིབ་བསྟུགས།

འཛམ་གླིང་ནང་གྱུ་ཁྱབ་བརྒྱུ་ལན་དང་འབྲེལ་ལམ་གྱི་མཐུན་རྒྱུ་ཚོགས་དར་འཕེལ་ཤུགས་ཆེར་འགོ་བཙུག་པ་འདིས་ཕྱོགས་གང་  
ཅིའི་ཐད་ནས་འགོ་བཙུག་མའི་ཡར་རྒྱས་ཐོག་རམ་འདེགས་ཆེན་པོ་ཞིག་བསྐྱབས་ཡོད་པ་མ་ཟད་ཞིང་པ་རྣམས་ཀྱིས་ཀྱང་མཐུན་རྒྱུ་  
འདི་བཅུ་སྟོང་གི་ཕྱི་ལོ་སློ་ནས་ཐོན་སྐྱོད་འཕེལ་འགྱུར་གཏོང་ཞིང་རྒྱལ་ཁབ་ཡར་རྒྱས་གཏོང་བ་ལ་ཕན་ཚུབས་རྒྱ་ཆེན་པོ་ཞིག་བསྐྱབས་  
ཡོད།

ཞིབ་འཇུག་འདི་བྱེད་དགོས་པའི་དགོས་པ་གཙོ་བོ་ཡང་དུང་དྲོད་ཁོང་ཁོངས་གཏོགས་ཐུག་ཅིང་དང་སྟོ་ལྟན་པ་ནི་ཡུལ་ཡར་རྒྱས་ཚོ་  
གས་པའི་ནང་གི་ཞིང་པ་ཚོར་མཐུན་རྒྱུ་འདིའི་ཐོག་གོ་རྟོགས་སྤེལ་བ་དང་མཐུན་རྒྱུ་འདི་བཅུ་སྟོང་གི་ཕྱི་ལོ་སློ་ནས་ཐོན་སྐྱོད་  
གོང་འཕེལ་དུ་གཏོང་བ་ལ་ཕན་གཞན་གཞི་ཚུན་འདྲེན་སྐབ་པའི་ལུས་པ་ཡོད་མེད་བརྟག་དཔྱད་བྱེད་རྒྱུ་ཆེད་ཡིན།

ཞིབ་འཇུག་འདིའི་ནང་གནས་ཚུལ་འདུ་ལེན་བྱེད་ཆེད་དམིགས་བསལ་གྱི་དྲི་བ་རྣམས་བཅུ་སྟོང་གི་ཕྱི་ལོ་མ་ཟད་ས་ཁུལ་དེའི་ས་  
ཞིབ་བྱེད་པའི་རིང་ས་ཁྱིམ་གྲངས་༡༤༥ ཙམ་ཞིག་དམིགས་བསལ་གྱིས་འདེམ་སྐྱུག་བྱེད་ཡོད།

ཞིབ་འཇུག་འདིའི་ཐུབ་འབྲས་ལ་ཆ་མཚན་པ་ཡིན་ན་ཞིང་ལས་པ་མང་ཆེ་བ་ལ་ལག་ཐོགས་ཁ་པར་དང་རྒྱུང་འཕྲིན་དེ་བཞིན་བརྟན་  
ན་འཕྲིན་བཅས་བཅུ་སྟོང་གཏོང་བའི་གོ་སྐབས་རྒྱ་ཡོད་པ་ཤེས་རྟོགས་སྐྱབ།

གནས་ཚུལ་མཐོ་སྐྱབ་བྱེད་ཆེད་ལག་ཐོགས་ཁ་པར་དང་རྒྱུང་འཕྲིན་དེ་བཞིན་བརྟན་འཕྲིན་བཅས་བཅུ་སྟོང་མང་པོ་གཏོང་བ་མཐོང་  
ཡང་དེ་ཚང་མའི་ནང་ནས་ཞིང་པ་ཚོས་ལག་ཐོགས་ཁ་པར་བརྒྱུད་སྤྱོད་ཚོགས་ཀྱི་གནས་ཚུལ་བརྗེ་ལེན་བྱེད་པ་དང་ཞིང་ལས་དང་འ  
བྲེལ་བའི་མཐུས་པ་ཚོར་འབྲེལ་ཡོད་དོགས་དྲི་བས་འཆར་ལྷུ་རྒྱུའི་ཕྱོགས་ལ་བཅུ་སྟོང་ཤུགས་ཆེ་བ་གཏོང་གི་ཡོད་པ་ཤེས་རྟོགས་བྱེ  
ད་སྐྱབ།

འདི་ལྟར་གྱུ་ཁྱབ་བརྒྱུ་ལན་དང་འབྲེལ་ལམ་གྱི་མཐུན་རྒྱུ་རྣམས་གཙོ་བོ་ཞིང་ལས་དང་འབྲེལ་བའི་གནད་དོན་ཏེ་དཔེར་ན་འབྲུ་མི  
ན་དང་ཞིང་ནང་སྤངས་འཛིན་བྱེད་ཕྱོགས་སྟོར། ལུས་བྱུང་ཞིང་ལས་ཀྱི་ལག་ལེན། གནམ་གཤིས་དང་འབྲེལ་བའི་གནས་ཚུལ།  
དཔལ་འབྱོར་སྤངས་འཛིན་བྱེད་ཕྱོགས་ཐད་ལ་བཅུ་སྟོང་ཤུགས་ཆེ་བ་བྱེད་པ་མཐོང་ཡང་མཐུན་རྒྱུ་དེ་ཚོ་རང་གི་ལོ་ཐོག་རྣམས་ཁོ  
མ་སར་ཚོང་རྒྱར་བྱེད་ཆེད་བར་ཚོང་པ་རྣམས་དང་འབྲེལ་བ་བྱེད་རྒྱུར་བཅུ་སྟོང་གི་ཕྱི་ལོ་མ་ཟད་ཅམ་སྤང་།

དེ་ལྟར་ཡིན་ཡང་རྒྱ་ཆེའི་མི་དམངས་རྣམས་ལ་མཐུན་རྒྱུ་དེ་འབྲེལ་གྱི་གཞི་རྒྱུའི་ཤེས་ཡོན་མེད་པ་དང་།

འབྲེ་སྟོག་བྱེད་མི་ཤེས་པ་དང་།

མཐུན་རྒྱུ་དུ་ལྱུར་བའི་ཡོ་བྱེད་དེ་ཚོའི་ཕན་ཐོགས་ག་རེ་ཡོད་མེད་ཐད་ལ་ཤེས་རྟོགས་མེད་པ་དང་སྐད་ཡིག་མི་ཤེས་པ་ལ་སོགས་པ  
འི་རྒྱུ་དང་གཞན་ཡང་དུས་ཐོག་ལ་སྟོག་མི་ཡོད་པ་དང་།

ཉེར་མཁོའི་འཇུགས་སྐྱུན་སོགས་དཀོན་པའི་དབང་གིས་ཡོ་བྱེད་དེ་ཚོ་ཕན་ལུས་འདྲེན་སྐབ་པའི་སློ་ནས་བཅུ་སྟོང་ཤུབ་པ་ལ་འག  
ལ་རྒྱུ་དུ་ལྱུར་ཡོད།

རྒྱ་མཚན་དེ་ལ་བརྟེན་ནས་རྒྱ་ཁྱབ་བརྒྱུ་ལན་དང་འབྲེལ་ལམ་གྱི་མཐུན་རྒྱུ་དེ་ཚོ་བཅུ་སྟོང་གི་ཕྱི་ལོ་མ་ཟད་ས་ཁུལ་དེའི་ས་  
དང་དེར་བརྟེན་ཞིང་ལས་ཐོན་སྐྱོད་གོང་འཕེལ་དུ་འགོ་བཙུག་པ་དང་ཁེ་བཟང་ཆེ་བ་ཡོང་ཕྱོགས་ཀྱི་སྟོར་ལ་སྟོབ་གསོ་རྒྱག་པ་དང་ཤེས་རྟོ  
གས་ཆེ་བ་གཏོང་དགོས་པ་གསུངས་སྤང་།

ལྷག་པར་དུ་མཐུན་རྒྱུ་དེ་ཚོ་སྐབས་བདེ་བའི་ཐོག་སྤྱོར་སྐབ་ཆེད་གལ་ཆེའི་ཁོར་ལུག་སྐྱུན་རྒྱུར་གྱུ་ཁྱབ་བརྒྱུ་ལན་དང་འབྲེལ་ལམ་  
གྱི་མཐུན་རྒྱུ་དང་འབྲེལ་བ་ཡོད་པ་དང་དེ་མིན་འཇུགས་སྐྱུན་གཞན་ཡང་ཡར་རྒྱས་གཏོང་བ་དང་ཆབས་ཅིག་ཏུ་གྲོང་གསེབ་ནང་  
ཡོད་པའི་ཞིང་པ་རྣམས་ལ་རང་གི་ཐོན་སྐྱོད་ཚོང་རྒྱར་བྱེད་ཕྱོགས་ཐད་གནས་ཚུལ་ཁྱབ་སྤེལ་བྱེད་དགོས་པ་ནི་ཤིན་ཏུ་གལ་ཆེར་སྤང  
དོ།

གནད་ཚོགས། བརྒྱུ་ལན་དང་འབྲེལ་ལམ་བཟོ་ལས་རིག་པ། སྐྱེ་བའམ། བཅུ་སྟོང་། ཞིང་ལས་གནས་ཚུལ།

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## **Abbreviations**

EAP	Economically Active Population
HDI	Human Development Index
HYV	High Yielding Varieties
ICT	Information and Communication Technology
ICT4D	Information and Communication Technology for Development
IPS	Internet Service Provider
IT	Information Technology
NICT	National Information and Communication Technology
OECD	Organization for Economic Co-operation and Development
SMS	Short Message Service
VDC	Village Development Committee

## **CHAPTER I**

### **INTRODUCTION**

The first chapter of the study defines the clear definition of the topic with need of Information and Communication Technology (ICT) in modern agriculture sector. Further it mentioned the problem of access, use and benefit of ICT tools for agriculture promotion and with associated problem the objectives and scope were set in for in-depth study to clarify the theme of the study. The study holds the valid reason for selecting the theme of the study as the farmers had common problem in accessing agriculture information which has halted in agriculture development so better plan and policies for easy access and use of these tools to sort out the problems and get benefit through use of these tools in remote rural areas.

#### **1.1 Background**

Agricultural systems have been changed over the years together with technological innovations and its spread out effects in globalization process. Technological advancements with the advent of scientific innovations have brought new methods and technical accessories to support each and every aspect of human activities. Farming being largely adopted by large population globally has advanced with recent information and communication technology which has not only made easy to perform agricultural activities but also becoming cost effective.<sup>1</sup> In recent years there has been widely spread out even in developing countries due to the effect of globalization, improvement in agricultural technology and education systems.

Affordable access is very unevenly distributed throughout the world. In many of the poorest and rural areas of developing countries there is simply no access due to infrastructure. There is unequal access to and use in developed countries and more in developing countries and one of major causes of unequal access for accessing information was cultural and language differences and skills to use it. If no action is taken, a substantial majority of people in poor countries will be excluded from contributing to and benefiting from the new forms of knowledge based development that are taking hold on a global scale. By promoting measures to universalize access, helps to empower stakeholders within developing countries to shape the use of these tools in support of their distinctive approaches to knowledge-based development.

ICT access can significantly contribute to the success of innovative business by improving information exchange and knowledge diffusion for innovation in production, foster growth by reducing production costs and increasing productivity and expand the market for goods and

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<sup>1</sup> The idea was given by my advisor Prof. Dr. Bharat Shrestha in discussion of Information and Communication Technology effective tools for agriculture promotion. During his lectures, the idea comes up with noteworthy and thought provoking principles and philosophy: MDeVs, 2017

services. ICTs are enablers or tools that can be applied in support of many social, cultural, political and economic activities. These tools are provided by the telecommunication and computing hardware and software industries and the information content industries, including the broadcasting, film and publishing industries. The systems increasingly incorporate digital technologies that enable the creation, storage, and processing of enormous amounts of information.

Information and communication technology are part of the day-to-day reality of a rapidly increasing number of people everywhere, independent of Information and Communication Technology for Development (ICT4D) programmes. Information and communication technologies provide new opportunities for those who are literate, have good education and adequate resources. Disadvantaged and marginalized groups have little chance to automatically benefit from tools such as the internet. This further increases social divides, widens the gap between rich and poor countries, regions, individuals and even between men and women. While the use of ICT has grown steadily over the past decade, it substantially varies across Organization for Economic Co-operation and Development (OECD) countries. Better access also increases competition, can facilitate access to foreign markets, help companies tap into skilled labor input and maximize their productivity. For promoting access and use, capabilities to use, infrastructure development and mobile application need to be developed as per local need. Thus these tools contribute directly to agricultural production and indirectly provide information to farmers for making quality decision in efficient management of their enterprises.

Mobile communication has rapidly increased in recent time hence giving even poor and disadvantage groups in rural areas. Mobile phone provides opportunity to access information across long distance through SMS, calling system. The need for being physically present to gather various kind of information has been reduced thus decreasing hassle of travel. The ever increasing trend of use of mobile communication through the android based information is quite easy to use and very user friendly that one can easily operate. Basically they were used for accessing market prices, market for inputs and products, weather forecast, advice from agricultural experts, etc. Today, it is most accessible technology that is available to great number of people including marginalized people in remote, rural areas. All these technological changes give advantage to farmers in creation of effective and inexpensive agricultural production and marketing programs and give opportunity for reduction of poverty and improvement of their life quality. With advent of mobile communication, the social media like Facebook, Viber, skype etc. becomes one of the popular communication tools for sharing and accessing information.

The information on the internet through web pages performs commanding roles and people do not have to rely on books and reports which are usually hard to find and access to people in rural areas. With use of internet, people can find relevant information all over the world through interacting

with national, international experts and farmers. Other tools used were television for accessing visual information which helping in easily understanding ideas to the rural people through best practices, radio as one of the common medium from the past for having information and newspaper which provides day to day information to farmers.

According to WB (2016), digital technologies primarily mobile phones and the Internet have contributed to considerable growth in developing countries that it is estimated that a 10 percent increase in high- speed Internet connections an average 1.4 percent increase in economic growth. According to 2011 Census, 7.4 percent of household have fixed telephone line connection, 3.3 percent of household have internet connectivity (Present estimate 6.2 percent), 64.6 percent of household has at least one mobile subscription, 7.3 percent of households own computer and total mobile subscription is 105 percent of population (one individual can subscribe multiple mobile connection) out of which 45 percent have subscribed Internet.

ICT and technological advancements are increasing at a rapid pace and developed economies are primed to exploit economic dividends to create wealth and improve the efficiency of public services and processes. The ICT aims to benefit society and organizations in their innovation and technology transfer activities (Galbraith, 2013). The existing developing environment is most favorable for tapping information and communication technology for agricultural extension and technology transfer. The need to see communication and information technologies as a goal to support agricultural extension for farmer-to-farmer interaction and farmer decision-making on important agricultural activities are relevant in carrying out effective extension services to rural area. ICT could be a tool to empower extension professionals and also framers (FAO, 2012).

A Study conducted in Bangladesh showed that the farmers using ICT in farming activities have increased 5.9 percent of their farm productivity (rice production) while farmers having no exposure have only increased by 3.9 percent (Moon, 2013). ICT through Extension service is one of the important initiatives for better services in agricultural development. Communication and publication of improved technologies through mass media play a vital role in communicating the improved and scientific technologies which help increase the production and productivity of the agriculture sector (CPDD, 2014).

## **1.2 Statement of the Problems**

Information and communication technologies hold tremendous potential for rural development in Nepal in the areas of agriculture, health, education and industries. The availability of relevant and timely information to farmers will contribute in agriculture production. The modern society demands intervention of ICTs in agriculture information dissemination rather than traditional methods. Except the great potential that has in improvement of agriculture, there are some

limitations that can make implementation and expansion of these tools in agricultural sector difficult.

There are skills gaps and illiteracy in using to access and disseminate agricultural information and knowledge. Most small-scale farmers do not have the skills i.e. formal education to practice modern or improved farming and require training on new technologies, value addition and farming as a business. Therefore, there is a need for a training to equip farmers with skills to use and made available to them. Language and illiteracy also influence the use in small-scale agriculture especially where content is too technical and available in English only.

Many people in rural areas have no computer and internet access. This contributes to their lack of awareness of the benefits from using ICT tools. On the other side, providers and policymakers are skeptical about ability and willingness of the rural population to accept and use of these tools. As a result, there are small numbers of projects that improve implementation and use in agricultural sector and rural areas.

The availability of internet access is low in rural areas because Internet Service Providers (ISP) delivers services mainly in urban areas. Reliable network connection is prerequisite for successful implementation in rural areas. There are several technologies to make connectivity in remote rural areas without fixed telephone network. Presently, cellular telephone network appears as the most appropriate wireless medium for connection of remotest villages while other technology is very expensive.

There are challenges related to availability of appropriate local content in appropriate formats and language. Most of the content available on ICT tools like mobile phone, computer and internet is too technical for farmers and it is largely in English. So in content of those tools there are local information barriers, literacy barriers, language barriers and cultural diversity barriers and pointed out that farmers rarely find relevant information on those tools.

Most small-scale farmers have weak institutions and poor collaboration among each other hence do not have the resources to operate independently hence, they face the challenge of diseconomies of scale. So they cannot compete in the market. Market information and linkage mechanisms are essential for improving markets and providing intelligence on where to buy agricultural inputs so Establishment of a mechanism to facilitate the sharing of information and knowledge of networks among farmers will strengthen the efforts of farmers in marketing their agricultural produce.

### **1.3 Rational of the study**

In the process of promoting agriculture, the reliable information about the agriculture activities seems inevitable to gear up the agricultural practices for better productivity to make profitable

business for encouragement to farmers. The ICT tools is found to be one of the important communication medium that help to show better picture of agriculture by sharing information through medium like voice, data and visual to the farmers living in remote areas.

Information and Communication Technologies access can significantly contribute to farmer success in agriculture sector through facilitating innovation by improving information exchange and knowledge diffusion incurred in the production of innovations, foster growth by reducing production costs and increasing productivity, and expands the market for agriculture products. Without accessing ICT tools farmer would not able to use it for accessing agriculture information. For the accessibility, farmer should have awareness about these tools and its benefit. Therefore, to find out farmer access of these tools, the study will explore the knowledge level about different types of the tools, source and duration of access which was affected by the education level, age factors and time of access of these tools.

Accessing agriculture information depends upon the use of ICT tools. Lack of access to information farmers are facing problems because of the farmer's knowledge about the benefit through accessing information. With use of these tools farmer will get disease and pest information, best practices, weather information, market information, input supplies and others but there are constraints using these tools. This study explains different types of agriculture information accessed through the tools and how the farmers are getting the information from the different ICT. The study will further examine the importance of using these tools in accessing information and the constraints faced during using these tools to the attitudes of farmers and eliminates the gap exist to use it to help in getting benefits.

With access and use of ICT tools farmer get agriculture information and get benefit through improving agriculture production and making profit which encourage the youth farmers to attach with agriculture activities. Farmers have lack of basic skill to use it which creates problem to get benefit therefore needs of training to the farmers. Therefore, the study explores level of the benefit of accessing different agriculture information which will help program planners, extension agents and input suppliers to improve their strategies of planning, delivering and evaluating the access, use and benefit of ICT tools to groups of smallholder farmer for agriculture promotion. Further the study examines skill and capacity build up to use these tools that impact farmers in access and use of ICT tools for promotion of agriculture activities will help farmers to get benefits from ICT tools with accessing valuable agriculture information. The change will therefore improve their knowledge and attitude towards the use of ICT tools for accessing agriculture information for improving their productivity through modernized agriculture practices and consequently to reduce the risk of food insecurity and improve their living standards.

The study will observe the effectiveness of ICT tools like mobile phone, television, radio and social media in disseminating agricultural information to smallholder farmers. It further observes level of accessing agriculture information and constraint to access this information which are associated with the problem of the study. It is therefore projected that the study will help the policy makers to design plan and policies for making better access of ICT tools and use of ICT tools in agriculture activities. The results of the study can help the government adjust ICT related programs for accessing agriculture information which will lead to the improvement in agriculture productivity through effective use of ICT tools. Furthermore, the study will help the farmers, extension agents to properly utilize the present ICT tools to provide critical access to knowledge, information and technology that farmer required in their farming activities. The study process and results will help the researcher to gain more research skills, knowledge and attitudes. Also the results will serve as a resource reference for further studies in related themes.

#### **1.4 Objective of the study**

The overall objective of the research was to analyze the linkage of the information and communication technology to youth farmers in agriculture sector<sup>2</sup>.

The specific objectives of the research were to

- i) understand farmers access to information and communication technology
- ii) evaluate the efficiency in use of information and communication technology in access to them
- iii) assess the benefit derived by youth farmers from information and communication technology in their agriculture activities

#### **1.5 Scope of the Study**

The study was based in the field study and desk review. The field study was focused on assessing information related to linking youth in agriculture with help of information and communication technology. The primary data collection was analyzed to generate the desired findings

- i) understand farmers access to information and communication technology
  - a) study farmer's the knowledge about different type ICT tools
  - b) find out the time of access of ICT tools to the farmers
  - c) find out the source who help to access ICT tools
  - d) find out the more access of ICT tools
  - e) study which age group of people have more access to ICT
  - f) find out the time period of accessing ICT tools

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<sup>2</sup> With intensive guidance of researcher mentor Prof. Dr. Bharat Shrestha the specified objectives with scopes of the study were designed with the delicacy and perfection in relation to the theme "Linking Information and Communication Technology with youth/ farmers for agriculture promotion".

- ii) evaluate the efficiency in use of information and communication technology in access to them
  - a) find out which ICT tools use most having agriculture information
  - b) find out type of agriculture information accessing with use of ICT
  - c) find out the importance of using ICT tools
  - d) study the constraint of using ICT tools
- iii) assess the benefit derived by youth farmers from information and communication technology in their agriculture activities
  - a) study the benefit taken from ICT tools by accessing to agriculture information
  - b) find out how benefit are gained by accessing to information
  - c) find out the person or organization that provided the training to farmers for getting benefit from ICT tools.

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

This study was primarily conducted for academic purpose and was based on data collected from various primary and secondary source of information. Some of the limitations of the study were; it study focusing on finding out the access, use and benefit of Information and Communication Technologies in Dhading district thus, it may represent similar situation at least of the hilly areas of other districts of Nepal.

The sample for the study was selected solely specific group of farmers from the two VDCs of Dhading district. Thus, generalizations made in this study may represent the similar situation of the whole country. The data, diagram, figures and graphs cited in the study may or may not represent the scenario of the other districts of Nepal. The calculation and analysis made in this study were based on the simple statistical tools such as percentage, average, simple bar and pie charts- mainly using Microsoft Excel.

### **1.7 Organization of the Study**

The study was organized into five chapters. The first chapter is Introduction which comprises of background of the study, problems, rationale and objectives, scope and limitation of study. Second chapter comprises of literatures reviewed in line with the objectives of the study. The third chapter is focused on research methodology applied to accomplish the research. The fourth chapter highlights the findings and discussion which is based entirely on the primary data collected by the researcher from field survey, group interviews, focus group discussions and key person's interview. The last chapter consists of the conclusion and policy implications.

## **Chapter II**

### **REVIEW OF LITERATURE**

This chapter presents review of literature by different author in relation with the objective and scopes of the study. The literature review ensured up-to-date understanding of the subject matter and its significance to practice and further it helped to made comparison to the research findings from the field survey. In line with the objective and scope of the study, the review of literature was focused on the following headings; global change of technology, changing pattern of ICT in farming, policy review on ICT, accessibility of ICT, potential and constraint of use of ICT and small holder farmers derived benefit from ICT<sup>3</sup>.

#### **2.1 Global Change in Technology**

With the advancement of people's need and requirements, they have been involved finding out the methods, mechanism and tools that help them to survive.<sup>4</sup>Therefore in terms of agricultural development with modernize farming system Information and Communication Technology play important role for providing relevant information to perceive benefit of its uses.

The ICT is playing a crucial role in the applications across the world and at either end of the development spectrum, and with such a high impact on young people and their explicit reference in such strategies is essential. The wider emergence of websites and help-lines as forms of technically mediated service delivery means that the potential of ICT an agent of change, paralleling the transformations in many other service sectors is now far greater than before (Watts, 2011).

Information and Communication Technologies (ICT) refers to technologies that provide access to information through telecommunications and it is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums (Wereh, 2012).

The world is becoming digitalized and it's answering your question. Now technology is becoming way more relied on. The ICT is important in today's life as almost everything has an aspect of ICT in it (Thioune, 2010). The ICT combines virtual instruction with hands on training to create a unique experience for youth that is flexible with the schedules of this new world, which can be very busy. After all, ICT is about enhancing the life you have, not weighing you down. It can experience us

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<sup>3</sup> Area to be covered for review was as guided by my advisor Prof. Dr. Bharat Shrestha with respect to the objective and scope of the study.

<sup>4</sup> The idea was given by my advisor Prof. Dr. Bharat Shrestha in discussion of Global Changes in Technology, MDeVs, Semester III, 2017

with the combination of online learning and hands on instruction that will give you all the knowledge and experience you need to have the career of your dreams (Hofkins, 2011).

The ICT does is it helps us to find solutions faster either through helping us to dig for solutions already out there or helping us communicate to find answers together. This also means that people now have more information at their fingertips than in any time of human history. ICT field is a must in meeting the future needs of the country and the world. Nothing is as accessible as technology nor comes at a cheaper rate. The technologies and the service sector that is developed in the ICT field will create jobs and engine that powers the economy for many years to come (Pathmalal, 2013).

## **2.2 Changing Pattern of ICT in Farming**

Transfer of technology to farmers is one thing and how the farmers are reached another important component of extension. The revolution is an intervention with the potential to ensure that knowledge and information on improved technologies, methods and practices are put into right use by farmers as information is an important resource in modern agriculture (Anya, 2013).

In different parts of the world ICTs are seen to have positively contributed towards rural development. Stienen *et al.* (2007) indicated that extension workers use ICTs to gather, retrieve, adapt, localize and disseminate a broad range of information needed by rural families. A study conducted by Fu and Acter (2010) in India found that the amount, speed and quality of the extension services delivery have been improved significantly through the use of mobile phone technology. Also Singh (2006) indicated radio and TV programs to have helped the farmers in South Korea to receive support for improved crop production, quality control methods, processing, packaging and marketing. This shows that ICTs have helped to fill the gap that exists in extension service provision. Therefore, effective use of ICTs in agricultural extension system can lead to the improved agricultural productivity

A significant leap forward was the development of the cellular telephone which allowed farmers could access and share information they needed. However, the conventional linear extension systems, even now in place in many developing countries, have not been able to use the potential of this new ICT and its more recent developments, the smart phone and 'Phablets' with their mixed media and information-processing capacities. This potential, when coupled with widespread broadband connectivity and 'cloud' computing, is bringing hitherto unimagined new capacities for farmers and all actors involved in complex agricultural market chains to access and use information for decision support. Therefore, it was important to understand how the potential of smart phones with broadband connectivity and cloud-based computing can be effectively used to transform smallholder agriculture in developing countries (FAO, 2013).

### **2.3 Agriculture Information System in Nepal**

Computers, internet, GIS, mobile phones, as well as traditional media such as radio or TV were used in Nepal for the contribution of ICT to agricultural development and poverty alleviation is becoming increasingly available. The SMS platform for short messages and mobile application for sharing large information became trend for exchanging and sharing information on farming in a low cost. With network (voice and data) coverage of more than 90% across the country and smart phones are getting cheaper, smart phone penetration among farmers became almost 4.5 million in Nepal (Regmi, 2016).

Project for Agriculture Commercialization (PACT) and Agriculture Management Information System (AMIS) under Ministry of Agricultural Development and other governmental organization has developed mobile application like *Smart Agriculture*, *Krishi Ghar*, *IFA krishi*, *Yuba Krishi*, *Hamro Krishi*, *Farm Nepal* etc. for sharing information about farming technologies, livestock, pest, weather, market prices for the literate youths and entrepreneurs to give the reliable information of the agriculture sector for promoting Agribusiness and to attract the youth in agriculture but have very limited access to Nepalese farmers. Due to low price of Smartphone these days however the use of this application are increasing but comparing with modernization and use of technologies in other countries, our country seems to be lagging too far (Regmi, 2016 and Naharki, 2017).

### **2.4 Policy Review on ICT**

"Constitution of Nepal 2072"<sup>5</sup> has stated that developing and expanding of information technology as required by the nation and make it easy accessible to general public and making its maximum use for national development. In line with the constitution there was National Information and Communication Technology 2015 which has made vision to transform Nepal into an information and knowledge-based society and economy with creating conditions for the intensified development and growth of ICT Sector as a key driver for Nepal's sustainable development and poverty reduction strategies. For the access to telecommunications in rural and remote areas a special national level program with infrastructure development to bridge the digital divide by expanding access to ICT to the people living rural and remote areas and a nation-wide digital literacy initiative to enhance the capacity of communities to meaningful harness ICTs. Intensive ICT awareness campaigns will be undertaken for all types of farmers in the use of traditional and new ICT tools at all levels, special program will be developed and executed to promote ICT skills among agricultural extension worker's managers of cooperative and farmers and special program will be developed to support

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<sup>5</sup> Constitution of Nepal, 2015 promulgated on September 20, 2015 from Constituent Assembly

local and indigenous content development and dissemination of local and indigenous knowledge, content and information resources.

For agriculture development NICT (2015), an integrated agricultural information system on agro-technologies, pricing and market information for all agro products will be created in order to provide strategic information for farmers, government agencies, agricultural cooperatives and other stakeholders at national, district and community levels, weather and agro-meteorology early warning systems will be developed and deployed to support agricultural production and predict as well as prevent disasters, incentive for deployment of affordable ICT solutions to support rural connectivity of farmers especially those within the geographical coverage of existing ICT infrastructure will be developed,

National Agriculture Policy 2004 has made the long-term vision of the agricultural sector with improvement in living standard through a sustainable agricultural development by transforming the current subsistence oriented farming system into a commercial and competitive farming system. The policy focuses on providing on-site extension services relating to food nutrition and agriculture technologies dissemination of information through information technology and means of mass communication. It also promises to develop and extend the market information system, established and activated a survey/surveillance system in order to assess (the impact) of excessive rains, droughts, diseases, insects and other natural calamities, and mobilize agricultural reliefs and guaranteed the flow of agricultural credit needed for the promotion of agricultural production and enterprises by linking with the returns of production and enterprises.

Ministry of Agricultural Development entrusted to produce agricultural information relevant to farmers, traders, entrepreneurs and professionals and to communicate the information through Radio, Television and Print media. In spite of the significant efforts made by extension system, however, there are still several problems and issues that require attention to perform its function more efficiently and effectively. One of the major challenges for agricultural extension system is how to serve the majority of rural poor and socially disadvantaged groups who had long been neglected by extension and other services (Sharma, 2011).

## **2.5 Accessibility to ICT**

ICTs act as a vector of social development and transformation by improving access to basic services, enhancing connectivity, and creating employment opportunities. If harnessed properly, ICTs can create economic opportunities and foster social and political inclusion, ultimately contributing to shared prosperity. From an economic point of view, ICTs boost productivity and reduce transaction and information costs. They allow new models of collaboration that increase

workers' efficiency and flexibility. ICTs foster entrepreneurship and create new business models" (GITR, 2015).

ICT and technological advancements are increasing at a rapid pace and developed economies are primed to exploit economic dividends to create wealth and improve the efficiency of public services and processes. The ICT aims to benefit society and organizations in their innovation and technology transfer activities (Galbraith, 2013). The existing developing environment is most favorable for tapping information and communication technology for agricultural extension and technology transfer. The need to see communication and information technologies as a goal to support agricultural extension for farmer-to-farmer interaction and farmer decision-making on important agricultural activities are relevant in carrying out effective extension services to rural area. ICT could be a tool to empower extension professionals and also framers (FAO, 2012).

ICTs have long been perceived by the literate and farmers. However, they have yet been stocked on to their old ICTs components for communication. Radio which has always been used by farmers is still the most preferred mode of communication due to its affordability, reliability, use of local languages to communicate and its easiness to operate as compared to other modes of communication. The only new ICT component that has been widely adopted by farmers is the mobile phone, because of its direct communication, portability and having features important to the farmers such as money transfer services (Benegas, 2013).

Mobile phones, radio and television are the most important tools of communication which can be accessed by farmers for agricultural related information and knowledge (Olaniyi, 2013; Chhachhar et al., 2014). Particularly, telephone facility (including mobile phones) has been reported to increase the opportunity of getting access to the people living in rural areas (Gupta, 2005). Ferris et al., 2008 also reported that 86 per cent of the farmers had access to a mobile phone which therefore contributed towards developing farmer's linkage with other people including extension experts (Gupta, 2005). The presence of e-village centers in East Siang District of Arunachal Pradesh has also helped people from surrounding villages to access IT infrastructure and knowledge (One World Foundation, 2012). Another significant use of new ICTs is also the World Wide Web or the Internet which enables people to access information (Munyua, 2000).

## **2.6 Potential and Constraint of Use of ICT**

ICTs has the potential to accelerate, enrich and deepen skills, to motivate and engage people, to help with experience to work practices, create economic viability for tomorrow's workers, as well as strengthening and helping for the change. In a rapidly changing world, basic education is essential for an individual be able to access and apply information. Such ability must include ICTs in the global village (Amin, 2010).

The use of ICT is to tackle agriculture challenges which are so new and are constantly changing in natures (WB, 2012). The use of ICTs particularly radio, television and mobile phones can accelerate agricultural development by improving access to information and knowledge services. They can provide useful and relevant information to solve problems of individual farmers and farming communities by enabling individuals and households to learn and acquire new skills and technologies and also share innovations globally. This will help to foster transfer of knowledge for sustainable and equitable agricultural development and help to bring about increased production in agricultural activities and improved livelihoods of the farmers. This is further supported by Soriano (2007) that through ICT use, there are more benefits linked to economic aspects in increased earnings and production.

Mobile communications technology has become the world's most common way of transmitting voice, data, and services, and no technology has ever spread faster especially important for developing countries because that is where it is growing. Low cost ICTs for agriculture information needs such as mobile phones have promising usability for increasing agricultural productivity and farming practices (Jayathilake et al. 2008).

The main barriers in adoption of ICT in rural segments are ICT illiteracy, availability of relevant and localize contents in their own languages delivered in a form that is of immediate use to them, easy and affordable accessibility and other issues as awareness and willingness for adoption of new technologies among the rural peoples among others (Mahant, et al. 2012 and Ramamritham, et al. 2005). Even in the most advanced economies, only certain segments of the population are benefitting from ICTs. Many are left behind because of their age, limited digital literacy, lack of access, or remoteness (Antonelli, 2003). Poor electrification in villages has always been a common problem which has restricted development in different aspects of life. In-fact, the low level of electricity coverage has also been found to inhibit the expansion of ICT services to rural areas (UNDP, 2012). The lack of confidence in operating ICTs among farmers also hindered the farmers in using ICTs (Agwu et al., 2008). However, the low awareness of opportunities and benefits in using ICTs for agriculture and rural development purposes among the farmers is also another problem faced by the farmers in using ICTs (ADB, 2004). Other problems faced by the farmers in using ICTs are lack of practical exposure (Shankaraiah and Swamy, 2012) and high cost of hardware and software (Agwu et al., 2008 and Oyeyinka and Bello, 2013).

## **2.7 Small Holder Farmers derived Benefit from ICT**

Smallholder agriculture has transformed from a subsistence activity to a profitable sustainable business and ICTs play a vital role in the transformation by providing timely advice and information. It is ensured that the positive effect of ICT in Technology transfer of agriculture is sustained. Governments also need to create enabling environments through policies promoting the

use of ICT along with ensuring that they become disseminators developing digital and not just aggregators of information (Olawale, 2013).

Modern agriculture requires a wide range of specific skills which can be obtained through ICTs. ICTs have a great role to play in agricultural development, food security and rural development (Bassols, 2012). The use of mobile phones is setting an unprecedented pace despite the poorly developed rural electrification. Mobile technology has provided multi-dimensional benefits to the rural people. Its importance in usage is clear in sense of urgency and emergency (Sife et al., 2010). For instance, farmers also reported to use ICTs to know the market days, to know where products could be sold and identifying different market location for efficient marketing of produce (Oyeyinka and Bello, 2013). However, ICT applications such as calls and Short Messaging Services have been found to be used often by farmers (Mtega and Msungu, 2013). This indicates that the uses of mobile phone are increasing and gaining importance in the lives of the people to further contribute to development and better communication. Computers and internet have also been shown to be used for agricultural information and sharing (Shetto, 2008). For instance, Internet kiosks in Tamil Nadu, India were reported to be owned by rural women to encourage savings and form credit groups (Narender and Anandaraja, 2008). Farmers in Tanzania also used internet to access agricultural information (Mtega and Msungu, 2013).

Most of the small farmers reported that there is some increase in convenience and cost savings from using their mobile phones as basic communication devices to seek information, such as input availability or on market prices. Some other benefits which farmers listed were that farmers benefited from improved access to information including seed variety selection, best cultivation practices, protection from weather-related damage and handling plant disease (Mittal & Mehar, 2012)

Attempts to apply technological tools and techniques along with agricultural knowledge result in a number of benefits. At first, the ICT tools improve the accessibility of valuable information in a broad range which may lead to improving agricultural productivity and quality. The tools along with appropriate training will enhance their skills in using ICT tools for different purposes which not only effects on the improvement of agricultural practices among farmers but also creates livelihood opportunities that will be gradually increased with minor supports from outside. Thus farmers have confidence and make them easier to adopt recent and advanced ICT tools (Rao, 2004).

## **CHAPTER III**

### **RESEARCH METHODOLOGY**

This chapter includes with the theoretical framework and conceptual framework linked with the theme of the study. Theoretical framework encompassed motivation theory and diffusion of innovation theory. The conceptual framework was relied on the access, use of ICT tools which helps to get benefit to access the agriculture information for the development of agriculture sector<sup>6</sup>. This chapter focuses on the methodology applied to carry out the study. This chapter also includes the sampling method for site and respondent selection and data collection method to collect the relevant data used in result and discussion chapter.

#### **3.1 Study Framework**

##### **3.1.1 Theoretical Framework**

Motivation theory of Fredrick Herzberg's (1959) conforms to satisfaction theories which assert that an employee provided with hygiene factor does not always perform better. Motivation is the force that initiates, guides and maintains goal-oriented behaviors. The forces that lie beneath motivation can be biological, social, emotional or cognitive in nature (Cherry, 2014). Diffusion of Innovation theory propounded by Everett Rogers (1962) is one of the oldest social science theories. It is originated in communication to explain how, over time, an idea or product gains momentum and diffuses or spread through a specific population or social system and the end result of this diffusion as people part of social system, adopt a new idea, behavior, or product. It's the adoption of innovations from top and somewhere constant in the middle and fall down.

The innovation decision process is characterized by five stages namely; Knowledge, Persuasion, Decision, Implementation and Confirmation. In the knowledge stage the individual or household is exposed to the innovation's existence and gains understanding of how it functions. However, even after acquiring information on an innovation, individuals may need to be persuaded to use it because they do not regard it as relevant to their situation. The implementation stage is when an individual puts an innovation into use. The final stage is confirmation during which the individual seeks reinforcement for the decision made (Nguthi, 2007). Leeuwis (2006) further explains that an innovation diffuses within a social system through its adoption by individuals and groups. The adoption process involves an interrelated series of personal, cultural, social, and situational factors. This includes the five distinguishable stages of awareness, further information and knowledge, evaluation, trial, and adoption. Characteristics of a technology, such as simplicity, visibility of results, usefulness towards meeting an existing need, and low capital investment promote its eventual adoption and should be considered when trying to transfer any technology. Particular

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<sup>6</sup>Under the shadow of research mentor Prof. Dr Bharat Shrestha the related theories were outlined in concerned to the whole study objectives, literature review and context.

innovations are used quickly by some and only taken up later by others, while others never adopt them.

Motivation theory suggests that people are motivated to do things because of external rewards. There are different ICT tools by which youth can be motivated toward the agriculture as employment creation and have profitable business. As mobile phones and internet services are easily available, youth are motivated towards the agriculture by introducing new application in mobile phone to have information about agriculture and creating network among the farmers to have success stories among themselves. Diffusion theory of innovation adopting ICT tool could be the new innovation for youth in agriculture where the youth use ICT.

### 3.1.2 Conceptual Framework

Information and communication technologies hold tremendous potential for rural development in Nepal in the areas of agriculture, health, education and industries. The productivity in agriculture is largely attributed to availability of relevant and timely information to farmers. The modern society demands intervention of ICTs in agriculture information dissemination rather than traditional methods. The information exchange by ICT tools has revitalized the role of extension services in providing information, education and decision-making assistance to agricultural producers but there still exists a gap on the information provided because of the problem of illiteracy and language barriers.

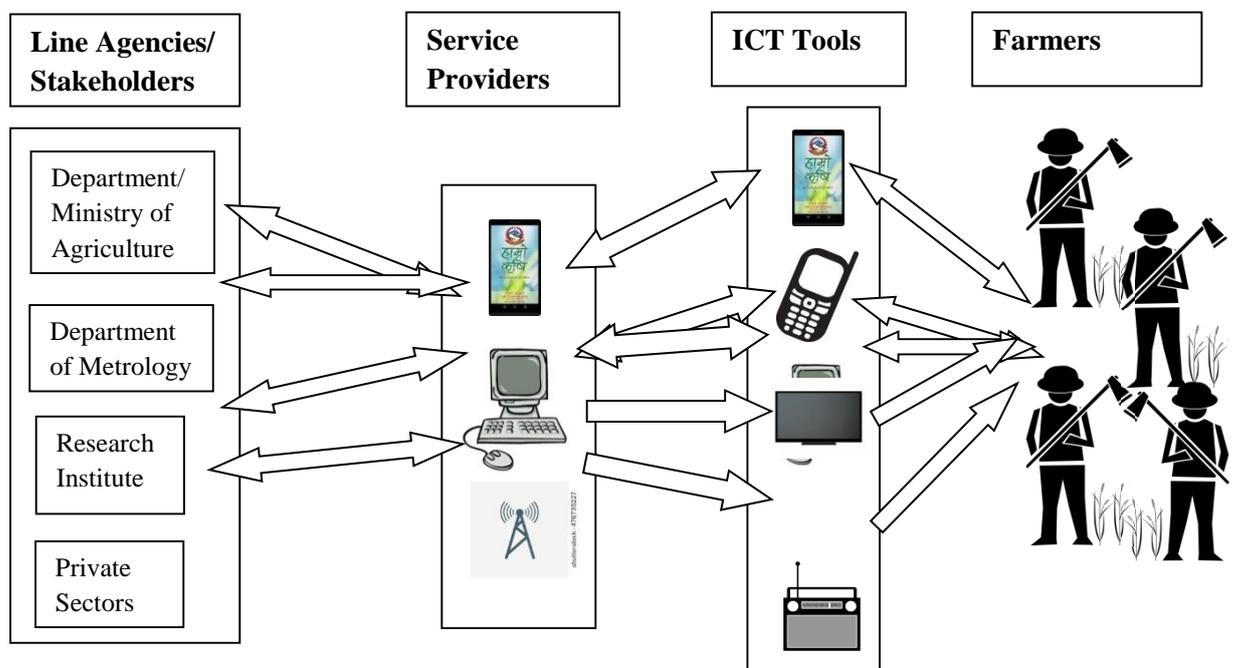


Figure 3. 1 Flow of Agriculture Information

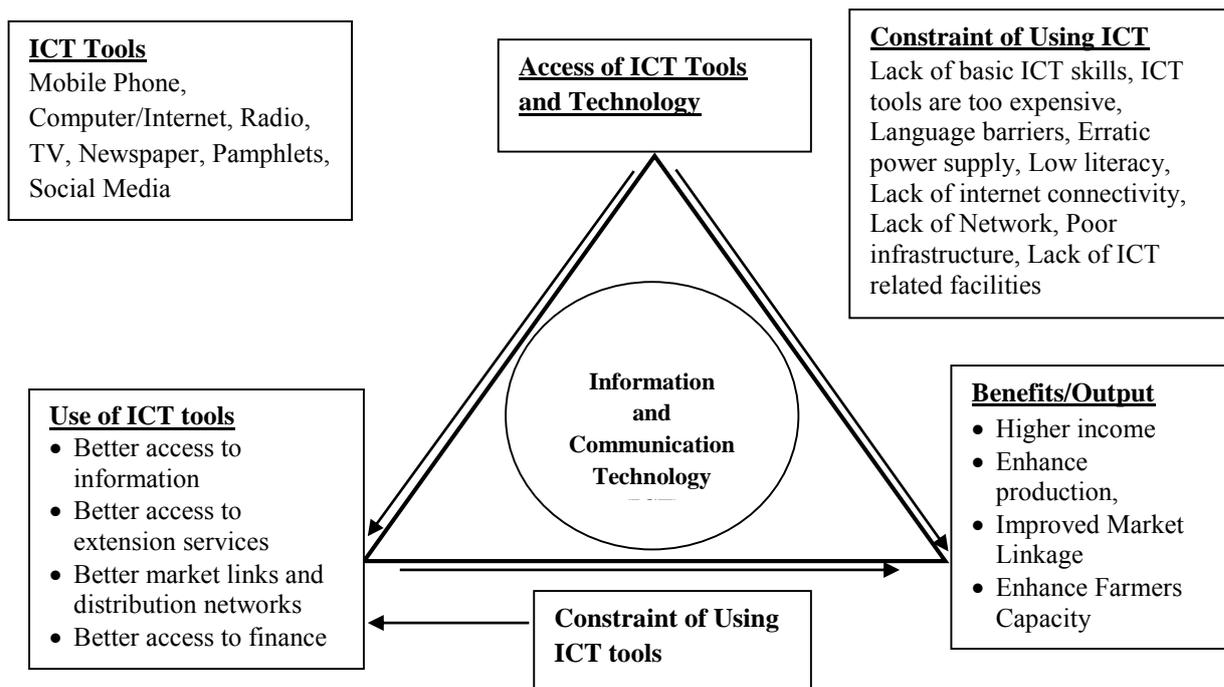


Figure 3. 2: Conceptual Framework of the Study<sup>7</sup>

### 3.2 Research Design

The research work was started with the concept on identifying the problems caused by youth not motivated and interested in agriculture due to low returns, but ICT can be the tool that can motivate youth to make their career in agriculture. These problems are identified based on both literature reviews and reality experienced. With this idea, a scientific research proposal was developed with the guidance and a series of discussions with the research advisor which encouraged on bringing out a critical thinking and thought provoking concepts. Finalization of theoretical and conceptual further helped in developing the questionnaires and field work in generating the information. Both primary and secondary sources were used for information collection. The secondary sources included review of literature, web sites observation, journals and article. Similarly, different data through the primary sources were collected through household surveys, focus group discussions with young farmers using ICT and direct observations.

### 3.3 Assumptions of the Study

With due considerations of the problems reviewed, objectives set and based on the review of different literatures, the following presumptions were made

- i) The access of Information and Communication Technologies are based on the knowledge of ICT of the respondent, source and duration of access and time table of access of ICT.

<sup>7</sup> A thoughtful discussion was done with Prof. Dr. Bharat Shrestha during proposal development and in the process of writing for making the conceptual framework more specific towards the topic of the study.

- ii) Farmers involvements in agriculture are encouraged by supporting and promoting rural infrastructure and equal access to the use of ICTs and efforts to improve access to market information, production techniques, new technologies and financing opportunities are complemented by the farmer attitude of using ICTs, their capacity to innovate and their propensity for taking higher entrepreneurial risks.
- iii) The benefit of using ICT for agriculture promotion depend on the access and usage of ICT directly therefore, maximum use of ICT tools effective for accessing information will effect on the development of agriculture sector and poverty reduction

### 3.4 Method of Sampling and Procedures

#### 3.4.1 Study Area

##### DHADING DISTRICT

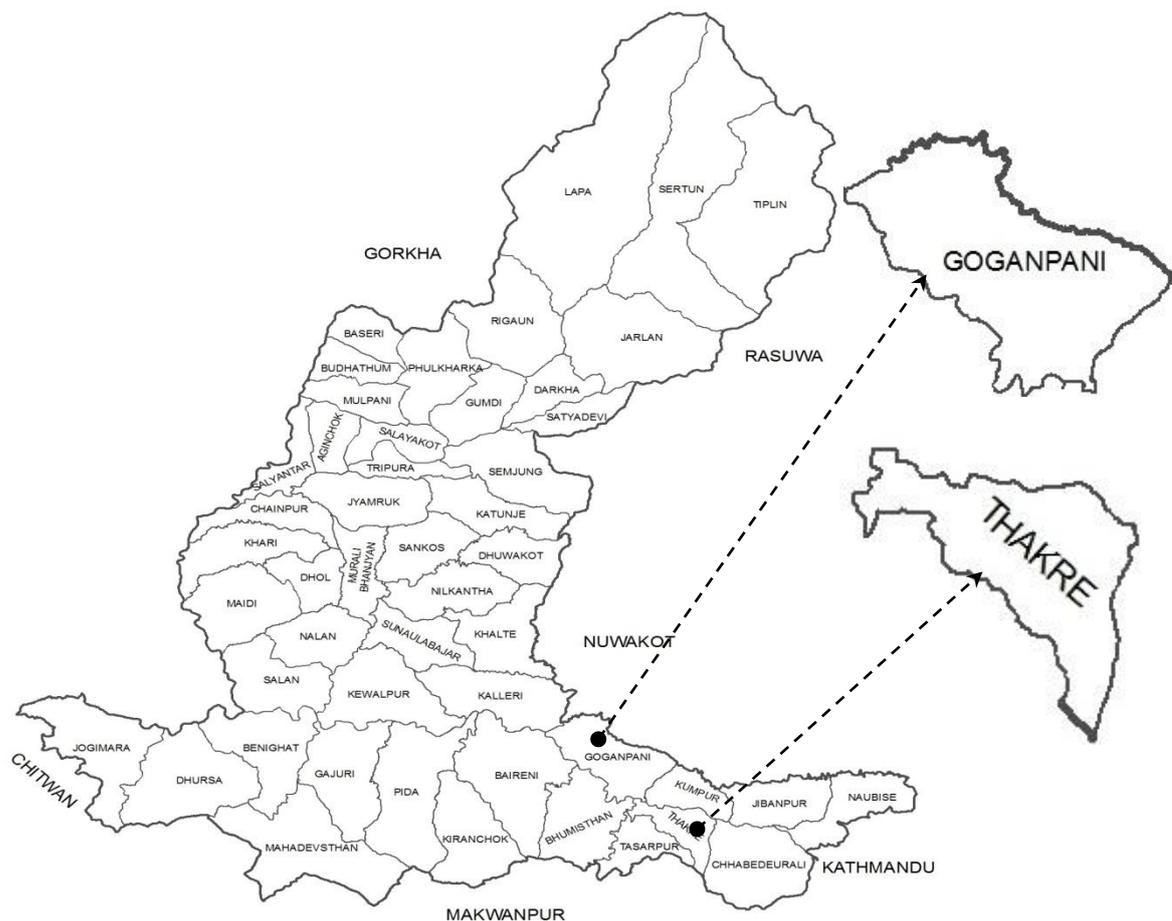


Figure 3. 3: Map of Study Area

Dhading district was selected purposively for the study because the district was one where ICT related project Building Resilience to Climate Related Hazards Project has been launched by Ministry of Agricultural Development supported by World Bank. Dhading district is located in Province 3 with area of 192,487 hector (1926 square kilometer) with total cultivable land area of

48,106 ha, which consisted of 12,949 hector khet land and 35,157 hector bari land. The district is covered with pasture land of 15,941 hector, forest area of 67,450 hector, bushy area of 25,404 hector, land slide covered land of 10,345 hector, and other land 35,568 hector. According to the National Census 2011, the total population of the district is 380,369 with a growth rate of 1.97. About 52.83% of people are being involved in agriculture as subsistence livelihood. For the study area, ward number 6, 7, 8 and 11 of Thakre rural municipality and ward number 8 of Galchi rural municipality were selected which previously Thakre VDC and Goganpani VDC of Dhading District.

### **3.4.2 Sampling Method**

- S1 This study was mainly focused on farmers accessing and using ICT tools for getting benefit through use of it with accessing information. Therefore, the purposive sampling method was used to find out the proper area where ICT was accessed and used for accessing agriculture information and respondents who have knowledge or experience about the ICT tools in the study area.
- S2 Next, key informant Agriculture, Social and Communication Specialist and Monitoring and Knowledge Management Specialist of Building Resilience to Climate Related Hazards Project, Ministry of Agricultural Development has been interviewed to find out the proper place and respondent accessing or using ICT tools.
- S3 with getting information about the respondent of the study area the purposive sampling method were used to collect the relevant information. So it is helpful to find out the information that is good enough to provide an overview of the situation to inform strategic decisions as well as fast enough to provide the information within a useful time frame.
- S4 Further, purposive sampling method key informant interviews with local level Agriculture Center personnel, District Agriculture Officers, Staffs of Building Resilience to Climate Related Hazards Project who are familiar with problem and issues of access, use and benefit of the ICT tools

### **3.4.3 Sample Size Determination**

- S1 The total number of households in former Thakre and Goganpani VDC of Dhading District was 3274 and the total numbers of household using at least one facility that is ICT tools household by types of household facilities are 2,866.
- S2 In research, researcher should keep in mind that the sample size should be taken optimum with respect to population size which fulfills the representativeness, reliability, flexibility and cost effectiveness. The information collected from sample size respondent represents the information from total population. Statistically, the maximum 30 percent is taken for small population but for moderate population 5 percent and 10 percent are taken. So in this study 5 percent of total population size was taken as per researcher convenient

- S3 The total population size (N) is 2866 therefore, the sample size (n) is taken 5 percent of total population (N) which is 143 households from total household population.
- S4 Lastly, 5 - 10 key informants will be interviewed and 4 group of focus group discussion will be formulated and interact with them from the two study area.

Table 3.1 Sample Size (n) Determination

S.N.	Study Area	Population Size (N)	Sample Population (n)
1	Thakre	1,857	93
2	Goganpani	1,009	50
	Total	2,866	143

### 3.5 Sources of Data and Collection Methods

#### 3.5.1 Secondary Data Collection

Secondary data refers to the data/information that was already collected by someone from various published and unpublished documents. The secondary data were collected with reviewing the publication, books, journals and articles, academic research, statistics and historical documents and dissertations. The secondary data are important to find out relevant literatures based on theme of studies and accumulate the ideas and concepts which helped to evaluate primary data collected in the study. Information, facts and figures taken from the secondary sources had been used to support and critically verify and supplement the information inferred in the finding of this study.

Secondary data in this study mainly focus on the relevant data through literature review of the access, use and benefit of ICT tools for agriculture promotion and was collected from the nationally and internationally published books, journals, articles and research paper. This secondary data had helped in cross examination and generalization of the primary data collected during field survey. Secondary data like study area overview, total population, average household size, population structure and literacy rate were collected from the CBS data, central and local government institution document which was later revisited during field survey.

#### 3.5.2 Primary Data Collection

Primary data were collected from various method i.e. interview, observation, questionnaires, schedules, focus group discussion, key informants, warranty cards, mechanical devices and depth interview etc. During field survey the tools for the primary data collection had been used were household survey, key informant's survey, focus group discussion and personal observation. The data/information had collected with the pre structured questionnaire interview with the respondent, checklist preparation for focus group discussion and key informants survey. Primary data in this study focus on the household information like family size, population structure and age and education level of respondent which has relationship with the access, use and benefit of ICT tools

for agriculture promotion. Primary data in this study has been collected to find out knowledge about ICT, duration and time access of ICT, usage of ICT tools in accessing agriculture information, constraint of using ICT tools, benefit of using ICT tools in agriculture sector and training provided to use ICT tools for effectively getting benefit from ICT tools. The tools used for primary data collection in this study were as follows:

**(a) Household Surveys**

Household survey were one of most important data source for collecting information from the individual and household for acquiring raw information about the study area as per the requirement of the researcher and help us to understand the general situation and specific characteristics of individual household or all households in the population. Household survey is the survey conducted to collect relevant information about individual and household. Household survey was carried out with individual respondents at their household using well-structured questionnaire regarding access, use and benefit of ICT tools for agriculture promotion. The tools for the Household survey were a well-structured close ended questionnaires designed by focusing on the problems and objectives of the study to find out the access and usage of ICTs tools and getting benefit through usage of ICTs tools. The questions were asked with individual respondent in the form of interview. A total of 143 households were purposively selected for interview to collect the primary information of household and one of the household families were chosen who were accessing/using ICT tools for agriculture promotion to establish the data more reliable and authentic for the discussion of the study.

**(b) Focus Group Discussions**

Focus group discussion (FGD) is a method of qualitative research for data collection in an organized way in which group of people are interviewed to find out the perceptions, opinions, beliefs and attitude of the respondent towards the specific subject. Focus group discussion was conducted through the discussion with the relevant group about their ideas and thought on the topics of the study. The interaction between groups of researcher and participants will be organized to get relevant findings. A checklist was prepared to conduct focus group discussion for getting more specific information about access, use and benefit of ICT tools with groups of people who have knowledge or experiences about ICT tools. For this study, 4 groups of focus group discussion were formulated which includes 1 male group, 1 female group, 1 mixed Group of both male and female and 1 mixed group including key informants. Each of the group for the focus group discussions was composed of 6 persons of farmers who have been accessing and using ICT for agriculture promotion and concern person who are familiar with issues. Information generated from the focus group discussion was considerably supplemented to verify and validate information generated from other sources.

### **(c) Key Informants Surveys**

Key informant surveys are the method in which people who know what is going on in the community are interviewed in detail. The purpose of a key informant is to collect information from a wide range of people including community leaders, experts who have first-hand knowledge about the topic which can provide insight on the nature of problems and give recommendations for the solutions. Key informant surveys/interviews for this study refer to in-depth interviews with leaders of farmer's associations who are using ICT tools, agriculture center personnel, District Agriculture Officers, Staffs of Building Resilience to Climate Related Hazards Project who are familiar with the problem and issues of access, use and benefit of the ICT tools for agriculture promotion. Key informant surveys were conducted with a checklist to capture relevant data regarding access, use and benefit of ICT tools which helps in the development of the agriculture sector therefore data through key informants helped in justifying the findings derived from household surveys and focus group discussions.

### **3.6 Reliability and Validity**

The information collected during field work to the best of the researcher's knowledge was completely reliable because firstly, the interview was taken by the researcher and no associates were used and secondly, the questions asked of the interviewees were in their own language as the researcher was from the same location. No biasness was involved. Questions and answers were clear during interviews and discussions with the respondent households. This attests to the full accuracy of the information generated at the household and group level. No disturbances from outsiders were made during interviews and discussion sessions. Respondents were free to say their thoughts and share their ideas.

The research was based on an in-depth survey of ICT tool users among farmers where the problems correspond to accessing information with the use of ICT tools for agriculture development. The approach of the study offers an excellent way to gather firsthand information from ground reality. The study helps to understand the knowledge level, source, duration and time of access of these tools from household surveys, further the use of these tools in accessing agriculture information, importance of accessing information were discussed with the respondent. The benefit of accessing information was further studied in the field survey with discussion with the respondent. In addition, the study explores the difficulties in access and use of ICT tools which helps to suggest for policy formulation and further research study. The study further identifies the relation between the access and use of ICT tools with the benefit through accessing information for agriculture promotion. The data about the access, use and benefit of these tools are analyzed with collection of first-hand data with the farmers who have relevant information about ICT tools accessing agriculture information.

Further, to validate the information collected from the household interviews, key informant's survey and focus group discussions were done. Some of the information collected from key informant and focus group discussion were validated during household interviews and observations. Similar types of questions were posted at different levels to validate the information to each other.

### **3.7 Analytical Procedures**

The first hand data collection from the field was followed through different phases before analysis. Firstly, filtering and sorting for the selecting the necessary information and removing the unnecessary information. Secondly, data entry was done in MS-Excel software. In this case, Excel was used for the data entry and analysis. Lastly, all the information in the software was coded with specific codes to derive the desired information during the analysis phase.

The data are analyzed with the help of using Excel to derive the desired statistical values for the statistical analysis and hypothesis testing to support the stated objectives of the study. All the information is coded, entered and tabulated. To make the findings clearer and striking to the readers, different graphs, charts and diagrams are prepared.

## **CHAPTER IV**

### **RESULTS AND DISCUSSIONS**

This chapter describes the findings of the field survey from household survey questionnaires and provided analytical view point based on review of literature, FGD and key informant survey. The results and discussion chapters has explained the access to information and communication technology with the farmer's knowledge about ICT, sources and duration of access to different types of ICT, use and efficiency of ICT in agriculture sectors from use of ICT in accessing agriculture information, importance of using ICT and constraint of using ICT and finally captures the benefit taken from ICT.

#### **4.1 General Information of the Study Area**

Dhading district is located at the border of Kathmandu Valley of Province 3 and is the only district of Nepal which ranges from the mountain Ganesh Himal to the Churevawar pradesh of Tarai. Geographically the district spreads 27°40" E to 28°17" E and 80°17" N to 84°35" N. It is surrounded by Gorkha district in the West, Kathmandu and Nuwakot in the East, Makwanpur and Chitwan in the South and Rasuwa district to the North. The north frontier is also bordered with Tibet Autonomous Region of the Peoples Republic of China. The shape of the district is like a military boot and represents different agro-climate zone comprising of valleys, Tarai (flat land) to middle hills and high hills. The elevation ranges from 488 meter to 7409 meter above mean sea level. The highest peak of Ganesh Himal is 7409-meter-high located most part of the district at Tipling VDC. The major climate zones found was Sub Tropical Zone (areas below 1000 m. above mean sea level) with the annual average temperature of above 20 °C, Temperature Zone (altitude between 1000 – 3000 m. MSL) with annual average temperature between 10 °C – 20 °C and Alpine Zone (greater than 3000 m above MSL) with average temperature of less than 10 °C.

It is also one of the most backward districts which stand in 41st rank in Human Development Index (HDI) among 75 districts of Nepal. It has poor development infrastructures like roads, electricity, and others. Most of the populations are based on subsistent agriculture and have low income for basic livelihood. It is commonly observed that large percentage of the youth populations are unemployed. The district has high percentage over 35 percent of poor and marginalized ethnic population. The main marginalized ethnic communities in the district are 19 percent Tamang, 9 percent Dalits, 3 percent Chepangs, and 1.2 percent Kumals. These ethnic communities have poorer socio-economic condition far behind the average population of the district.

District population was 336,067 populations with a growth rate of 1.97 and an average family size is 4.5. The district has only 43 percent adult literacy rate whereas female literacy rate is considerably lower 33.8 percent compared to the male 53.7 percent. It covers an area of 192,487 hector (1926

square kilometer) with arable land of 48,136 hector and agriculture land of 35,150 hector whereas the population having no land was 0.6 percent, less than 1 hectors was 86.8 percent and greater than was 1 hector was 12.6 percent. While number of agriculture household with holding no land 392 has 12.7 hector of land and holding land 64,125 has 35,385.3 hector. The study was conducted on ward number 6, 7, 8 and 11 of Thakre rural municipality and ward number 8 of Galchi rural municipality previously Thakre and Goganpani VDC of Dhading District. Thakre total population is 9,838 of 2,141 households with male 4,781 and female 5,057 and Goganpani total population is 5,563 of 1,133 households with male 2,696 female 2,867. Goganpani has 3334 hector of land with 1285 arable land and 1,003 agriculture lands whereas Tharke has 1566 hector of land with 652 arable lands and 827 agriculture lands.

Table 4. 1 Socio-economic Characteristics of Respondents

Characteristics		%
Households (No.)	143	
Family Size (No.)		4.6
Age (Year)	25-34	21.7
	35-44	44.1
	45-54	11.9
	55-64	18.9
	above 65	3.5
Population Structure (No.)	Male	58.7
	Female	41.3
EAP <sup>8</sup>		77.6
Education	Illiterate	26.6
	JL <sup>9</sup>	40.6
	SE <sup>10</sup>	25.2
	HE <sup>11</sup>	7.7

Source: Field Survey, December 2017

It is depicted in Table 4.1 that the average family size of the sample population was found as 4.6 in 143 households. The ages between 25 to 34 years were 21.7 percent of respondent, likewise 44.1 percent of respondent were ages between 35 to 44 years, 11.9 percent of respondent were ages between 45 to 54 years, 18.9 percent of respondent were ages between 55 to 64 years and only 3.5 percent of respondent were ages above 65 years. The population structure of male was high of 58.7 percent and female was 41.3 percent and the economically active population was 77.6 percent. While in education, 26.6 percent was illiterate, 40.6 percent was just literate, 25.2 percent under secondary education and 7.7 percent of the respondent have higher education.

<sup>8</sup> Economical active population considered as age 15-60 years

<sup>9</sup> Just literate refer as attained formal education

<sup>10</sup> Secondary Education refer as Intermediate Level

<sup>11</sup> Higher Education refer as Graduate level and above

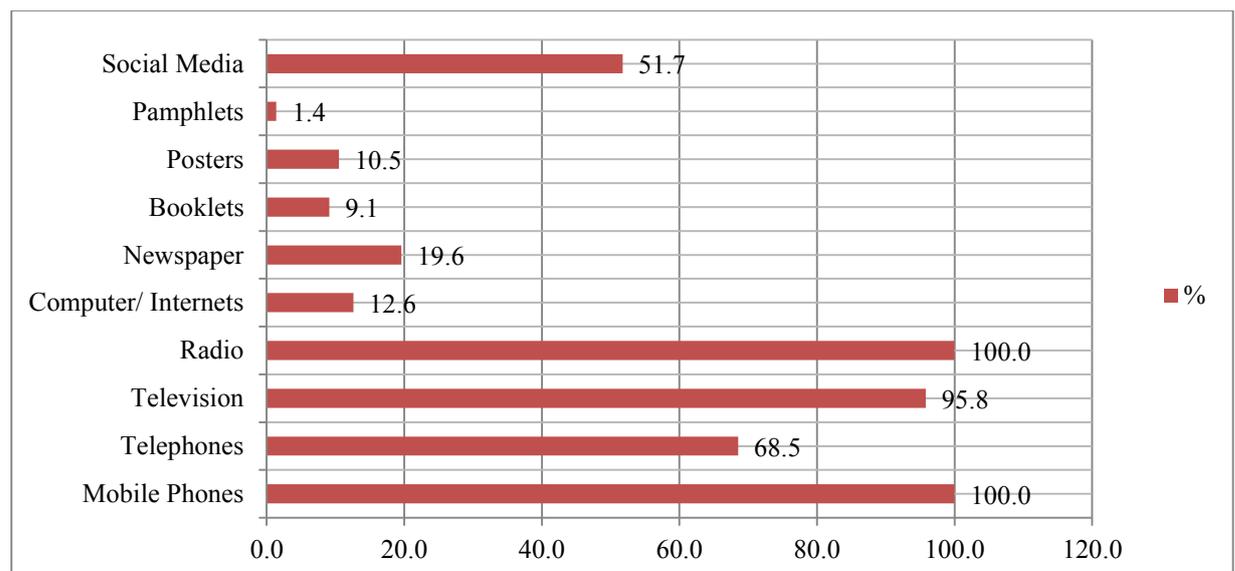
## 4.2 Access to Information Communication Technology

### 4.2.1 Farmers Knowledge About ICT

The introduction of ICT through television programs, radio, internet and other ICT systems has positive and negative impact in society. The positive impact has been access of information and empowering of youth through education materials while negative impact has been the erosion of cultural values and practice amongst the youth. On accessing to these tools, the young people and farmers need knowledge, information and acquisition of skills so that they are effectively involved in national development efforts. However, accessing these tools for acquiring different information related to agricultural activities and other sectors, farmers had limited access to appropriate information due to low education and lack of training. The tools mentioned for the study were mobile phones, telephones, computer/ internet, television, radio, newspaper, booklets, reports, posters and pamphlets.

All of the respondents have some knowledge about these tools. Most of the farmers are attracted towards mobile phones which is known by almost all of the farmers and have highest in number than others were of 100 percent. Radio has been using as means of communication from many years by fathers, forefathers and other ancestors, therefore 100 percent of respondent have the knowledge about radio. Likewise, television was developed since many years and it is medium from which the people has been listening and visualizing the picture to gain knowledge about the relevant information and 95.8 percent of the farmers were well known about television which ranks the third highest in number through the survey (Figure 4.1).

Figure 4. 1 Knowledge about ICT tools



Source: Field Survey, December 2017

Social media becomes one effective medium to communicate with family, friends and extension workers that 51.7 percent of respondent have knowledge about it and was increasing drastically from rural and urban area but the knowledge about the computer and internet was only 12.6 percent. There were highest number of farmer who knows about mobile phones and social media but there were least number of farmers who know about posters, booklets and pamphlets which were 10.5 percent, 9.1 percent and 1.4 percent respectively. Newspaper were also oldest means of communication and were only the medium to communicate message of the different parts of country, world and people but only 19.6 percent of respondent farmers has knowledge about newspaper due to remoteness for availability of it. Through this survey, it was found that most of farmers are attracted towards mobile phones as it easy to handle, easy to carry and easiest medium to communicate with friends, families and other organization through own ICT tools so there were highest percent of farmers knowing about the mobile phones.

#### 4.2.2 Access to Different Types of ICT

Information Communication and Technologies have increases a potential of farmers for access to better education and knowledge. Digital opportunities are particularly effective in reaching rural communities that lack educational resources. Lack of access to information and communication technologies has remained a major challenge to youth development. The effective use of technology will help to strengthen various forms of youth engagement. The effective technology and associated electronic content has significantly changed the lives of many young people in developed countries, this is not always the case for those in less developed countries (UN, 2012). Access to ICTs such as mobile phones and the Internet, especially broadband, remains a challenge for youth in the developing world.

Table 4. 2 Source and Duration (%) of accessing ICT tools

ICT Tools	Sources (%)					Duration (%)			
	Own	Neighbor	Friend	Gov.	Other	<5	5<10	10<15	>15
Mobile Phone	100					21	64.3	14.7	
Telephone	29.4					2.8	9.1	3.5	14
Television	89.5					4.2	21.7	44.8	18.9
Radio	42				19.6	5.6	10.5	28.7	16.8
Computer/Internet	12.6					12.6			
Newspaper	1.4	2.8	2.1		12.6		5.6	10.5	2.8
Booklet				6.3	2.8		5.6	2.1	1.4
Poster				2.8	7.7		2.1	2.8	5.6
Pamphlet				2.1			0.7		1.4
Social Media	48.3					48.3			

Source: Field Survey, December 2017

The tools in access to the farmers have been identified through the sources and time duration. The sources of accessing were categorized as the access through own, neighbor, friend, government organization and other while the time or duration of accessing were classified as the years of using less than 5 years (<5), between 5 to 10 years (5<10), between 10 to 15 years (10<15) and more than 15years (>15).

The ICT tools can be access through different sources; own, friend, neighbor, government organization and others. The 100 percent of farmers were found access to mobile phones and all of them had got source of using their own phones and access to telephone also had the source of using their own which was 29.4 percent. Likewise, sources of accessing television by farmers were also using their own which was 89.5 percent while the source of accessing radio by the respondent farmers through own and others factors were 42.0 percent and 19.6 percent. The source of accessing computer/internet was of their own were 12.6 percent and newspapers were accessing by owns, sharing among neighbors and friends were 1.4 percent, 2.8 percent, 2.1 percent respectively. The source of accessing booklets was from government organization and others were of 6.3 percent and 2.8 percent respectively and also source of accessing of posters are same as booklets which was government organization and others were 2.8 percent and 7.7 percent respectively which was mainly found in the walls and street near government organization and fixed on wall by NGO and INGO for awareness raising activities. While talking about the source of accessing pamphlets by respondent farmers had got their access from government organization while visiting to office for fund and getting information related to agricultural activities which were only 2.1 percent of total respondents.

The duration of the farmers accessing of ICT tools were found from many years, some were accessing from less than 5 years, between 5 to 10 years, between 10 to 15 years, or more than 15 years. The farmers accessing mobile phone was found highest between 5 to10 years were 64.3 percent after that 21.0 percent in less than 5 years and 14.7 percent between 10 to 15 years. Likewise, the farmers accessing telephone was found between 5 to 10 years were 17.5 percent and 10 to 15 years were 15.8 percent. The radio and television were the oldest medium of communication for information flow within the respondent farmers and both radio and television was found higher between 10 to 15 years which were 28.7 percent and 44.8 percent respectively. However, computer/internet was found 12.6 percent in less than 5 years and the farmers accessing newspaper were highest between10 to15 years were found 10.5 percent and least in greater than 15 years were 2.8 percent. The farmer duration accessing booklets were found 5.6 percent between 5 to 10 years, 2.1 percent between 10 to 15 years and 1.4 percent in greater than 15 years and posters were 2.1 percent between 5 to 10 years, 2.8 percent between 10 to 15 years and 5.6 percent in greater than 15 years whereas accessing pamphlets were found between 5 to 10 years and greater than 15 years were 0.7 percent and 1.4 percent respectively. As the social media is one of the latest

ICT tools and most of youths and farmers are attracted to it to connected with friends, families and others extension workers therefore duration accessing social media quite higher other than mobile phone and television, 48.3 percent of respondent were accessing the social media during less than 5 years.

Table 4. 3 Number of Farmers accessing of ICT tools

<b>ICT Tool</b>	<b>Access (%)</b>
Mobile Phone	100.0
Telephone	29.4
Television	89.5
Radio	61.5
Computer/ Internet	12.6
Newspaper	18.9
Booklet	9.1
Poster	10.5
Pamphlet	2.1
Social Media	48.3

Source: Field Survey, December 2017

According to the field survey, access of ICT tools like mobile phone, telephone, television, radio, computer/internet, newspaper, booklets, posters, pamphlets and social media are as follows: the access of ICT tools mobile phone was found highest in number i.e. each and every household are in touch with mobile phone i.e. out of total 162 households, 100 percent of respondent farmers had in access of Mobile phone. As compare to others ICT tools, lowest among ICT tools that in access to farmers are pamphlets which is only 2.1 percent of the respondents. After mobile phone, the second highest ICT tool in access to farmers was found television which was of 89.5 percent whereas telephone access was found only of 29.4 percent. Likewise, the access of radio was of 61.5 percent as it was found some of household has radio set of their own and some didn't have exactly the radio set but they listened from mobile phones. One of the most important technologies of today's world is computer/internet but only 12.6 percent of farmers are in access to it which was quite in lower percent as compared to others. While access to booklets were only of 9.1 percent, as booklets were considered as the mostly used tools but nowadays instead of reading books farmers prefer technology and digitalized system therefore social media are becoming one of the reliable technologies for sharing information among farmers and 48.3 percent of respondent was found using it.

Thus the field survey show that the access of the mobile phone was highest among other tools as mobile phone will be available within the working time and easy to handle due to portable i.e. farmer carry in pocket which makes the time of accessibility and availability of mobile phone is flexible to communicate with friends, family and extension workers. But for other ICT tools radio and television, the time of access were mostly between 6 pm to 10 pm after working time i.e. mostly

the access of ICT tools like television and radio for audio and visual program about agriculture activities. While other ICT tools newspaper, booklets, pamphlets are rarely access to farmers as most of time the farmers were at the field.

### **4.3 Use and Efficiency of ICT in agriculture sectors**

#### **4.3.1 Use of ICT for accessing agriculture information**

People both in urban and rural areas revealed that agriculture is the last career or job choice. For many agriculture remains an old fashioned sector, a sector that cannot generate income for their living. With the rapid development of Information Communication Technology has exposed rural farmers into fast moving world, even those who wish to engage in agriculture would want to practice modern agriculture that use more of technical skills and less energy to produce. Farmers interviewed in the study revealed to be attracted by the development of telecommunication sector which has changed every aspect of people's life even in rural areas. Using of ICTs tools for accessing information in agriculture sectors, for example for spreading information about practices and market prices for agricultural products, requires other tools like mobile phones, computers etc. has proved to be effective tools in stimulating young people's interest in agriculture. These tools help to promote agricultural interest and opportunities for youth and finally, they bring about new jobs liked to agricultural software and technology based agribusiness with mobile applications, market information system, etc.

In Table 4.4, the data were collected for usage of these tools for good agricultural practice, disease and pest management, weather information, market linkage and prices, extension services and financial management in agriculture sectors. According to the field survey, mobile phone was highest in use for agriculture information among others tools due to easy to handle, easy access of agriculture information and the mobile phone was used through *Hamro Krishi* Application, SMS and Call Services to contact expert/extension personnel. As depicted in table 4.4, the mobile phone was used mostly for accessing information about disease and pest management which was 70.6 percent as disease and pest has been main problem for agriculture production. 33.6 percent of the respondent usage of mobile phone was for accessing information about extension services like support system from government bodies, input supplies and others. As the climate change causes losses in agriculture production and decreases the farmer profitability so weather information was also one of the important aspects of the accessing information for agriculture production where 29.4 percent of the respondent usage mobile phone for accessing weather forecast for appropriate agriculture production as per the temperature available for agriculture products. 20.3 percent of respondent usage mobile phone for good agricultural practice to apply somehow same approach for agriculture profitability and 14.7 percent usage mobile phone for accessing information about financial management i.e. accessing information about subsidies, credit for agriculture activities

and insurances of agriculture products. As per the field survey one of the least usage of mobile phone was information about the market linkage and prices was 9.1 percent as accessing market information does not make any difference in agriculture product prices because middleman has overlap the market link and distribution network.

The second highest was television which has been used for accessing information about good agricultural practices 16.8 percent, extension services 8.4 percent, disease and pest management and weather information were 4.9 percent and financial management 2.8 percent. The radio was third in rank for accessing agriculture information through community radio program and local radio station were used for accessing information like good agricultural practice, disease and pest management, weather information, extension services and financial management. The least usage was pamphlets 1.4 percent for disease and pest management and extension services. The social media like Facebook, twitter were used by 8.4 percent of respondent for good agricultural practices and 4.2 percent for extension services whereas Newspaper were used by 7.7 percent for good agricultural practices and 1.4 percent for market linkage and price, Booklets were used by 1.4 percent for good agricultural practices and 4.2 percent for disease and pest management and poster were used by 2.1 percent for information about extension services and financial management.

Table 4. 4 Use of ICT Tools

ICT Tools	Good Agricultural Practices (%)	Disease and Pest Management (%)	Weather Information (%)	Market Linkage and price (%)	Extension Services (%)	Financial Management (%)
Mobile Phone	20.3	70.6	29.4	9.1	33.6	14.7
Telephone					5.6	5.6
Computer/ Internet	3.5	2.1	2.1	2.1		
Television	16.8	4.9	4.9		8.4	2.8
Radio	9.8	6.3	4.9		3.5	2.1
Newspaper	7.7			1.4		
Booklet	1.4	4.2				
Poster					2.1	2.1
Pamphlet		1.4			1.4	
Social Media	8.4				4.2	

Source: Field Survey, December 2017

The finding of the study shows that the most accessing agricultural information was disease and pest management and second was good agricultural practices. The least usage of these tools for accessing information related to market linkage and price which quite low compare to accessing other agriculture information. Further it shows that majority of the farmers in rural areas were found to have used mobile phone as a tool of connecting with people and friends who shows that the increase in the usage of mobile phones is increasing at an alarming rate. This is due to the reason

that mobile phones are easy to access and easy to handle than other tools. The usage trend in mobile phones also indicated that it can offer huge scope in the future if appropriately use for the purpose of agriculture and other rural development purposes. Thus mobile phone was widely used mainly for the purpose of social communication. This study is also in accordance with the findings of Mittal and Mehar (2012).

Next to mobile phones, television was also used very frequently by the farmers. It was also reported that the use of radio is lower as compared to mobile phones and television since the level accessibility was also lower as compared to other tools. Computer/Internets are being used rarely by few of the respondents who are young and educated. Further, there was less usage of posters, pamphlets and booklets as farmers were quite low visited to the government organization due to its length and hassle process to have services.

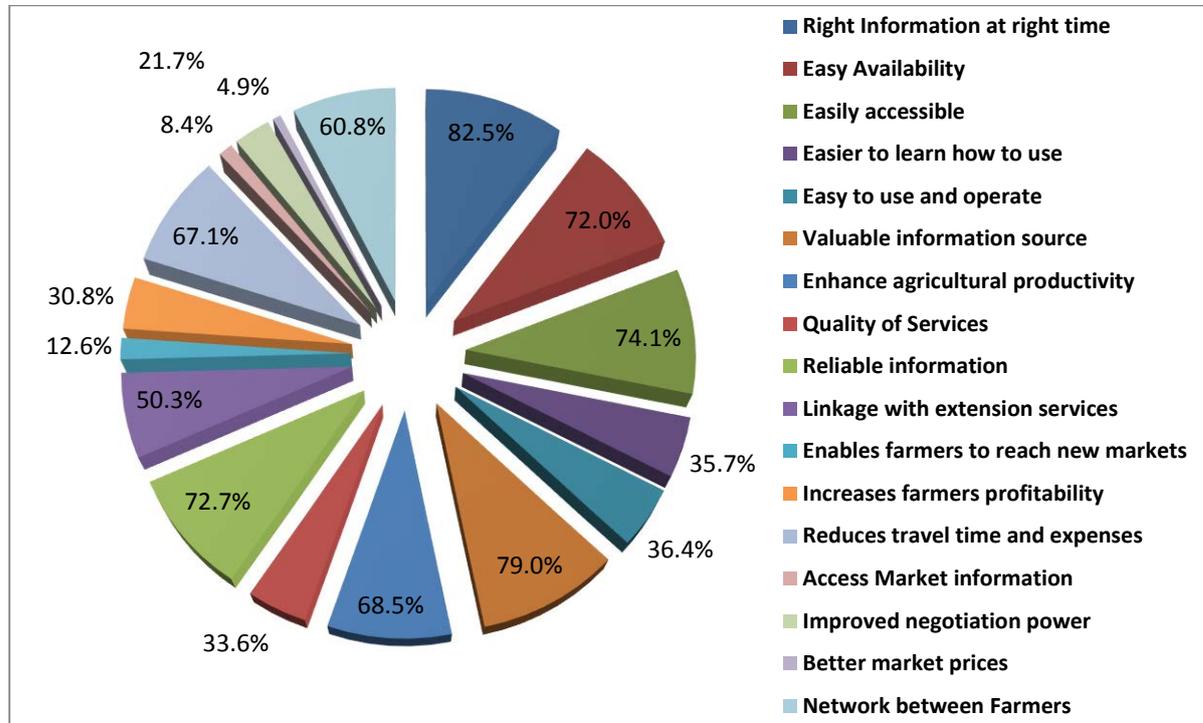
#### **4.3.2 Importance of ICT**

ICT is fast becoming popular in the country today and it has great importance in globalized world. The importance of these tools in development process was long recognized and access of these tools was even made targeted in the fight against poverty. It holds a lot of potential for economic growth and takes the initiative of empowering the youths for the challenges ahead as well as build the confidence level on them. Almost every single activity in the modern world is becoming more dependent on the application of ICTs for one use or another. The benefits of these tools reach even those who do not themselves have first-hand access to them. Further it has become imperative to acquire knowledge and skills to use these tools for a means of meeting current development goals (Okyere and Mekonnen, 2012).

Figure 4.2 shows the why ICT tools was used most by farmers i.e. importance of using these tools for agriculture promotion. The highest percent of respondent out of 143 households, 82.5 percent reveals the importance of using was providing right information at right time likewise second highest 79 percent was valuable information sources for improvement in agriculture production to the farmers therefore they could use this information in agriculture activities which helps in better production. While taking about other importance was easily accessible by farmers, easy availability, enables to get correct and updated information, enhance agricultural productivity, reduces travel time and expenses, helps to make network between farmers, linkage with extension services that there has been good relationship with extension workers and input suppliers for efficient extension services delivered, easy for farmers to use and operate, easier for farmers to learn how to use, improves the quality of services offered to farmers, increases farmer's profitability and improved negotiation power. But figure depicted market linkage and price of agriculture product was preferred as less important by the respondents compared to other agriculture information that 8.4

percent respondent reveals that enables farmers to reach new markets and access market information while 4.9 percent secure better market prices.

Figure 4. 2 Importance of using ICT tools



Source: Field Survey, December 2017

### 4.3.3 Constraint of Using ICT tools

The major constraint faced by farmers for effective utilization of ICTs tools was revealed by 81.1 percent as lack of basic skills for usage which shows there was a lack of training and practical exposure to use of these tools and felt that there needed some training to educate and teach them how to use that could benefit them for agriculture and rural development. Lack of ICT related facilities such as computers, internet ranked second as reported by 76.2 percent of the respondents. Most of the facilities such as the Internet Café are located only in major town. Extension workers who are supposed to be resident in rural areas and serving farmers may not have adequate access to them. Lack of awareness of benefits has another problem for using these tools which reveals by 69.2 percent of respondent therefore there were lack of confidence in operating particularly mobile phone applications due to less exposure and lack of awareness of how to properly use in order to derive its benefits.

Farmers also had difficulty in using mobile applications and internet due to the lack of skill in using it. This however is related with low level of literacy. 68.5 percent of respondents said they cannot use most of the basic functions of the mobile phones, such as SMS, mainly because of illiteracy and lack of skill in using it. Whereas 57.3 percent of the respondents have revealed the problem of

accessing using of these tools due to lack of electricity. Power supply is erratic and unstable in most rural areas which creates problem in the use due lack of electricity at appropriate time there was difficulty in charging mobile phones, using television, radio and other tools as well.

Table 4. 5 Constraint of Using ICT

Constraint of Using ICT	%
Lack of basic ICT skills	81.1
Lack of ICT related facilities	76.2
Low literacy	68.5
Erratic power supply	57.3
Lack of Network	54.5
Poor infrastructure	53.1
Language barriers	44.1
Lack of internet connectivity	39.9
ICT tools are too expensive	21.7
Lack of awareness of benefits of ICTs	69.2

Source: Field Survey, December 2017

Lack of network connectivity is also one of the problems faced by the farmers in using mobile phones that 54.5 percent of farmers disclose the connectivity is very low and limited to only few networks. Due to this reason, farmers do not find the use of mobile phones as reliable and credible when the condition of low network connectivity is a barrier to their usage. Poor infrastructure like road connectivity, bridge and telecommunication infrastructure, poor connectivity of the internet services due to least or no internet provider in rural areas revealed and the cost of repairing of mobile phones and television sets is quite high which makes these tools too expensive. The most of mobile phones were in English language menus therefore 44.1 percent farmers have language barriers to use the mobile phone therefore they had difficulties with understanding the English language which create technical barrier for using mobile phone.

The findings reflect what was observed on the ground where factors like low education, illiteracy and lack of basic skills resulted in slower adoption of these tools to some farmers particularly to the informal and primary school education holders. This notifies that knowledge and basic skills are important aspects if farmers are to use effectively for accessing agriculture information. Basic knowledge and skills can enable farmers to take advantage of going beyond the local market through global supply chains via the Internet, etc. Poor infrastructures in rural areas is another barrier for the effective access and use in Dhading District, which shows that the most remote villages seemed to lack infrastructures to enable proper connectivity with other parts of the District.

#### **4.4 Benefit from ICT Tools**

Information and Communication Technologies are now seen as an important tool for development, especially in developing countries. The use of these tools is gaining popularity in rural and urban

communities in the developing world. In modern context, efficient application of these tools has an impact of rural societies by supplying the information required by the poor, farmers in order to pursue sustainable livelihood.

Therefore, the Table 4.6 depicts the benefit of ICT tools in agriculture sectors with effective usage. The highest percent of respondent 82.5 percent reveals increase capacity to use of insecticide and pesticides as the benefit by providing relevant information which helps in appropriate use of insecticides and pesticides at relevant time and appropriate portion of insecticides and pesticides through communication with agriculture experts from mobile application, SMS and Call services, visual agricultural program in television and audio program through local community radio. The second highest 79.7 percent of respondent describes the benefit was increased in partnership among farmer's associations, government organization and agricultural input suppliers with use of mobile phone, telephone and social media which creates the better coordination between farmers group, Agriculture Centers, District Agriculture Office for getting support for poverty reduction through agricultural development programs. Likewise, 59.4 percent of respondent preview increase in farmer skills/knowledge in agricultural production and 54.5 percent information about latest best practices for higher agricultural production reveals with having latest practices, skills information from radio, television, sharing information through mobile and social media and use of newspaper, booklet, poster and pamphlets.

According to field survey, 53.8 percent of respondent shows the increase in use of bio-fertilizers and organic manure as benefit of using which shows that with use of these tools there is increase in awareness organic production to have quality products for better health. Another benefit was increase in agricultural production with availability of HYV seeds/Improved varieties and quality seed relate by 48.3 percent of respondent, Likewise, 42 percent reveals the benefit of using these tools was farmers gets information about climatic condition of particular areas for suitable agriculture production and new disease information with climate change using mobile application *Hamro Krishi* and television, radio, booklets which makes farmers to have better disaster and risk management with climate and disease information. Whereas 12.6 percent of respondent reveals that improved in access to agricultural product insurances for disaster management and decreases in losses due to disaster which shows that some of the rural farmers were getting insurances of their agriculture goods for making their loss low due to disaster with climate change and unwanted disease attack during agriculture production. The least percentage of farmers reveals that there is low benefit in market linkage and prices as there is no appropriate means to connect farmers to more efficient distribution chain i.e. direct links between farmers, suppliers and buyers so there is higher exploitation by middleman and farmers gets lower price of their products which makes farmers less motivation to have agriculture activities. 8.4 percent and 4.9 percent of respondent

respectively shows less the benefit about increases market access to supply agricultural production and higher prices of agricultural products.

Table 4. 6 Respondent responses on benefit from ICT

<b>Benefit from use of ICT tools</b>	<b>%</b>
Best Agriculture Practices	54.5
Knowledge of modern agriculture	29.4
Disaster and Risk Management	42
Capacity enhancement for disease control	82.5
Skill enhancement for soil preparation	21
Availability of HYV seeds	48.3
Organic Production	53.8
Agricultural production improvement	59.4
Negotiation power increased	21.7
Higher prices of agricultural products	4.9
Better market linkage	8.4
Access to modern agricultural inputs	26.6
Subsidies in agricultural inputs	41.3
Access to credit facilities	14.7
Agricultural product insurances	12.6
Decreases in losses	12.6
Better coordination	79.7

Source: Field Survey, December 2017

Other benefits were improved in access to subsidies in agricultural inputs like fertilizer, seeds from government organization, improvement in the knowledge of modern agriculture while most of the farmers in rural areas still having traditional subsistence agriculture farming system, increases market access to get modern agricultural inputs for efficient production within in short duration, improvement of agricultural product marketing with improvement in the negotiation power among the farmers to have better market place of their agriculture products, knowledge about soil preparation (soil testing, soil treatment and soil sampling) for better production so farmers makes proper decision for suitable farming in agriculture field and access to credit facilities from government organization and other financial institution which helps to motivate poor farmers to stick on agriculture activities which will help to increase the agriculture production.

The most of respondent farmers in the survey areas don't have any training to use ICT tools so they are using those tools by oneself with little knowledge and inappropriate knowledge and some of the farmers have informal training from friends, relatives, extension workers or private company to use these tools to communicate with each other for accessing information about agriculture activities. Whereas some of the farmers have been provided training to use mobile application to have climate disaster management from *Hamro Krishi* application by the project run by Agriculture Ministry but only few farmers get those training and most of farmers out of reach to those training and also provided mobile phone to use those application.

## **CHAPTER V**

### **CONCLUSION AND POLICY IMPLICATIONS**

This chapter concludes the finding of the study that with access and use of ICT tools for accessing information thus resulting in benefit to the farmers for agricultural development and the constraint faced during the use of these tools. Since the finding of the study has revealed that there still needs some improvement in access and use of these tools for having effective benefits in agriculture sector so the chapter concludes with the policy implications for effective management in future for getting as much benefits which helps in encouragement of farmer in agriculture activities.

#### **5.1 Conclusion**

Information and communication technologies are an important factor in social and economic development. A significant aspect in this context is the level of education, understanding the needs, benefits and skills are the important factors. It is worth noting that the full equipment is not a development factor itself, however lack of such equipment certainly is a serious barrier. First of all, appropriate skills are required in order to make an effective use of the existing infrastructure.

This research study examined the access, use and benefit of using information and communication technologies for agriculture promotion. In this research, the study was mainly focused on the knowledge about different tools, access through different source, duration and time of accessing, usage for accessing different agricultural information, importance and difficulties for accessing agriculture information, benefit through usage in agriculture sector and training to get benefits.

The study concludes that major tools which known by the respondent, mobile phone as most attracting due easiness to communicating with friends, family and other people. The next known was radio and Television as oldest medium of accessing information through audio and visual program. Similarly, the study concludes that the most accessing tools were mobile phones, television and radio. Further the access of social media was fairly high by the respondent while sharing information and communicates with each other. In this study the age between 34 to 44 years were the major sections of the population who were found to have more access for getting agriculture information thus it shows that there was relationship between age and access of these tools. The study also finds out the major source of access was by oneself due to wider availability of mobile phone, television, radio and social media but computer, newspaper, booklet, poster and pamphlet are in low accessing. Computer and Internet was accessed by only few of the respondent; it was still the most important source of information for modern world. The other sources of access were government organization, neighbor and other. The duration of accessing mobile phone was most between 5 to 10 years whereas the duration of accessing television was most between 10 to 15 years and duration of accessing radio most was also between 10 to 15 years.

The study concludes that there were several motivations for using these tools. These motivations included easy availability of information; easy access to information and reduced costs in acquiring information of agriculture sector. The mobile phone was mostly used for accessing agriculture information followed by television and radio. Also used of the social media was increasing in faster rate for accessing information. The study focused on accessing the agriculture information like good agricultural practice, disease and pest management, weather information, market linkage and Price, extension services and financial management in agriculture sectors. The study concludes that most of respondent farmers used for accessing disease and pest management then good agricultural practices and weather information whereas the least used for accessing information about market price and market linkage.

The study concludes that the most influence for adoption of these tools among farmers was provides right information at right time, valuable information source for farmers, reduces travel time and expenses, and easily accessible and available by farmers. Further, concludes that the important sections were enables to get correct and updated information about agriculture sector and helps to make network among farmers and associations which helps enhance the farmer's ability for better production. The study concludes that the major constraints facing for adoption among farmers was lack of basic skills, lack of ICT related facilities, lack of confidence in operating and lack of awareness. The study concludes that adoption was further hindered by personal barriers such as illiteracy of farmers which create language barriers and age factors.

The study concludes that the majority of respondent has enhanced their capacity to use insecticides and pesticides and build network between farmers, government organization and other agriculture related organization through use of mobile application, television, and radio. But most of them don't have market information about prices and supply chain as market was occupied by middle man for adjusting the market prices. The major constraint faced by farmers are lack of basic skills, related facilities and lack of confidences but only few farmers were provided training to use these tools for getting benefit through accessing agriculture information from mobile application but major population were out of training facilities so there was low level of awareness about getting benefit with usage of these tools.

Since there is an increased penetration in the level of accessibility of ICT tools among the farmers in the study area, there is a need to ensure that the problems associated with the farmers are being met in order to enable the farming community derive maximum benefits on better access to information services through the use of these tools for agriculture and other developmental purposes.

## 5.2 Policy Implications

Based on the findings of this research, there is still room for improvement and issues like the following should be taken care for effective utilization of ICT tools for getting benefit with accessing valuable information at right place at right time.

There were always need of agriculture information to the farmers for improvement the agriculture production therefore information and communication technology will be important tools for accessing agriculture information. In rural areas of Nepal accessibility of these tools are difficult due to erratic power supply, low network bandwidth, lack of internet connectivity and poor infrastructure for development. Therefore, rural areas should be provided with necessary infrastructure such as electricity, network so as to bring services like internet closer to the people. There should be infrastructure development for linkage remote areas through construction of road, bridge so telecommunication infrastructure and facilities will easily available in remote areas therefore mobile network and internet connectivity will be improved which helps in real time access of information and easily available of updated data.

Lack of basic skills is major constraint in use of these tools therefore government, research organizations, I/NGO should run awareness about benefit of these tools which helps in easy access of agriculture information and also provide the training to use for all community farmers in order to increase the confidence, competence and skill so farmers will able to use mobile phone, social media effectively which was more accessibility with farmers. Thus farmers were able to used for accessing most valuable and updated agriculture information with use of mobile application like *Hamro Krishi, Smart Agriculture, Krishi Ghar, IFA krishi, Yuba Krishi and Farm Nepal*. Also make network through social media for sharing agriculture information for improvement in agriculture production. Government should also provide smart phones with concessions in the rural areas so that it is affordable to the common farmers and encouraged young graduate to take up the job of agricultural extension services so as to bring in their youthful knowledge and skills for effective transformation of the agricultural sector.

Improvement in agriculture production only will not encourage farmers to stick on agriculture activities but there should also have better market linkage and prices of their agriculture products. In current situation agriculture market has been occupied by middle man and determines the market prices of agriculture products and takes maximum profit than farmers who work in the field. Therefore, the government should take initiative to determine the market price of every agriculture products and make them available to farmer with use of ICT tools for easy accessing information like market linkage and prices so farmers get maximum profits of their agriculture products.

## References

- ADB. (2004). Asian Development Bank: Building e-Community centers for rural development: Report of the regional workshop, Bali, Indonesia.
- Agwu, A.E., Uche-Mba, U.C and Akinnagbe, O.M. (2008). Use of Information and Communication Technologies among researchers, extension workers and farmers in Abia and Enugu states: Implications for a national agricultural extension policy on ICTs. *Journal of Agricultural Extension*.
- Amin, S. (2010). *An Effective Use of ICT for Education and Learning by Drawing on Worldwide Knowledge, Research and Experience: ICT as a Change Agent for Education*.
- Antonelli, C. (2003). *The digital divide: understanding the economics of new information and communication technology in the global economy*, Information Economics and Policy.
- Anya, K. (2013). *Sparking Up Youth Involvement in Agriculture with Social Media, Modernising Agriculture in Ekiti State*.
- Bassols, V. (2012). *ICT Skills and Employment: Organization for Economic Co-operation and Development STI Working Papers*, Paris.
- Benegas, L. (2013). *Use of ICTs by Farmers in Dissemination of Agriculture Information*, ICTWCC.
- Cherry, K. (2014). *Theories of Motivation*, Psychology.
- Chhachhar, A.R., Querestic, B., Khushk, G.M. and Ahmed, S. . (2014). Impact of ICTs in Agriculture Development. *Journal of Basic Applied Scientific Research*, 4(1):281-288.
- CPDD. (2014). *Annual Report 2069/70 (2012/13)*, NARC Publication Serial No. 0006-2013/14. Nepal Agricultural Research Council Communication, Publication and Documentation.
- FAO. (2012). *Expert Consultation on Agricultural Extension, Research-Extension-Farmer*, Regional Office for South Asia and Pacific. Food and Agriculture Organization.
- FAO. (2013). *Information and communication technologies for sustainable agriculture. The emerging contours of new agricultural development*, Ajit Maru.
- Ferris, S., Engoru, P. and Kaganzi, E. (2008). *Making market information services work better for the poor in Uganda*. CAPRI Working Paper No. 77: CGIAR System wide Program on Collective Action and Property Rights (CAPRI), Washington DC.
- Fu, X. and Akter, S. (2010). *The Impact of ICT on Agricultural Extension Services Delivery: Evidence from the Rural e-services Project in India*. TMD Working Paper Series. University of Oxford.
- Galbraith, B. (2013). *The Convergence of OCT, Policy, Intermediaries and Society for Technology Transfer: Evidence from European Innovation Projects*.
- GITR. (2015). *The Global Information Technology Report: ICTs for Inclusive Growth*. World Economic Forum.
- GoN. (2015). *National Information and Communication Technology Policy*. Ministry of Information and Communication, Government of Nepal, Kathmandu, Nepal.
- Gupta, D. (2005). *Modern encyclopedia of media and mass communication*. Rajat Publications, New Delhi, India.

- Herzberg, F., Mausner, B., & Snyderman, B.B. (1995). *The Motivation to Work*, New York: John Wiley & Sons.
- Hofkins, D. (2011). Why ICT is Transforming Education, *The Guardian*.
- India, O. W. (2012). Model e-villages in North-East India: An ICT project for development in remote tribal areas. [http://www.indiagovernance.gov.in/files/e-model-village\\_gkc.pdf](http://www.indiagovernance.gov.in/files/e-model-village_gkc.pdf).
- Jayathilake, H., Jayaweera, B. P., & Waidyasekera, E. C. (2008). ICT Adoption and Its' Implications for Agriculture in Sri Lanka.
- Mahant, M., Shukla, A., Dixit, S. & Patel, D. (2012). Uses of ICTS in Agriculture, *International Journal of Advanced Computer Research*.
- Mittal & Mehar. (2012). How Mobile Phones Contribute to Growth of Small Farmers? Evidence from India. *Quarterly Journal of International Agriculture*.
- Moon, S. (2013). Awareness of the farmers about benefit of using Information and Communication Technology (ICT) towards increased farm productivity in Bangladesh. Norwegian University of Life Sciences, Department of International Environment and Development Studies.
- Mtega, W.P and Msungu, A.C. (2013). Using Information and Communication Technologies for enhancing the accessibility of agricultural information for improved agricultural production in Tanzania. *The Electronic Journal on Information Systems in Developing Countries*.
- Munyua, H. (2000). Information and Communication Technologies for rural development and food security: Lessons from field experiences in developing countries. Sustainable Development Department (SD), FAO of the United Nations.
- Naharki, K. (2017). ICT in Nepalese Agriculture.
- NAP. (2004). National Agriculture Policy, Department of Agriculture.
- Narender, K. and Anandaraja, N. (2008). Information and Communications Technology for women experience of women managed internet kiosks at Melur, Tamil Nadu. In: extension of technologies from lab to farm. Ed. Anandaraja, N., Chandrakandan, K. and Ramasubramaniam, M. New India Publishing Agency.
- Nguthi, F. (2007). Adoption of Agricultural Innovations in the Context of HIV/AIDS: Adoption of Agricultural Innovations in the Context of HIV/AIDS: The Case of the Tissue-Cultured Banana in Central Kenya. PhD Thesis, Wagenigen University.
- Okyere K. A. and Mekonnen D.A. (2012). The Importance of ICTs in the Provision of Information for Improving Agricultural Productivity and Rural Incomes in Africa.
- Olaniyi, O. (2013). Assessment of utilization of Information and Communication Technologies (ICTs) among poultry farmers in Nigeria: an Emerging Challenge. *Journal of Animal Science Advances*.
- Olawale, O. (2013). How Youths Can Use ICT to Support Agriculture and Rural Development?
- Oyeyinka, R.A. and Bello, R.O. (2013). Farmers Use of ICTs for Marketing Information Outlets in Oyo State, Nigeria. *Journal of Agricultural Science*.
- Pathmalal, L. (2013). Why Information and Communication Technologies and Why Now?, *End Poverty in South Asia*.

- Ramamritham K., B. A. (2005). Innovative ICT Tools for Information Provision in Agricultural Extension. Developmental Informatics Lab, Indian Institute of Technology-Bombay.
- Rao, S. (2004). Role of ICTs in India's rural community information systems.
- Regmi, A. (2016). Application of ICT tools in agriculture sector in Nepal.
- Rogers, E. M. (1962). Diffusion of Innovation.
- Shankaraiah, N. and Swamy, B.K.N. (2012). Mobile communication as a viable tool for Agriculture and Rural Development. Proceedings of Mobiles for Development held on 2012. Department of Agricultural Extension, University of Agricultural Sciences, Bangalore.
- Sharma, N. K. (2011). Country Paper on National Agriculture Extension Systems in Nepal An analysis of the System Diversity. Lalitpur: Nepal Economic, Agriculture & Trade (NEAT) Activity.
- Shetto, M. (2008). Assessment of agricultural information needs In African, Caribbean and Pacific (ACP) States Eastern Africa Country Study: Tanzania. Ministry of Agriculture, Food Security and Cooperatives on behalf of the Technical Centre for Agricultural and Rural Cooperation (CTA).
- Sife, A., Kiondo, E. and Lyimo-Macha, J. G. (2010). Contribution of mobile phones to rural livelihoods and poverty reduction in Morogoro Region, Tanzania. The Electronic Journal on Information Systems in Developing Countries 42 (3): 1-15.
- Singh, S. (2006). Selected Success Stories on Agricultural Information Systems. Asia-Pacific Association of Agricultural Research Institutions. Bangkok, Thailand.
- Soriano, C. (2007). Exploring the ICT and rural poverty reduction link: Community telecenters and rural livelihoods in Wu'an, China. The Electronic Journal of Information Systems in Developing Countries, 32.
- Stienen, J., Bruinsma, W., and Neuman, F. (2007). How ICT Can Make a Difference in Agricultural Livelihoods. The Commonwealth Ministers Reference Book.
- Thioune, R. M. (2010). Information and Communication Technologies for Development in Africa: Opportunities and Challenges for Community Development, Volume 1, . Ottawa, IDRC.
- UN. (2012). United Nations, Youth and Information Communication Technology.
- UNDP. (2012). Promoting ICT based agricultural knowledge management to increase production and productivity of small holder farmers in Ethiopia.
- Watts, A. G. (2011). The Role of Information and Communication Technologies in an Integrated Career Information and Guidance System. National Institute for Careers Education and Counselling, United Kingdom.
- WB. (2012). ICT in agriculture, Agriculture and Rural Development: Connecting Small Farmers to Knowledge, Networks and Institutions.
- WB. (2016). World Development Report: Digital Dividends. World Bank Group.
- Wereh, H. (2012). The Role of ICTs in Dissemination of Information on Ecological Organic Agriculture. Biovision Farmer Communication Programme, Kakamega, Kenya.