



**Addis Ababa University**  
**Collage of Natural and Computational**  
**Science**  
**School of Information Science**

**ICT Utilization in livestock Production Management**  
**Of Friendship Agro-industry**

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**Addis Ababa, Ethiopia**

**Addis Ababa University**  
**Collage of Natural and Computational**  
**Sciences**  
**School of Information Science**

**ICT Utilization in livestock Production Management**  
**Of Friendship Agro-industry**

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**By**

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**June-2017**

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## **Dedication**

*This work is dedicated to:*

*My beloved father Kebede, mom Alemenesh, and aunt Etet, thank you for nourishing the family  
with love and respect!*

*My beloved wife Menbere and our sweet kids Nathan and Kaleal, you are the reasons for all my  
life, thanks to be God for this precious gift!*

*My beloved sisters and brothers (Tshai, Fre, Nani, Tewede, Yetu, Kuku and Ake) thanks for all  
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## **Abstract**

The main objective of this research is to identify and analyze the implemented Information and Communication Technologies (ICT) tools and their contribution to the livestock production managements, with a particular stress on the purposively selected private livestock farm, Friendship Agro Industry. The study assesses and evaluates different implemented ICT medias, ICT devices and ICT applications of the private livestock farm. Descriptive research method was used, and it applied questionnaires and interviews as data gathering instruments. Data were acquired through questionnaires from about 45 randomly selected respondents of the private livestock employees, each departments were addressed as much as possible, to identify and evaluate

- The easiest accessible source of information for livestock update
- The preferred ICT Medias, and
- The available ICT solutions, devices and their application.

In addition, interview guide was developed and interviews were conducted among three senior management and co-founder of the farm (General manger, deputy general manager and marketing manager), In the meantime secondary data analysis conducted to investigate the background of the farm, the ICT utilization in the farm. Data were thoroughly observed and analyzed using SPSS statistical analysis packages version 20. The result depicted that only four of the technologies are implemented in the farm (Internet, Email, Financial management system (FMS), and Management information systems (MIS)) each supported by more than half of the respondents, regarding the easiest accessible ICT media, Internet and (newspaper, magazine, brochures) were selected by 66.7% and 60% of the respondents respectively. Around 44.4% respondents preferred Internet as the most preferred source of information for livestock update and information. Regarding their Attitude towards the Importance of ICT. Despite some of the employees have negative thought towards ICTs, the majority of the respondents have good expectation towards the importance of ICT tools and applications; the private farm has limited communication among different livestock farms and institutions.

Recommendations were also made based on the conclusions drawn from the findings,

- The management should keep working in infrastructure (Internet, Network, etc.) advancement for each brunch of the farm.
- The farm should give attention for the establishment of research and development department, thus studies on modern and advanced ICT solutions and tools can be conducted and accordingly important ICT tools and solutions can be adapted, customized and implemented.
- The farm need to work on the subscription of different journals, universities', institutions' and governments' webpages for information update (newsletters, reports, research results...)
- The farm management should work on capacity building activities for their employees, also they should be imitative on the establishment of private livestock farm associations.

This research is believed to provide some highlights on the utilizations of ICTs in private livestock farms so that stakeholders (individuals, institutions, local government, etc...) can get some inputs. It also can be used as a benchmark for further studies in this area.

**Keywords:** - ICT utilization, ICT adaption, ICT Tools or solution,

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## **Abbreviations and Acronyms**

AAU	Addis Ababa University
AGP	Agricultural Growth Program
AMC	Agricultural Marketing Corporation
BC	Before Christ
CAADP	Comprehensive Africa Agriculture Development Programme
CSA	Central Statistical Agency
C4GD	Center for Global Development.
DBMS	Database Management System
DSS	Decision Support System
E-Commerce	Electronics Commerce
ECX	Ethiopia Commodity Exchange
EPTD	Environment and Production Technology Division
FANRPAN	Food, Agriculture, and Natural Resources Policy Analysis Network.
FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia

FIS	Financial management system
FMD	Foot and mouth disease
GC	Gregorian Colander
GDP	Gross Domestic Product
GIS	Geographical Information System
GOE	Government of Ethiopia
GPS	Global Positioning System
GTP	Growth and Transformation Plan
IC4D	Information and Communication for Development
ICT	Information and Communication Technology
ICTDA	Information Communication Technology Development Agency
ICT4D	ICT for Development
IDI	Information Development Index
IFPRI	International Food Policy Research Institute
ILRI	International Livestock research Institutions
ISO	Chief Information Officer
IT	Information Technology
ITU	International Communication Union
KACE	Kenya Agricultural Commodity Exchange.

LAN	Local Area Network
LIMS	Livestock Information Management System
LMIS	Livestock Market Information System
MCIT	Ministry of Communication and Information
MILS	Market Information and linkage system
MIS	Management information systems
MOA	Ministry of Agriculture
MOE	Ministry of Educations
MOT	Ministry of Trade
OAU	Organization of African Unity
SMS	Short Messaging Service
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WAN	Wide Area Network
WMS	warehouse management system
WWW	World-Wide Web

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# Chapter One

## 1. Introduction

### 1.1. Background Study

Animals found in a farm are collectively called livestock, they are distinguished from other animals by the fact that they're domesticated and raised for food or money if you get wool, milk, meat, or eggs from animals, they are livestock. [1] (Vocabulary.com, 2017)

Livestock are used by humans for a variety of purposes, many of which have an economic value. Examples of livestock products having economic value are meat, dairy products, clothing & adornments, Fertilizer, etc., They continue to play a major economic and cultural role in numerous communities in different countries.

According to, [2] (FAO, 2017), growing populations, rising affluence and urbanization are translating into increased demand for livestock products, particularly in developing countries. Global demand is projected to increase by 70 percent to feed a population estimated to reach 9.6 billion by 2050.

Intensive livestock farms are growing and their scales differ. The increasing automation enables economies of scale, and many farms in developed countries have automated feeding systems and climate control. In this regard, computer systems that recognize individual animals enable farmers to care for their animals more efficiently and manage their products effectively.

Ethiopia is believed to have the largest livestock population in Africa. According to Federal Democratic Republic of Ethiopia Central Statistical Agency agricultural sample survey conducted [3] (CSA, 2012/13), the total cattle, sheep, goats and poultry population for the country are estimated to be about 53.99 million, 25.5 million, 24.06 million and 50.38 million respectively. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country.

The development in Information Technology over the past few decades has been tremendous and offers great potential in improving animal health and their products. This is achieved through various measures like effective disease forecasting, rapid and accurate disease diagnosis, modern therapeutic measures, modern livestock management systems, modern financial management system, etc.

According to experts in FAO, ICT solution, in terms of the end result for the consumer can be categorized as:

- *ICT for production systems management,*
- *ICT for market access services, and*
- *ICT for financial inclusion.*

And it is believed that each category has their contribution for the success of the livestock sector at all. [4] (FAO, 2013)

The wider adoption of ICT in agriculture is of strategic importance to five main stakeholder groups:

- **Businesses:** businesses, associations, other organizations
- **Farmers:** individuals; organized and informal associations
- **Researchers:** researchers; educators and trainers
- **Government:** ministries of agriculture, and other relevant departments and agencies
- **Citizens,** both as consumers and as custodians of the environment, for instance through civil society organizations. [5] (FAO, 2004/2005)

Due to the very important role that the livestock sector contributes for the community in forecasting local consumption and export demand, evaluating the potential of ICT in livestock management is indispensable. It is therefore imperative that livestock should be supported on the basis of reliable Information technologies, and hence, timely and accurate data and information are required for decision making, these lets the sector to be competent in the market and to deliver quality of products and services for end users.

## 1.2. Statement of the Problem

Developed countries are employing technologies to oversee their agriculture industries, this leads them to be productive in the sector, and it is thought that ICT tools are their main means of achievement.

Ethiopia is agriculture oriented country, the majority (82.4%) of the population is based in the rural areas and this community heavily depend on agricultures as a source of their livelihood [5] Ethiopia's average livestock products (meet, milk and eggs) annual growth rate in 1990-2000 was 1.2% which was significantly lower than that of Kenya and Uganda which grew 2.4% and 2.3% respectively. [5] (FAO, 2004/2005). this shows that Kenya and Uganda achieved better and were probably giving more devotion for technologies in their livestock sector than Ethiopia.

It is obvious that the majority of Ethiopian agriculture communities are stuck in primitive agriculture practise, thus products are in poor quality and less in quantity.

According [6] (H. Jeong, C.J. Yang and H. Yoe, 2012), farmers that poorly adapt ICT in their farms are losing animals. The main reasons for that are.

- Lack of knowledge in infectious disease;
- They are not aware of the latest existing market information;
- They are not feeding their animals with the proper diet;

These lead to increased mortality rate and financial damage of livestock farms; this shows that serious attention should be given for the industry especially in developing countries like Ethiopia. It also shows that unless this sector is supported with modern technologies the struggle for poverty reduction and food security will be difficult even impossible to achieve.

Even though many studies have been conducted on assessment of ICT utilization in agriculture industry, limited studies are available in Ethiopia that investigate the ICT utilization in livestock production management. Hence, more studies are still required to perceive the impact of ICT in livestock production management and to give a better insight for stakeholders of the industry.

Therefore this study seeks to investigate the utilizations of ICT in livestock production management in friendship agro industry and to access the extent in which ICTs and medias are being utilized in livestock production managements.

### **1.3. Research Question**

In this study attempts will be made to answer the following questions:

1. What information technology services are being used in the farm?
2. How do private livestock farms utilize Information Communication Technologies to manage their livestock industries?

### **1.4. Objective(General & Specific)**

#### **1.4.1. General Objective**

General objective of this study is to identify and assess the various ICT tools and medias utilized in “Friendship agro industry”

#### **1.4.2. Specific objectives**

The specific objectives of this study are:

- To identify employed ICT solutions in the farm,
  - The easiest accessible source of information for livestock update
  - The preferred ICT Medias
- To perceive the level of usage of implemented ICT solutions in
- To recommend the best appropriate ICT solutions for the livestock farm
- To make general recommendations for stakeholders (individuals, institutions, local government and etc...) as well as for future research problems to be examined in greater detail.

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

The scope of the research is enclosed to the analysis of the utilizations of ICT in livestock production management in a case of Friendships agro industry, In addition to that the research assesses any implemented ICTs solutions in the farm, if already in use, and its utilization by the livestock farm itself. Therefore, the study was delimited to provide recommendation on the technologies for the private livestock farm.

## **1.6. Limitations and Challenges of the study**

In dealing with this research the most and worst scenario was getting negative feedback for the research from the selected two big livestock farms in the country “ELFORA and Geneses” due to the fact the process of gating green light for the research and data collection from the third selected farm “Friendship agro industry” took more time than the scheduled timeframe (delayed at list for one month)

In addition to that the respondents were found in four different locations in Addis Ababa and around its surroundings (Debre Zeyet, Ayertena, Ferensay Legasion, and British Embassy area), it was also time consuming to visit each branch, distribute and collects questionnaires and conduct interviews. Moreover, most of the collected questionnaires were incomplete and had errors that can’t be managed by data clearance, thus the researchers did redistribut questionnaires and collect the data again, this also took additional time.

The recommended application system “Livestock Information Management System (LIMS)” is not open source, therefor it was difficult to get the application so that the researcher was limited on the theoretical concept of the system.

Hadn’t it been in the above problems, the researcher would have been able to see the research in more depth.

## 1.7. Significance of the Study

World is in the globalization period, technologies are changing rapidly, our livestock products should be ended with standard form, the livestock industry should be supported with technologies then, products can be competent in the market, and at the end the country can get economic advantages through export as well as can have sufficient products for local community demands.

Different researches have been conducted in Agriculture technologies, due to its important contribution for the developing country's economy, this study give feedback recommendation to help better utilization of ICT by the private livestock farms in Ethiopia. It would specifically

- Assess the current ICTs and media usage in Friendship agro industry
- Suggest most relevant optional ICT solutions for livestock production systems management.
- Share research findings for the stakeholders of private livestock farms
  - In helping to develop more appropriate decision making,
  - For further research to be conducted

## 1.8. Organization of the Thesis

This research documentations contains five chapters.

**Chapter One:** - is a general introduction to the problem and includes the objective of the research along with the scope, limitations and significance of the study.

**Chapter Two:** - is devoted to literature review, discussion will begin with the simple definitions of livestock and will assess different concepts regarding to ICT and livestock, basically the contribution of ICT in agricultural development, ICT utilization and Challenges, etc...

**Chapter Three:** -discussed the research design, methods, sampling techniques and data collection tools in details.

**Chapter Four:** -detailed data presentation, analysis and discussions of the collected data take place in this chapter.

**Chapter Five:** -presented general conclusions and recommendations made based on observations and results from the study.

## Chapter Two

### 2. Literature Review

In this chapter literatures regarding ICT in agriculture development, ICT utilization and challenges, historical background of ICT utilization in Livestock, role of ICT tools in Livestock production and similar topics are reviewed, the articles were searched from different sources of internet like, Google, Google Scholar, Yahoo, subscribed journals, etc. using various keywords targeting to see the link between ICT and livestock.

#### 2.1. Theoretical concept

Under this subtopic, the general definitions for livestock, from different researcher's point of view and the ICT impact in agricultural development are discussed briefly.

##### 2.1.1. livestock Production

Animals found in a farm are collectively called livestock, they are distinguished from other animals by the fact that they're domesticated and raised for food or money, if you get wool, milk, meat, or eggs from animals, they are livestock. [7] (Vocabulary.com, 2017).

Livestock are domesticated animals raised in an agricultural setting to produce commodities such as food, fiber, and labour. The term is often used to refer solely to those raised for food, and sometimes only farmed ruminants, such as cattle and goats. In recent years, some organizations have also raised livestock to promote the survival of rare breeds. The breeding, maintenance, and slaughter of these animals, known as animal husbandry, is a component of modern agriculture that has been practiced in many cultures since humanity's transition to farming from hunter-gatherer lifestyles. [8] (Wikipedia, 2017)

Livestock products have different classification, according to Hans, it classified as Food, Materials (Manure), Work, and Animals Reproduction and Growth. [9] (Hans E.Jahnke, 1982)

- **Food**, The main product of livestock is foods which are meat, milk and eggs including their byproducts.
- **Materials (Manure)**, the value of livestock droppings for soil fertility is recognized by most farmers and livestock holders, moreover manure is used for fuel and as a building material.
- **Works**, The two most important categories of animal work are traction and transport. Traction refers to the employment of animals force in crop production; Transport to the translocation of loads.
- **Animals Reproduction**, animals are reproducing themselves, additions to the existing stock therefore be considered as livestock products.

Needs for livestock products is increasing, more livestock products are mandatory to sustain the live of the world society, [2] (FAO, 2017)

### **2.1.2. ICT in agriculture development**

The livestock sector in developing countries contributes more than 33% to agricultural Gross Domestic Product (GDP), and is one of the fastest growing agricultural subsectors. The livestock sector has been experiencing what has been said the “Livestock Revolution”. Population growth, urbanisation, and most importantly, increasing income have resulted in a rapid increase in demand for livestock products, which is likely to continue well into the future. This growth of the livestock sector presents both opportunities and challenges. [10] (FransSwanepoel, AldoStroebel and SibonisoMoyo, 2010).

ICT in agriculture (E-Agriculture) is an emerging fields focusing on the enhancement of agriculture and rural development through improved information and communication technology processes. The advancement in ICT can be utilized for providing accurate, timely, relevant information and services to the stakeholders especially for the farmers, this creates an environment for diversity of agricultures. [11] (Manish, Abhishek, Sunil, and Dileshwer, 2012)

The importance of ICTs in development process was recognized and even it was one of the targets of the Millennium Development Goal No. 8 in World Bank report. [12] (World

Bank, 2009), which emphasizes the benefits of new technologies, especially ICTs in the fight against poverty. “With 10% increase in high-speed internet connections, economic growth increases by 1.3%”. Other report was also shows how ICT enhancement plays important role in different sub discipline “connectivity whether the Internet or mobile phones is increasingly bringing market information, financial services, and health services to remote areas, and is helping to change people's lives in unprecedented ways”. [13] (Importance of ICTs, 2012)

Applications of e-Agriculture in intensive agricultural systems in developed countries are a means of productivity in both quantity as well as quality of production, integrated computerized system and satellite technology system is used to cut costs, improve yields and protect the environment; e-commerce (or e-marketing) in which the marketing and sale of agricultural products is conducted over electronic networks such as the Internet and extranets is also fasten the activities towards productivity. On the other hand, in many developing countries farmers’ access to information is still in grass root level. [14] (World Information Society summit, Geneva 2003& Tunis 2005)

ICT help agricultures stakeholders (extension workers, researchers...) to adapt improved agriculture practices and disseminate them to the end users, such as agricultural techniques, commodity prices, weather forecasts, and many more. The utilization of ICTs, especially mobile technologies, help farmers in many aspects, an individual who are often unaware of commodity prices, at the end will be the loser. Delays in obtaining this regard information or is misinterpretation by middle trades has serious consequences for agricultural producers. Leading to charging low prices or high/low produce supply in the markets also relying on trades or agents creates rent seeking opportunities, adding to the agricultural workers’ cost of doing business. As a result of mobile technological developments, especially mobile phones have had some dramatic effects, particularly in rural Africa. [15] (Aker and Abiti, 2010; Chavula 2012)

## **2.2. ICT utilization and Challenges**

### **2.2.1. ICT utilization trend in Livestock farm in Africa**

In Africa, agriculture provides a livelihood for 75% of the people who live in rural areas. Unfortunately, the rural areas in Africa have the largest concentration of poverty and food insecurity. One of the causes of the low incomes in rural Africa is the low productivity of agriculture. Therefore, any attempt to reduce poverty should pay particular attention to transforming the agricultural sector, Lack of technological and market information has been given as the major reason for the low productivity in African's agriculture. [16] (Kwadwo and Daniel, 2012)

ICT can bring economic development and growth as it can help bridge critical knowledge gaps. Mobile technology, on the other hand, is increasingly being adapted. The wider adoption of ICT in agriculture is of strategic importance to five main stakeholder groups: [17] (ICTs for agriculture in Africa, 2012)

- Businesses: businesses, associations, other organizations
- Farmers: individuals; organized and informal associations
- Researchers: researchers; educators and trainers
- Government: ministries of agriculture, and other relevant departments and agencies
- Citizens, both as consumers and as custodians of the environment for instance through civil society organizations.

The majority of East Africa people is highly dependent on income from livestock and livestock products. Therefore, the development of reliable and timely livestock market information is vital for the development of economy of the countries in the region and provides a basis for livestock stakeholders (producers, traders, etc.) to make informed marketing decisions. In this regard, LINKS - a livestock information network and knowledge system was established as a sub-project within the global livestock collaborative research support program. it was implemented by Texas A&M University provides regular livestock prices and volume information on most of the major livestock markets in east Africa, in Ethiopia, Kenya and Tanzania along with information on feeding conditions, disease outbreak, conflict and water

supply to support decision making at multiple scales. The system provides real time market information which is available on request via SMS text message system, email, WorldSpace radio systems and on the internet. [18] (LMIS, 2011).

ICTs in Africa have become important tools for recording livestock performance and production levels. Many commercial farmers run PC-based recording and management software that turns raw performance data into information that can be used immediately at the local farm level. In many countries ICTs do not go beyond this level, but in South Africa most local livestock data is fed into the centralized Integrated Registration and Genetic Information System (INTERGIS). The system sets national livestock productivity benchmarks, enables comparisons of all animals in terms of genetic potential, and provides information for the stakeholders (policymakers, farmers, etc.) with a reliable source of reference. Therefore this Information system plays a critical role in keeping South Africa's livestock producers globally competitive. This Information system contains productivity and performance data for beef cattle, dairy animals, small stock, pigs and poultry. Farmers record the data electronically at farm level using a PC or Palmtop and free software that allows them to directly transfer the data to the system. [19] (Japie van der, 2003).

Livestock information management technology (LIMT) is being effectively used in some countries in Africa with remarkable success on market price information, weather forecasts, transport information, information on storage facilities and information related to crop and livestock diseases and general advice related to agriculture. [20] (Gakuru et al, 2009).

### **2.2.2. ICT utilization trend in Livestock farm in Ethiopia**

Ethiopia is believed to have the largest livestock population in Africa. According to Federal Democratic Republic of Ethiopia Central Statistical Agency agricultural sample survey conducted in 2012/13, the total cattle, sheep, goats and poultry population for the country are estimated to be about 53.99 million, 25.5 million, 24.06 million and 50.38 million respectively. [21] (ECS, 2013). The country has genetically diverse cattle population, suitable agro-climate, and potentially large and growing market for livestock products. The livestock sector has been contributing considerable portion to the economy of the country, and still

promising to rally round the economic development of the country; however the potential has not been fully exploited. [22] (Ahmed al, 2004)

Ethiopia is one of the few countries in Africa that has consistently surpassed the CAADP targets of 6% annual agricultural growth and 10% national public expenditure towards the agriculture sector. Over the past decade, Ethiopia committed an average of 14% of its national budget to agriculture. This investment has been used to lay strong foundations for the sector by building effective institutions and structures, strengthening policies and regulations, and expanding agricultural services throughout the country. [23] (ATA, 2016)

In many developing countries, more people have access to mobile phones than to older technologies like telephone landlines, newspapers, and radio. [24] (Aker, 2011), Mobile phone coverage is widely expanding in Africa. Ethiopia is one of the lowest ICT penetrated countries in Africa, had more than 25 million mobile subscribers in 2013. [25] (Trading Economics, 2014). Although many of the subscribers are in urban centres and small towns, the penetration to rural areas is also remarkable and growing very fast over time, many farmers have got access to mobile telephone services in recent periods although the network coverage is still very poor. Many studies, have confirmed that mobile phones are indeed improving farmers' production practices and adaption of new practices. Generally ICT increase overall agricultural productivity, [26] (Lio and Liu, 2006).

Government of Ethiopian (GoE) developed growth transformation plan GTP II through four basic strategic objectives within the agriculture sector among them “*Increased livestock production and productivity*” is the one that promoting the adaption of improved livestock husbandry practices/ technologies, feed production technologies, and livestock health system are central elements of the GTP II approach to increas livestock production and productivity, through focusing in that Ethiopian livestock products can move in to the international standards. [23] (ATA, 2016)

ATA underlines ICT as its one of the main objective for Agricultural Services program during GTP II, to develop and support ICT related solutions for all agricultural challenges encountered by government institutions, smallholders, and other key stakeholders.

The program will also actively support the establishment and implementation of a comprehensive ICT in agriculture strategy to enhance innovation, efficacy, knowledge sharing, and transparency in the sector. ATA implements SMS service using a number 8028 for agricultural community especially for smallholders, anyone in the country's network region can request any agricultural support through SMS and can get free response from the agency. [27] (ATA, 2017)

Ethiopian Commodity Exchange (ECX) plays important role in disseminating agricultural products price data "Push", the office transmitted data in real time (In less than 2 seconds) to outdoor electronic ticker boards in 32 rural sites, the ECX website, 256,000 mobile subscribers via instant messaging, the radio, TV and print media. "Pull" market data is available through a toll-free phone-in service. The service have received more than 1 million calls in September 2011, that means 61,000 calls each trading day, 70% coming from rural caller. ECX also implemented streamlined payment transfers system "T+1" (exact day payment after a trade) from its clearinghouse to its partner commercial banks. [28] (EleniGabre-Madhin, 2012)

On the other hand, [29] (Getaw and Godfrey, 2014) reported that, the impact of mobile phone in Ethiopia is not strong enough to believe that it is really helping farmers marketing decisions. Mobile may be useful for certain farmers in certain types of circumstances but in the study area mobile phones do not seem to be an important channel to access price information. Therefore, they suggest that establishing information centers either at farmers' cooperative centers or at local agricultural development centers will serve farmers as a reliable source of information and knowledge.

### **2.2.3. ICT utilization challenges in livestock farms**

ICT tools and solutions also come with a range of challenges like, technological dependence, lack of accessible telecommunication infrastructure in many rural and remote areas, capital cost of technologies, high cost of on-going access and support, essential need for capacity building, difficulty in integrating with existing media, and local communication methods and traditions, and, often lack of involvement of all stakeholders

in planning, these all greatly challenges for the adaption of the new technologies [30] (Richardson, 2009). On the other hand, though Ethiopia has no open telecom police, commercial investments including ICTs are driven by profit motive, ICT operators may not be willing to cover the rural areas unless there are strong incentives to do so. This is because of the high cost of start-up, operating, and programming costs given the capacity of the rural people to pay for the services offered. [31] (Souter et al, 2005).

On the other study, [32] (Munyua, 2008) explains the main challenges and factors that influence the use of ICT tools and solutions are: -

- High cost of available technologies,
- Inadequate infrastructure and low ICT skills,
- Poor and expensive connectivity,
- Inappropriate ICT policies,
- Language barriers,
- Weak institutions and inadequate collaboration
- Awareness gap on the existing ICT facilities and resources,
- Poor information sharing culture

On [33] (Kurtenbach and Thompson, 2000) discovery, the numerous factors that influence ICT adoption and use in agricultural organizations can be grouped into five categories such as access to IT, demographic, IT training/education, trust, and time. The most important limiting factors in developing countries are infrastructure and cost of technology but these factors cannot be a problem for ICT adoption in developed countries.

Based on [34] (Gillwald et. al, 2010) study, across 17 African countries, the dissemination of ICTs (mobile, internet, radio and television) is highly uneven, concentrated in urban areas and rarely found in some rural areas. The study also reported that important factors such as income, education and social position played a major role in explaining ICT access and usage. That means those reach, educated, men are mostly use and access ICT than poor, none literate, and women respectively. When men and women have similar backgrounds, the differences in access to ICTs and their use are less. Women

generally have less access to ICTs and this increases as the technologies and services become more sophisticated and expensive.

Extension workers and technologies can play a critical role in the transformation process to transfer technology, support learning, assist farmers in problem solving, and enable farmers to become more friendly with the agricultural technology. [35] (Christoplos& Kidd, 2000). However, extension workers may not be easily in touch with the farmers due to different reasons, for instance Malawian female farmer, during a dialogue session in Chimphedzu, told the local District Agriculture Development Officer “*we no longer have agricultural extension workers based in our communities, and visiting us every day, so how do you expect smallholder farmers like us to learn new farming technologies or to learn how to improve our agricultural enterprises?*” [36] (Fanrpan, 2011). Even when they are available many women do not get access to extension officers because many of them are men and there may be cultural inhibitions for their interaction with women farmers. [37] (Kwadwo& Daniel, 2012)

### **2.3. Role of ICT tools in Livestock production**

#### **2.3.1. ICT role in livestock production management**

Number of Information technology tools and solutions on agriculture has been built up in the world over many years with the ultimate goal of increasing agricultural production. These information can be stored and disseminate properly to the respected users through technologies only, Information is very crucial for the adoption of technologies and experience; therefor improved information and knowledge sharing mechanism within the agricultural sector stakeholders is a precondition for effective agricultural development. Investing in information technology can facilitate effective flow of information in all sectors of the economy. [38] (J.Kaaya, 1999)

ICT has been used widely for the study and improvement of various aspects of livestock production, research and education. Mainly the ICT is playing a greater role in livestock disease control, dairy herd management, livestock production and for marketing of livestock and livestock product; thus a farm with these integrated ICT system leads the sector

to be profitable, efficient and competent in the market. [39] (H.R. Meena, & Y.P. Singh, 2013)

Advanced information management is increasingly an essential component of profitable livestock production. A technology like Precision Livestock Farming (PLF) is used to enhance farm profitability, efficiency and sustainability by improving the nutritional, environmental and other management aspects of various livestock species. It also provides a framework to “enforce” the application of best practice management/nutrition on farms. PLF could also deliver additional food hygiene, traceability, welfare and environmental benefits. [40] (T.M Banhazi, L.Babinszky, V.Halas, M.Tscharke, 2012)

Decisions based on relevant, timely and accurate information is expected from the stakeholders’ management of livestock farm. One of the modern computerized information system “Livestock Information Management System” (LIMS), which helps the livestock stakeholders in decision making was developed by International Livestock Centre for Africa (ILCA) in 1991/92, now it is called International Livestock Research Institute (ILRI), LIMS was designed to facilitate the recording and processing of livestock related data. The system is not specialized in any species or production system, but is applicable for all mammal species in different situations, such as research, extension and commercial production [41] (ILCA, 1992).

ICTs are potentially important tools for improving livestock management, and protecting environmental resources. Using GPS devices livestock stakeholders are learning to address the problems of increasing drought and overgrazing, GIS mapping is used to monitor and manage their livestock movements. Also ICTs are helping small scale farmers to play a role in the increasingly integrated livestock production and marketing chain. [42] (AliouneKâ, 2004).

### **2.3.2. ICT role in livestock health control**

Transmissible animal disease outbreaks require rapid identification and elimination of all virus sources, for managing the vast amount of data and for help in setting the correct priorities, computerized decision support systems (DSS) plays important role. EpiMAN of

New Zealand is the first decision support system for controlling of foot and mouth disease (FMD) outbreaks. The system was initially developed to control FMD but through time it has been progressively expanded to manage other exotic and endemic diseases. [43] (Jalvingh et al, 1995) and [44] (Sanson et al, 1999)

Now a days technologies is simplifying things, computerized system with combined technologies (wireless sensors, mobile system network and applications) is used to control and remotely monitor the poultry farm, the poultry holder can simply able to received information about the climatic condition of poultry farm on the individual mobile number, the person can perform an action by resending the message to the system then the system will do the task accordingly, remote sensors passing the value to the server which can be later viewed on Google spread sheets. [45] (K. SravanthGoud, 2015)

ICT plays important role in real time data processing and decision making, the information discovered from the real time system may need urgent decision making, in this regard:

- The National foot-and-mouth disease (FMD) task Force of Philippines uses an information system in managing data regarding disease situation, vaccination, and animal movement, which gives accurate information on the animal disease situation of an area at the quickest possible time. [46] (Santos, 2002)
- In Italy to control the blue tongue disease in cattle effectively, a surveillance system was established that included clinical, entomological and serological surveillance elements. The National Reference Centre for Veterinary Epidemiology developed a Web-based National Information System (NIS) and a Geographical Information System (GIS) to collect and manage data from Veterinary Services across Italy. Surveillance data are displayed to the user in different ways, tables and interactive maps. [47] (Conte et al, 2005).

### **2.3.3. ICT role in livestock feeding (diet) management**

Most important part in Livestock farming is feeding, high quality, fresh and nutritious food and fresh & clean water always ensures good health, proper growth and high production. So, it is important to feed livestock healthy and nutritious feeds. It is necessary to add required vitamins and minerals to their feed, of course the nutrient intake of animals may vary from place to place according to the seasons and climatic changes. Whenever animals are restricted from consuming the amount of feed they desire, their production will cease. Now day's modern technologies overcome on the traditional method which is very suitable for the livestock growth. For example using wireless sensor network and DC motor system has design a food control modem for chicken. So food should not get waste and man power has reduced. [48] (Rupali and Sonavane, 2016)

The improper management of available feeding both dry and green has been one of the major problems in development of animal husbandry and dairying sector. The three major sources of food supply are crop residues (paddy straw, wheat straw), cultivated food and food from common property resources like forests, permanent pastures and grazing land. With the help of computer based software such as 'MakeFeed' the farm owners can formulate balanced feed for their animals according to their physiological condition with the available resources. 'MakeFeed', is windows based software developed by the scientist of Central Avian Research Institute for formulation of balanced feed for maximum production performance. It provides information on nutritive values for wide range of feed ingredients along with the maximum inclusion level for each ingredient. It is user friendly and persons having little computer knowledge can utilize it effectively. [49] (Nath et al, 2002).

Over involvement of humans in the feeding system of poultry could lead to disease outbreak, also excessive human involvement in poultry farms lead to minimal product from the farm, [50] (O. M. Olaniyi, 2014) has studied an Intelligent poultry feed and water dispensing system using fuzzy logic control technique, the system could imitates the roles of the poultry attendants in delivering water and feed dispensing for birds at specified time intervals. Water and feed would be sensed by the designed system and dispense

intelligently with respect to the variations in water and feed level as birds consume the feed and water. This system reduces workload of the poultry attendants, increases cost benefits and generates better return on investment in a deep litter poultry farming system.

#### **2.3.4. ICT role in livestock marketing**

ICT has great significances in information disseminations among the livestock stockholders, in developing countries, a variety of governments, NGOs, and private sector companies offer country specific and regional price information for numerous agricultural goods. Some of these have begun to integrate mobile channels.

In Ethiopia, Ethiopian Commodity Exchange (ECX) transmits commodity price information to farmers in real time within two minutes of a deal being made at ECX from Addis Ababa. Market data feeds directly to farmers via-electronic display boards in 31 centres spread across Ethiopia as well as on the exchange's website. Market data is also provided via text messaging to interested mobile phone users. ECX also provides market data in four local languages via automatic telephone messaging. On average, about 20,000 calls are made daily via a toll free number seeking for price information. [51] (World Bank, 2011).

In Kenya and Malawi, the Kenya Agricultural Commodity Exchange (KACE) and the Malawi Agricultural Commodity Exchange (MACE). [52] (KACE, 2011), respectively have commodity exchange service through offers and bids, which are prominently displayed on blackboard and which are disseminated via SMS and Internet. KACE collects, updates, analyses and provides reliable and timely market information and intelligence on a wide range of crop and livestock commodities, targeting actors in commodity value chains, with particular attention to smallholder farmers and small scale agribusinesses. The KACE market information and linkage system (MILS) involves harnessing the power and advantages of modern ICTs for information collection, processing and delivery.

In Uganda, SMS-based comprehensive system developed to deliver market information to farmers. The service is like a “knowledge hubs” for smallholder farmers, giving them advice and information on how to carry out their activities. All the services are SMS based and designed to work with basic mobile phones to reach the broadest possible

audience. The new services can be accessed by existing village phone operators, who extend service to people without mobile phones. The customer sends in the query and the answer is returned later. [53] (Pyramid Research, 2010).

In Zambia, the National Farmers' Union uses SMS (and a website) to provide not only aggregated price information, but also information linking quoted prices to individual, identifiable buyers, including contact information and whereabouts. This offering falls short of full transaction support, but is rather online matchmaking for offline transactions. [54] (Jonathan Donner, 2009)

In Nigeria, cassava growers receive market information through a new initiative called the Integrated Cassava Project. Based on mobile phones and Internet and online marketplace Trade Net Africa, the project aims to disseminate market information using the Agri-Business Information Points (market information centres) and trade agents. These services include prices, demand volumes and offers, trade assistance, training, SMS Alerts, and technical messages. [53] (Pyramid Research, 2010).

In Senegal, Manobi provides access to price data on various crops, collected from different markets across the country. Manobi personnel use mobile phones to send the price data to the Manobi database using the wireless application protocol (WAP). Farmers use their mobile phones to query the database. [55] (ITU, 2010b).

In west Africa, Market information systems and traders' organizations of west Africa (MISTOWA) in partnership with the private sector, developed a platform ([www.tradenet.biz](http://www.tradenet.biz)) to exchange market information in real time on-line or through cellular phones SMS on market prices, buy and sell offers, and trader contact information for easy interpretation; and online space for producer and trader organizations to create websites for featuring business information. [56] (Davis and Addom, 2010).

## 2.4. Related works

In [57] (H.I Kubkomawa and J.M Salihu, 2010) research, which assess level of utilization and effect of information and communication technology on the Nigerian livestock industry, on the data generated through random administration of 1000 questionnaires to livestock producers and oral interview to some selected groups, results depicted that 50% of farmers are more familiar with radio, 20% are highly use mobile phones, 15% follows television, 5% are using internet, 5% use magazines and 5% use newspapers; on the other hand 30% of the livestock producers use ICT to watch football and other sporting activities, 20% to obtain agricultural and 20% use ICT for political news whereas 5% use ICT to obtain health information and 5% as business outlet, 10% also use ICT for entertainment and 10% for religious news. Generally only 30% of the farmers agreed that ICT have positively impacted their livestock agriculture while 70% confirmed that they have not been able to coordinate and harness information obtained from ICT to improve their productivity in livestock agriculture.

Another study in Nigeria by, [58] (Olaniyi, O. A, 2013), assessed, the utilization of ICTs among poultry farmers. Multistage sampling technique was used in the selection of 120 respondents for the study. Data collected from the selected poultry farmers and analyzed with aid of frequency counts, percentages and mean as descriptive statistical tools, the result of analysis showed that majority (79.2%) who have a mean of 8 years poultry farming experience have ranked Radio, TV and personal mobile phone respectively as mostly used and accessible ICT facilities in receiving poultry related information. Technical knowhow, poor power supply and inadequate access to some of the ICT facilities are the major constraints that limits them to do not use the ICT tools effectively. The study finally recommends, the government should encourage the use of ICTs among the poultry farmers in the area and in Nigeria at large through its inclusion in the agricultural extension programme curriculum of different states.

On the other study conducted by, [59] (P.Sireesha, B.Sudhakar, and D.Thammi, 2014). in various 33 different animal husbandry organization (A.H) in India, Several ICT tools *i.e.* Radio, TV, Mobile Phone, Internet, Video conference, Teleconference, Personal computers, Fax, Information kiosks, multimedia compact disks and other ICT tools were utilized by each

organizations, and the extent of use of the above ICT tools were assessed then the following results found,

1. Radio was observed to be a relevant tool of ICT because the majority in all organization listens Radio programs that transmitting timely information regarding livestock.
2. Most of the respondents from all organization used TV but mostly to watch films, of course there is only one livestock program transmitted once in a week.
3. The majority of the respondents from all the organization were found to be using mobile phones daily base, mainly for the purpose of information dissemination and information sharing with the officials, colleagues and sub-ordinates in view of its portability, its easy availability and instant accessibility.
4. Most of the respondents utilize Internet daily for various purposes including technical information on animal husbandries, to have update information. Email is one of the main internet based tool widely used for exchange of information such as administrative reports, monthly progress reports, etc.
5. Only some department higher managements in some organization are utilizing video conferencing for any important programmers and when required and they hire it from technology service providers.
6. Among all organization none of them was utilizing Tele conferencing as they do not possess the tele conferencing units.
7. The use of Multimedia CDs in all organization are very much experienced but for different purpose.

On the other survey conducted in three districts of Nepal by, [60] (P.R. Bist and S. Gajurel, 2015), under the title “*ICT potential in poultry production management*”, the result depicted that around 60% of the farmers are much more benefitted by the use of ICT. Around 60% of the poultry farmers have good attitude towards the ICT, it may be due to their economic status and education level becomes the constraints in the adoption of the ICT. ICT is an umbrella term that includes anything ranging from radio to satellite imagery to mobile phones or electronic money transfers. The agriculture always need information about updated cultivation material and practice due to changing weather and different insect, pest infestation in the crops, livestock rearing, which is

controlled by the new practice developed in the research center .The information about the new evolution in research center is obtained by farmer through means of ICT.

On the research, [61] (Anthony GikandiMuriithi, Eric Bett, and Sarah AyeriOgaleh, 2009) discussed about the *role of ICT and its practical contributions to agriculture and rural development* in Kenya. Data from various sources, Kenya's agricultural departments, ICT providers, NGOs and grey literature reviews were used. Results indicate that there has been an upsurge in the use of mobile telephony for agricultural information in the recent past. Approximately one member of smallholder farming households own mobile phones. Any farmer anywhere in the country can access updated and reliable market information on prices and commodity offers at an affordable rate using their mobile phones. There was a significant increase in farmers requesting for information on seed varieties to plant, hence more adoption of superior seeds for planting. The Interactive Voice Response (IVR) which covered maize, beans, potatoes, tomatoes and cabbages showed a significant increase.

The research by [62] (Bayessa, 2014) which assessed farmers' use of Information Communication Technology to get access to agricultural and market information, both qualitative and quantitative approaches were employed, quantitative data was collected from 80 purposely selected smallholder farmers using questionnaires, also qualitative data were gathered, the findings of the study showed that Agricultural extension workers or DAs served as the main source of agricultural information, followed by radio and mobile phone, barriers such as language, lack of operating skills and illiteracy have also been found as obstacles to adopt the ICT technologies. Finally the researcher recommended that farmers should get ICT basic operation and usage skills in their village on adult literacy program.

## Chapter Three

### 3. Methodology

There are various scholars defining methodology in the way that one can adequate to his/hers specific field of studies. [63] (Polit & Hungler, 2004), refer methodology as, a ways or mechanism of gathering, organizing and analyzing data. [64] (Henning, 2004) also explains methodology as, the logical groups of methods that harmonize one another and that have the ability to fit to deliver data and findings that will reveal the research questions and go with the research purpose. This chapter discusses details of the research design, research methods, target population & sampling technique, data collection tools, and related concepts that has been used in this study.

#### 3.1. Research Design and Methods

Mixed research methods (quantitative and qualitative) have been used to conduct this study, the core assumption of mixed methods research inquiry is that the combination of qualitative and quantitative approaches provides a more complete understanding of a research problem than either qualitative or quantitative approaches alone. [65] (Creswell, 2009).

Stokes, emphasized the benefit of combining both methods saying, “...by conducting two or more methods of research, you can often achieve a more textured understanding of your object of analysis”. [66] (Stokes, 2003).

As [67] (Merriam, 1998) elaborates implementation of descriptive research as “....Descriptive research is undertaken when description and explanation of a phenomenon are needed and not a prediction based on cause and effect”. Therefore the researcher used descriptive research to analyze and describe quantitative data which include use of frequencies, percentages, tables and charts as much as possible.

#### 3.2. Target Population and Sampling Techniques

In order to determine the sample population of the private livestock farms, the researcher used purposive/Judgmental sampling technique; purposive sampling technique enables the

researcher to neglect the non-significant representatives of the population. [68] (Lawrence A. Palinkas, Carla A. Green, Jennifer P. Wisdom, 2013)

Therefore due to the following reasons the researcher selected *Friendship Agro-industry* for this research

- The farm size
- The population size of manpower in the livestock farms,
- The location of the farm physically found, and
- limited project resources from the researcher side (time and budget),

The study sample consists of all employees of the selected livestock farm, since the number of staff's size in each livestock branches and its departments matters, purposive sampling techniques have been employed to get relevant total number of respondents from each branches of the farm for quantitative data.

Purposive sampling method also applied for the qualitative/Interview data to select respondents who can provide the researcher with in-depth and relevant information.

### **3.3. Data collection tools**

To conduct the study the researcher used both primary and secondary data sources. Quantitative data gathered using questionnaires in order to quantify the findings in terms of frequencies and percentages. Qualitative data on the other hand, have gathered using interviews and observations in order to confirm the findings obtained from quantitative data.

#### **3.3.1. Questionnaire**

Questionnaire for quantitative data, is the main instruments of data collection, data have been collected from those selected sample study participants using primary method of data collection. Accordingly, self-administered questionnaire have been adapted and customized from literatures of similar studies particularly from the research entitled "A Study on Smallholder Farmers' Use of Information and Communication Technologies

(ICT) to Get Access to Agricultural and Market Information”, That was conducted by Bayissa in 2014, closed and open ended questions were included in the questionnaire.

### **3.3.2. Interview**

In interview for qualitative data, the researcher had interviews with three managerial level staffs who has in-depth and relevant information, general manager, deputy general manager and marketing manager of the farm, also two of them are the co-founder of the private farm; interview questions were adapted and customized and finally presented for the target groups.

### **3.3.3. Field Observation**

Field observation is a fundamental and highly important method in all qualitative inquiry and understanding the environment using sense organ [69] (Kawulich, 2005), therefor the researcher had a visit in each livestock brunches and observes real conditions of the farm.

### **3.3.4. Documents Review/Analysis**

For the secondary data sources, different documentation from each farms as well as from their websites have been assessed to get relevant information about the farms.

## **3.4. Validity and Reliability of the Tools**

To maintain the validity of the tools, professional experts and the advisor have reviewed the questionnaires before the data collection. Furthermore, the questionnaires have passed through pilot test, 15 respondents have been purposively selected from Ayertena brunch, discussion was held with the pilot study respondents, and questionnaires were distributed, all of the participants filled the questionnaire. Once the questionnaires were filled and collected, feedbacks also gathered from the participants then the questionnaire was amended to improve the clarity and ambiguity of the questions, accordingly, after all this the researcher conduct the main study using the amended tools.

### **3.5. Ethical consideration**

Ethical clearance was obtained from department of Information science and official letters have been submitted to the selected livestock farm “Friendship Agro-industry”. All the study population are requested for oral or written informed consent prior to enrolment to the study. The purpose of the study was clearly described to the study participants including the benefits and risks of the study.

Participant’s involvement in the study was on voluntary basis; those who are unwilling to participate in the study were not being forced to do so. Any information concerning the study participant kept confidential and the specimen collected from the study participants were analyzed for the intended purposes only.

## Chapter Four

### 4. Data Presentation, Analysis and Discussion

#### 4.1. Data Presentation and Analysis

This part deals with presentation, analysis and discussion of results obtained from the study on the ICT utilization in livestock production managing, findings are based on the respondents response collected from the private livestock farm. There were around 26 employees in friendships agro industry, who are below high school education and working as a laborer in each brunches of the farm (as of the HR profile). The researcher purposively exclude this group of employee from the survey and distributed only 60 questionnaires for the rest of employees. Among the distributed 60 questionnaires, only 52 (86.7%) are collected, eight (13.3%) questionnaires were not collected as respondents did not reply and about seven (11.7%) questionnaires were rejected due to the incompleteness and ambiguity of the response, thus 45 questionnaires only, which is 75% of the total sample size were carefully and systematically reviewed and analyzed using SPSS ver. 20 statistical packages tools.

#### 4.2. Description of the Study industry

Friendship agro industry P.L.C was established in 2010 G.C with the memberships of three friends in Addis Ababa with initial capital of 45,000 ETB (forty five thousand birr) and 80 (eighty) chickens in Addis Ababa,

Upon starting the business, the entrepreneurs had only one employee to help them with the production and distribution of eggs. They had 80 chickens laying eggs and a single shop selling the eggs.

Currently, they have 87 employees in their different branches. The private farm industry has seven brunches in (DebreZeyet, Ayertena, FerensayLegasion, and British Embassy area), 25,000 chickens, a training center, a metal workshop to produce improved cages, a vegetable garden, a poultry farm, a feed-processing plant, a business plan preparation

service, and lorry rental facility; Moreover, providing poultry-based advisory services and continuous supervision of client producers is also part of their operations.

**Figure1: Head office of Friendship Agro industry**



Head office of the farm is found in Addis Ababa, the office is handling and facilitating the main activities of the farm, training service, advisory service, feed processing plant and distribution service, metal workshop cages service, sells and related service take place in the main office.

**Figure2: Poultry farm at Friendship agro industry**



The poultry farm has more than 25,000 chickens and collecting more than 5000 eggs per day and distributing for the local customers in the market, also they are regularly providing products for stars hotel in Addis Ababa.

**Figure3: Vegetable farm at Friendship agro industry**



The vegetable garden is found in Deberesiet, and growing limited vegetables for the local demand as well as for their feed-processing plant demand. Feed sales have reached 1 million ETB per month.

#### **4.3. Data Analysis**

The research questionnaire has five components namely “Demographic profile”, “ICT Media”, “ICT Devices & Access”, “Implemented ICTs and their application” and “Attitude towards the Use of ICT devices, applications and technologies”. The researcher considered all the components for analysis but selected the main fields from each category that the researcher believed they will support the objective of the research.

### 4.3.1. Demographic Profile

The following tables describe demographic profile of sample respondents took part in the study.

**Table 1: Sex of the respondents**

<b>Sex</b>	<b>Frequency</b>	<b>Parentages</b>
Male	33	73.3%
Female	12	26.7%
Total	45	100%

From the table above, among the total respondents that took part on the study (73.3%) of them are men and the rest 26.7% are woman, this results clearly showed that majority of the livestock employees who participated in this survey are men.

**Table 2 : Age of the respondents**

<b>Age</b>	<b>Frequency</b>	<b>Parentages</b>
Less than 23	1	2.2%
23 - 30	19	42.2%
31 – 40	22	48.9%
41 – 50	3	6.7%
Total	45	100%

As shown in the above table, regarding to respondents' age, adults are widely dominating the livestock industry almost half of the respondents (48.9%) are between age 31-40 years old and the second populated groups is the age between 23 and 30 which is 42.2%, only 6.7% is

between 41 and 50 years old and there is only 2.2% below 23 years old and no respondents are above 50 years.

**Table 3: Educational status of the respondents**

<b>Educational Status</b>	<b>Frequency</b>	<b>Parentages</b>
High School Certificate	12	26.7%
Diploma	19	42.2%
Degree	10	22.2%
PHD	1	2.2%
Total	42	93.3%

As shown in the above table 42.2% of the respondents are diploma graduates from vocational and/or technical colleges, 26.7% of the respondents are high school graduates, 22.2% are degree holders from the university, and there is only one person (2.2%), who has PHD in animals veterinary but there is no masters graduates in the livestock farm, and there were three respondents (6.7%) who didn't respond for the educational status question.

#### **4.3.2. ICT Media**

**Table 4: Respondents' main sources of livestock Information**

<b>Source of Information</b>	<b>Frequency</b>	<b>Percentages</b>
From Media (Radio)	23	51.1%
From Media (TV)	16	35.6%
From Media (newspaper, magazine, brochures)	27	60%
From agriculture institutions through SMS	8	17.8%
From modern technology (Internet)	30	66.7%
From other sources	10	22.2%

As shown in the above table, *Internet* was observed to be the main sources of information for livestock updates and technologies, the majority 66.7% of the respondents use the technology in transmitting timely information, exchanging reports, visiting webpages and etc.,. Also *media (newspaper, magazine and brochures)* is the second main source of informations supported by 60% of the respondents, *radio* is the third main source of livestock related updates supported by 51.1% of respondents and the rest (*TV and SMS*) were selected as main source of livestock related information by 16% and 8% of respondents respectively, and the remaining *other source* of information, probably informal communication is selected as a main source of information supported by 10% of the respondents.

**Table 5: Preferred source of information for livestock update and technologies**

Source of Information	Frequency	Percentages
Media (Radio)	7	15.6%
Media (TV)	2	4.4%
Media (newspaper, magazine, brochures)	10	22.2%
Agriculture institutions through SMS	2	4.4%
Modern technology (Internet)	20	44.4%

From the above table, about half 44.4% of the respondents agreed that Internet is their preferred source of information, Media (newspaper, magazine, brochures) is the second preferred means of information agreed by 20% of the respondents, and the rest Radio, TV and SMS are lastly preferred means of information for livestock related updates and technologies, selected by 15%, 10% and 5% of the respondents respectively.

### 4.3.3. ICT Devices and Access

**Table 6: Respondents' easy access towards ICT devices**

<b>Devices</b>	<b>Frequency</b>	<b>Percentages</b>
Radio	29	64.4%
TV	15	33.3%
Computer or Laptop	37	82.2%
Mobile phone	44	97.8%
Tablet	5	11.1%
Other	5	11.1%

As shown in the above table, mobile is the easiest accessible device in friendship agro industry 97.8% of the respondents do access the device easily, next to mobile, computer and/or laptop are the second easiest accessible device in the farm industry agreed by 82.2% of respondents, the third easiest accessible device is radio supported by 64.4% of respondents and the rest TV, Tablet and Others are supported by 33.3%, 11.1% and 11.1% of respondents respectively.

### 4.3.4. Implemented ICTs and their application

**Table 7: Implemented Technologies in the farm**

<b>Technologies</b>	<b>Frequency</b>	<b>Percentages</b>
Internet	27	60%
E-mail	25	55.6%
Financial management system (FMS)	26	57.8%
Management information systems (MIS)	25	55.6%

As shown in the above table, respondents agreed that there are only four technologies available in friendship agro industry, the remaining technologies are neither not

implemented nor unknowingly jumped by the respondents because the degrees of the respondents agreement are zero or insignificant. Among the four implemented technologies agreed by the respondents, Internet was supported by 60% of the respondents, financial management system (FMS) also was supported by 57.8% of the respondents, the remaining Email and Management information systems (MIS) were supported by 55.6% each.

The others technologies listed in the questionnaire (*E-Commerce, Webpage/ Website, Video conferencing, SMS, Decision support systems (DSS), computerized production control system, computerized livestock health and reproduction control system, computerized livestock feeding control system*) were either 0% chosen or insignificantly chosen.

**Table 8: Frequency of Internet usage**

<b>Duration</b>	<b>Frequency</b>	<b>Percentages</b>
More than once in a day	14	31.1%
Once in a day	15	33.3%
Once in a week	6	13.3%
Once in a Month	0	0%
Never used	10	22.2%

**Table 9: Frequency of Email usage**

<b>Duration</b>	<b>Frequency</b>	<b>Percentages</b>
More than once in a day	13	28.9%
Once in a day	16	35.6%
Once in a week	5	11.1%
Once in a Month	0	0%
Never used	11	24.4%

**Table 10: Frequency of Financial management system (FMS) usage**

<b>Duration</b>	<b>Frequency</b>	<b>Percentages</b>
More than once in a day	1	2.2%
Once in a day	7	15.6%
Once in a week	9	20.0%
Once in a Month	7	15.6%
Never used	21	46.7%

**Table 11: Frequency of Management information systems (MIS)**

<b>Duration</b>	<b>Frequency</b>	<b>Percentages</b>
More than once in a day	10	22.2%
Once in a day	9	20.0%
Once in a week	9	20.0%
Once in a Month	2	4.4%
Never used	15	33.3%

The result of the survey in the above four tables revealed that, 29 respondents (64.4%) were accessing Internet either once or more than once in a day using computer, laptop or mobile (smart phone), the same size of population (64.4%) are also accessing email through computer, laptop or mobile (smart phone), around 19 respondents (42.2%) are also accessing Management information systems (MIS) once or more than once in a day and lastly 8 respondents (17.8%) were accessing Financial management system (FMS) once or more than once in a day.

#### 4.3.5. Attitude Towards the Use of ICT Devices and Applications

The following table shows respondent's attitudes towards the Importance of ICT in livestock industry, their responses are based on 5-point likers scales (Strongly agree (SA), Agree (A), Neutral (N), Disagree (D) and Strongly Disagree (SD))

**Table 12: Attitude towards the Importance of ICT**

	SA	A	N	D	SD	Total
ICT devices, applications and technologies are easily accessible?	15.6%	33.3%	15.6%	17.8%	17.8%	100%
Learning how to use ICT devices and applications is easy?	15.6%	46.7%	15.6%	6.7	15.6%	100%
Using ICT devices and applications are scary?	17.8%	20.0%	22.2%	17.8%	22.2%	100%
ICT devices, applications and technologies are affordable to purchase by the private livestock farms?	22.2%	33.3%	13.3%	24.4%	6.7%	100%
ICT is valuable information sources to the private livestock farms?	51.1%	22.2%	20.0%	4.4%	2.2%	100%

Using ICT devices, applications and technologies enhances livestock productivity?	51.1%	28.9%	17.8%	2.2%	0%	100%
Using ICT devices, applications and technologies improves the quality of services offered by the livestock farms?	40.0%	35.6%	17.8%	6.7%	0%	100%
Using ICT devices, applications and technologies improves livestock communication with agriculture institutions, input suppliers, customers, and other trade partners?	44.4%	28.9%	24.4%	2.2%	0%	100%
Using ICT devices, applications and technologies improves livestock's access to get latest and updated livestock information?	46.7%	24.4%	26.7%	2.2%	0%	100%
Using ICT devices, applications and technologies enables livestock farms to reach to new animals feeding systems?	26.7%	28.9%	37.8%	6.7%	0%	100%

Using ICT devices, applications and technologies enables livestock farms to reach to new animals Health controlling systems?	24.4%	28.9%	40.0%	6.7%	0%	100%
Using ICT devices, applications and technologies enables livestock farms to reach to new marketing systems	31.1%	35.6%	33.3%	0%	0%	100%
Using ICT devices, applications and technologies enables livestock farms to reach to new e-commerce systems	26.7%	31.1%	42.2%	0%	0%	100%
Using ICT devices, applications and technologies increases livestock farm profitability	48.9%	40.0%	11.1%	0%	0%	100%

From the above table about half (48.9%) of the respondents strongly agreed or agreed to the statement “*ICT devices, applications and technologies are easily accessible*”, whereas around 35.6 % of the respondents replied negatively either by strongly disagreeing or disagreeing to the claim, about 15.6% of the respondents prefer to stay neutral.

The same respondents were asked another question which is “*Learning how to use ICT devices and applications is easy?*” The majority of the respondents 62.3% were positively agreed by either strongly agree or agree, 22.3% of the respondents were negatively agreed, that means they were either strongly disagree or disagree at all, and 15.6% of respondents remain neutral.

With respect to the statement “*Using ICT devices and applications are scary?*” the two extremes stands in each corners with almost in equal percentages 37.8 % and 40% respectively, meaning that those categorized under strongly agree and agree is 37.8% and those strongly disagree and disagree is 40% and the remaining 22.2% are preferred neutral.

Coming to the statement “*ICT devices, applications and technologies are affordable to purchase by the private livestock farms?*” more than half 55.5% of the respondents believed that the technologies costs can be afforded by the livestock farms, conversely around 31.1% respondents are negatively agreed with the statement by either strongly disagree or disagree, that means the technologies are either unreachable or expensive or the farm has other reasons so that the technologies are not affordable.

For the next five statements “*ICT is valuable information sources to the private livestock farms*”, “*Using ICT devices, applications and technologies enhances livestock productivity?*”, “*Using ICT devices, applications and technologies improves the quality of services offered by the livestock farms?*”, “*Using ICT devices, applications and technologies improves livestock communication with agriculture stakeholders?*” and “*Using ICT devices, applications & technologies improves livestock’s access to get latest and updated livestock information?*” majority of respondents have positive feedback towards the statements thus they strongly agreed or agreed with the percentages of 73.3%, 80%, 75.6%, 73.3%, and 71.1% respectively. Those negatively agreed for the statements are insignificant but those who preferred neutral are about 20%, 17.8%, 24.4%, and 26.7% of the respondents, respectively.

Regarding to the next three statements “*Using ICT devices, applications and technologies enables livestock farms to reach to new animals feeding systems?*”, “*Using ICT devices, applications and technologies enables livestock farms to reach to new animals Health controlling systems?*”, and “*Using ICT devices, applications and technologies enables livestock farms to reach to new e-commerce systems*” most respondents surprisingly preferred neutrals more than others choice with respective percentages of 37.8%, 40.0% and 42.2%, these might be due to the respondents won’t respond, or do not know the technologies, or they do have other reasons. Of course mathematically 55.6%, 53.3% and 57.8% of the respondents respectively, were positively agreed that the technologies has impact in reaching to the new modern livestock management system.

For the last two statements, “*Using ICT devices, applications and technologies enables livestock farms to reach to new marketing systems*” and “*Using ICT devices, applications and technologies increases livestock farm profitability*” majority respondents for each statements 66.7% and 88.9% respectively were positive with 0% disagreement, they strongly agreed or agreed that ICT devices, applications and technologies ended take the livestock farm to new marketing systems and profitability in general, the remaining 33.3% and 11.1% of respondents for each statements were abstains either to agree or disagree respectively.

#### **4.4. Discussion**

##### **4.4.1. Gender, Age and Education**

It is good practice for Friendship livestock farm to give an opportunities for young population to work in such livestock industry, as Ministry of educations (MOE) give high respect for technical and vocational education through the country’s educational policy, the private farm is contributing their part by hiring and skilling these young generations, however, to be competent in the world market, the farm need to be supported by highly skilled and professional manpower, having skilled manpower will let the farm to produce best quality of products and being competent and profitable in the market.

##### **4.4.2. ICT Media**

Internet was observed to be a main sources of information in Friendship agro industry because the majority utilize Internet daily base for various purposes including for livestock updates, for technical information regarding livestock’s, for market related informations, for social media access. Email is one of the main internet based application widely used by the staffs for exchange of information such as administrative reports, monthly progress reports, etc. however in my visit, it is difficult to find well-structured networking and information systems in any of friendships’ agro industry main and/or brunches offices.

Technologies are changing the world, Internet is one of the technological tools that is fast, and rapid growing in Internet service makes dramatic change in the country’s

economy, according to World Bank study with 10% increase in high-speed internet connectivity, economic growth increases by 1.3%”. [12] (World Bank, 2009).

World has an estimated number of 350 million internet users. Over 90% of them are in industrial countries, although developing countries comprise about 85% of the world population. [70] (Berndt and Morrison, 1995). We are in the era of cloud computing, most of today's modern applications are web based, hence Internet is their backbone, well developed countries livestock industries are widely based on modern technologies thus they can maximize their productivity and profitability.

The private farm need to lie in modern ICTs, Internet is one of the tools of modern technology, ICT based farms can produce quality products and can be competent in the market; of course Ethiopians' internet service is not promising; besides only 11.60% of the population are internet users, on the same study, Kenya 45.62%, Sudan 26.61%, Uganda 19.22%, Ruanda 18.00%, and South Sudan 17.93% of their total population are active internet users, they are better than Ethiopian's user. [71] (Akamai Q4, 2015). Moreover the sector is monopolized by a single telecom service provider, which is one of the limiting factors which decelerated the speeds towards modernization. Ethiopian Telecommunication Corporation (ETC) is government owned telecom service provider in country, according to the country's ICT policy, the telecom service is not open for private company; however having number of service provider is one of a means for having quality of service. [72] (budde.com.au, 2017), modern technology-enabled governments can become more efficient, transparent and responsive but it requires commitment such as organizational and behavioral changes that must be driven by high-level political obligation and effective coordination. [12] (World Bank, 2009).

Newspaper, magazine and brochures are the second main source of informations, in Friendship agro industry, there were number of documents in the individuals table, Variety in type, magazines, brochures, and flayers published by different organization especially by ministry of agriculture, it is good practices that staffs updating themselves using such source of informations, especially those who do have limited access to the other means of technologies can easily access the documentation.

#### **4.4.3. ICT Devices and access**

Mobile is the easiest accessible ICT device in Friendship agro industry, most of the staffs are mobile technology users. Mobile telephone service in developing countries like Africa has been booming, it becomes the most universal telecommunication technology in the region, the telecommunications market is still in its early stages of development, it is also one of the fastest-growing sector in the world. [73] (Internet in Africa, 2016).

Subscription rates have soared from 250 million in 2000 to 4 billion a decade later in 2010. [55] (ITU 2010). According to (ETC). As of 2012, 20.524 million cellular phones were in use. [74] (ETC, 2012), this rapid growth was made possible through falling handset prices and calling rates, the introduction of different mobile phones packages (pre-paid, post-paid, hybrid,...) and the expansion of networks into rural areas. Equivalently most mobile friendly applications have been developed, individuals can start managing and monitoring most activity using his or hers mobile phone remotely, for instance using the integrations of mobile system and wireless sensors, someone can control environmental parameters (temperature, humidity, ammonia gas...) of the livestock farm remotely. [48] (Rupali, and Sonavane, 2016)

Computers and/or laptops are also the other easiest ICT device to be accessed by friendship agro industry staffs, The researcher have seen some of the office workers in different brunches of the farm have laptop/desktop in his/hers table, most activities are being performed using computers. Now a days most office works in every discipline are dependent on computers, there is nowhere that you can't find computer; however the farm need to have more technological devices which the researcher believes, lets them to be more active, effective and efficient in their day to day job activities.

#### **4.4.4. Implemented ICTs and their application**

From the analyses Friendship agro industry have limited ICTs applications, analysis indicates that only four ICT applications out of twelve listed options are available in the farm (Internet, Email, Financial management system (FMS), and management Information system (MIS)) are the only available technologies in the farm; Internet and email are

frequently used technologies supported by 64% of the respondents. Most staffs also use MIS technologies (computers, laptops, printers, scanners, flash disks, CD/DVD and etc...) to manage their day to day activities even though there is no well-structured computer networks in any of the offices.

There is no any modern technology regarding to livestock feeding system, health control system, marketing system, production system, etc.

Each brunch offices of friendship agro industry has finance department and they are performing their day to day activities using Excel and Peachtree applications independently, since there is no e-commerce system in the farm there is no such sophisticated financial activities nevertheless having modernized and centralized financial system will benefit the organization in many aspects.

#### **4.4.5. Attitudes towards using ICT technologies**

With regard to attitudes towards using ICT technologies, among all Friendship agro industry respondents, there was a feeling in 35.6% of respondents that ICT devices are not easily accessible, of course 26.7% of the respondents are high school graduates thus they might not get basic ICT education in their schooling. Despite some negative thought, most respondents believe that ICT:-

- Is valuable information sources
- Enhances livestock productivity
- Improves the quality of services
- Improves communication with stakeholders
- Enhances new Feeding systems
- Enhances new Health controlling systems
- Enhances new Marketing and E-Commerce systems
- Increases profitability

In general, modern ICT technologies strength livestock production management system through:-

- **Livestock Information Management System (LIMS)**, recording and processing of livestock related data can be done and livestock related decision making can be touched easily (41) (ILCA 1992).
- **Computer based Health control technology**, animal disease situation will be addressed early and immediate action can be taken, vaccination, and animal movement will be managed[46] (Santos. 2002)
- **Computer based Feeding control technology**, wastage of food and water will be avoided, animals will get balanced feedwith appropriate nutritive values then maximum production performance will be reached. [49][50] (Rupali, and Sonavane; 2016), (Nath et al. 2002).
- **Computer based production and marketing technology**, traditional farming system will be replaced with an intelligent farming system, Man power gets reduced, advertisement andmarket prices information exchange will be simple, E-Commerce system can take place thus buyers and sellers can do their business. [57] (Davis and Addom, 2010).

Branch offices that geographically located in different areas can be linked through a means of portal network so that departments can work together, resources can be shared easily and manged centrally. Traditionally, dedicated Wide Area Network (WAN) used to link between the central and branch offices, when you have more than two branch offices, more dedicated lines are needed to ensure connectivity, number of lines that are needed for full connectivity increases dramatically as new offices are added, and so does the cost.

A more scalable solution is to connect branch offices using a site-to-site virtual private network (VPN). These days, what most organization are doing, as opposed to implementing dedicated WAN connectivity, businesses can rely and depend on VPNs that run over the Internet, VPN can offer maximum scalability while ensuring that communications between offices stays secure.

Virtual Private Network /VPN/ enables companies or organizations to connect with their various branches and to establish their own private networks, VPN enables the users to share information

and activate all information technology systems inside the branches via fixed and/or mobile options. The service is available all over Ethiopia in areas covered by Ethio telecom terrestrial and mobile network that support data services. VPN provide secure connections between individual users and their organization's network over the Internet. They provide more secure site-to-site connections, they transfer information much faster than WANs, since we can use a single leased line to the Internet for each offices VPNs are much less expensive. [75] (ETC, 2017)

Media also plays important roles in disseminating informations, now a day's most organization and institutions like universities, research institutions, etc. are regularly post news and updates on their activities for the end users using different ICT medias like Facebook, Twitter, LinkedIn, Flickr, YouTube, etc. the end users can simply subscribe the tools and can have the update periodically.

## Chapter Five

### 5. Conclusion and Recommendation

This part deals about conclusion and recommendations for the selected problems from the analysis part.

#### 5.1. Conclusion

This study attempted to investigate what information communication technologies and medias are being used in the livestock farm, the extent in which ICTs and medias are utilized in livestock production managements.

Friendship agro industry have been using ICTs and medias at different levels in supporting their business. The farm use the ICT primarily for communications, for livestock updates, for resources sharing and for processing financial transactions.

After making thorough investigation, the research found out that:-

- From a range of information sources for livestock updates on which the assessment was made, most of the respondent choice internet as their main sources of information as well as their preferred sources of information for livestock updates. Of course Internet plays important roles in decision making, management can reach to the appropriate decision through relevant and timely data and/or information, individuals can be updated and fasten job activities through relevant and timely data and/or information, all these can be done through Internet, however the farm have very limited internet service in any of the brunches, moreover almost all brunches are working independently, there is no means of working together in same departments in different brunches.
- The study also revealed that the essayist accessible ICT device in Friendship agro industry are mobile, and computers and/or laptops respectively, these ICT devices are playing important role in disseminating, exchanging and sharing of information among different stakeholders of the farm, however despite of the advancement of Information

communication technologies the staffs in the farm need to use more modern ICT devices with their respective applications.

- There is a big gap on implementation of modern ICT tools in the farm. There is no any implemented modern technology solutions concerning to:
  - Livestock feeding management system,
  - Health control management system,
  - Production and marketing management system

Also there is underutilization of the existing ICT solutions, most of the ICT applications, Internet, webpage, Email, FMS, MIS (computers, laptops, printers, scanners, websites, Infrastructure etc.) are underutilized.

- Despite some negative thought towards ICTs, the majority of the respondents have good understanding towards the contribution of ICTs for the livestock industries, nevertheless the management of the farm need to see the available opportunities to minimize the gap. Friendship agro industry has poor communication with different stakeholders like Ministry of agricultures (MOA), Agricultural Transformation agency (ATA), Ministry of Communication and Information Technology (MCIT), Agricultural Marketing Corporation (AMC), Ethiopian Commodity Exchange (ECX), different universities, research institutions,...etc, but regular communication among these institutions will play important role.

## **5.2. Recommendation**

Based on the conclusion discussed above, the researcher has forwarded the following recommendations.

- The management should sufficiently grasp the role of Information and communication Technologies and medias like “Internet, Network, etc.” in their day to day operational performance and keep working in infrastructure advancement in each branches of the farm.

- All branches need to work together through a means of portal networking, for this the organization should assess the available service like VPNs from the local and/or global service provider by considering the country's IT/ICT policies.
- The farm should give a good deal of attention in the need of research and development department establishment, thus studies on modern and advanced ICT solutions and tools can be conducted and accordingly important ICT tools and solutions can be adapted, customized and implemented.
- The farm need to work on the subscription of different medias (Facebook, Twitter, LinkedIn, Flickr, YouTube, journals, etc.) from universities', institution's and government's webpages for latest information updates (newsletters, reports, research results...) thus printable documents can be organized and distributes among the staffs easily.
- The farm should invest on capacity building of their employees in terms of modernization and ICT awareness gap minimization, this could be done through formal and/or informal communication, or on job trainings, the farm also need to take the initiativity of the establishment of private livestock farm associations.

Finally, this study was conducted in one of the private agro industries with relatively small population size, further research need to be conducted in order to draw a comprehensive conclusion on the Utilization of ICTs in livestock production managements, therefor the researcher recommend for further research to be conducted in this area.

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## **Appendices**

### **Appendix 1**

#### **Appendix 1: Request for research**

## **Appendix 2**

### **Appendix2: Questionnaires**

#### **Questionnaires for Friendships Agro Industry employees**

**Dear respondents,**

This questionnaire is prepared to collect data with regard to *ICT utilization in livestock Production Management*. It will provide a major input for my thesis and it is purely conducted for academic purposes.

Therefore, you are kindly requested to provide your valid responses to the sets of the questions included in the questionnaires. All your responses remain confidential.

We thank you in advance for your cooperation

Best Regards

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**Part 1: Demographic Profile**

Please circle your response for questions (1, 2, 4, 6 & 7) and fill your response for questions (3 & 5)

**1. Your gender?**

1. Male

2. Female

**2. Your age group?**

1. Less than 23 years

2. 23-30 years

3. 31-40 years

4. 41-50 years

5. Above 50

**3. Your position? \_\_\_\_\_****4. Educational Status?**

1. High School Certificate

2. Diploma

3. Degree

4. Masters

5. PHD

**5. Field of Study? \_\_\_\_\_****6. Department of work?**

1. Production

2. Health

3. Feeding

4. Sells

5. Finance

6. Support

7. Management

8. If others, please specify \_\_\_\_\_

**7. Your experience in the livestock farms**

1. Less than 3 Years

2. 3-5 Years

3. More than 5 Years

## Part 2: ICT Media

Please circle your response for question 8 & 9

**8. From where do you get information regarding livestock update and technologies that help your organization to increase productivity? (Multiple answer is possible)**

- a. From media (Radio)
- b. From media (TV)
- c. From media (newspaper, magazine, brochures...)
- d. From agricultural institutions through SMS
- e. From modern technology (Internet)
- f. From other sources, please specify \_\_\_\_\_

**9. Which one of the following is your preferred source of information regarding livestock update and technologies?**

- a. From media (Radio)
- b. From media (TV)
- c. From media (newspaper, magazine, brochures...)
- d. From agricultural institutions through SMS
- e. From modern technology (Internet)
- f. From other sources, please specify \_\_\_\_\_

**Part 3: ICT Devices and Access**

Please tick “✓” mark, for your response for question 10, the responses are presented in Yes or No form also fill number 1 up to 5 for your response for question 11

Devices	Response	
	Yes	NO
Radio		
TV		
Computer or Laptop		
Mobile phone		
Tablet		
Other Specify _____		

**10. Do you have easy access to use Information communication Technology devices listed below in your organization? (Thick your response and multiple answer is possible)**

**11. How often/frequently are you using these ICT devices?**

**Part 4: Implemented ICTs and their application**

Please tick “✓” mark for question 12 and 13 under Yes or No column and fill number 1 up to 5 for your response for question 14

**12. Does your organization implement the following ICT technologies? (Multiple answer is possible)**

Applications	Response	
	Yes	NO
Internet		
E-mail		
E-Commerce		
Webpage/ Website		
Video conferencing		
SMS (Text messaging)		
Financial management system		
Decision support systems (DSS)		
Management information systems (MIS)		
Computerized production control system		
Computerized livestock health and reproduction control system		
Computerized livestock feeding control system		

	<b>1. More than once in a day</b> <b>2. Once in a day</b> <b>3. Once in a week</b>
Radio	
TV	
Computers or Laptop	
Mobile Phone	
Tablets	
Other Specify _____	

**13. Have you ever used the above ICT technologies in the livestock's day to day working activity? (Multiple answer is possible)**

Technologies	Response	
	Yes	NO
Internet		
E-mail		
E-Commerce		
Webpage/ Website		
Video conferencing		
SMS (Text messaging)		
Financial management system		
Decision support systems (DSS)		
Management information systems (MIS)		
Computerized production control system		
Computerized livestock health and reproduction control system		
Computerized livestock feeding control system		

**14. How frequently are you using these ICT technologies?**

<b>Technologies</b>	<b>1. More than Once in a day</b> <b>2. Once in a day</b> <b>3. Once in a week</b> <b>4. Once in a Month</b> <b>5. Never used</b>
Internet	
E-mail	
E-Commerce	
Webpages	
Video conferencing	
SMS (Text messaging)	
Financial management system	
Decision support systems (DSS)	
Management information systems (MIS),	
Computerized livestock health and reproduction control system	
Computerized livestock health control system	

**15. Do you believe that the above implemented ICT technologies let the livestock farm to increase production and productivity? (Yes or No).\_\_\_\_\_**

**Part 5: Attitude towards the Use of ICT devices, applications and technologies**

Please circle your response. The responses are presented in a scale ranging from 1 to 5.

1. Strongly agree (**SA**)      2. Agree (**A**)      3. Neutral (**N**)      4. Disagree (**D**)  
 5. Strongly Disagree (**SD**)

	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>
16. ICT devices, applications and technologies are easily accessible?	1	2	3	4	5
17. Learning how to use ICT devices and applications is easy?	1	2	3	4	5
18. Using ICT devices and applications is scary?	1	2	3	4	5
19. ICT devices, applications and technologies are affordable to purchase by the private livestock farms?	1	2	3	4	5
20. ICT is valuable information sources to the private livestock farms?	1	2	3	4	5
21. Using ICT devices, applications and technologies enhances livestock productivity?	1	2	3	4	5
22. Using ICT devices, applications and technologies improves the quality of services offered by the livestock farms?	1	2	3	4	5
23. Using ICT devices, applications and technologies improves livestock communication with agriculture institutions, input suppliers, customers, and other trade partners.	1	2	3	4	5
24. Using ICT devices, applications and technologies improves livestock's access to get latest and updated livestock information?	1	2	3	4	5
25. Using ICT devices, applications and technologies enables livestock farms to reach to new animals feeding systems	1	2	3	4	5
26. Using ICT devices, applications and technologies enables livestock farms to reach to new animals Health controlling systems	1	2	3	4	5
27. Using ICT devices, applications and technologies enables livestock farms to reach to new marketing systems	1	2	3	4	5

28. Using ICT devices, applications and technologies enables livestock farms to reach to new e-commerce systems	1	2	3	4	5
29. Using ICT devices, applications and technologies increases livestock farm profitability	1	2	3	4	5

## Appendix 3

### Appendix3: Interview questions

**Interview questions for Key Informants (managements and, head of the departments) who has in-depth and relevant information**

**Dear respondents,**

This Interview questions is prepared to collect data with regard to **ICT utilization in livestock Production Management**. It will provide a major input for my thesis and it is purely conducted for academic purposes.

Therefore, you are kindly requested to provide your valid responses to the sets of the questions. All your responses remain confidential.

We thank you in advance for your cooperation.

Best Regards

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**Interview questions for Key Informants (managements and, head of the departments) who has in-depth and relevant information**

1. What sort of information and communication channel (E.g. informal communication, Radio, TV, Computer, Internet, Mobile Phone, Tablets & etc.) will you use to gather and/ or disseminate livestock related information?
2. From the different ICT devices which one do you think is easily accessible for the staff to get livestock related information?
3. What is the basic problem that you identified in gathering and/ or disseminating livestock related information?
4. Which of the following ICT technologies is/are implemented in your organizations

Applications	Response	
	Yes	NO
Internet		
E-mail		
E-Commerce		
Webpage/ Website		
Video conferencing		
SMS (Text messaging)		
Financial management system		
Decision support systems (DSS)		
Management information systems (MIS)		
Computerized production control system		
Computerized livestock health control system		
Computerized livestock feeding control system		

- 4.1.** For those yes answers in the above question, what do you think the advantage of using the technologies?
- 4.2.** For those no answers in the above question, what is the reasons for not implemented?
- 5.** How do you assess new ICT technologies and devices available in the market, which will be very helpful for the livestock farms productivity?
- 6.** Do your livestock farm has IT department?
  - 6.1.** If the answer yes; what are the IT department contribution other than IT support to improve organizational productivity?
  - 6.2.** If the answer is No, what is the reasons for not having the department?
- 7.** Is there a private livestock farm union/ association in city, or regional, or country, or continental, or international level?
  - 7.1.1.** If the answer yes, is your farm a part of that?
    - 7.1.1.1.** If the answer yes, what kind of information you are exchanging about? And how?
    - 7.1.1.2.** If the answer is No, what is the reasons for not joining the union/ association?
  - 7.2.** If the answer is no, what is the reasons for not having association/union in different level?
- 8.** In case if there are challenges that hinder the farm from using ICT to get livestock related information, what are the most important ones?
- 9.** To exchange livestock related information among different stockholders through various ICT channels, what do you suggest or recommended?

## DECLARATION

I declare that the thesis is my original work and has not been presented for a degree in any other university.

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Date

This thesis has been submitted for examination with my approval as university advisor.

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Advisor