



**Rural Public Infrastructures and Livelihood Outcomes: The Case of  
Rural Households in Kersa District, Jimma Zone**

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## DECLARATION

I, HassenNagesso, hereby declare that; this thesis entitled *“Rural Public Infrastructures and livelihood Outcomes; The Case of Rural community in Kersa District, Jimma Zone”* is my original work. It has not been submitted, in full or part, for the attainment of any academic degree elsewhere. This work has also accredited the views of the research participants. To the best of my knowledge, I have fully acknowledged the materials and pieces of information used in the study. The reporting procedures comply with a regulation of the University.

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## ACRONYMS AND ABBREVIATIONS

ADB- African Development Bank  
CSA- Central Statistics Authority  
DCs- Developing Countries  
DFID- Department for International Development  
et al. - and others (from Latin et alii)  
etc. - Etcetera  
EU- European Union  
GDP- Gross Domestic Products  
GTPI- Growth and Transformation Plan I  
HAD- Human Development Africa  
HH- Household  
ICT- Information, Communication and Technology  
i.e. - That is  
IEA- International Energy Agency  
Km- Kilometers  
MDGs- Millennium Development Goals  
NGOs- Non-governmental Organizations  
No. -Number  
ONRS- Oromia National Regional State  
PI- Public infrastructures  
Sig- Significant  
TV- Television  
UK- United Kingdom  
UN- United Nation  
Vol. – Volume  
WB- World Bank



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## ABSTRACT

*Public infrastructures such as roads, agricultural extension services, electricity, ICT, protected water sources, irrigation, formal education centers, and formal health centers are essential for economy and society to operate properly. They have an irreplaceable role in the improvement of rural people's livelihood outcomes. The general objective of this study is to examine the possible effect of rural public infrastructures on the rural households' livelihood outcomes. The empirical assessments elsewhere in Ethiopia and the circumstances on the rural livelihood in association with public infrastructures have conferred the paucity of sociological research. The assumptions of activity theory deployed to carry out the analysis of concepts, facts and themes. This study used the pragmatist research philosophy that advocates ontological and epistemological mixes in an effort to minimize the gaps noted on the empirical knowledge. Accordingly, the research strategy employs the triangulation of quantitative and qualitative approaches. As a mirror to the methodological triangulation, the analysis has followed a convergent design that combines descriptive and inferential techniques with the themes emerging through qualitative explorations. Cross-tabulation descriptive statistics and binary and multinomial logistic regression were employed. Consequently, the findings of the research revealed that public infrastructures have a significant influence on selected livelihood bases, livelihood diversification strategies, and components of livelihood outcomes. Specifically, there were significant associations whereby households who have an access to assumed infrastructures did more likely improve their livelihood assets, engage in mixed livelihood diversification strategies, feel as a livelihood outcomes components (food security, job opportunities, adequate house, contacting and consulting formal health professionals) are being improved and feel as a social capital such as (respecting each other, trusting each other and helping each other) are decreasing than households who don't have access to respective rural public infrastructures. Thus, by including cultural elements of local people, responsible bodies should increase the required resources for the purpose of upgrading and managing public infrastructures particularly on all-weather roads.*

## **CHAPTER ONE**

### **1. Introduction**

#### **1.1 Background**

The beginnings of construction public infrastructures can be traced as far back as the Roman Empire two thousand years ago. The industrialization in Europe of the 19 century brought rapid urbanization and expansion of public infrastructures such as transport (railways, tramways, metropolitan), water supply and sewerage and energy. Nowadays cross the globe, infrastructure is the lifeblood of prosperity and economic confidence (Phillips and Roth 2013).

Public infrastructure is decisive means for agriculture, agro-industries and overall socio-economic and political development. It also, incidentally, provides basic amenities that improve the quality of life (Satish 2007). It plays a key role in reaching the large mass of poor people particularly in rural areas. When public infrastructure has deteriorated or is non-existent, the poor live a worsened life. Poor public infrastructure also limits the ability of the traders to travel to and communicate with remote farming areas, limiting market access from these areas and eliminating competition for their produce (IFAD 1993). While the state of public infrastructure varies widely among developing countries, most lower-income developing countries suffer severe public infrastructure deficiencies. Deficiencies in transportation, energy, telecommunication, and related infrastructure translate into poorly functioning community (Anderson and Shimokawa 2006).

The 1994 World Development Report considers public infrastructure narrowly as long lived engineered structures, equipment and facilities, and the services they provide that are used in economic production by households (World Bank 1994). Other researchers such as Fosu, Heerink, Ilboudo, Kuiper, Kuyvenhove (1995) distinguished and listed public infrastructures in

to: irrigation and public water facilities; transport facilities; storage facilities; marketing and export facilities; processing facilities; utilities; agricultural research and extension services; communication and information services; soil conservation schemes; credit and financial institutions; and education and health facilities.

Access to public infrastructures is often identified as a key factor for sustained and rapid socio-cultural, economic and political development for rural people (Mensah, Bourdon and Latruffe 2014). Improved rural infrastructure also leads to expansion of markets, improvement of food security, social participation, female participation, and job opportunities. The development of rural infrastructure also helps to enlarge services with greater access to factors of production and productivity. The female labor participation rate increases as traditional taboos against it are overcome with public infrastructures enhancement (Rahman 1993). Easier access to rural public infrastructures allows diversification of livelihood diversification strategies. These effects of infrastructure accentuate the process of upgrading in agriculture and rural sector (Jaffee and Morton 1995). It has been observed that there was a direct relationship between increase in human development and the standard public infrastructures among rural communities (Bonney 1964).

Because of well documented importance of rural public infrastructures to promote the above listed and other advantages for rural people, either national governments or international aid agencies seem to prioritize investments in the construction of new public infrastructures and maintenance of existing infrastructures. Much of the required investment is of a public goods nature and thus most of the infrastructure investments must come from public sources and for common public purposes. Failure or slackening to accelerate investments in rural infrastructure will make a mockery of efforts to achieve the Millennium Development Goals in poor

developing countries while at the same time severely limit opportunities for these countries to benefit from trade liberalization, international capital markets, and other potential benefits offered by globalization (Anderson and Shimokawa 2006).

Consequently, the UN Millennium Project (2005) has re-emphasized the need for a ‘big push’ strategy in public investment to help poor countries and groups of people break out of their poverty trap and meet the MDG goals. Cavallo and Daude (2008) found out that the most valid generalizations about the poor are that those who are disproportionately located in rural areas. Likely, Foster and Morella (2010) believed that most of the Third World poor live in rural areas. Thus, governments in developing countries (DCs) have been giving top priority to develop rural public infrastructures to improve the livelihood of the rural people assuming that there is a strong positive correlation between the development of rural public infrastructures and socio-economic transformations (World Bank 2010).

Regarding public infrastructures in Africa; infrastructure has been responsible for more than half of Africa’s recent improved growth performance and has the potential to contribute even more in the future(Foster and Briceño-Garmendia 2010). Africa’s infrastructure networks increasingly lag behind those of other developing countries and are characterized by missing regional links and stagnant household access. Africa’s infrastructure services are twice as expensive as elsewhere, reflecting both dis economies of scale in production and high profit margins caused by lack of competition. Power is by far Africa’s largest infrastructure challenge. The infrastructure challenge varies greatly by country type—fragile states face an impossible burden and resource-rich countries lag despite their wealth. A large share of Africa’s infrastructure is domestically financed, with the central government budget being the main driver of infrastructure investment (Foster and Briceño-Garmendia 2010). In addition, African

governments need further scientific researches for the purpose of bringing a balanced socio-economic development in selection, funding, implementing, monitoring and evaluating the projects of rural public infrastructural development (ADB 1999).

Moreover, in a world with scarcity of financial resources, like the one that prevails in developing countries such as Ethiopia, knowing the relative profitability and indispensability of public infrastructure in improving livelihood is critical. This is especially important if we are interested in devising policy recommendations that may maximize the welfare possible effect of rural public infrastructure development on livelihood outcomes of rural people. Thus, studying the possible effect of rural public infrastructures on the rural livelihood outcome could be relevant.

In this research activity theory of Engeström (1999 2012) was employed. The theory states that all humanities have for their subjects' different aspects of human activity. Activity is a specific form of the societal existence of human consisting of purposeful changing of natural and social reality. Engeström (1999) suggests that activity theory may be summarized with the help of five principles. They stand as a manifesto of the current state of activity theory: a collective, artifact-mediated and object-oriented activity system, seen in its network relations to other activity systems, is taken as the prime unit of analysis; the multi-voicedness of activity systems; historicity; the central role of contradictions as sources of change and development; and the possibility of expansive transformations in activity systems. Besides, Modernization theory also argues that the development of public infrastructures is conducive to economic growth and social well-being improvement (Bryceson and Bradbury 2008).

Subsequently, the conceptual and analytical framework for the study was adapted from the Sustainable Livelihood Framework (SLF) developed by Escobal (2005)<sup>1</sup>, depending on the framework of Carney (1998) and used in several studies. The SLF conceptualizes and analyzes the relationship among public infrastructures, livelihood assets, diversification strategies and components of livelihood outcomes. Accordingly, the framework postulates that household livelihood outcome is a function of: livelihood capitals held by households; public capital that transpires to households through the manifestation of the prevailing institutional structure and public policy decisions; and households' livelihood diversification strategies- households' activities and choices as a result of change in livelihood base; and livelihood outputs.

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<sup>1</sup>See figure 2.1

## 1.2 Statement of the Problem

Ethiopia is the second-most populous country in Africa with a population of 100 million. It is one of the world's poorest countries. It has lowest level of public infrastructure particularly in rural areas of which an estimated 83 percent of the country's population lives (CSA 2015). Nowadays, it is alleged that the fundamental causes of poverty, isolation, powerlessness, vulnerability, unemployment, and high income inequality are insufficient and also unequal access and custody of public infrastructure (Escobal 2005). As a result, international community in general and Ethiopia government in particular are promoting basic services<sup>2</sup> program at a national and local levels to improve access to and quality of public infrastructures such as education, health, water supply, rural roads, agricultural extension services, electricity, ICT, irrigation, and credit services (FAO 2014). Given that an engagement of rural households in multiple economic activities, food security, income, and labor allocation within the household are enriched (Zimmerman and Carter 2003).

Researchers (such as Baron 2010; Dubale 2010; Tirkaso 2011; Mogues 2011; Assefa, Bienen, and Ciuriak 2012; Deribe and Roda 2012; Kahssay and Mishra 2013; Chen and Swain 2014; Demenge, Rossella, Katharina, Alemu, and Kebede 2014; Derso, Mamo and Haji 2014; Bowser 2015; FAO 2014; Shiferaw, Söderbom, Siba, and Alemu 2015;) studied the role of a given specific infrastructures in improving the life of rural people in socio-economic and political aspects. They all come up with the findings that improvement in a given public infrastructure improves the livelihood outcomes (augmentation of household incomes, boost of production and productivity, improvement of human and social well-being, decreasing poverty,

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<sup>2</sup> These basic services are funded by the Government of Ethiopia and a number of development partners including the World Bank, the African Development Bank, the UK's Department for International Development (DFID), the European Union (EU), Austria, and Italy. In addition, the social accountability component is being supported by DFID, Irish Aid, and the EU (HAD 2014).



increment of natural resources conservation and management, decrement of vulnerability and increment of working days).

Dubale (2010) stated that telecommunication has an indispensable role in increasing productivity for the rural people. Tirkaso (2011) conducted on the impact of ICT on the poverty reduction in Hossana district, southern parts of Ethiopia and argued that ICT plays a significant role in poverty reduction of rural people. Kahssay and Mishra (2013) studied an impact of hydroelectric project on community development and concluded that hydroelectric project development is positively correlated with the improvement of livelihood outcomes and community development. Demenge et al. (2014) based on fieldwork conducted in 2014 in the semi-arid region of Tigray, Ethiopia, explores the opportunities and potential for multifunctional roads and argued that improving road connectivity could result in improving the livelihood of rural people.

Although many studies were done so far on the impacts of public infrastructure on the livelihood outcomes, there are still gaps that this study anticipated to fill. Most of the researches conducted, didn't compare and determine a combination of public rural infrastructures in improving the rural livelihood outcomes. They didn't also show the correlation among livelihood strategies and outcomes in the context of accessibility of public infrastructures. Thus, this study attempted to fill this gap.

## **1.3 Objectives**

### ***1.3.1 General Objective***

The general objective of the research is to investigate the possible effects of public rural infrastructures on the livelihood outcomes of rural people in Kersa Woreda, Jimma Zone

### ***1.3.2 Specific Objectives***

The specific objectives of the study are to:

- ✚ describe the possible effect of accessibility to public infrastructures on livelihood assets
- ✚ determine the possible effect of accessibility to public rural infrastructures on livelihood diversification strategies
- ✚ describe the possible effect of accessibility to public infrastructures on components of livelihood outcomes
- ✚ find out the associations between livelihood diversification strategies and components of livelihood outcomes along with accessibility to public infrastructures

## **1.4 Conceptual Definitions**

### **A. Infrastructures**

Infrastructure is a basic foundations, facilities, services, and installations such as all-weather roads, formal health centers, formal education centers, clean piped water, telecommunications (mobile), electricity, agricultural extensions services, and irrigation (Escobal 2005).

### **B. Livelihood**

“Livelihood is the capabilities, assets (stores, resources, claims and access) and activities required for a means of living” (Chambers and Conway 1991:6). Ellis (2000: 10) defined it as “a livelihood comprises the assets (natural, physical, human, financial and social capital), the

activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household.”

#### C. Livelihood assets

Livelihood assets are the private assets such as education, family size and composition, age, land, cattle, and income.

#### D. Livelihood diversification strategies

Livelihood diversification strategies denote a dynamic process in which households combine the range and combination of activities and choices by standing on their private livelihood bases public infrastructures in order to achieve their livelihood goals.

### **1.5 Operational Definitions**

- ✚ Accessibility of public infrastructures – households’ getting an access of a given public infrastructures within a given limit and criteria.
- ✚ Access - one’s capability (i.e. distance, time, convenience and energy) to reach those facilities that will enhance one’s living condition.
- ✚ Accessibility - involves the facility being located within safe physical reach, being affordable and being accessible in law.
- ✚ Livelihood outcomes components’ improvement - households heads’ feeling about either the components such as food security, adequate house, female participation, health status of households’ members, and education status of households’ members are being improved or not.

## 1.6 Significance

This study will provide a solid document that might be used as a source of information on public rural infrastructure for various actors (readers, students, researchers) working in rural areas. It will also help the responsible bodies and stakeholders of an area, in which the study will be conducted, to get information, to improve strategic plans and to reconsider social policy. This can be possible since the result will be published and the finding document will be provided to district's responsible bodies.

## 1.7 Scope

Two parameters have delimited the scope of the study. These were: thematic issues assessed in the study and unit of observation<sup>3</sup>. The research explores the types of livelihood diversification strategies, livelihood assets and components of livelihood outcomes; thereby associations and possible of selected public infrastructures on these issues explained. All components of livelihood outcomes were not included. In concise terms, the thematic delimitations of the research focuses on: (a) the types and natures of livelihood diversification strategies, one element of each livelihood asset<sup>4</sup> and ; (b) possible effect of selected public infrastructures on selected elements of livelihood assets; strategies and selected components of livelihood outcomes<sup>5</sup>; and (c) association between livelihood strategies and components of livelihood outcomes. The second dimension of the delimitation of the thesis was in terms of the target

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<sup>3</sup> Units of observations, in this thesis, are the participants of the research from which relevant data are collected. The households unit of observations. The conclusions made to communities in the local settings depend on the responses extracted from heads of the households. The in-depth interviews, key informant interviews, and the observations complemented the generalizations drawn to the rural livelihood outcomes.

<sup>4</sup> The researcher has selected school age children out of school from human capital, households cultivated land size from natural capital, access to credit from financial capital, and mutual support among community from social capital.

<sup>5</sup> The researcher selected; food security, job opportunities, adequate house, contacting and consulting formal health professionals immediately as soon as they feel ill and social balance (respect and trust among household members) among other components of livelihood outcomes. The reasons for the selection for these components is researcher interest.

groups that serve as the primary sources of data. The target groups were households, government offices, and elders from each kebele.

### **1.8 Limitations**

Several limiting contexts present challenges to the level of progresses required in this study. The major ones involve unavailability of pertinent information, finance, dearth of research outputs on the themes under focus and poor institutional operations.

The scantiness of empirical research, unavailability of forums and scientific papers exclusively or primarily dedicated to the effects of public infrastructures on livelihood outcomes created challenges to the research endeavor. It demanded the researcher to labor in search of relevant literature and information produced on relevant themes in sociology of rural development. Part of the challenge falls on the absence of empirical and theoretical models that capture the specific possible effects of rural public infrastructures on components of livelihood outcomes. It was so cumbersome to have a model that capture and guide the research activity. Obtaining reliable and up-to-date data i.e. digitalized using technology, which would enable its easy

Transfer and processing regarding the rural development phenomena in Ethiopia was another major challenge of the study. Across the government bureaus and offices, pertinent data were inaccessible or they do present often-contradictory claims. Systems for registering household's profiles, expenditure, income and other attributes were non-existent despite their indispensability in research and development planning. The antiquated data recording and processing systems have added to the challenges of obtaining relatively appropriate and timely data.

In connection with the absence of reliable data, there were also troubles of accessing data and pertinent information from the households. The attempts to generate data from households via the survey or interviews were most cumbersome. The households were all suspicious when approached through structured interviews although explicitly informed about the objective of the research in advance. This is because they feel that there was no any change by information they were providing previously for other researchers.

## **Chapter Two**

### **2. Review of Literature**

#### **2.1 Conceptual Framework**

The selected conceptual framework among the definitions of public infrastructures is the conceptualization of the conventional theory on public goods that recognize public infrastructures as goods that are typically technical indivisible, have low excludability, long life and are rarely traded (Escobal 2005). Ahmed and Donovan (1992) however, took issue on the definition of "infrastructure" showing how the concept has evolved since the work of Arthur Lewis and that of Albert Hirschman. They, recognize that with the increasing importance of the role of agriculture in economic development, the literature started including agricultural research, extension services, financial institutions or/and irrigation as part of a much broader concept of infrastructure.

As can be seen in Figure 2.1, the livelihood assets may include the infrastructure services a rural household has access to. If there is a positive shock to this livelihood base, for example through some kind of infrastructure investment (i.e. a new or improved road, access to electricity, rural telecommunication, water facilities), this will affect household livelihood diversification strategies. How livelihood diversification strategies change because of this policy shock will depend on the context where such investment takes place, which may include not only the characteristics of the physical environment where this household is located (something that we refer as "geography"), but also the social and institutional setting and finally, any other shock that the household may be subject to (Escobal 2005).

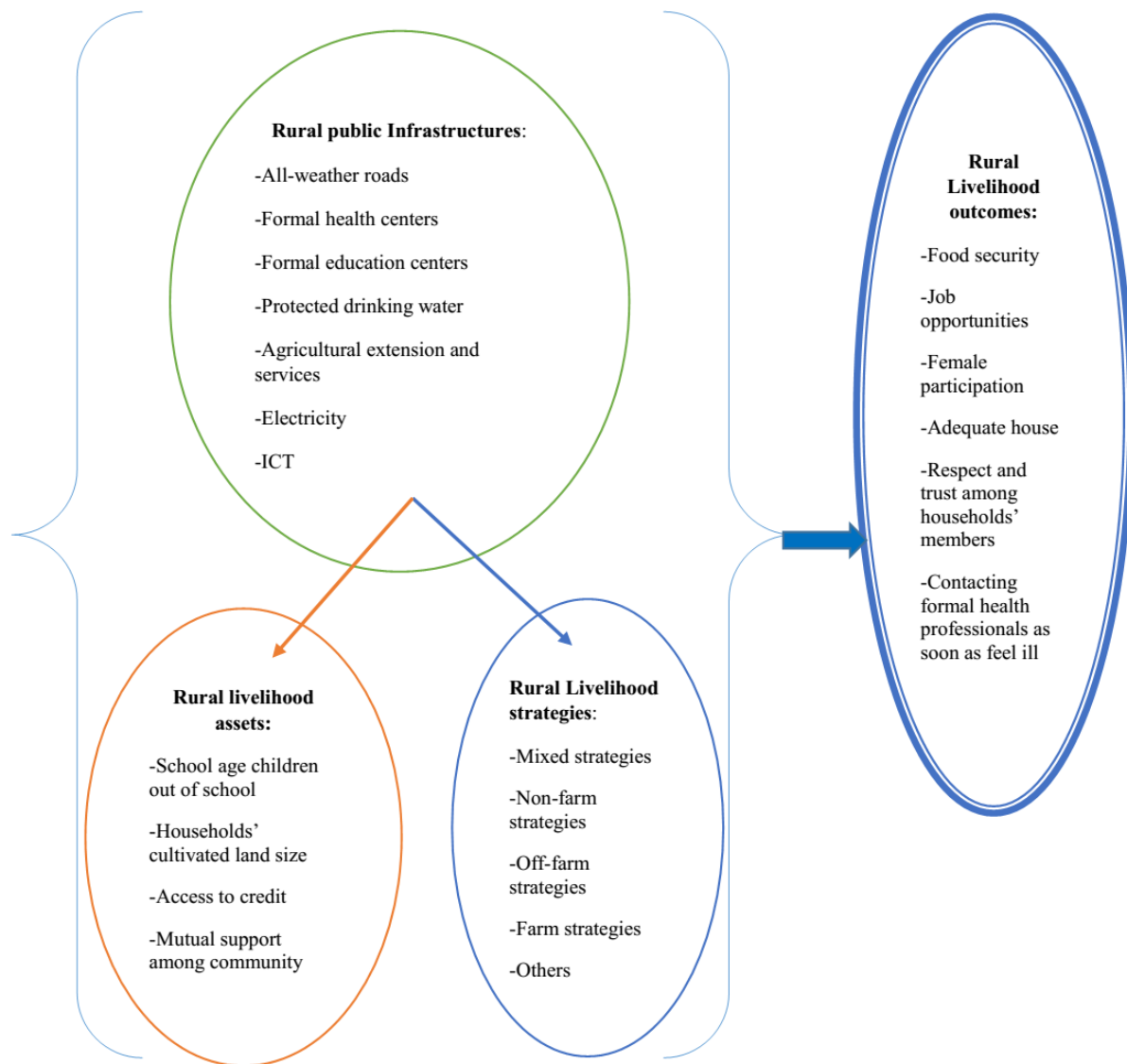


Figure 2.1: Conceptual framework (Source: Adapted from Escobal (2005))<sup>6</sup>

As an infrastructure investment changes the livelihood base, its impact will be reflected in an improved access to services, in changes in the utilization of labor and other factor markets, and ultimately in changes in livelihood diversification strategies (Escobal 2005). In turn, these diversification strategies, depending on the asset base, will help cope with or reduce

<sup>6</sup>Escobal (2005) had adapted from Ellis (2000) and Earney (1998). Subsequently, the researcher has also adapted another model in summarizing his work (see figure 5.1)



vulnerabilities or will be used as a search mechanism for new market opportunities that would enhance the asset base and allow these rural households to escape from poverty (Escobal 2006).

A lot of researchers envisage that infrastructure investments may have macroeconomic and microeconomic impacts. At the macroeconomic level, improved access to new infrastructure services may change the marginal rate of return of the main infrastructure, but it may also affect the marginal rate of return of other public infrastructure as well as the returns to those private assets that are already in the hand of the poor. Thus from changes in infrastructure endowments and the rate of returns of public and private assets may trace the impact of infrastructure investments on rural income growth. On the other hand, microeconomic effects can be traced through changes in market specific relationships or household specific behavioral changes. Microeconomic effects can also be traced at the household specific level, as infrastructure investments changes factor markets, affecting input choice and mix, as well as labor allocation (Escobal 2006).

Although extensively reviewed for developed countries, the literature between infrastructure and rural livelihood is relatively scarce in developing countries. Most work is concentrated in the developed countries and as Creightney (1993) recognizes, it is mostly restricted to evaluate the impact of public investment on aggregate demand and output. The works of Fan and Hazell (1999), Zhang and Fan (2000) in India and China are the first and most comprehensive attempts to link infrastructure investments to rural growth and poverty alleviation. This research will shows that investment in infrastructure, especially irrigation, roads, electricity, and telecommunications contributed not only to agricultural production growth, but also to the reduction of rural poverty and regional inequality and finally improve the livelihood outcomes of rural people.

## **2.2 The livelihood Impact of Public Infrastructure: Theory**

Sustainable livelihood outcomes approaches are based upon evolving thinking about poverty reduction, the way the poor live their lives, and the importance of structural and institutional issues. The twin influences of the policy framework and governance, which have dominated much development thinking since the early 1980s, are also reflected in sustainable livelihood, as is a core focus on the community. Community-level institutions and processes have been a prominent feature of approaches to natural resource management and are strongly emphasized in sustainable livelihood approaches, though in sustainable livelihood the stress is on understanding and facilitating the link through from the micro to the macro, rather than working only at community level (Ashley and Carney 1999).

Despite stated commitments to poverty reduction, the immediate focus of much donor and government effort has been on resources and facilities (water, land, clinics, infrastructure) or on structures that provide services (education ministries, livestock services, NGOs), rather than people themselves. SL approaches place people firmly at the center; the benchmark for their success is whether sustainable improvements in people's livelihoods have taken place. It is anticipated that this refocusing on the poor will make a significant difference to the achievement of poverty elimination goals(Ashley and Carney 1999).

## **2.3 Activity Theory**

Engeström (1999) suggests that activity theory may be summarized with the help of five principles. They stand as a manifesto of the current state of activity theory: 'The first principle is that a collective, artifact-mediated and object-oriented activity system, seen in its network relations to other activity systems, is taken as the prime unit of analysis. Goal directed individual and group actions, as well as automatic operations, are relatively independent but subordinate

units of analysis, eventually understandable only when interpreted against the background of entire activity systems. Activity systems realize and reproduce themselves by generating actions and operations (Engeström1999).

The second principle is the multi-voicedness of activity systems. An activity system is always a community of multiple points of view, traditions and interest. The division of labor in an activity creates different positions for the participants, the participants carry their own diverse histories, and the activity system itself carries multiple layers and strands of history engraved in its artifacts, rules and conventions. The multi-voicedness is multiplied in networks of interacting activity systems. It is a source of trouble and a source of innovation, demanding actions of translation and negotiation (Engeström1999).

The third principle is historicity. Activity systems take shape and get transformed over lengthy periods of time. Their problems and potentials can only be understood against their own history. History itself needs to be studied as local history of the activity and its objects, and as history of the theoretical ideas and tools that have shaped the activity. Thus, medical work needs to be analyzed against the history of its local organization and against the more global history of the medical concepts, procedures and tools employed and accumulated in the local activity (Engeström1999).

The fourth principle is the central role of contradictions as sources of change and development. Contradictions are not the same as problems or conflicts. Contradictions are historically accumulating structural tensions within and between activity systems. The primary contradiction of activities in capitalism is that between the use value and exchange value of commodities. This primary contradiction pervades all elements of our activity systems. Activities are open systems.

When an activity system adopts a new element from the outside (for example, a new technology or a new object), it often leads to an aggravated secondary contradiction where some old element (for example, the rules or the division of labor) collides with the new one. Such contradictions generate disturbances and conflicts, but also attempts to change the activity (Engeström1999).

The fifth principle proclaims the possibility of expansive transformations in activity systems. Activity systems move through relatively long cycles of qualitative transformations. As the contradictions of an activity system are aggravated, some individual participants begin to question and deviate from its established norms. In some cases, this escalates into collaborative envisioning and a deliberate collective change effort. An expansive transformation is accomplished when the object and motive of the activity are re-conceptualized to embrace a radically wider horizon of possibilities than in the previous mode of the activity. A full cycle of expansive transformation may be understood as a collective journey through the zone of proximal development of the activity(Engeström1999).

#### **2.4 The Impacts of Infrastructure on Livelihood Sustainability**

Several studies conducted show that rural infrastructure (both physical and institutional) such as irrigation, watershed development, rural electrification, roads, markets, credit institutions, rural literacy, agricultural research and extension together play a key role in determining the people livelihood (Narayanamoorthy and Hanjra 2006). For example, rural electrification increases the energization of pump sets, which helps to increase the irrigated area using groundwater; the output of crops cultivated under groundwater irrigation is always higher than those under canal or tank irrigation, because of its better reliability and controllability (Barnes and Binswanger 1986; Dhawan 1988; Vaidyanathan *et al.* 1994; Shah *et al.* 2006).

Rural road increases the diffusion of agricultural technology by improving access to markets, enhances more efficient allocation of resources, reduces the transaction costs as well as helps the farmers to realize better input and output prices (Ahmed and Donovan 1992; ESCAP 2000; van de Walle 2002).

Viitanen (2003) states that ICT's encompasses the combination of all manufacturing and service industries that capture, transmit and display data and information electronically. In the same way (Marcelle 2000) illustrates the term ICT's as a complex and heterogeneous set of goods, applications and services used for producing, distributing, processing and transforming information, through diverse means such as telecommunications, television and radio broadcasting, computer hardware and software, computer services and electronic media. Moreover, the provisioning of basic health service in rural area is influenced by the level of available information communication schemes.

In this regard, the work made by Chaya (2007) argued that the existing poor transportation and communication outlets limited provisioning of basic health services for societies residing in rural and remote areas especially on times of emergencies needed. On the other hand, it is observed that the level of educational coverage and quality is positively influenced by effective application of modern communication technologies where better exchange of knowledge and information between student and teachers takes place (Tinio 2002).

There is a close correlation between an inadequate supply of energy and poverty. It is estimated that more than 1.3 billion people, approximately one in five globally, still lack access to electricity, and almost all of them live in developing countries (IEA 2011). Meanwhile, about 2.6 billion people rely on solid fuels such as wood, coal, and charcoal for subsistence, which cause emphysema and other respiratory diseases and kill approximately 1.5 million people annually,

therefore the access to electricity must be environmental and socially sustainable (World Bank 2013).

Moreover, the population growth, urbanization, and its increasing demands for more food, goods and services have put enormous challenges to the energy supplies and energy structure, which was dominated by fossil fuels nowadays. When energy supplies are insufficient, employment is hindered. There will certainly be an abundance of health issues, lack of goods and services. Hence economic growth will be stunted and poverty will remain. Rodrigues and Comtois (2013) in their study state that there is a close correlation between the use of energy and the quality of life.

In line with this Najam and Cleveland (2008) finds that access to sustainable energy is a key factor for promoting social progress and economic growth-s-both of which are closely linked to sustainable poverty reduction. Roger (2008) finds an observable links between energy and gross domestic product (GDP); he states that there is a straight correlation with energy usage and economic growth, Therefore, he argued energy per capita usage is now days perceived as one of the indicator of sustainable development.

## **2.5 Policy Framework of Infrastructures**

The development of public infrastructures enable all countries to achieve the MDGs, there should be identification of priority public investments to empower poor people, and these should be built into MDG-based strategies that anchor the scaling-up of public investments, capacity-building, resource mobilization, and official development assistance. Seven main investment-and-policy clusters are identified in the areas of rural development; urban development; health systems; education; gender equality; environment; and science, technology and innovation. Dramatic increases in external aid flows, to the tune of 0.54% of rich countries' gross domestic

product (GDP) by 2015, are seen as the inevitable source of the necessary finance, given the lack of domestic resources in many countries. This ‘big push’ strategy is designed to set low-income economies on a growth path that will become self-sustainable, as core investments in infrastructure and human capital will enable poor people to join the global economy and establish the basis for private-sector-led diversified exports and economic growth (Anderson, Renzo and Levy 2006).

Despite the development of increasingly sophisticated methods for assessing the desirability of public expenditure during the 1960s and 1970s, large increases in public investment in many developing countries between 1974 and 1982 often yielded few returns (Little and Mirrless 1990; Easterly 2001). Nevertheless, there is a possibility that at least one of the reasons was that the methods available to assess the desirability of public investment alternatives were flawed, badly implemented, or ignored.

In the 1980s and 1990s the focus was largely on macroeconomic stability and aggregate fiscal discipline whereas more recently, criteria for resource allocation and issues of efficiency and effectiveness of public spending have come to the fore, highlighting the importance of the role of government in determining the ‘pro-poorness’ of growth paths and public investment policies (Wilhelm and Fiestas 2005). However, figuring out the likely aggregate effects of alternative policies, and their impact on the well-being of various social groups, remains a difficult task (Paternostro, Rajaram, and Tiongson 2005).

The difficulties related to the definition of appropriate resource-allocation criteria may also derive from what has been termed the ‘basic budgeting problem’, or the stated impossibility of ‘defining a comprehensive utility function or decision-making mechanism that can satisfactorily

reconcile the competing claims of different interests for resources across the whole public sector’ (Fozzard 2001).

Moreover, much of the material is highly technical and not adequate for use by non-specialists. On the other hand, the reality of the policy process and of political cycles in many poor countries is not often conducive to a rational approach to policy-making and resource allocation. (Anderson et al. 2006).



## Chapter Three

### 3. Research Methods

#### 3.1 Study Setting and Population

The study area is in the Oromia National Regional State (ONRS) of Ethiopia, Jimma Zone administrative area. According to the CSA (2015) census, the Oromia regional state has a population of 33,692,000 of which 4,880,000 is urban dwellers and 28,812,000 is rural dwellers (CSA 2015). Jimma Zone is purposively selected from the zones of Oromia region. The total population of Jimma zone is 2,986,957 of which 1,498,021 are male and 1,488,936 are female. Among its districts, Kersa district was again purposively selected. Interest of the researcher, officially allowed time to conduct a research and distance of selected sites were the reasons for the selection of both Jimma Zone and Kersa district.

Kersa is one of the *woredas* in the Jimma Zone of the Oromia Region of Ethiopia. It is bordered in south by Dedo, southwest by SekaChekorsa, west by Mana, north by Limmu Kosa, northeast by TiroAfeta, and southeast by Omo Nada. The altitude of this *woreda* ranges from 1740 to 2660 meters above sea level; mountains include Sume, Gora, Kero, Folla and Jiren. Perennial rivers include the GilgelGibe, Karsa, Bulbul, Melekta and the Birbirsa<sup>7</sup>.

#### 3.2 Research Design

Creswell and Clark (2011:53) defined research design as, “the procedures for collecting, analyzing, interpreting and reporting data in research studies.” The study at hand deployed a mix of both quantitative and qualitative approaches. For Bryman (1998) the quantitative research approach explores human experience through numerical categories while the qualitative research strategies describe human interaction. More comprehensively, (Marvasti 2002) believes the

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<sup>7</sup> The researcher has put map of the study area with the coverage of public infrastructures under results' chapter (*see* figure 4.1)

synthesis of these strategies provide a relatively complete image of human experiences and interactional encounters both through numerical and interpretative descriptions. The philosophical foundation of the study is pragmatism<sup>8</sup>. The reasons for the selection of pragmatic approach are: to use variety of data sources, to use multiple methods in the study at the same time or one after the other and to use multiple perspectives to interpret the results. Approximating longitudinal survey with cross-sectional design<sup>9</sup> was employed. The researcher selected this study design to use the both advantages of cross-sectional and longitudinal design at the same time. Moreover, this study is descriptive and explanatory. It is descriptive since it defined about changes in households' livelihood assets and strategies along with the development of rural infrastructures. Finally, it is explanatory since it has explained and predicted about why changes in households' livelihood assets and strategies happened.

### **3.3 Methods of Data Collection**

#### **3.3.1 Household survey**

##### **A. Types and Sources of Data**

The collected data through household survey are: demographic and socio-economic data (age, sex, religion, marital status, educational status, household's monthly income, household's size); nature and changes of livelihood assets; types of livelihood diversification strategies; accessibility to a given infrastructures; types of services households getting from a given public infrastructures; and feeling of household's heads about (existence of food security

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<sup>8</sup> Morgan (2014:1051) concluded that, "in increasing in pragmatism as a paradigm for social research, it is essential to recognize that paradigms are more than simple statements about future directions for the research. Rather than framing the study of social sciences research as commitments to an abstract set of philosophical beliefs, pragmatism concentrates on beliefs that are more directly connected to actions. This calls for an approach to methodology that goes back to its original linguistic roots, the study of methods."

<sup>9</sup> Yerasework (2010:127) stated that, "to gain from the best of both of the two worlds (i.e. the efficiency of cross-sections surveys and the special advantage of the longitudinal surveys), certain devices are employed in a cross-sectional survey that is used in approximating longitudinal surveys. The devices used are: asking respondents to furnish data relevant to the past, age or cohort comparison, and logical interpretation of cross-sectional data to indicate process over time."

throughout year, adequate house, job opportunities, school age children (7-18) out of schools, and social network (feeling of household heads about respect among household's members and trust among household members) from respondents).

### B. Sampling and Sample Size

For authors such as Corbetta (2003), simple random sampling technique appears appropriate when the lists of the units studied are accessible. This technique bears its usefulness in the sample survey conducted with households. It was possible to access the lists of the residents from the respective study *kebeles*. Aside from accessing the lists of households, according to Cohen, Manion and Morrison (2000:100), "in simple random sampling technique, each member of the population under study has an equal chance of being selected from a list of the population." Such qualities marked simple random sampling technique as the most appropriate to be used. From thirty one rural Kebeles, four kebeles (Tolikarso, Bulbuli, Babo and kallacha) were randomly selected. Thereby 255 households, from 710 households, were selected by simple random sampling; and lottery method of sampling was utilized among its strategies.

The sample size was determined by depending on the formula of Yamane (1967:886) because it's the simplified in the case of finite population. The formula considers 95% of confidence, and 5% margin of error. The formula is:

$$n = N / [1 + N (e)^2] \rightarrow n = 710 / [1 + 710 (0.05)^2] = 255$$

Where n is the sample size, N is the population size, and e is the level of precision.

### 3.3.2 In-depth Interview

In-depth interview, as a distinctive form of field research, entailed the use of a face-to-face interaction between the researcher and the target groups. Crano and Brewer (2002: 223) shared

that, "...interview occurs when the nature of the research issue demands a personal, interactive, method of data collection. ... [Particularly] when highly sensitive information is sought..." In-depth interview was employed in collecting detailed information to substantiate quantitative data and to offer a complete picture of association among accessibility of public infrastructures, livelihood bases, strategies and outcomes. Hence, *kebeles*'<sup>10</sup> elders – 16 individuals (four<sup>11</sup> from each *kebele*) were purposively selected and deeply interviewed. The selection of these respondents depended on the respect and role they have in community. The researcher selected the above participants assuming that they have experience on issues under study and can provide profound information on the changes of livelihood assets, strategies, and components of outcomes as a result upgrading public infrastructures.

### **3.3.3 Key Informant Interview**

In the opinion of Bernard (2006), key informants are groups of people with whom the researcher talks and communicates extensively over a lengthy of duration. The key informant interview was held with key individuals on all selected sectors of public infrastructures. Accordingly, the head of all respective infrastructures (sectors) bureaus at district level – 16 individuals (two each) from office of: health; education; water, mineral and energy; irrigation and rural development; electricity (power); transportation; agricultural; and ICT were interviewed about an associational changes of public infrastructures, livelihood bases, strategies, and outcomes.

### **3.3.4 Field Observation**

Observation<sup>12</sup> as a data-collection method presented a crucial opportunity to gather substantial facts during the fieldwork. Scholars (such as Sarantakos 1996; Simmel et al.

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<sup>10</sup>Babo, Kallacha, Tolikarso and Bulbul

<sup>11</sup> Two each from both sex

<sup>12</sup> The researcher identifies himself as a researcher and interacts with participants in social processes; but makes no pretense of actually being a participant.

1997 and Ruane 2005) contended that field research provides contexts for probing social life in its natural setting. Observation was instrumental in conducting thorough nature of the standard of households' house and public infrastructures. Babbie (2008) acknowledged the superior merits of observation as it created the opportunities for observing and thinking at the scene of the action, event, processes or phenomena. Field level observations serve as a complementary method to triangulate data collected through in-depth interviews and other tools.

### **3.4 Instruments of Data Collection**

Colton and Covert (2007:6) defined data collection instruments such as a questionnaire as “mechanisms used to collect factual information, support observations, or assess attitudes and opinions of units...in a given study.” In this study, the main data-generation instruments were structured questionnaires and semi-structured checklists. The primary objective of structured questionnaire was to elicit quantitative information from households' heads.

The preparation of structured questionnaires, i.e. the instruments followed a design that hastensenticing pertinent information from the target groups. Items on each of the instruments communicated clearly the purposes of the study, shaded light on precautionary ethical issues and explained the powers of following instructions while filling out the questions. Altogether, the contents of the questionnaire items covered issues on an association and extricable effect among an accessibility of public infrastructures, livelihood bases, strategies, and outcomes. Structurally, most of the items were close-ended while a few of them followed open-ended formats in situations that demanded probing and detailed explanations accounted by respondents.

Checklists used for the qualitative field research were semi-structured guides that elicited qualitative information (meanings, words and ideas) through deeper consultations from informants, key informants and discussants. The checklists have also guided the field

observations. All of these checklists were constructed following an open-ended semi-structured questionnaire formats.

### **3.5 Pilot – Testing: Purpose, Usefulness and Lessons**

Pilot – testing practices refine, assist to modify and reformulate the items in a questionnaire. The practice generally verifies, among others, the consistency, concepts and logical flow and connections among questionnaires. The researcher executed pilot – testing of ten questionnaires in four selected *kebeles*. Thereby, it has shown the gaps in the constructed questionnaire and items contained in it. Accordingly, the reviews of an items on the pilot- testing lead to the oversimplified version of the final instrument.

### **3.4.1 Reliability and Validity**

#### ***3.6.1 Reliability***

Reliability signified the consistency of the measures involving the capacity of the instrument to measure the same phenomena a number of times (Bernard 2006; Singh 2007; Babbie 2008). Singh (2007), for instance, outlined the test-retest technique, the inter-rater technique and the split-half reliability as techniques of examining the reliability of research results. The aspects of inter-rater technique of reliability proved its usefulness in the context of the pilot testing. The inter-rater reliability assessed the reliability of research instruments by utilizing four interviewers per site (Tolikarso, Bulbuli, Babo and kallacha). Through cross-examination of the reflections of the pilot testers, the evidence obtained from them showed the non-existence of crucial deviations. Researcher also ensured internal consistency of instruments by the split-half correlation from plot-testing of ten questionnaires. This was done by comparing the results of one half of instruments with the results from the second half which could be separated as first half

and second half. The two halves of an instruments provided similar resultof ( $r = .88$ ). Subsequently, instruments had strong internal consistency.

### ***3.6.2 Validity***

Like the reliability concerns, validity involved examining the external and internal contents of the constructed questions to capture the essential concepts in the research scheme. Bryman (1998:29) understood validity as, "...the issue of how we can be sure that a measure really does reflect the concept to which it is supposed to be referring." Babbie (2008:160) also added a complementary view that, "...validity refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration." Hence, both the face validity and content validity appear apparent to judge whether the instrument have captured the core concepts in the study or not. The researcher believed that the items on the instrument captured the concepts that are essential in the research. The reviews of relevant empirical literature on related themes demonstrated the quality and instrumentality of the questions included on the items. Besides, content validity were assured by giving the instrument for four experts in the area of study. Then their comments and suggestions were included to verify the validity of the instrument.

### **3.5 Methods of Data Analysis**

The analysis applies a mixed design. This design was optimal as it allowed the researcher to "triangulate ...compare and contrast quantitative statistical results with qualitative findings for justification and validation purposes" (Creswell and Clark 2011: 77). Thus, a convergent design that mixed the data from qualitative and quantitative sources has led the overall analysis. Quantitative analysis uses the numeric data gathered through the sample household. The quantitative data applied both the techniques of descriptive and inferential statistics. The

descriptive analysis emphasizes on percentages, central tendencies and graphic presentations. Mwanje and Butte (2001) conferred that descriptive statistics gives an array of tools that portray data through tabular formats, charts, graphs and numbers.

Consequently, the interpretations followed presentations made through pie charts, frequency tables and bar charts portraying numeric facts in finding chapter of the study. The Chi-square test of association was an essential tool for looking at the prevailing associations among the interactional variables. Cross-tabulation results help to discern the general patterns seen among the associated variables. Healy (2005) elaborated on the measures of association as a form of descriptive statistics instrumental in summarizing the relationship between variables. The results conferred the prevailing relationships among the variables compared through column percentages.

Furthermore, Binary and Multinomial Logistic Regression Models serves to determine the probabilities of the independent variables to predict the categorically dependent outcomes. The models maps out the determining relationship that occurs between independent and outcome variables in terms of probable predictions. While running the tests of statistical associations, Binary and Multinomial Logistic Regression, the researcher applied a 95 percent confidence interval. As a result,  $\alpha=0.05$  serves as a critical distinguishing value, without strict assumptions of normality under most circumstances. In addition, the Phi<sup>13</sup>-coefficient, Lambda-coefficient and Spearman's Rho-coefficient help to explain the strength and direction of association wherever the data appeared apparent.

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<sup>13</sup> Phi coefficient, as a measure of association, appears appropriate for simple tables of nominal variables. For Phi values between 0.000 & 0.10, the strength of the association is weak while phi values between 0.11 & 0.30, the strength of association is moderate while phi values between 0.30 & 0.70 and the strength of association becomes strong while phi values between 0.70 and 1.0 (Healey, 2005: 342).



The qualitative data were transcribed<sup>14</sup>, categorized, schematized and interpreted based on their respective contents and themes. The meanings, words, symbols and argumentative texts have formed basic premises in the structures of reporting the sub-titles, sections and chapters.

### **3.6 Ethical Considerations**

In conducting this study, an ethical considerations and safety measures were made. Accordingly, before going to the field the letter from Jimma University, college of social sciences and humanities research coordinate, was taken and given to the *woreda* administrative and other required bodies. After I went to the field and contacted with respondents, the purposes and importance of the study were explained for the participants of the study and informed consent was obtained from each of them. Thus, participants were given the authority to permit or refuse in the collection of data in any form; full right was deserved to withdraw at any time: to change ideas or to edit recorded materials. Besides, the privacy of the participants was promoted and they were informed that whatever information they provide be kept confidential. That is, the confidentiality and anonymity of information were strongly maintained.

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<sup>14</sup> The researcher translated and summarized the audio-recorded data sets [observations, interviews-both key informants and in-depth interviews] into English.

## CHAPTER FOUR

### 4. Data Analysis and Presentation

This chapter deals with data analyses and presentation of the study and attempts to answer the research objectives concerned with possible effect of public infrastructures on the rural livelihood outcomes in four *kebeles* of Kersa district. Specifically, it includes about the presentation of: (a) demographic and socio-economic information of respondents; (b) public infrastructures coverage contexts of kersa woreda; (c) possible effects of accessibility to public infrastructures (all season road, formal health centers, formal education centers, ICT, protected water sources, agricultural extension services, electricity, and irrigation) on livelihood assets (sending children to school, households' farming land size, access to credit and mutual support among community); (d) nature and types of livelihood diversification strategies (mixed livelihood strategies, only non-farm strategy, merely off-farm strategy, purely farming strategy and others) along with accessibility of public infrastructures; and (e) possible effect of accessibility to public infrastructures on the components of livelihood outcomes (food security, contacting and consulting formal health professionals as soon as feel ill, job opportunities, adequate house, and trust and respect among household's members).

#### 4.1 Demographic and Socio-economic Characteristics of Sample Respondents

This section presents demographic and socio-economic variables such as sex, age, religion, educational status, marital status, households' monthly income, and household size.

##### 4.1.1 Sex, Age, Religion, Educational Status and Marital status of Respondents

Table 4.1: Demographic background of respondents

Variables	Category	Frequency	Percent
Sex	male	218	55.5
	female	37	14.5
Age	<30	3	1.2

	31-40	20	7.8
	41-50	99	38.8
	51-60	33	12.9
	61-65	80	31.4
	>65	20	7.8
<b>Religion</b>	orthodox	31	12.2
	Islam	199	78.0
	Protestant	17	6.7
	Other	8	3.1
<b>Educational status</b>	Can't read and write	99	38.8
	Grade 1-8	96	37.6
	Grade 9- 10	45	17.6
	Grade 11 - 12	9	3.5
	Diploma holder	3	1.2
	Degree and above holder	3	1.2
<b>Marital status</b>	Married	192	75.3
	Divorced	16	6.3
	Widowed <sup>15</sup>	47	18.4

Source: Household Survey 2016

Table 4.1 shows that the majority of the respondents were male (55.5percent) and followed by (14.5percent) of female. Concerning age, majority of respondents were fall under a category of 41-50 (38.8percent) and followed by 61-65 (31.4percent), 51-60 (12.9percent), 30-40 (7.8percent), >65 (7.8) and <30 (1.2percent) respectively.

Regarding religion of respondents the majority of respondents were Muslims (78.2percent), followed by Orthodox (12.2percent), Protestant (6.7percent), and other<sup>16</sup> (3.1percent) respectively. On the subject of educational status of the survey respondents, the majority of the respondents 99 (38.8 percent)were can't read and write. The second largest were those between grade one and eight 96 (37.6percent). An accumulation of respondents below grade eight were

<sup>15</sup> Majority of widowed respondents (84.8 percent) were female; it needs further research to answer the Question; 'why?'

<sup>16</sup>Waaqeffannaa and Catholics constitute this category

76.4%. The smallest were those who hold diploma and who hold degree and above each of 3 (1.2percent). To conclude the mainstream of the sample households 192 (75.3percent) were married; followed by widowed 47 (18.4percent) and divorced 16 (6.3percent) respectively.

Majority of respondents believed that these variables have an undeviating and unforeseen effects on their social, cultural, economic, and political aspects. They attached values, norms, and beliefs with these variables in accessing and utilizing public infrastructures. Dependably, one 67 years old male from Bulbul stated that:

*Being male and female, being old and young, being educated and uneducated are labeled and interpreted by various individuals and organizations differently. Customarily, women and men have different and unbalanced roles in our community. Women are responsible for taking care of children and household management, whereas men have responsibility for protecting the family. Women make decisions which are related to their assigned roles. Even where men and women work together in productive activities, men make the decisions. Women's decision making capacities depend on land ownership, their level of education, and the extent of their participation in community organizations. Even men can decide to utilize public infrastructures. For example, there is a case where going to health centers is determined by husband.*

One of interviewed health extension workers, in describing about prominence of education of households' head on utilizing public infrastructures, stated that, "educated households contact and consult us than those who didn't ever attend a class." Additionally, one of interviewed teacher<sup>17</sup> assumed that, "education is like a flash light because it gives everybody a power of

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<sup>17</sup> Director of Babo's High school

deciding an invaluable decisions for him/herself.” Furthermore, regarding age, one of interviewed Babo’s *skebele* elder<sup>18</sup> argued that:

*Age teaches you countless happenings; you can get a lot of experiences. Thereby a lot of people learn from you. Being an old is blessing from God. They know various histories; predict a lot about the future more than youth. This is why an elderly people are respected with what they decide and select for an action. But nowadays, everything is leaving its place. For instance, there is no respect for old people in utilizing public infrastructures.*

#### **4.1.2 Households’ Size**

Households’ size is another elements of households’ socio-economic background. Majority of respondents alleged; as per households who have small household size may live satisfactory life, diversify their livelihood diversification strategies, and utilize public infrastructures than those who have large household size. The 156 (61.2 percent) of the survey respondents have greater than five household’s members, and 99 (38.8 percent) have five or less than five.

#### **4.2 Contexts<sup>19</sup> of Public Infrastructures’ Accessibility in Kersa Woreda**

Before coming to analyze the associations between an accessibility to public infrastructures and livelihood assets, describing about the contexts of public infrastructures’ accessibility in Kersa woreda has fundamental role. Consequently, description about all-weather roads, any formal health centers, any formal education centers, protected water sources, irrigation and agricultural extension infrastructures will be given below.

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<sup>18</sup> Female of 56 age years old

<sup>19</sup> “Context is any information that characterizes a situation related to the interaction between humans, applications and the surrounding environment” (Bazirel and Brézillon 2006:35).

Regarding roads, a district has a total coverage of 481kilometers of which 50 kilometers is asphalt, 181.5 kilometers is all-weather road and 249.5 kilometers is only winter road. One expert from transportation office claimed that, “we are working to enhance all-weather road within five kilometers to connect all *kebeles* of woreda. However, of 31*kebeles* of rural district, only eleven *kebeles* have all-weather roads with 159.5 kilometers of averagely 14.5 kilometers for those*kebeles*. The transportation officer also added:

*We are enlightening all-weather road by pressing ‘all-weather road for all rural people’ as slogan, because we believe that households’ access to all-weather roads improve food security, contacting and consulting formal health professionals, job opportunities, adequate house and trust and respect among households members.*

One of a sector expert also added as; “among other factors, distance of all-weather road from households home has decisive role in fluctuating livelihood assets, strategies and outcomes.”

Depending on standard of district’s rural roads office, which was derived from universal rural roads guidelines of transportation minister, ‘five kilometers’ has been considered as demarcation line of either households have access to all-weather road or limited access in the following sections for the purpose of this study.

Health centers and services is another pivotal public infrastructure. Officer from health office confirmed that, ‘district has thirty four health posts with maximum distance of five kilometers among them and seven health center catchment. All rural *kebeles* have at least one health post. It has five thousand people to one health extension worker ratio.” One of 55 health extension workers also added as;

*There is substantially improvement of health centers and services in our woreda; consequently, there is an improvement of households' livelihood outcomes. The health behaviors and illness behaviors of those who have access within five kilometers are not the same with those who have not an access. However, there is also large number of people out of five kilometers' coverage of health posts.*

Consequently, the distance of 'five kilometers' between health posts or health centers catchment and home of households was considered as delineation boundary for a variable in the following sections for the purpose of this study.

Kersa district has also 73 primary schools of 71 are in rural *kebeles* with minimum of three kilometers among them, three secondary schools of two are in rural *kebeles* with minimum of seven kilometers among them and one preparatory school in Serbo town. All rural *kebeles* have 2-3 primary schools (Education office of Kersa district 2016). One education expert stated that, "standard of three kilometers was adopted from federal education ministers. The intention is that children should not go more than it. It also decreases dropouts and school age children out of school." Hence, the researcher used 'three kilometers' as a demarcation of either households have accessibility to an infrastructure or not.

The other central infrastructure, on which a district's responsible bodies are effectively and efficiently working, is protected water sources. Officer from water, energy and mineral office described that:

*Rural water supply projects take different forms, ranging from simple, protected springs, to surface water systems with piped distribution of treated water system. The design and implementation of the simple schemes such as hand-dug wells, protected spring on*

*spot, and spring with rural pipe scheme are being conducted. Simple schemes designed and implemented by the Woreda are known as Woreda Managed Projects (WMPs) and that of by the community are known as Community Managed Projects (CMPs) in the rural water supply sector. Accordingly, 60% of a district is getting protected water sources. It has 193 protected spring sources and 129 pump water.*

An expert from the same office also added:

*Access to water is a prerequisite for health and livelihood. The availability of improved and quality water supply infrastructure is widely recognized as an essential component of human rights and social and economic development. Accordingly, the government of Ethiopia has prepared a water policy document as an integral part of the country's water management policy. We are also working in light of that document.*

Households are believed to have an access to protected water sources if time for collecting and waiting at the point is  $\leq 15$  and  $\leq$  five minutes respectively. These guidelines value have been recommended by (WHO 1983). The researcher considered this demarcation boundary in either households have access to infrastructures or not.

Regarding irrigation, officer of Kersa district development and irrigation stated that:

*Sixty seven percent (18,540) of households are using irrigation on 0.5 hectare for each household. However, they aren't allowed to irrigate on more than 0.5 hectare unless with certain conditions. Generally about 9,945 hectares were irrigated of which 7,226 hectares by traditional irrigation, 140 hectares by modern irrigation, 445 hectares by underground water irrigation, and 2134 hectares by pump irrigation. Of 18,540 (67%) of*



*households who use irrigation: 13,630 use traditional irrigation, 253 use modern irrigation, 1,580 use underground water irrigation, and 3140 use pump irrigation.*

An expert from the same office claimed that, “production and productivity by modern irrigation is significantly greater than that of other types of irrigation. Pump irrigation is the second. Thus gradually, we are improving to modern irrigation.” Another expert from irrigation office also added:

*Nowadays, modernized irrigation systems are mostly used which works based on the pressurized energy system. The sprinkler and drip irrigation systems are of this type of water application systems. It is considered as a basic strategy to alleviate poverty and hence food security. It is useful to transform the rain-fed agricultural system which depends on rainfall into the combined rain-fed and irrigation agricultural system. This is believed to be the most prominent way of sustainable development in the country.*

Depending on this argument, the researcher made distinction between those who are using modern and pump irrigation as they have access to irrigation while those who are using traditional and underground water irrigation and who are not completely using irrigation as they have limited or lack of access to irrigation for the purpose of this study.

The other institutional public infrastructure is agricultural extension services. Kersa district has sixty four agricultural extension workers of 2-3 workers for each *kebele*. It has three groups: (plant extension workers - 36, animal extension workers – 17 workers, and cooperative workers- 11 workers). Besides, the officer perceived that:

*These groups (groups of agricultural extension services) have their own respective duties though they might work cooperatively with each other. Always they should be in rural*

*areas. They give services through various mechanisms. Among those going house to house and giving training through organized zones of each kebele twice per month are the most invaluable mechanisms. However, all households have not the alike willingness of participating on the training or contacting with extension workers. There are households who frequently contact and consult agricultural extension workers while there are also others who participate once per month or twice per month or never attend the trainings. We have seen that the production and productivity of these two categories of households are fiercely different from each other.*

Subsequently, the researcher grouped those households, who participate on training twice or more than it per month and also contact with extension workers frequently, as they have an access to agricultural extension services whereby otherwise as they have not an access or have limited access.

Generally, the described demarcation line in this section will be used in the following section where binary logistic regression model was employed to analyze the possible effects of the above described public infrastructures on livelihood assets, livelihood diversification strategies and components of livelihood outcomes.

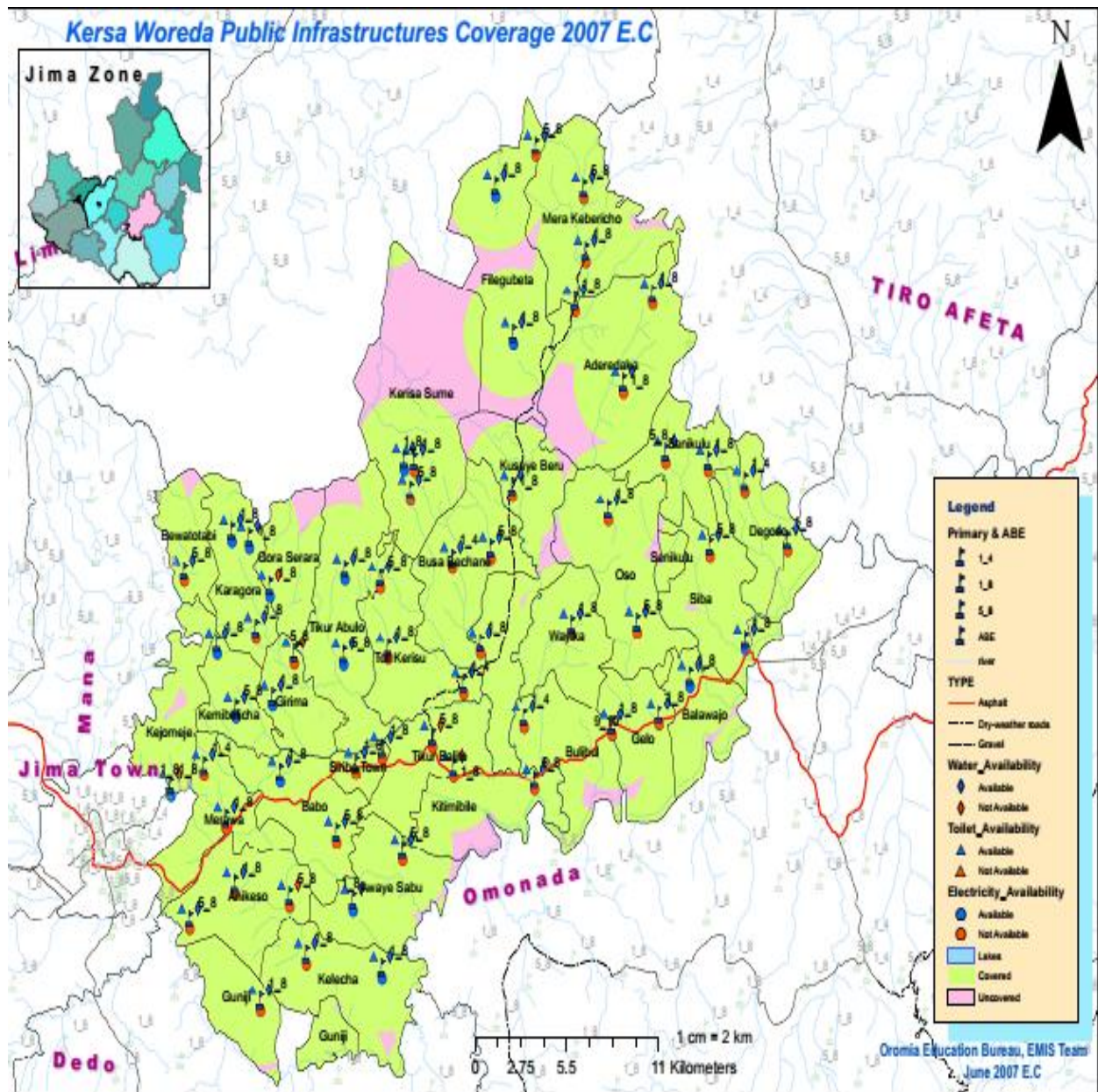


Figure 4.1: Public infrastructures coverage of Kersa district (Source: Education Office of Kersa district 2016)<sup>20</sup>

<sup>20</sup> Blue sign in the map shows accessibility of a given public infrastructure while red sign indicates limited access or lack of access to an infrastructure.

### 4.3 Accessibility to Public Infrastructures

Table 4.2: Accessibility of respondents to public infrastructures<sup>21</sup>

Infrastructures	Categories	Frequency	Percent
All season road	Accessible at $\leq 5$ km	113	44.3
	Lak of access	142	55.7
Electricity	yes	55	21.6
	No	200	78.4
Protected water sources	Accessible at $\leq 1$ km	123	48.2
	Lak of access	132	51.8
ICT	Accessible	125	49
	Lak of access	130	51
Health centers	Accessible at $\leq 5$ km	111	43.5
	Lak of access	144	56.5
Education centers	Accessible at $\leq 3$ km	137	53.7
	Lak of access	118	46.3
Irrigation	Yes	21	8.2
	No	234	91.8
Agricultural extension	Yes	159	62.4
	No	96	37.6

Source: Household Survey 2016

Depending on the standards given in section 4.2, the respondents who have not or limited access to: all-weather roads were 55.7 percent, electricity were 78.4 percent, protected water sources were 51.8 percent, ICT were 51 percent, health centers were 56.5 percent, education centers were 46.3 percent, irrigation were 91.8 percent, and agricultural extension services were 37.6 percent. Except an access to education centers and agricultural extension services, more than half of respondents have not accessibility to public infrastructures. This implies that the level of public infrastructures in rural areas is at infant stage. The interviewed respondents from all sectors also witnessed as coverage of respective public infrastructures is at low rate in a district. They also argued as responsible bodies need to be increase proportionally high

<sup>21</sup> See the criteria of the classification as; either households have accessibility to the infrastructures or not, under section 4.2

infrastructures funding and careful handling of public investments so as to reach infrastructures' targets within a reasonable time.

#### **4.4 Public Infrastructures and Livelihood Assets**

The following section presents about possible effect of presumed public infrastructures on specific selected elements of other livelihood assets. Since covering all elements in this single section is tedious, only one element from each asset<sup>22</sup> (human capital, natural capital, financial capital, and social capital) was selected; but not physical capital because it has been considered as an explanatory variable by the name of 'public infrastructures'.

##### **4.4.1 Public Infrastructures and School Age Children out of School**

Majority of households, who have access to a given public infrastructures, haven't school age children out of school. However, on average 83.9 percent of households, who haven't an access to assumed public infrastructures, have at least one school age children out of school.

The chi-square test<sup>23</sup> found that there is negative and significant association between being school age out of school and access to school centers with ( $\chi^2 (1) = 115.904, P=0.000$ ) at ( $\alpha=0.05$ ); all-weather road with ( $\chi^2 (1) = 5.228, P=0.000$ ) at ( $\alpha=0.05$ ) and protected water sources with ( $\chi^2 (1) = 104.911, P=0.000$ ) at ( $\alpha=0.05$ ). This means as households' access to these infrastructures increases, the being of school age children out of school decreases. The phi coefficient reported as the strength of association is moderate for these infrastructures of which: school centers with (0.674), all-weather road with (0.673), and protected water sources with (0.641). Remaining

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<sup>22</sup> For detail, *see* at footnote 4

<sup>23</sup> Pearson's chi-square statistic was used to test independence between the row and column variables. Independence means that knowing the value of the row variable does not change the probabilities of the column variable (and vice versa).

infrastructures<sup>24</sup> have either significant association or weak association with existence of school age children out of school.

In addition, ‘binary logistic regression model’<sup>25</sup> was employed to analyze about possible effect of public infrastructures on existence of school age children out of school. The model consists of eight independent variables (households accessibility to: all-weather roads, health centers, education centers, agricultural extension services, protecting drinking water, ICT, electricity, and irrigation). The model predictors was statistically significant at  $P < 0.01$ , with chi-square value of 223.178 (8,  $N=255$ ),  $P < 0.05$ , indicating that the model was able to predict respondents’ response about being school age children out of school.

Table 4.3: Binary logistic model output of public infrastructures and school age children out of school

	<b>School age children out of school</b>				
	$B^{26}$	S.E. <sup>27</sup>	Wald <sup>28</sup>	Sig.	Exp(B) <sup>29</sup>
All-weather road(1)	-1.665*	.540	9.507	.002	.231
Any formal health center(1)	-.712	.483	2.179	.140	.490
Any formal education center(1)	-3.038*	.567	28.688	.000	.048
Agri. Extension services(1)	.198	1.238	.026	.873.	.189
Protected water sources(1)	-1.214**	.490	6.133	.013	.297
ICT(1)	-.578	.634	.832	.362	.561
Electricity(1)	-1.464	1.190	1.514	.219	1.219
Irrigation(1)	-18.248	5552.00	.000	.998	.000

<sup>24</sup> ICT, formal health centers, electricity, agricultural extension services, and irrigation

<sup>25</sup>“Logistic regression sometimes called the logistic model or logit model, analyzes the relationship between multiple independent variables and a categorical dependent variable, and estimates the probability of occurrence of an event by fitting data to a logistic curve. There are two models of logistic regression, binary logistic regression and multinomial logistic regression. Binary logistic regression is typically used when the dependent variable is dichotomous and the independent variables are either continuous or categorical. When the dependent variable is not dichotomous and is comprised of more than two categories, a multinomial logistic regression can be employed” (Hyeoun 2013: 155).

<sup>26</sup>The B coefficient indicates the increase in the log-odds of the outcome for a one unit household increase in access to public infrastructures.

<sup>27</sup> Conceptually, the standard error of estimate is related to regression analysis in that it typically provides an estimate of the dispersion of the prediction errors when the researcher were trying to predict particular outcomes values from the values of accessibility to public infrastructures in both binary and multinomial logistic regression analysis.

<sup>28</sup>The use of the Wald statistic is analogous to the t-test performed on the regression coefficients in linear regression to test whether the variable is making a significant contribution to the prediction of the outcome, specifically whether the explanatory variable’s coefficient is significantly different from zero.

<sup>29</sup>See footnote 30

Constant	21.651	555.009	.000	.998	252.327
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\* Significant at  $p < .01$  and \*\* significant at  $p < .05$

Source: Household survey 2016

Variable(s) entered on step 1 of this model and all logistic models in this paper are: all-weather road dummy have access at 5km, health centers dummy have access at 5km, education centers dummy have access at 3km, agricultural extension services dummy have access, water dummy have access at 1km, ICT dummy yes, electricity dummy yes, and irrigation dummy yes.

Table 4.5 shows that households' access to school centers and all-weather roads at ( $\alpha=0.01$ ) and protected water sources at ( $\alpha=0.05$ ) have significant possible effects on being of school age children out of school. Inversely, Ex (B)<sup>30</sup> column shows that households who have an access to all-weather roads were five times, formal education centers were 21 times, and protected water sources were three times less likely to have school age children out of school than those who haven't respective public infrastructures. This implies that an access to these infrastructures initiates households to send their children to school.

Further, the respondents who have infrastructures were asked either access to a given specific infrastructure initiated them to send school age children to school. Accordingly, of 137 households who have an access to education centers, 99.3 percent; of 113 households who have an access to all-weather roads, 88.5 percent; and of 123 households who have an access to protected water sources, 88.6 percent responded that an access to these infrastructures assisted them in sending their school age children to school. For detail, see at the figure 4.2

<sup>30</sup> Ex (B) is better known as the odds ratio predicted by the model. "The odds ratio (OR) is a comparative measure of two odds relative to different events. (Hyeoun 2013: 155). In the case of this study, The OR can be used to determine whether accessibility to a particular infrastructure is a possible factor for a particular outcome, and to compare the magnitude of various possible factors for that outcome. OR=1 indicates accessibility to an infrastructure does not affect odds of outcome. OR>1 indicates accessibility to an infrastructure associated with higher odds of outcome. OR<1 indicates accessibility to an infrastructure associated with lower odds of outcome.

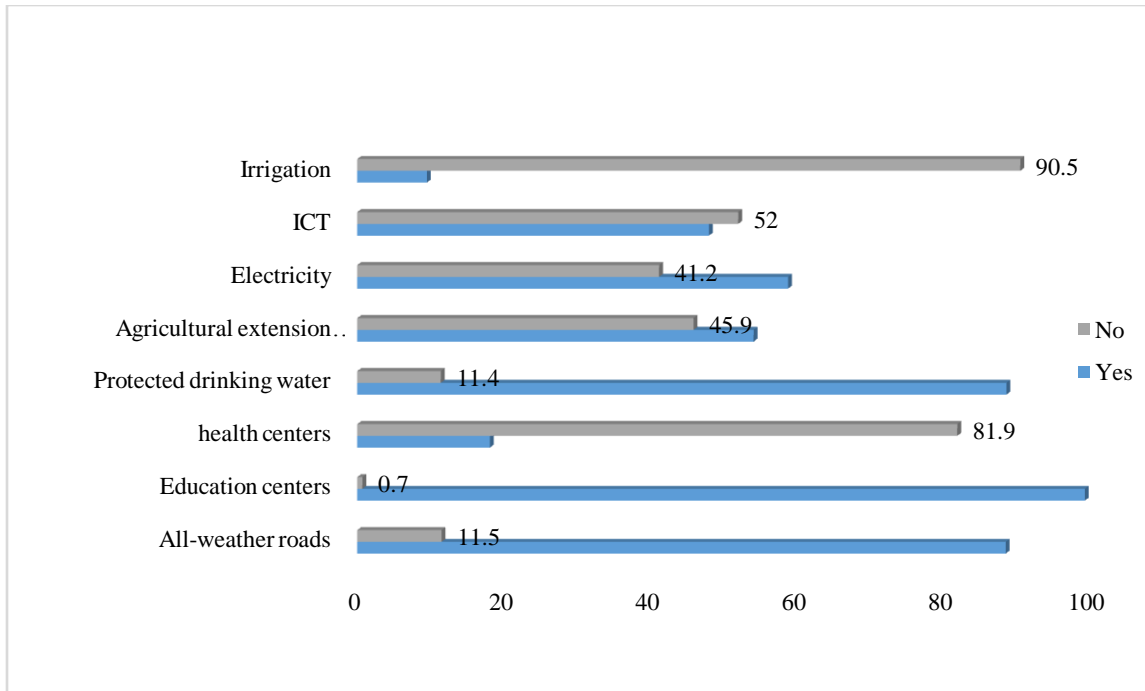


Figure 4.2: Accessibility to public infrastructures and sending school age children to school (Source: Household survey 2016)

Expert from transportation office added that, “an access to all weather road made rural households fearless in sending their children to school.” An access to protected water sources and education centers were also the major assistants of households in sending their children to schools. Another interviewed respondents from Kalacha’skebele claimed as:

*We need help of our children in various activities; among those fetching water is a usual activity performed by them. An existence of protected water sources within one kilometers from our home decreases time and energy demanding from children. As a result opportunities are opened for children to join nearby schools.*

An officer from water, energy and mineral office moreover added that, “universal access to protected water sources could give ample time for women and children to go to school.”



#### 4.4.2 Public Infrastructures and Households' Farming Land Size

Among other infrastructures, the chi-square found that households' access to agricultural extension services with ( $\chi^2 (1) = 166.606, P=0.000$ ) at ( $\alpha=0.05$ ) have a significant and positive association with households' farming land size. ICT has also significant and weak association with it. Respondents argued that agricultural extension workers, ICT and farmers' capacity and intention of increasing of their farming land are intractably associated with each other. Correspondingly, respondent from ICT office alleged that:

*Households effective using of their farming land is highly influenced by the extent of using modern communication technologies. For instance, better exchange of information between agricultural extension agents and farmers are among the benefits that arise, when modern ICT goods and services are effectively deployed. Moreover, there is a possibility of optimizing ICT tools among rural societies in terms of exchanging local knowledge and information which have fruitful influence in utilization of their land effectively and efficiently. In other ways, access to updated metrological information such as weather forecast constitutes further important benefits associated with ICT infrastructure. Thus it is possible to say that framers can increase their farm land either by changing the types of usage of their own land or share from the others as result of an existence of information.*

Of 159 households who have access to agricultural extension services, 56.7% responded that access to agricultural extension services instigated them to increase their farming land size. This doesn't mean that these households increased their farming land size by intensifying on new lands, however by decreasing their livestock land or effectively using ineffectively used land. In consistent with this, one of respondents stated that:

*Agricultural extension workers have told us about how and when we use the small land effectively by classifying in to different strata such as for vegetables, chats, maize and livestock. Before their intervention we used 1.5 hectares for few livestock and one hectare for farming. Now after their intervention, we are using only 0.5 hectare for livestock and remaining for farming. So, thanks to God and them (agricultural extension workers); now our life is being improved.*

By the help of agricultural extension services, there was also an increment of farming land size by renting or half-sharing. One of the respondents argued that, “agricultural extension workers are moderating and initiating households at different levels to work with each other. Consequently, households are working with each other either by half-sharing or other mechanisms.”

#### **4.4.3 Public Infrastructures and Households’ Access to Credit**

The chi-square tests show that household access to all-weather roads and ICT have a significant and positive association with households’ access to credit with ( $\chi^2 (1) = 206.46, P=0.000$ ) at ( $\alpha=0.05$ ) and ( $\chi^2 (1) = 3.83, P=0.000$ ) at ( $\alpha=0.05$ ) respectively. In other words, 68.5 percent of those who have an access to all-weather roads and 57.4 percent of those who have an access to ICT have an access to credit. Congruently, an expert from the transport office supposed that:

*The more households move and get information, the more they have an access to credit.*

*In other words, as people may have an access to all-weather roads within five kilometers from their home, the probability of getting either formal or informal credit increases.*

*Farther, they can easily access the credit from various sources by using mobile.*

Similarly, the result of binary logistic regression of table 4.7 indicates that access to all-weather road and ICT have significant influences in households’ getting access to credit. The odds ratio

shows that households who have an access to: all-weather road were 40 times and ICT were six times more likely have an access to credit than those who haven't or have limited access to these respective infrastructures.

Table 4.4: Binary logistic model output of public infrastructures and households' access to credit

		<b>Households' access to credit</b>				
		B	S.E.	Wald	Sig.	Exp(B)
Step 1 <sup>a</sup>	All-weather road(1)	3.695*	.387	91.268	.000	40.264
	Formal health center(1)	.055	.693	.006	.937	1.057
	Formal education center(1)	1.069	.811	1.737	.187	2.911
	Agricultural extension services(1)	-.296	.914	.105	.746	.744
	Protected water sources(1)	-.398	.829	.231	.631	.672
	ICT(1)	1.773**	.741	5.719	.017	5.9
	Electricity(1)	.586	.987	.352	.553	1.796
	Irrigation(1)	-.163	1.161	.020	.888	.849
	Constant	-2.275**	.962	5.595	.018	.103
						-2LL <sup>31</sup> = 202.909
					Chi-square <sup>32</sup> = 147.303*	

Variable(s) entered on step 1: roadacce, health, school, agriexte, water, ict, electric, irrig

\* Significant at  $p < .01$ , \*\* significant at  $p < .05$

Source: Household survey 2016

#### 4.4.4 Public Infrastructures and Mutual Support among Community

The feeling of households head about the trend of mutual support among community was asked.

Then the dummy variable of either decreasing or otherwise was coded as "1" or "0" respectively.

In analyzing its association with public infrastructures, the chi-square indicates that all assumed

<sup>31</sup> The deviance, or -2 log-likelihood (-2LL) statistic is basically a measure of how much unexplained variation there is in logistic regression model – the higher the value the less accurate the model. It compares the difference in probability between the predicted outcome and the actual outcome for each case and sums these differences together to provide a measure of the total error in the model. One way to interpret the size of the deviance is to compare the value for our model against a baseline model.

<sup>32</sup> Uses to see if there is a significant difference between the Log-likelihoods (specifically the -2LLs) of the baseline model and the new model. If the new model has a significantly reduced -2LL compared to the baseline then it suggests that the new model is explaining more of the variance in the outcome and is an improvement.

public infrastructures have significant association at  $p < 0.01$ . An access to all-weather road, ICT and education centers were negatively associated while the remaining were positively associated with it.

Table 4.8 of binary logistic model also shows that an access to health centers and irrigation have no significant effect on mutual support among community. An access to all-weather road and any formal education centers have significantly and negatively predicted about it at  $p < .01$ . Access to ICT has also negative and significant possible effect on mutual support among community at  $p < .1$ .

The odds ratio, inversely, indicates that households who have an access to: all-weather road were 14 times, formal education centers were six times, and ICT were twice less likely responded that mutual respect among community is increasing or remaining than those who haven't these infrastructures. This implies that as household's access to all-weather road, school centers, and ICT increases; mutual support among community decreases.

Table 4.5: Binary logistic model output of public infrastructures and mutual support among community

	B	S.E.	Wald	Sig.	Exp(B)
All-weather road(1)	-2.653*	.849	9.767	.002	.070
Formal health center(1)	.657**	.391	2.814	.093	1.928
Formal education center(1)	-1.737*	.361	23.205	.000	.176
Agricultural extension services(1)	.787	.492	2.559	.110	2.196
Protected water sources(1)	1.032	.876	1.385	.239	2.805
ICT(1)	-.691**	.367	3.545	.050	.501
Electricity(1)	-.653	.510	1.634	.201	.521
Irrigation(1)	.413	.617	.448	.503	1.511
Constant	1.704	.293	33.922	.000	5.497
-2LL = 253.586					
Chi-square = 97.76*					

Variable(s) entered on step 1: roadacce, health, school, agriexte, water, ict, electric, irrig.

\* Significant at  $p < 0.01$  and \*\* significant at  $p < 0.05$

Source: Household survey 2016

One respondents also described this issue as:

*Time is running as well we are running with it. To hasten our speed, we have all-weather roads and ICT. These are associated with the coming of all other infrastructures. Before the coming of public infrastructures people stand with each other in all aspects; but nowadays, staying with other for an hour is testing. Consequently, people in our local are not sharing problems with each other as usual. Even there is decrement of support among households' members without calculating interests for their activities. This seems as infrastructures increase competition rather than cooperation.*

#### **4.5 Accessibility to Public Infrastructures and Livelihood Diversification Strategies**

The people in the study area have involved in numerous livelihood diversification strategies. In so doing, describing about the nature and types of these livelihood diversification strategies has a lion share in presenting the possible effect of an assumed infrastructures on it.

Diversification as a livelihood strategy is defined as a process in which the person or the rural family unit builds a group of activities and goods looking for better ways of living<sup>33</sup>. One of interviewed respondents stated that, “diversification is our norm. Very few people manage their life by single source, hold all their wealth in the form of any single asset, or use their assets in just one activity.” This implies that almost all of rural households diversify their life. For the purpose of this study, the researcher has grouped it into: (1) mixed livelihood diversification strategies – missing one or more of activities from either off farm activities, non-farm activities,

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<sup>33</sup>(Ellis 2000)

farming activities and others; (2) only off-farm<sup>34</sup> strategy – fetching from only one or more off farm activities such as land renting to other farmers, purchasing additional farm land, and employment on another farm; (3) only non-farm strategy - endeavoring in only one or more of non-farm activities such as daily employment out of farm (skilled, semi-skilled and non-skilled worker); and small business (charcoal production, quarrying and production of building materials, furniture making, carpentry, painting, pottery, baskets making and selling); (4) only farming strategies (specialty crops, organic and biomass production, and crop harvesting); and (5) others - appealing with either getting social help, family and friends help, or begging. Mixed strategies of diversification of income sources has been put forward as one of the strategies households employ to minimize household income variability and to ensure a minimum level of income.

In other words, the percentage of respondents who affianced in mixed strategies were (60.4 percent) followed by only farming strategy (19.6 percent), only non-farm strategy (9.8 percent), and 5.1 percent each of only off-farm strategy and other. This is equivalent to saying that the probability of engaging in mixed, only farming, only non-farm, only off farm and other strategies in sample were 0.604, 0.196, 0.098, 0.051, and 0.051 respectively.

Majority of respondents claimed that accessibility to public infrastructures suggestively initiates them to engage in mixed livelihood diversification strategies. Consistently, one respondent argued that, “an access to a given infrastructures can easily expand our means of income generation.” Majority of key interviewed respondents from different sectors also contended as an upgrading of a given public infrastructures is a pull factors for rural households

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<sup>34</sup> Some authors use off-farm strategy and non-farm strategy interchangeably. However, for the purpose of this study, the researcher used: off-farm strategy as activities made up of agricultural wage income; while non-farm refers to those activities that are not primary agriculture or forestry or fisheries.

in diversifying their income generating activities. Specifically, an interviewed expert from finance office perceived that:

*For many institutional, infrastructural, technological, and informational reasons, financial markets (credit) are routinely incomplete in rural Africa, so individuals must act outside of financial markets in order to reduce consumption variability driven by real income variability. Thus, diversification is a primary means by which many individuals reduce risk and improve life.*

Furtherly, the following table 4.6, from cross-tabulation descriptive statistics,describes the livelihood diversification strategies of respondents and an accessibility of a given infrastructures along with a criteria described under section 4.2.

Table 4.6: Livelihood diversification strategies byan accessibility of public infrastructures

Public Infrastructures	Categories	Household Livelihood diversification strategies					Total	Chi-square
		Mixed strategy	Off farm strategy	Non-farm strategy	Others	Farming strategy		
All season road	Accessiblewithin 5km	62.8%	6.2%	8.8%	8%	14.2%	100%	131.8*
	Lack access	58.5%	4.2%	10.6%	2.8%	23.9%	100%	
Formal education	Accessiblewithin 3km	78.1%	1.5%	4.4%	3.6%	12.4%	100%	40.9*
	Lack access	39.8%	9.3%	16.1%	6.8%	28.0%	100%	
Formal health centers	Accessible within 5km	80.2%	4.5%	7.2%	0.9%	7.2%	100%	36.4*
	Lack access	45.1%	5.6%	11.8%	8.3%	29.2%	100%	
Protected water sources	Accessible within 1km	91.7%	0.0%	5.3%	0.0%	3.0%	100%	116.2*
	Lack access	26.8%	10.6%	14.6%	10.6%	37.4%	100%	
	Total	60.4%	5.1%	9.8%	5.1%	19.6%	100%	
ICT	Accessible	87.7%	0.8%	4.6%	0.0%	6.9%	100%	55.1*
	Lack access	32.0%	9.6%	15.2%	10.4%	32.8%	100%	
	Total	60.4%	5.1%	9.8%	5.1%	19.6%	100%	

Agricultural extensionservices	Yes	88.5%	1.0%	3.1%	1.0%	6.2%	100%	51.2*
	No	43.4%	7.5%	13.8%	7.5%	27.7%	100%	
Electricity	Yes	88.2%	0.0%	10.6%	0.0%	1.2%	100%	50.9*
	No	46.7%	7.7%	9.5%	7.7%	28.4%	100%	
Irrigation	Yes	100%	0.0%	0.0%	0.0%	0.0%	100%	15.1*
	No	56.8%	5.6%	10.7%	5.6%	21.4%	100%	

\*significant at  $P < 0.01$

Source: Household Survey 2016

Of 113 who have an access to all-weather roads, 62.8 percent mixed their livelihood diversification strategies while the remaining fell in either one of a categorized livelihood diversification strategies. The chi-square test shows that there was significant and positive association between all-weather roads and livelihood diversification strategies with ( $\chi^2 (4), 255 = 131.881, P=0.000$ ) at ( $\alpha=0.05$ ). The phi coefficient reported that there is strong association between variables with ( $\Phi=0.719$ ) value.

Expert from transport office indicated as, “all-weather road helps rural people particularly youth in diversifying their income generating activities. Households living in poorly connected areas were less likely to diversify their activities in order to satisfy their own demand (the ‘push’ factor).” Expert from agricultural and development office also added, “all-weather road helps rural people to expand their production from that of only for consumption to that of for market.”

Regarding public education centers, of 137 respondents who have an access to it, 78.1 percent encompassed in mixed strategies while the remaining incorporated in either one of a given strategies. The Chi-Square test found positive and significant association between an access to formal education centers and livelihood diversification strategies, with ( $\chi^2 (4) = 40.992, P=0.000$ )



at ( $\alpha=0.05$ ). The Lambda coefficient<sup>35</sup> with the value (0.347) also reported the strength of the association to be moderate. Likely, officer from education office claimed that:

*Formal education centers are where knowledge is produced. The existence of education centers at nearby of households home initiate them to learn for themselves and send their children to school. Thus education increases farmers' ability to use their labor and other assets effectively and efficiently. To summarize, households receive income from farming and non-farming activities, wage employment, remittances from migrants, and others where education thought to be increasing the probability of success in each of these endeavors and in so doing diversify households income sources to improve livelihood outcomes.*

Regarding public health centers, of 111 respondents who have an access to it, 80.2 percent mixed their livelihood diversification strategies. The Chi-Square test also shows positive and significant association with ( $\chi^2 (4) =36.44, P=0.000$ ) at ( $\alpha=0.05$ ). The Lambda coefficient with the value (0.216) reports that the association had weak ties. In addition, officer from a district's health office contended that:

*The main objective of health posts are to keep healthy of community. If they are healthy, they engage in whatever they want. This means, there is no predecessors of health. Health institutions do not follow only curative approach but also protective approach. In the courses community are informed about the nature, types and advantages of activities in which they shall participate for the purpose of improving their livelihood outcomes.*

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<sup>35</sup> This is a measure of association for cross tabulations of nominal-level variables. It measures the percentage improvement in predictability of the dependent variable (row variable or column variable), given the value of the other variable (column variable or row variable).

*Thus over all, through keeping health of society, health centers increases livelihood diversification for rural community.*

The majority of respondents; who have an access to protected water sources(91.7 percent) engaged in mixed strategies and those who have not an access (37.4 percent) betrothed in only farming activities. The association was tested significant and positive with ( $\chi^2 (4) = 116.2$ ,  $P=0.000$ ) at ( $\alpha=0.05$ ). The lambda coefficient with the value (0.642) reports that an association had moderate influences. An expert from water, energy and mineral office also claimed this as:

*Availability of water poses several challenges to households and communities. In areas where water is not available, women and children travel tens of kilometers to fetch water. This is seen through queues in water points during dry seasons. However, the time spend could be utilized for other productive duties such as child care, harvesting, or any other income generating activity that the household would utilize for improving its livelihood and living standards. Disease associated with water affect the poor with greater margins as compared to those who have an access with a burden of ill health that creates a vicious cycle of poverty and sickness. Such families and communities may not be able to carry out their tasks effectively due to several hours or even days supporting sick people or relatives. This limits their socio-economic development. The availability of a good quality water source close to home has numerous benefits especially in terms of livelihood diversification, with subsequent linkages to all other dimensions of livelihoods. Providing water next to the house for domestic use and on a larger scale for economic use helps to increase the productivity of arable lands and watering livestock.*

The majority of respondents who have an access to ICT (87.7 percent) encompassed in mixed strategies while those who have not an access (32.8 percent) engaged in farming activities. The association between an access to ICT and livelihood diversification strategies was tested significant and positive with ( $\chi^2 (4) = 55.1, P=0.000$ ) at ( $\alpha=0.05$ ). The lambda coefficient with the value (0.552) states that there was moderate association between ICT and livelihood diversification strategies. An interviewed respondents also witnessed, “An access to ICT components particularly to mobile is highly helping us to diversify our livelihood diversification strategies.” Another expert from ICT sector also claimed that:

*The use of ICT for livelihood diversification is a matter of behavioral change and a matter of technology diffusion which takes over time. We have seen the importance of using low-end ICTs such as radio, cell phones and TV as a strategy for linking rural people to global opportunities is contextually relevant in the face of knowledge-based income generating activities.*

Of 159 respondents who are getting agricultural extension services, 88.5% mix their livelihood diversification strategies. Getting agricultural extension services and diversifying livelihood diversification strategies were significantly and positively associated with ( $\chi^2 (4) = 51.2, P=0.000$ ) at ( $\alpha=0.05$ ). However, the strength of the association between the variables was weak ( $\Phi=0.448$ ). One of interviewed agricultural extension workers also added as, “We are teaching and showing people about the nature and advantages of diversifying their livelihood diversification strategies by using the resources they have effectively and efficiently.”

All of respondents who have an irrigation access managed their life by engaging in mixed livelihood diversification strategies. The chi-square test found the significant and positive association between an access to irrigation and livelihood diversification strategies with ( $\chi^2 (4)$

=15.1, P=0.000) at ( $\alpha=0.05$ ). However, cramer's V coefficient<sup>36</sup> with value (0.243) reports that there was very little strength of an association.

Finally, an access to electricity had also a significant and positive association with livelihood diversification strategies with ( $\chi^2(4) = 50.9, P=0.000$ ) at ( $\alpha=0.05$ ). However, ( $\Phi=0.348$ ) reports shows weak association between variables.

In addition, table 4.7 below presents the parameter estimates of the level of livelihood selection consequences of an access to public infrastructures.

#### **4.5.1 Multinomial Logistic Regression: Predictors on the Households' Livelihood Diversification Strategies**

##### ***4.5.1.1 Model Fitting Information and Procedures***

A Multinomial Logistic Regression Model distinguishes the predictors on the types and natures of livelihood diversification strategies. It is helpful to highlight all the procedures followed while running the Model before providing the interpretation of its results. The presentation of the procedures would clarify the steps pursued in reporting MLRM. The first action was to select a reference group from the existing data. The principle of the category with the largest frequency normally governs the selection of the reference category. That is, it involved comparing the number or percentage of respondents falling in the mixed livelihood diversification strategies, only off farm diversification strategies, only non-farm diversification strategies, only farming strategies and other. Consequently, SPSS used the last category as the reference group [i.e. other<sup>37</sup>] because closer to 21 (5.1 percent) respondents fall in this category, which is the lowest of other categories.

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<sup>36</sup> A measure of association independent of sample size. This statistic is a modification of the Phi statistic so that it is appropriate for larger than  $2 \times 2$  tables. V ranges between 0 (no relationship) and 1 (perfect relationship).

<sup>37</sup> Households who depend on others to manage their life (begging, relatives, or others)

Following the determination of the reference group, the next step was to undertake the case-processing summary. The case-processing summary reports three elements: (1) the total number of observations; (2) the response categories of the predictor variables; and (3) the marginal percentage. The marginal percentage reports the proportion of valid observations found under each of the outcome variables. In the analysis at hand, the types of livelihood diversification strategies represents the outcome variable and categorized as 1= mixed livelihood diversification strategies, 2= only off farm diversification strategies, 3 = only non-farm diversification strategies, and 4= only farming strategies.

Then, Pearson and deviance goodness-of-fit were run to examine the fitness of the data for analysis, and both of the tests confirmed not to be significant at  $\alpha= 0.05$ . Had these two models been significant at  $\alpha= 0.05$ , it would imply and interpreted that the model was unfit to the data (*see Annex=2a*). These two models of goodness-of-fit provided analogous overall fit tests of the models. The models also screened the variables that fit to the final analysis. Moreover, the likelihood ratio tests demonstrated the appropriateness of the data for the required statistical procedure. In contrast to the deviance goodness-of-fit, the likelihood ratio test proved the fitness of the model's significance at  $\alpha=0.05$  (*see Annex-2b*). The likelihood ratio tests helped to refine and condense the key significant variables in assessing the effects of the predictors on the types of livelihood diversification strategies. The parameter estimates provided the final tests of the predictors on the categorically ranked outcomes. Table 4.7 presents the values for statistically significant categories, based on the parameter estimates.

Table 4.7: Parameter estimates for statically significant predictors on the livelihood diversification strategies

<b>Households' Livelihood Diversification Strategies</b>		<b>B</b>	<b>Std. Erro</b>	<b>Wald</b>	<b>Sig.</b>	<b>Exp(B)</b>
		<b>r</b>				
<b>Mixed diversification strategies</b>	Intercept	-3.829	.614	38.868	.000	
	[irrigation=.00]	-1.534	1.394	1.211	.271	.216
	[irrigation=1.00]	0 <sup>b</sup>	.	.	.	.
	[ICT=.00]	1.236**	.509	5.906	.015	3.442
	[ICT=1.00]	0 <sup>b</sup>	.	.	.	.
	[agri. Extension services=.00]	1.475*	.525	7.907	.005	4.371
	[agri. Extension services=1.00]	0 <sup>b</sup>	.	.	.	.
	[formal health center=0]	.604	.526	1.32	.250	1.830
	[formal health center=1.00]	0 <sup>b</sup>	.	.	.	.
	[all-weather road=0]	2.028*	.518	15.355	.000	7.602
	[all-weather road=1.00]	0 <sup>b</sup>	.	.	.	.
	[formal education center=.00]	1.343***	.718	23.499	.061	3.829
	[formal education center=1.00]	0 <sup>b</sup>	.	.	.	.
	[protected water sources=.00]	1.227**	.565	4.723	.030	3.411
[protected water sources=1.00]	0 <sup>b</sup>	.	.	.	.	
[electricity=.00]	1.936**	.898	4.649	.031	6.928	
[electricity=1.00]	0 <sup>b</sup>	.	.	.	.	
<b>Only off farm diversification strategies</b>	Intercept	-.693	.703	.973	.324	
	[irrigation=.00]	-.640	1.449	.195	.659	.528
	[irrigation =1.00]	0 <sup>b</sup>	.	.	.	.
	[ICT=.00]	1.917*	.579	10.963	.001	6.804
	[ICT =1.00]	0 <sup>b</sup>	.	.	.	.
	[agri. Extension services=.00]	.427	.889	.231	.631	1.533
	[agri. Extension services =1.00]	0 <sup>b</sup>	.	.	.	.
	[formal health center=0]	.463	.733	.399	.528	1.589
	[formal health center =1.00]	0 <sup>b</sup>	.	.	.	.
	[all-weather road=0]	-.935	.683	1.874	.171	.393
	[all-weather road =1.00]	0 <sup>b</sup>	.	.	.	.
[formal education center=.00]	.042	.716	.003	.953	1.043	

	[formal education center =1.00]	0 <sup>b</sup>	.	.	.	.
	[protected water sources=.00]	.811	.796	1.039	.308	2.250
	[protected water sources =1.00]	0 <sup>b</sup>	.	.	.	.
	[electricity=.00]	-2.654**	1.053	6.359	.012	.070
	[electricity =1.00]	0 <sup>b</sup>	.	.	.	.
Only non-farm diversification strategies	Intercept	-3.182	.630	25.475	.000	
	[irrigation=.00]	-1.784	1.580	1.276	.259	.168
	[irrigation =1.00]	0 <sup>b</sup>	.	.	.	.
	[ICT=.00]	.427	.500	.728	.394	1.532
	[ICT =1.00]	0 <sup>b</sup>	.	.	.	.
	[agri. Extension services=.00]	1.374***	.748	3.376	.066	3.953
	[agri. Extension services =1.00]	0 <sup>b</sup>	.	.	.	.
	[formal health center=0]	.682	.530	1.657	.198	1.977
	[formal health center =1.00]	0 <sup>b</sup>	.	.	.	.
	[all-weather road=0]	3.139*	.614	26.109	.000	23.072
	[all-weather road =1.00]	0 <sup>b</sup>	.	.	.	.
	[formal education center=.00]	.039	.514	.006	.940	1.039
	[formal education center =1.00]	0 <sup>b</sup>	.	.	.	.
	[protected water sources=.00]	.080	.567	.020	.888	1.083
	[protected water sources =1.00]	0 <sup>b</sup>	.	.	.	.
	[electricity=.00]	1.733***	.939	3.406	.065	5.656
[electricity =1.00]	0 <sup>b</sup>	.	.	.	.	
Only farming diversification strategies	Intercept	2.050	.497	17.028	.000	
	[irrigation=.00]	20.107	.000	.	.	54.312
	[irrigation =1.00]	0 <sup>b</sup>	.	.	.	.
	[ICT=.00]	-.244	.614	.158	.691	.784
	[ICT =1.00]	0 <sup>b</sup>	.	.	.	.
	[agri. Extension services=.00]	-.735	.867	.718	.397	.480
	[agri. Extension services =1.00]	0 <sup>b</sup>	.	.	.	.
	[formal health center=0]	-.130	.652	.040	.842	.878
	[formal health center =1.00]	0 <sup>b</sup>	.	.	.	.
	[all-weather road=0]	-.639	.532	1.441	.230	.528
	[all-weather road =1.00]	0 <sup>b</sup>	.	.	.	.
	[formal education center=.00]	-.434	.578	.564	.453	.648
[formal education center =1.00]	0 <sup>b</sup>	.	.	.	.	

[protected water sources=.00]	-.254	.674	.142	.707	.776
[protected water sources =1.00]	0 <sup>b</sup>	.	.	.	.
[electricity=.00]	-1.94***	1.013	3.682	.055	.143
[electricity =1.00]	0 <sup>b</sup>	.	.	.	.

a. The reference category is: other

b. This parameter is set to zero because it is redundant.

\*significant at .01, \*\*significant at .05 and \*\*\*significant at .1

Source: Household Survey 2016

The descriptions proceed through the comparison of households who engaged in mixed livelihood diversification strategies in reference to those who involved in ‘other’ category of livelihood strategy. It then followed by the comparison of those who intricate in only off farm, only non-farm, and only farming categories in reference to the responses of locals who fall in ‘other’ category

#### 4.5.1 Mixed Livelihood Diversification Strategies versus ‘Other’ Category

An access to:ICT with (Wald = 5.906, df = 1, p < .05); agricultural extension services with (Wald = 7.907, df = 1, p < .01);all-weather road with (Wald = 15.355, df = 1, p < .01);any formal education centerswith (Wald = 3.499, df = 1, p < .1);protected water sourceswith (Wald = 4.723, df = 1, p < .01);and electricity with (Wald = 4.649, df = 1, p < .01)were significant predictors of an engagement of households in mixed livelihood diversification strategies than those in other category as compared to those who haven’t respective public infrastructures.

Holding ‘other’ category constant, Ex (B) shows that households who have an access to ICT were 3.442 times more likely engage in mixed livelihood diversification strategies than those who haven’t an access. One of interviewed respondents also added that:



*We are getting information from radio about social, political and economic aspects. We ask others by telephone about which strategy is more valuable than others. Accordingly we are participating in a lot of activities which are corresponding with these demanding social, political and economic issues at various levels.*

Regarding agricultural extension services, households who are getting an access were 4.371 times more likely engross in mixed livelihood diversification strategies than those who have limited access. One of interviewed respondents stated that, “as a result of agricultural extension services, we are generating untold yields both for consumption and market. A few members of households instigated trade. Generally, we are intensifying the means of income generation.”

As well, The Ex(B) in the column tells us that, holding ‘other’ category constant, households who have access to all-weather road were 7.602 timesmixlivelihood diversification strategies than those who haven’t an infrastructures. Likely one of interviewed respondents also added, “After we had gotten all season road, we have started various income generating activities such as vending wood and vegetables. My family members’ participation in innumerable activities also occurred after access to road.”

The other is that an access to any formal education centers was significant and positive as to partaking of households in variegated doings. The odds ratio shows that households who have an access to it were 3.829 times more likely absorb in mixed strategies than households who haven’t an access to an infrastructures. One of my interviewed teachers also added that, “socialized children don’t follow only one way in all aspects. They initiate their families to participate in various livelihood diversification strategies than diversifying only in a single strategy.”

An access to protected water source significantly initiated households to engage in mixed livelihood diversification strategies. Likely, the odds ratio shows that households who have an access to it were 3.411 times more likely drive their life by mixed activities than those who haven't an infrastructure.

Finally, regarding electricity, households who have access to it in their home were 6.928 times more likely occupied with mixed activities than households who haven't electricity. One respondent witnessed that, "as a result of access to electricity my neighbor are opening DSTV and small shops and buying fridge. They use these to generate income." Officer from water, energy and mineral office of a district added as:

*New access to households' electrification may change the nature of work in the home as well as the amount and type of work that can be done in the market. Providing new public infrastructure to a location also may affect migration of employed and unemployed individuals. As a result I help the members of rural people to engage in non-farm activities for the purpose of diversifying their livelihood strategies.*

#### **4.5.2 Only off-farm Strategy versus 'Other' Category**

Among other, holding 'other' category constant, an access to ICT with (Wald = 10.963, df = 1, p < .01) and electricity with (Wald = 6.359, df = 1, p < .05) have significantly predicted about an engagement of households in only off-farm strategy. The odds ratio shows that households have access to ICT were 6.804 times more likely engage in only off farm activities than those who haven't an access. Inversely, households who have an access to electricity were 14.21 times less likely manage their life by only off-farm activities than households who haven't an infrastructure.

### **4.5.3 Only non-farm Strategy versus ‘Other’ Category**

Table 4.8 shows that an accessibility to all-weather road with (Wald = 26.109, df = 1, p < .01) has significantly predicted about an engagement of households in only non-farm strategy holding constant ‘other’ category.

The Ex (B) in the column tells us that, holding an engagement of households in ‘other’ category, inversely, households who have an access to all-weather road were 23.072 times more likely engage in only non-farm activities than households who haven’t access to infrastructure.

### **4.6 Accessibility to Public Infrastructures and Components of Livelihood Outcomes**

It is assumed that public infrastructures have possible effects on livelihood outcomes such as food security, rural households’ initiations of contacting and consulting health professionals as soon as feel ill, job opportunities, adequate house, and respect and trust among household’s members.

#### **4.6.1 Public Infrastructures and Household Heads’ Feeling of Food Security**

The focuses in food security by measuring the protein, micronutrients, food quality and safety have to be treated as value judgments (Maxwell and Smith 1992). Thus for the purpose of this study, the researcher asked respondents almost subjective responses depending on the indicators of food security explained by Bouis and Hunt (1999) - the physical availability of food, the ability of household to access the available food and the ability of individuals (particularly those susceptible to food deficits such as women, infants and children) to secure entitlement to it throughout a year. Accordingly and subjectively, if household head responded as these three elements are satisfactory; it has been considered as household has food security. Consequently, food security as a dependent variable, assumes the value of Y= 1 if a household is food secure, 0 otherwise.

Majority of respondents (64.3 percent) were food insecure while only 35.7 percent were food secure. Of 113 households who have access to all-weather roads, 70.8 percent; of 111 households who access to any formal health centers, 45.1 percent; of 137 households who have access to any formal education centers, 51.1 percent; of 123 households who have access to protected water sources, 52.8 percent; of 125 households who access to ICT, 60 percent; of 159 households who have access to agricultural extension services, 54.08 percent; of 55 households who have access to electricity, 90.9 percent; and of 21 households who have access to irrigation, 95.2 percent had food security throughout a year.

In opposite, among those who have no access to: all-weather roads (99.1 percent); any formal health centers (78.5 percent); any formal education centers (88.1 percent); protected water sources (98.4 percent); ICT (88.8 percent); agricultural extension services (92.5 percent); electricity (88.8 percent); and irrigation (67.1 percent) were food insecure throughout a year.

The following figure 4.3 shows the feeling of households, who have an access to a given infrastructures, that either an intervention (accessibility) of respective infrastructures could improve their food security or not. Accordingly, majority of respondents who have access to all-weather roads (73.4 percent), irrigation (96 percent) and agricultural extension services (98.1 percent) responded that accessibility to these respective infrastructures could improve their food security status. Other infrastructures fall around half of respondents who have access to these respective infrastructures.

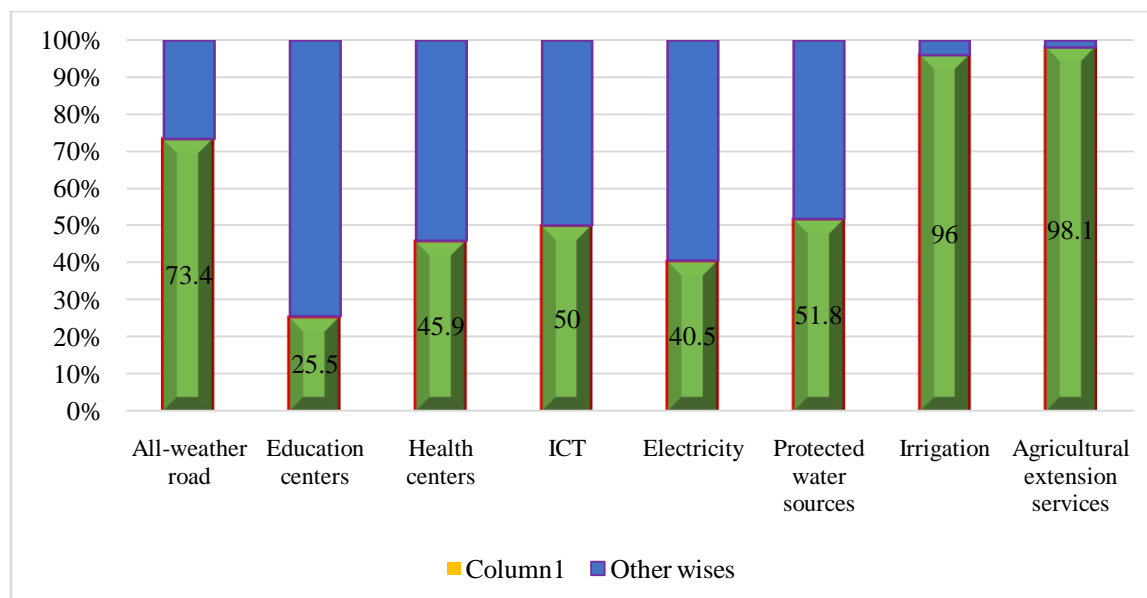


Figure 4.3: Households' feeling about food security and public infrastructures (*Source: Household survey 2016*)

Besides to the above descriptive finding, binary logistic regression was computed and the result was put as the follows.

Table 4.8: Binary logistic regression output about an accessibility of public infrastructures and households feeling about food security

PI	B	S.E.	Wald	Sig.	Exp(B)
All-weather road(1)	3.229*	.551	14.388	.000	25.259
Formal health centers(1)	.817	.792	1.065	.302	2.26
Formal education centers(1)	.111	.771	.021	.886	1.117
Agricultural extension services(1)	3.761*	.743	25.619	.000	42.983
Protected water sources(1)	1.134	1.239	.838	.360	3.109
ICT(1)	1.049	.715	2.149	.143	2.554
Electricity(1)	2.486	1.626	2.337	.126	12.2
Irrigation(1)	1.014**	.530	3.660	.056	2.758
Constant	-4.466	1.237	13.037	.000	.011
-2LL	67.687				
Chi square	19.738*				

\*significant at .01 and \*\*significant at .1

Source: Household Survey 2016

The above table 4.10 shows accesses to all-weather roads and agricultural extension services have significant and positive possible effects on the food security of households at  $p < 0.01$ .

Consequently, the odds ratio tells us that the households who have an access to; all-weather roads were 25 times and agricultural extension services were 43 times more likely subjectively responded that they have food security throughout a year than households who have not an access to these infrastructures respectively. Majority of respondents who have an access to all-weather roads and agricultural extension services were very happy. One respondent from interview stated, “After we have gotten all-weather roads and agricultural extension services we put off the problems of food insecurity.”

In addition an expert from transport office detailed the relationship between all-weather roads and food security as; “Nowadays we are working to connect all rural *kebeles* by road assuming that enhancing road has its own role in increasing food security of rural households”. *Woreda's* agricultural office officer also added that; “we are sure that rural people food security status is increasing satisfactorily as a result of getting an agricultural extension services.” An expert from water office also witnessed that; “as it is usual without water everything is impossible. Protected water sources played a great role in ensuring food security of rural households. It helps them in producing quality food and increasing their production and productivity.”

#### **4.6.2 Public Infrastructures and Contacting and Consulting Formal Health Professional**

Health is main aspect of human society to exist. It has many definition, indicators and components. It is a complex concept which one can't cover under a single title. Here for the purpose of this study, households' contacting and consulting physician or formal health professionals as soon as they feel ill was rumored. The rates at which households contact and consult are different depending on various factors. There are individuals who contact and consult

health professionals for all types of diseases immediately. However there are others who stay for a long period of time to see the changing situations. Accordingly, the researcher made a demarcation between (a) contacting and consulting formal health professionals, for whatever types and natures of disease, within one day and (b) otherwise. It is believed that an access to public infrastructures helps to contact and consult a physician as soon as they feel ill.

Of 142 households who haven't an access to all-weather roads, 79.6 percent; of 144 households who haven't an access to any formal health centers, 89.4 percent; of 118 households who haven't an access to any formal education centers, 84.2 percent; of 132 households who haven't an access to protected water sources, 71.8 percent; of 130 households who haven't an access to ICT, 78.3 percent; of 96 households who aren't getting agricultural extension services, 65.2 percent; of 200 households who haven't an access to electricity, 69.9 percent; and of 234 households who haven't an access to irrigation, 95.2 percent didn't more likely contact and consult a health professionals as soon as they feel ill.

These respondents raised a lot of factors which hinder them to do so. These are: adherence to the local community's culture (value and norms), quality and facility of a given services, personality of health professionals, personal factors (such as lack of willing and motivation), geographical distances; economic problems (lack of money) and others. One of interviewed respondent stated that:

*Health is given from Allah (God). He can do whatever he wants. In our home, if a household's members feel ill we don't run to health centers instantaneously. We should have patience because Allah has ordered it for us. If we can tolerate with a disease, which we bestowed with, in return we can get a reward from Allah. Besides in our culture also the one runs always to hospital or health centers is considered as a weak. Society*

*doesn't believe in him in all aspects of life. He is not given with a best responsibility in a society. Thus we depend on a condition. First we attempt to treat an individual who feels ill in a home by traditional healers. Thereby if there is no change we take him/her to health centers.*

Another interviewed also added:

*Going to health centers depends on situations in which we are. We are poor. Even not money paid for hospital, we couldn't eat three times per day. I tell you that one of my daughters died before I hadn't taken her to hospital. I had taken her in to health station in our kebele. They ordered me as I take her to hospital. I hadn't a birr in my pocket. I attempted a lot to get mortgage from other individuals. I couldn't get. But finally I had decided to sell an only mule I have. But before that she passed. I was regretted. I hate myself. I have also conflicted with my wife, her sisters and brothers because I refused to sell that mule. For whatever she passed. The same is true for a majority of people in our village. Before taking to hospital they wait for a condition in which as a matter of chance an individual who feels ill recover by Allah or traditional healers. If not they go to hospital by selling their assets or loaning from the one who have money.*

The following figure 4.4 shows the feeling of respondents, who have an access to public infrastructures, that either access to a given respective infrastructures initiated them to contact and consult professional health workers as soon as feel ill or not.



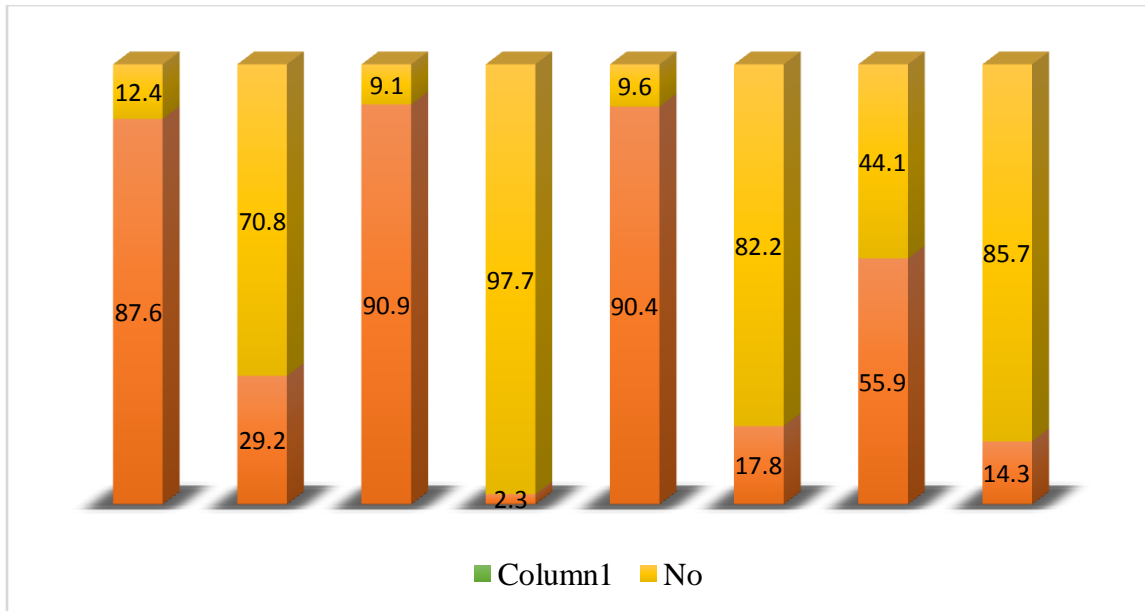


Figure 4.4: Public infrastructures and contacting professional health workers as soon as feel ill (Source: Household survey 2016)

Figure 4.3 indicates that an intervention of all-weather road, health centers and ICT were highly initiating them to see professional health workers as soon as feel ill. Even though, they were fascinated with the construction of health centers in their neighbor, majority of them concern about the issues of quality of services and capacity or skill of workers. Majority of respondents who have an access to electricity and protected water sources responded that having access to these respective infrastructures had the lowest contributions for them in contacting and consulting professional health workers as soon as they feel ill. Regarding ICT one of my interviewed respondents stated that; “ICT is contributing a lot for us in contacting and consulting formal health professionals as soon as feel ill. The message reminders on TV, by mobile and radio are initiating us.” Officer from health office also witnessed, the importance of media in initiating rural community to contact and consult health professionals as:

*ICT could be used by both health practitioners and rural community for the common purpose. For example, health extension workers in particular could improve their*

*effectiveness through the provision of information on key treatment practices such as the management of malaria or fever in children under five. Such interventions could enhance the capacity of health extension workers and might have immense implications for improving the quality of health services in the given area and as a result encourages rural people to solve their health problems immediately by being with health practitioners. Secondly, ICT could be used to provide health information to the general public. It could also be used for alerting the people during emergency situations and outbreaks of disease; and reminders for medication adherence and defaulter tracing. Finally, mobile phones could be used as a tool for strengthening the health management information system. This facilitates collection and compilation of information from wide areas. In conclusion, we believe that it is now time to harness mobile phone technology for public health practices in Ethiopia.*

Another expert from the same office also added:

*ICT helps people in making informed choices about their own health; governments in becoming more responsive to health needs; policymakers and the public in becoming more aware of health risks; and people in having better access to the information and knowledge they need for better health.*

Binary logistic regression was also employed in analyzing as either the public infrastructures had really significant possible effect in increasing people awareness and taking actions in keeping their health by contacting and consulting formal health professionals as soon as they feel ill. Consequently, households who haven't access to given infrastructures were considered as a constant while access to given infrastructures was dummy that entered into step.

Table 4.9: Binary logisticregression output about an accessibility of public infrastructures and households' contacting formal health professionals as soon as they feel ill

Contacting formal health professionals as soon as feel ill					
PI**	B	S.E.	Wald	Sig.	Exp(B)
All-weather road(1)	4.714*	1.136	17.212	.000	111.460
Formal health centers(1)	3.719*	.484	59.118	.000	41.240
Formal education centers(1)	.551	.582	2.142	.143	2.342
Agri. <sup>38</sup> Extension services(1)	.698	.620	1.267	.260	2.009
Protected water sources(1)	1.042	.833	1.564	.211	2.836
ICT <sup>39</sup> (1)	2.462*	.577	18.183	.000	11.725
Electricity(1)	.706	.662	1.137	.286	2.025
Irrigation (1)	.686	1.154	.353	.552	1.955
Constant	-3.396	1.068	10.119	.001	.034
					-2LL = 121.01
					Chi square =39.179*

\*significant at .01 and \*\* public Infrastructures

Source: Household Survey 2016

Table 4.12 indicates that among other infrastructures, access to;all-weather road with (Wald = 17.212, df = 1, p < .01); any formal health centers with (Wald = 59.118, df = 1, p < .01) and ICT with (Wald =18.183, df = 1, p <.01) had significant possible effect in initiation of households to contact and consult formal health professionals as soon as they feel ill.

As well, The Ex(B) in the column tells us that households who have an access to:all-weather road were 111 times, any formal health centers were 41 timesandICT were 11 times more likely contact and consult formal health professionals as quickly as they feel ill than households who haven't access to a given infrastructures in a set leading edge.

<sup>38</sup> Agricultural

<sup>39</sup> If households have mobile (\*) and other ICT components (\*\*), they have been considered as they have access to ICT and not in other cases. \* = obligatory and \*\* = optional

### 4.6.3 Public Infrastructures and Job Opportunities of Household Members

FAO and the government of Ethiopia signed a partnership agreement which aims to reduce youth mobility caused by poverty, through innovative policies that will create jobs and business opportunities for young people in agricultural sector and in rural areas more broadly. Accordingly, the respondents were asked as if they have youth household members who could get job opportunities in the area within the last five years or not. In the case, 111 (43.5 percent) responded that their household members could get job opportunities as a result of one or more specific given infrastructures. The following figure 4.4 shows the respondents' responses of which type of public infrastructures could create job opportunities for their household's members. Accordingly, of 111 households, 75.6 percent and 77.5 percent of respondents answered that job opportunities for their household's members could be created by access to all-weather roads and agricultural extension services respectively. For detail, look at figure 4.4

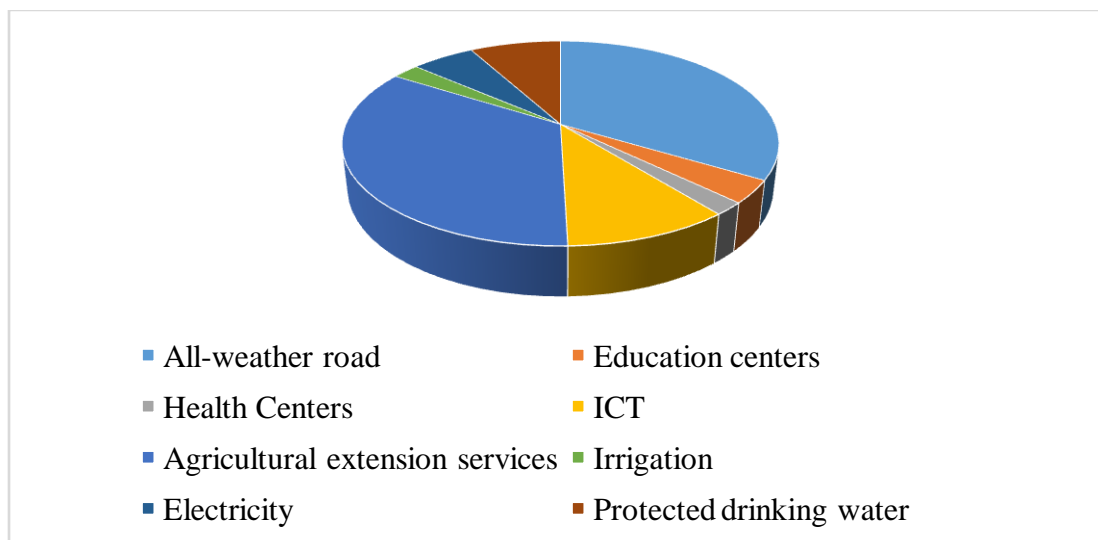


Figure 4.5: Public infrastructures and job opportunities (*Source: Household survey 2016*)

One interviewed respondent stated that; “as a result of all-weather roads and agricultural extension services advancement, youth owned micro and small enterprises in rural community are increasing.” An officer from agricultural and natural resources offices also added as:

*We are organizing different workshops on maximizing ways to create more jobs in rural areas over the weekend. Much focus is to be given to youths and women so as to enable them highly benefit economically through agricultural and non-agricultural potentials. We are doing this by training and organizing them in work areas that they are much interested as well as facilitating credit services. The targeted groups for this initiative are those within five kilometers of all-weather roads from their working areas, uneducated rural youths, school dropouts, and unemployed youths those have relatively better educational background and capacity.*

An expert from transportation sector also claimed as:

*Transport infrastructure reduces improve rural livelihood outcome by creating employment and new job opportunities. For one thing, the construction and maintenance of a road are labor-intensive operations that can provide job opportunities for people living near the road. In other ways, upgrading all-weather roads encourage technological development practices that enhance and support entrepreneurship are essential because they cultivate innovation which, in turn, creates new jobs, new wealth, a better quality of life and sustainable development.*

The chi-square tests found that there was positive and significant association among considered public infrastructures and creating or getting new job opportunities among rural households at ( $p < .01$ ). Regarding the strengths of association, lambda coefficient reports an access to; all-weather

road with (0.857) and agricultural extension services with (0.846) values had strong association; any formal education centers with (0.45), protected water sources with (0.382), and ICT with (0.475) had moderate association; and any formal health centers with (0.234) and electricity with (0.272) had weak association.

Moreover table 4.13 shows us the statistical significance calculated from binary logistic regression about the feeling of households as per public infrastructures create job opportunities.

Table 4.10: Binary logistic regression output about an accessibility of public infrastructures and households' job opportunities

<b>Access to public infrastructures and job opportunities</b>					
	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>Sig.</b>	<b>Exp(B)</b>
All-weather road(1)	3.429*	.496.	47.786	.000	30.558
Formal health centers(1)	.222	.433	.262	.609	1.248
Formal education centers(1)	.590	.427	1.908	.167	1.803
Agri. extension services(1)	1.051**	.427	6.062	.014	2.559
Protected water sources(1)	.049	.375	.017	.897	1.050
ICT(1)	.415	.547	.574	.449	1.514
Electricity(1)	.004	.568	.000	.994	1.004
Irrigation(1)	.108	.723	.022	.881	1.114
Constant	1.840	.653	7.947	.005	6.296

\*significant at .01 and \*\* significant at .05

Source: Household Survey 2016

Table 4.13 indicates that an access to; agricultural extension services with (Wald =6.062, df = 1, p <.01) and all-weather road with (Wald =47.786, df = 1, p <.01) had significant and positive possible effect in creating job opportunities for the youth members of rural households.

The Ex (B) in the column tells us that households who have an access to agricultural extension services were three times and all-weather road were 31 times more likely responded that the youth members of their household have created or gotten job opportunities than households who haven't an access to those respective infrastructures.

#### **4.6.4 An Accessibility to Public Infrastructures and Adequate House**

Housing conditions are one of the most important factors which influence the livelihood conditions of households and community at large. Housing is the conjunction of the home, the dwelling, community and immediate environment. Therefore, adequate housing depends on the sufficient provision of the services and conditions on all the four dimensions. The researcher has observed that poor housing conditions were the most dominant problems in the residents of the study area.

Furthermore, the problems were heightened by sharing of sleeping rooms with domestic animals and use of poor quality energy in the main houses. Most of the households' houses have been constructed from mud and wood, which are not durable. Thus, for the purpose of this study, the researcher considered as households have adequate house if they have: separate sleeping rooms from domestic animals, windows, sanitary facilities, fences, and durable building materials of house while inadequate in other cases. Accordingly, only 15.7 percent of respondents have an adequate house.

The chi-square shows that assumed public infrastructures have significant and positive association with existence of adequate house of rural households at ( $p < 0.01$ ). The strength of associations for all variables was proved to be moderate.

Table 4.14 indicates that all households (100 percent); who haven't an access to all-weather road, any formal health centers, protected water sources, and electricity; have inadequate house. Of 118 households who haven't an access to formal education centers, only 0.8 percent; of 159 households who haven't an access to agricultural extension services, only 3.1 percent; of 130 who haven't an access to ICT, only 1.6 percent; and of 234 households who haven't an access to irrigation, only 9.4 percent of households have adequate house.

Table 4.11: Adequate house of respondents by an accessibility of public infrastructures

PI	Categories		Adequate house		Total	Chi square
			Yes	No		
<b>All season road</b>	Accessible within 5 km	F	40	73	113	37.753*
		%	35.4%	64.6%	100.0%	
	Lack of access	F	0	142	142	
		%	0.0%	100.0%	100.0%	
<b>Formal health centers</b>	Accessible within 5 km	F	40	71	111	61.546*
		%	36.0%	64.0%	100.0%	
	Lack of access	F	0	144	144	
		%	0.0%	100.0%	100.0%	
<b>Formal education centers</b>	Accessible within 2 km	F	39	98	137	36.566*
		%	28.5%	71.5%	100.0%	
	Lack of access	F	1	117	118	
		%	0.8%	99.2%	100.0%	
<b>Protected water sources</b>	Accessible	F	40	83	123	44.207*
		%	32.5%	67.5%	100.0%	
	Lack of access	F	0	142	142	
		%	0.0%	100.0%	100.0%	
<b>ICT</b>	Accessible within 5 km	F	38	87	125	36.786*
		%	30.9%	69.1%	100.0%	
	Lack of access	F	2	128	130	
		%	1.5%	98.5%	100.0%	
<b>Agricultural extension services</b>	Yes	F	35	124	159	50.229*
		%	22%	78%	100.0%	
	No	F	5	91	96	
		%	5.2%	94.8%	100.0%	
<b>Electricity</b>	Yes	F	40	45	55	96.396*
		%	47.1%	52.9%	100.0%	
	NO	F	0	169	169	
		%	0.0%	100.0%	100.0%	
<b>Irrigation</b>	Yes	F	18	3	21	84.553*
		%	55.7%	14.3%	100.0%	
	No	F	22	212	234	
		%	9.4%	90.6%	100.0%	

\* Significant at  $p < 0.01$ ,  $F$  = frequency,  $PI$  = Public Infrastructures

Source: Household survey 2016

Generally, it is possible to say that an access to public infrastructures can lead to improvement of rural housing.



#### **4.6.5 An Accessibility to Public Infrastructures and Respect and Trust among Household's Members**

Households were asked about subjective feeling of respect and trust trends among their household members. Accordingly, one of interviewed respondents detailed that;

*Respect and trust are building blocks for an existence of household members. If there is no respect and trust among household's members, the family disorganization will follow. Thereby a country's destruction will happen. During the past there were a respect and trust among household's members. However now there is a change. This change came with cell-phones and has an effect on our life.*

They argue that time is coming with various new things. Indirectly those new things are associated with public infrastructures. Concerning this one of my interviewee also specified as:

*My son, we are waiting for a time at which respect, trust, love and emotion will totally disappear. I haven't a respect from and a trust in my children. Particularly, I don't know about the future of my daughter. Always at day and at night she is with phone. She doesn't response to our requirements. She debunks us, mocks to us, and insults us by saying you illiterate and so on. She goes where she wants like Jimma and wherever. Everlasting for a car! If we ask her, why she did that, she says I will leave your home as soon as possible. Thus as I think, even though it has an advantages, different public infrastructures such as phone and road are taking us to an end of the day.*

Extending to the community, the stake holders on a given public infrastructures particularly those of drivers and assistants insult, slur and undermine them. They use immoral words and actions. In other words what they do are against the value, beliefs and moral of local community.

On this issue one of my interviewed respondent argued:

*The drivers and servants say what is on their tongue than what is in their mind. The way they treat us is disparaging and destructive. One day they drop me from a car by saying that your leg aroma is bad so you shall go by another car. There is no respect at least by seeing age. Another day also I am with my father in-law. We were going to a serbo town. A servant conflicted with individual who refused to be dropped after they saw traffic on a road. They took him first. Thereby after we travel along, they saw traffic and say let you be dropped. He refused. Then they started to insult by saying a words which are heavy in a tongue such as 'inatinlibda' literally means "...fuck your mother". I was ashamed. By the way these words is being used everywhere in the bus stations as a benzene. My father in-law also said what system and time are in which we are living. There is no borderline in their words. They insult old female and male by difficult words.*

Besides, binary logistic regression was performed to analyze the relationship between public infrastructures on one hand and respect and trust among household members on another hand. The researcher categorized these variables in to dummy variable as; decreasing of respect and trust – coded as “0” and increasing or remaining constant or other cases – coded as “1”. Subsequently, households’ access to; all-weather roads, any formal education centers and ICT had significant possible effect on the respect and trust among household members at  $p < 0.01$ . The negative sign of coefficients indicate that as access to these infrastructures increases, respect and trust among households decreases. An access to agricultural extension services and electricity had also significant possible effect on respect and trust among household members at  $p < 0.01$  and  $p < .1$  respectively. For detail see at table 4.15

Table 4.12: Binary logistic regression output of Respect and trust among household members and public infrastructures

Respect among Households' members		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Yes	roadacce(1)	-4.802*	1.284	13.989	1	.000	.008	.001	.102
	health(1)	-.306	.618	.245	1	.621	.737	.220	2.471
	school(1)	-4.880*	.802	36.982	1	.000	.008	.002	.037
	agriexte(1)	2.631*	.921	8.156	1	.004	13.890	2.283	84.518
	water(1)	.254	1.271	.040	1	.841	1.290	.107	15.575
	ICT(1)	-2.011*	.709	8.039	1	.005	.134	.033	.538
	electric(1)	-2.501**	1.189	4.425	1	.035	.082	.008	.843
	irrig(1)	-13.932	8087.28	.000	1	.999	.000	.000	.
	Constant	3.832*	.698	30.141	1	.000	46.153		
<b><i>Trust among households' members</i></b>									
Yes	roadacce(1)	-3.149*	.894	12.408	1	.000	.043	.007	.247
	health(1)	.338	.480	.496	1	.481	1.402	.548	3.590
	school(1)	-2.807*	.456	37.553	1	.000	.060	.025	.148
	agriexte(1)	1.138***	.650	3.059	1	.080	3.120	.872	11.163
	water(1)	.247	.930	.071	1	.790	1.281	.207	7.932
	ICT(1)	-1.687*	.279	36.499	1	.000	.155	.107	.320
	electric(1)	-1.420***	.736	3.729	1	.053	.242	.057	1.021
	irrig(1)	.748	1.203	.386	1	.534	2.112	.200	22.318
Constant	2.481*	.387	41.044	1	.000	11.959			

\* Significant at .01, \*\*significant at .05, and\*\*\* significant at .1

Source: Household survey 2016

**Note:** *Irrig*= irrigation, *agriexte* = agricultural extension services, *health* = formal health centers, *roadacce* = all-weather road, *school*= formal education centers, *water* = protected water sources, *electric* = electricity

The Ex (B) in the column in the above table 4.15 tells us comparatively, the households who have access to agricultural extension services were 14 times and three times more likely responded as the respect and trust among households' members are remaining constant or increasing than households who haven't an access the given infrastructures.

Inversely, odds ratio shows that households who have access to; all-weather road were 122 times; any formal education centers were 132 times, ICT were 7times and electricity were 12 times less likely responded as respect among households' members is remaining constant or increasing. Regarding trust,inversely, odds ratio shows that households who haven't access to; all season road were 23 times, any formal education centers were 17 times, ICT were 5 times and electricity were 4 times less likely have trust in their household's members than households who haven't an access to a given infrastructures respectively. Majority of respondents also argued that miscommunication, misunderstanding and lies are the products of these infrastructures particularly that of ICT. One interviewed elder stated that; "Because of media, this world is embellished by false information. Truth and followers of truth are hidden and considered as deviancy/ts. These is pointing to demolishing of culture."

#### **4.6 Livelihood Diversification Strategiesand Components of Livelihood Outcomes**

There is conventional association between livelihood diversification strategies and livelihood outcomes along with an accessibility of public infrastructures. Thereby, it is assumed that an engagement of households in mixed livelihood diversification strategies lead to an improvement of livelihood output components. Interviewed respondents and experts from various sectors witnessed as livelihood diversification strategies and components of livelihood outcomes are undistinguishably associated with each other.Expert from agricultural office claimed that; "Diversification to non-farm livelihood strategies rather than relying only on subsistence farming enables households o have better incomes, enhance food security, increase agricultural production by smoothing constraints and also to better cope with environmental stresses."

Officer from the same office also added;

*The focus of livelihood diversification in our woreda necessarily implies broadening of income and livelihood strategies away from purely crop and livestock production towards both off-farm and non-farm that are undertaken to generate additional income, increase food security, live standardized life, create job opportunities and increase female participation.*

Continuously, we see an associations among given category of livelihood diversification strategies (mixed, off-farm, non-farm, farming and others) and components of livelihood outcomes' components. The chi-square tests also shows that an association among livelihood diversification strategies, food security, job opportunities and adequate house were significant.

#### 4.7.1 Livelihood Diversification Strategies and Food Security

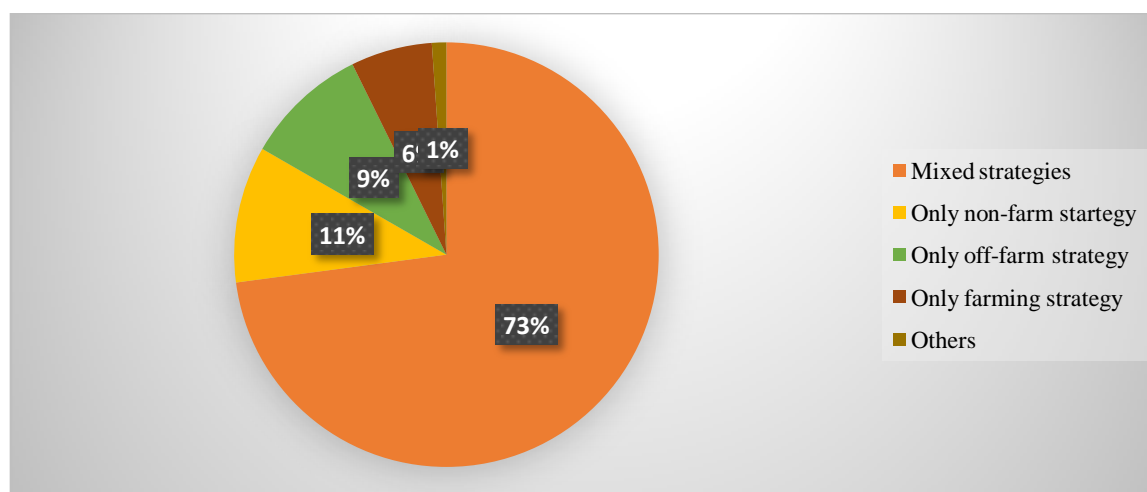


Figure 4.6: Livelihood diversification strategies households' food security (*Source: Household Survey 2016*)

Figure 4.5 indicates, of 96 households who have food security, 73% mixed their diversification strategies while diversification in a single strategy was range from one to eleven. One of the interviewed respondents about mixed diversification strategies as, “We have mixed various income generating activities in my household. These are agricultural wages, non-agricultural

wages, self-employed income, remittances, and other income such as capital earnings. As a result we are food secure.” All key informants interviewed from various sectors also assured as most of rural households in their district adopt mixed livelihood diversification strategies in order to overcome food poverty.

#### 4.7.2 Livelihood Diversification Strategies and Job opportunities

The following figure 4.6 indicates, off 111 households who responded that job opportunities have been created for their household’s members, 93.7 percent mixed their livelihood diversification strategies.

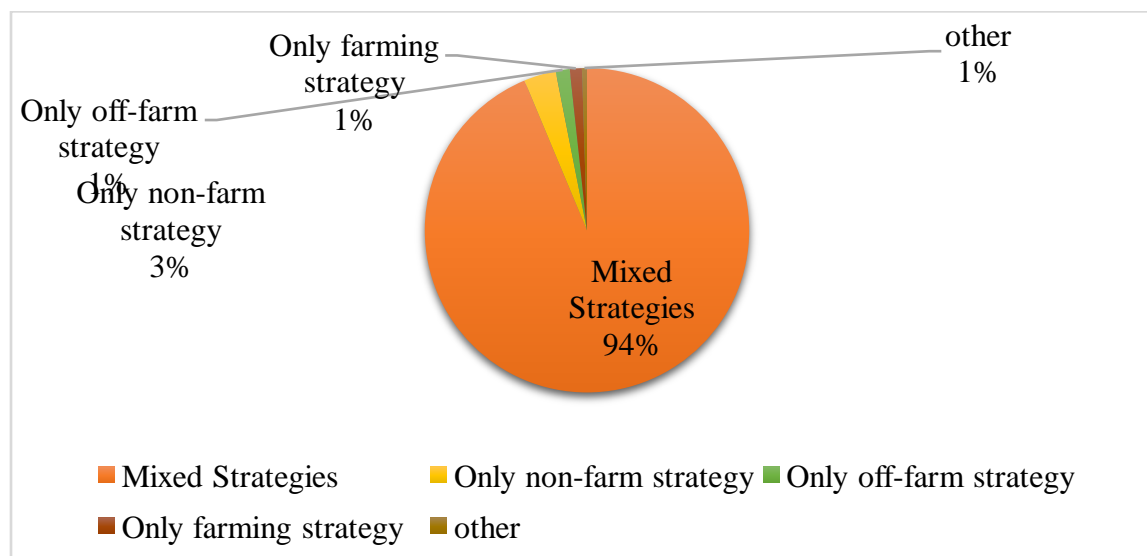


Figure 4.7: livelihood diversification strategies and job opportunities (Sources: Household Survey 2016)

All of interviewed experts from various sectors assured that in creating job opportunities for rural youth, government and other responsible bodies are initiating and encouraging households to mix their livelihood diversification strategies than running in only single diversification strategy. Majority of respondents also believed in mixing livelihood diversification strategies for the purpose of getting and creating job opportunities.

### 4.7.3 Livelihood Diversification strategies and Adequate House

Of 40 households who have adequate house, 95 percent mixed their livelihood diversification strategies. Majority of households who engaged in only single livelihood diversification strategy haven't adequate house. For detail look at the following figure

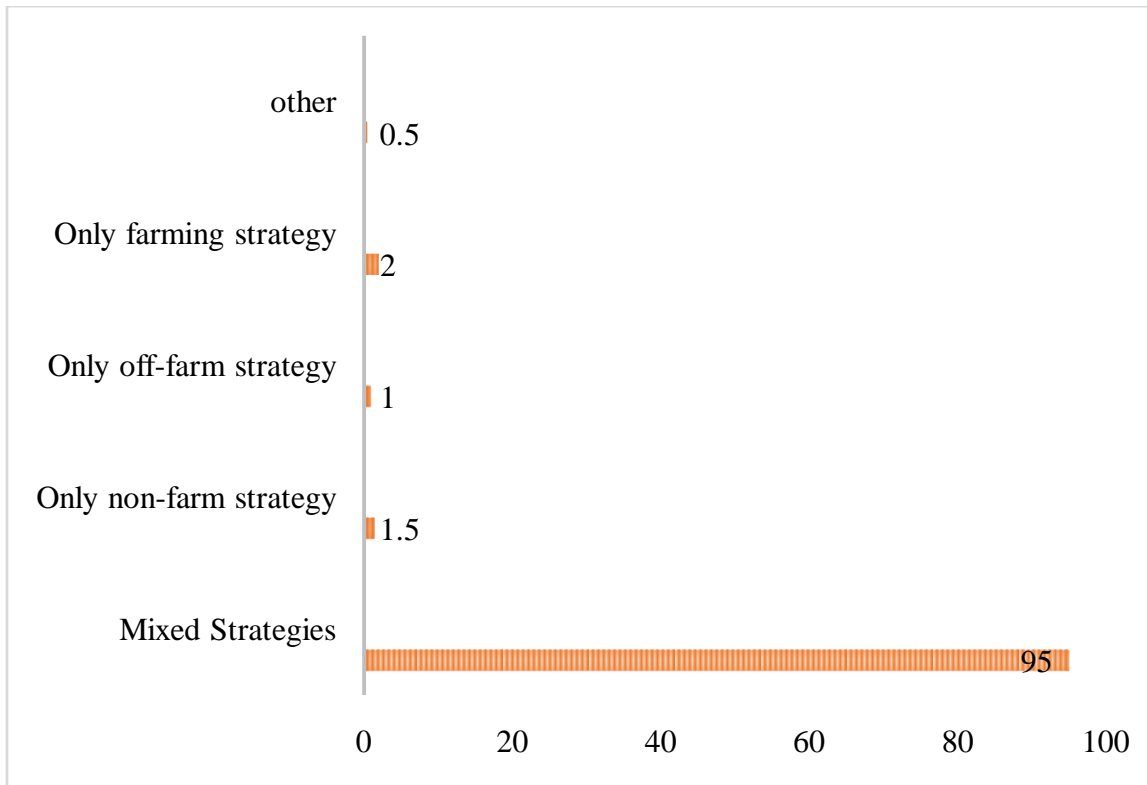


Figure 4.8: Livelihood diversification strategies and adequate house (*Source: Household survey 2016*)

## CHAPTER FIVE

### 5. Discussion

Currently, the fundamental causes of poverty, isolation, powerlessness, vulnerability, and unemployment are significantly associated with insufficient and also unequal access and custody of public infrastructure. Hence, analyzing the possible effect of public infrastructures on the changing nature of households' livelihood assets, strategies and components of outcomes has a lion share on socio-cultural, economic and political development.

The majority of households in rural areas haven't accessibility or have limited access to public infrastructures. In other words, the rate coverage of public infrastructures is very stumpy. Thus, responsible bodies are left with a lot of burdens which community is necessitating. In this case Foster and Morella (2010) also found: Ethiopia has very low road accessibility, has the lowest ICT coverage in Africa, and has one of the most under developed power systems in Sub-Saharan Africa.

The government of Ethiopia is also planning major investment programs to upgrade these rural infrastructures. In rolling out these programs, it will be important to prioritize areas with agricultural potential and open for diversifications of livelihood diversification strategies to improve food security, standard of life, female participation and job opportunities.

Majority of those who have a given infrastructures send their children to school, access to credit easily, engage in mixed livelihood diversification strategies, feel food secure, have job opportunities, contact and consult formal health professionals as feel as ill, initiate female's participation and have adequate house than households who haven't an access with a given criteria. However, since it doesn't consider societal norms, values and beliefs; respecting,



trusting and helping among households and community are decreasing as an access to some infrastructures such as all-weather roads and ICT increases.

This is consistent with Hughes and Hans (2001) who argued that despite of the rapid increase in the diffusion of information and communication technology the significance of these development for families, especially the impact of ICT on elderly people's connection with their families, remains unclear. Katz and Rice (2002) also added that the domestication of new technology involves a two-way process where consumers change the meaning and influence of technologies while at the same time influencing family interactions. Mesch (2003) also added internet access in the household negatively altered family communication patterns.

The members of a household combine their capabilities, skills and knowledge with the different resources at their disposal to create activities that will enable them to achieve the best possible livelihood outcomes for themselves and the household as a whole. Everything that goes towards creating that livelihood can be thought of as a livelihood asset. It is believed that access to public infrastructures has positive and significant association with other livelihood assets (sending school age children to school, access to credit and except in the cases of social capital).

Accordingly, an important component of the Ethiopian government plans in rural people livelihood improvement is investment in human capital. People's health and ability to work, the knowledge and skills they have acquired over generation of experience and observation, constitute in human capital. Education can help to improve people's capability to use existing assets better and create new assets and opportunities. Sending school age children to school is a decisive tool of enhancing human capital. Among others all-weather road, school centers, agricultural extension services and protected water sources are significantly associated with being of school age children out of school.

Majority of households who have not these infrastructures do not send their school age children to school. For example, absence of all season roads resulted in dropout of children during summer since it is difficult for them. However, construction of all-weather road makes safe road and thereby a family feel secure in sending their children. Correspondingly, fetching water from a distance is also another problem which keeps children out of school. Thus, getting a protected water sources at nearby helps students in saving their time and energy. In other words it decreases the rate at which parents need their children for help.

Alike with above, Filmer (2003) consider education in general and decreasing the rate of school age children out of school have significant and positive association with development of public infrastructures. Thus, upgrading public infrastructures and reconsidering various related social policies are expected from government to have highly educated citizens. Likely, Demenge et al. (2014) found in their study that road has a significant contributions in getting the services of social infrastructures (education and health). It is also coincides with that of Bhatta (2004) that road accessibility significantly influenced households to enroll their children to school.

All-weather roads, agricultural extension services, and ICT have a significant possible effect on mutual support among community. Except agricultural extension services, accessibility to these infrastructures are negatively associated with mutual support among community. This seems that the development of these infrastructures didn't incorporate the indigenous culture of helping each other. Stated in other ways, as access to these infrastructures increases, the mutual support among community decreases. For example, at the absence of all-weather road, people help each other in carrying the sick individual, giving and taking horses for bringing production from/to the market and etc. Following the work by Dercon et al. (2004), describes the extent of *Iddir*, insurance institutions indigenous to Ethiopia that are used to cope with the high cost of funerals.

However, nowadays as movement of individual from place to place and 'misinterpreted modernizations' increases, this and the like activities of helping each other are decreasing.

Developing individualism, media dependence, deviation from societal norms are the aspects developing with public infrastructures and resulted in decreasing mutual support among community members. This consistent with the finding of Hoddinot, Dercon and Krishnan (2005) who found that Ethiopian rural households belong to some type of network that provide assistance in time of need. As they argued these networks are decreases as dependence of households on public infrastructures increases and thereby rural people start to diversify their livelihood diversification strategies.

Public infrastructures have significant and positive association with an engagement of households in mixed livelihood diversification strategies by enhancing non-farm activities than only farming or only off-farm activities. Infrastructures open the way for households to drive their life by messing various activities from various sources. Reardon et al. (2007) found that the development of public infrastructures have significant effect in increasing non-farm activities besides agricultural activities. Thus the process helps the rural people in diversifying their livelihood diversification strategies which resulted in achieving expected rural livelihood outcomes.

Likely Gibson and Oliva (2009) argue that there is growing interest in the rural non-farm sector in developing countries as a contributor to economic growth, employment generation, livelihood diversification, and poverty reduction. Consistently, Barret, Reardon and Webb (2001) found that although the returns to market infrastructure via improved access to nonfarm opportunities are therefore difficult to establish with any precision, the qualitative point seems to stand: public

services such as education, communication, and transport infrastructure matter significantly to participation in nonfarm activities.

In other words majority of households who have access to assumed public infrastructures diversify their livelihood diversification strategies and in so doing recover the components of livelihood outcomes such as food security, contacting formal health professionals, female participation, adequate house and job opportunities. The improvements of all assumed infrastructures are positively and significantly associated with households' food security.

Consistently, FAO (2007) states as poor infrastructures are associated with food insecurity. Other findings such as that of Ahmed and Donovan (1992) and van de Walle (2002) also states that an enhancement of public infrastructures has a significant influence in increasing a food grain and gradually food improvements. Tesfaye and et al. (2008) findings in Ada Liben district of Ethiopia also argues that about 70% of the irrigation and water infrastructure users are food secure while only 20% of the non-users are found to be food secure.

The role played by an all-weather road in initiating households to contact and consult formal health professionals is substantial. Improved roads have reduced the traveling time involved in accessing health services. With a shorter and less tiresome journey, the chronically sick may present themselves more frequently, as may the healthy for routine check-ups and immunizations.

This is consistent with the finding of Bhatta (2004) that states roads can significantly improve access to health care facilities, thus making it easier to respond to medical emergencies. Likely Bhatta (2004) also states that road construction and maintenance significantly give employment opportunities for the local people; whilst on the other improved transport reduces the physical

costs of access to resources and markets. Diribe and Roda (2012) also found that mobile phones were found to be effective means of communication for public health surveillance and the provision of health information on pre-specified illnesses. The critical role of energy in the development process was also recognized in the outcome of the Rio+20 conference in 2012 (United Nations General Assembly 2012) that access to sustainable modern energy services helps to eradicate poverty, save lives, improve health and supplies basic human needs.

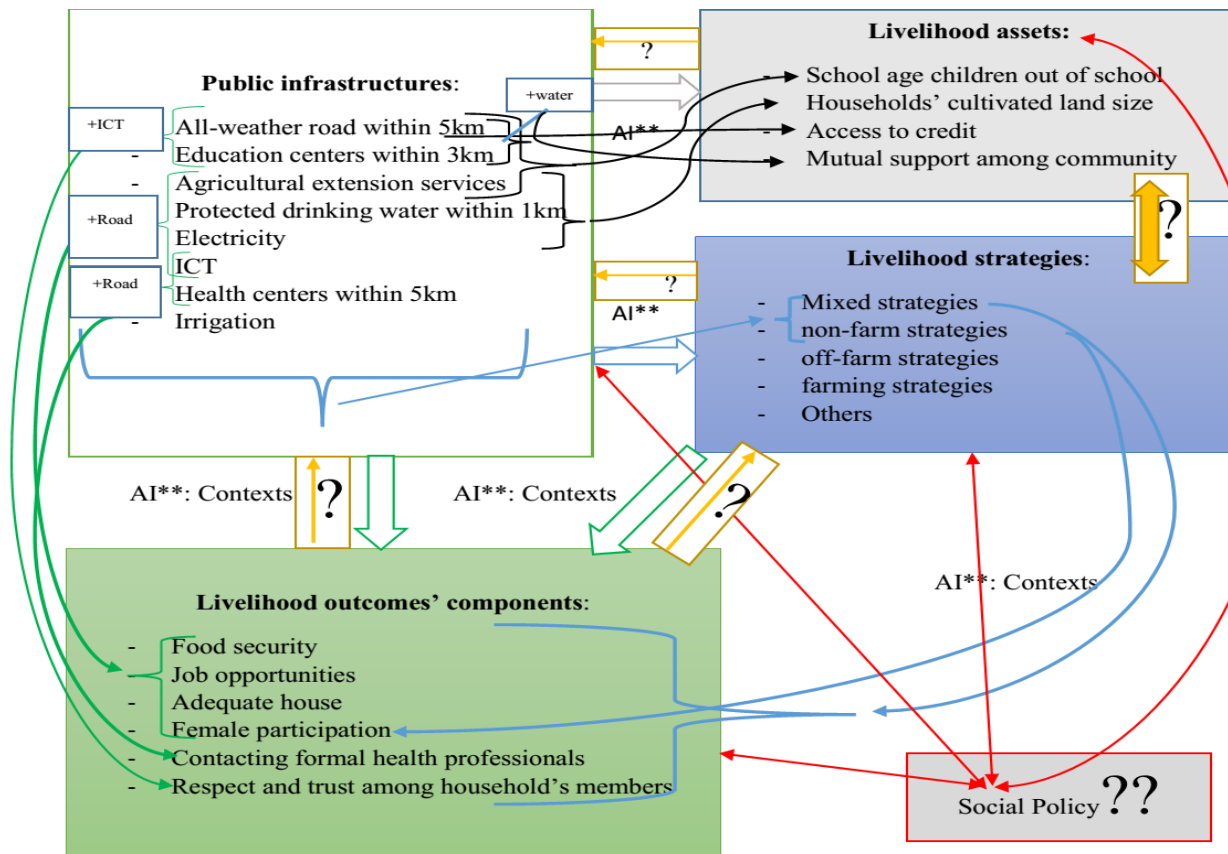
An efficient and equitable strategy of providing better rural livelihood must be based on a full understanding of the gendered nature livelihood. The public infrastructures burden faced by women contributes to poverty from all aspects. Lack of time is a key constraint on the ability of women to build their assets and reduce their vulnerability. For example enhancing all-weather roads can increase women's productivity and income and also enhance their assets. This would also give women more time to rest, enjoy social life, and participate in community activities.

Consistently, Fernando and Porter (2002) found that facilitating mobility can empower women to gain greater control over their own lives by increasing their access to markets and their exposure to education, training, and information and by offering them more opportunities for political participation. Likely Paudel (2014) found that transportation facilities were significantly aided to increase in participation of women in social and income generating activities.

Diversification of livelihood strategies- mixed strategy in this study- have significant association with improvement of livelihood outcomes' components. In other words, the more households diversify their income generating activities, the more they assure food security, female participation, job opportunities, adequate house and social participation. Consistently, Beyene and Muche (2010) found that development interventions aiming at increased income diversification will immensely and significantly contribute to the attainment of food

security. Gachassin, Najman and Raballand (2015) also found that better road access increases the number of activities within households. This corresponds to a ‘pull’ factor that draws people into greater earnings opportunities. By connecting places, people, and opportunities, tarred roads can act as a development tool in rural areas of Africa.

To summarize, the following figure describes about the significant associations among public infrastructures within a given limit, livelihood assets, livelihood diversification strategies and livelihood outcomes’ components.



Note: AI\*\* = Areas of Interaction: Contexts in which interaction happens, “?” With yellow single arrow = needs further researches, “?” within social policy box = it needs further research by reconsidering and analyzing social policy in enhancing public infrastructures, explaining and describing households status of livelihood assets, livelihood strategies and livelihood outcomes.

Source: Household survey 2016

Figure 5.1: Model of interactions among public infrastructures, livelihood assets, strategies and outcomes (source: Researcher’s own construction 2016)

## **CHAPTER SIX**

### **5. Conclusion and Recommendations**

This chapter begins by offering a glimpse on the core foundations of the inquiry. It draws the conclusions based on the presentations, analysis and discussions made in the previous chapters. It also forwards a range of recommendations to public infrastructural development, policy practice, institutional operations and casts light on public infrastructures and rural livelihood research that seeks perfection.

#### **5.1 Conclusion**

Conclusion entails empirical knowledge generated on the four and inter-related key components of the study: (1) accessibility of public infrastructures and rural livelihood assets, (2) accessibility of public infrastructures and rural livelihood diversification strategies, (3) accessibility of public infrastructures and components of rural livelihood outcomes, and (4) interrelation of livelihood diversification strategies and components livelihood outcomes.

Regarding demographic and socio-economic backgrounds, majority rural household's head are male, can't read and write, marriage, have 501-1000ETB per month, and have greater than five households members.

Public infrastructures coverage in rural parts of Ethiopia is at infant stage. However, large number of people live in rural areas. In other words, the demand of rural people about public infrastructures couldn't be answered. They are using traditional means of life in place of these infrastructures. As a result they can't get an access to livelihood assets, strategies and components of livelihood outcomes easily.

The levels of public infrastructures and livelihood assets are directly related with each other among rural communities. As there is low level of access to public infrastructures, there is low level of livelihood assets. In the case, lack of accessibility to education centers could be resulted in low enrolment ratio; limited access to irrigation and agricultural extension services point to malnutrition; limited access to all-weather roads and ICT trace to lack of access to information and credit; and limited access to health centers and health extension workers indicate unhealthy people in rural areas.

However, elements of social capital are negatively accompanied with upgrading of rural public infrastructures. In other words, advancement public infrastructures is shrinking the norms of respect, trust and helping each other among rural communities. Unswervingly, with activity theory, the contradictions happened between new coming cultural elements along with progressing of public infrastructures and existing cultural elements which were practiced commonly by rural people. All cultures or cultures of all are not included. Likely, respecting elders and females are excluded. Standing with each other during risky times is demolishing. Giving respect and taking orders of mothers and fathers are being forgotten.

Among others, access to mobile phone and all-weather roads play a lion share in these and others demolishing elements of culture, values, beliefs, norms and mores. To put in other ways, rural people have their own culture in all activities of life. As these activities of life are being diversified and changed, prevailing cultural elements are replaced by upcoming ones. However, if focus is given for community's cultural elements, diversifying livelihood diversification strategies has an indispensable role in assuring rural livelihood.

All public infrastructures are significantly and positively associated with an engagement of rural people in mixed livelihood diversification strategies. They move from a single strategy to



multiple strategies proportionally to access to a given specific infrastructure. All-weather roads, electricity, ICT and agricultural extension services might initiate rural people to start petty trade, engage in skilled and unskilled labor wage, share farming land with other, and etc. for instance, if there is no road there is no production for market but only for consumption. So, an advancement of public infrastructures leads rural households to diversify their livelihoods which inextricably intimates to achieving improved rural livelihood. This is also consistent with 'multi-voicedness' principle of activity theory which argue that livelihood diversification is a multiple role division among household's members that leads to livelihood outcomes' components improvement.

Public infrastructures and components of livelihood outcomes are inseparable from each other. Balanced, effective, efficient, inclusive and robust public infrastructures can significantly improve the livelihood outcomes of rural people. In other words, advanced and accessible public infrastructures increase food security, job opportunities, contacting and consulting formal health professionals, female participation and standard of life. For example all-weather roads help rural people to get access of food during summer easily when they run out of their own. Irrigation and agricultural extension furtherly help them as rural households produce sufficient production throughout a year scientifically.

Health centers and services and education centers and services also show and inform rural households about the process, natures and types of balanced food for all members of households particularly for children and females because they are more susceptible to malnutrition and food related diseases. Protected water sources also helps rural people in preparing quality food which can assures food security among others. Generally, there is no denying the reality of public infrastructures in creating a functional and healthy community in rural areas.

Finally, an advancement of public infrastructures and rural livelihood assets, strategies and components of livelihood outcomes are intractably associated with each other. This is consistent with the conclusion of Ellis (2000), who argued, “Livelihood includes natural, physical, human and financial goods, and social capital. Facilities to access these goods determine rural families’ livelihood and well-being.” Similarly, an access to public infrastructures improves rural livelihood assets, strategies and outcomes simultaneously. Analyzing one of them separately from the others is problematic. In other words, to get a full map of rural people with its objective oriented activities, multi-voicedness, historicity, contradictions and transformation; studying instantaneously about the possible effects of public infrastructures on the complex and changing rural livelihood assets, strategies and components of outcomes have a decisive role.

## **5.2 Recommendations**

The implications of the research call for ways to merge the theoretical claims and the practical actions pertaining to effect relationships between rural public infrastructures development and livelihood improvement. In this respect, the research forwards a range of intertwined implications to development, research, policy and institutional operations in view of promoting the practices associated with the sociology of rural sociology.

All sectors of government should keep on in constructing new public infrastructures and maintaining the existing ones. Lagging of public infrastructures coverage resulted in lagging of rural people livelihood improvement. The more public infrastructures constructed the more livelihood assets improved except social capital, the more rural people diversify their livelihood diversification strategies and the more components of livelihood outcomes improved.

Local communities' culture is not at the center of public infrastructures development and by implication pushed away to the fringes of socio-cultural development. Locals are in the margins of the wider interactional scenarios and benefits. A countervailing initiative, taken by responsible organs, should reconsider ways to educate, train, re-orient and abridge direct stakeholders who give services to the rural community about a local cultures and mores. The rural people are considered as they don't know many things. Thus they are insulted, undermined and not welcomed formally and legally. Thus responsible bodies should work on these issues.

Upgrading public infrastructures is not inclusive. For example rural people could not use the languages by which messages are sent for them from telecommunications. Urban people treat them again as they are far from information. They consider themselves as they are isolated from urban people by many aspects. In other words, they consider urban people and themselves as they are living on different planets, have their own unique rights and duties, activities, and capacities. These lead them to fearing of asking for their rights in utilizing public infrastructures. Consequently, they don't utilize and access to a given infrastructures easily and willingly. Thus responsible bodies should work on raising awareness on the rights and duties of rural people in accessing and utilizing public infrastructures.

Public infrastructures intervention programs need to pursue a more clearly defined gender strategy to ensure participation by women in infrastructures resource management and decision making in all aspects. Public infrastructures users, especially women and children, should be among those consulted during the planning stage before any decisions are taken about public infrastructures improvement.

Finally, the aim and purpose of construction should be vibrant and unambiguous. In other words, the sectors working on specific public infrastructures should be transparent and accountable.

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## Annexes

### Annex- 1: Specific Objectives, Unit of Analysis, Unit of Observation and Corresponding Data Collection Methods

Specific Objectives	Study of What/Unit of Analysis	Information From	Data Collection Method/s
<b>Ascertain the possible effect of public infrastructures' accessibility on livelihood assets</b>	<ul style="list-style-type: none"> <li>- Possible effect</li> <li>- Accessibility to public infrastructures</li> <li>- One each selected element from all capitals</li> </ul>	<ul style="list-style-type: none"> <li>- Rural households</li> <li>- Officer</li> <li>- Kebeles' elders</li> <li>- experts of various sectors</li> </ul>	<ul style="list-style-type: none"> <li>- Household survey</li> <li>- Interview</li> </ul>
<b>Determine the possible effect of accessibility of public rural infrastructures on households' livelihood diversification strategies</b>	<ul style="list-style-type: none"> <li>- Possible effects</li> <li>- Livelihood diversification strategies by classifying in to five categories</li> </ul>	<ul style="list-style-type: none"> <li>- Rural households</li> <li>- Officer</li> <li>- Kebeles' elders</li> <li>- experts of various sectors</li> </ul>	<ul style="list-style-type: none"> <li>- Household survey</li> <li>- Interview</li> </ul>
<b>Describe the possible effect of an accessibility of public infrastructures on components of livelihood outcomes</b>	<ul style="list-style-type: none"> <li>- Possible effects</li> <li>- Feeling of household's head about some selected components of livelihood outcomes</li> </ul>	<ul style="list-style-type: none"> <li>- Rural households</li> <li>- Officer</li> <li>- Kebeles' elders</li> <li>- experts of various sectors</li> </ul>	<ul style="list-style-type: none"> <li>- Household survey</li> <li>- Interview</li> <li>- Observation</li> </ul>
<b>Find out the associations between livelihood diversification strategies and outcomes</b>	<ul style="list-style-type: none"> <li>- Associations</li> </ul>	<ul style="list-style-type: none"> <li>- Rural households</li> <li>- Officer</li> <li>- Kebeles' elders</li> <li>- experts of various sectors</li> </ul>	<ul style="list-style-type: none"> <li>- Household survey</li> <li>- Interview</li> </ul>

## Annex -2a: The Results of the Goodness of Fit to the Data

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Goodness-of-Fit			
	Chi-Square	df	Sig.
Pearson	207.808	236	.907
Deviance	186.699	236	.992

---

**Pearson and deviance goodness of fit:** The "Goodness of Fit" table in multinomial logistic regression gives two similar overall model fit tests. Like the Hosmer-Lemeshow goodness of fit test in binary logistic regression, adequate fit corresponds to a finding of non-significance for these tests, as in the illustration below. Both are chi-square methods, but the Pearson statistic relied on traditional chi-square and the deviance statistic applies the likelihood ratio chi-square. The deviance test is preferred over the Pearson (Menard 2002: 47).

**Annex -2b: The Test of Predictors: The Likelihood Ratio Tests**

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<b>Likelihood Ratio Tests</b>				
Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	287.438 <sup>a</sup>	.000	0	.
irrigation	290.346	2.908	4	.573
ICT	302.590	15.152	4	.004
Agri. extension services	297.219	9.781	4	.044
Health centers	292.206	4.768	4	.312
All-weather road	342.797	55.359	4	.000
Education centers	289.637	2.199	4	.699
Protected water sources	294.890	7.452	4	.114
Electricity	303.314	15.876	4	.003

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model.

The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

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**Annex- 3a: Household survey questionnaire  
Jimma University**

**College of Social Sciences and Humanities**

**Department of Sociology and Social Work**

Dear respondent! The main objective of this study is to investigate the effect of public rural infrastructures on the rural livelihood outcomes. The information you provide will have a paramount importance for the success of the study. All information you provide will be kept in secret. To this end, your name will not be mentioned in any part of the study.

**Part I. Demographic and Socio-economic backgrounds of the respondents (household head). Please write the specific answers in the black space provided in front of each questions**

1. Sex: \_\_\_\_\_
2. Age: \_\_\_\_\_
3. Religion: \_\_\_\_\_
4. Educational level: \_\_\_\_\_
5. Marital Status: \_\_\_\_\_
6. House hold size = \_\_\_\_\_
7. Number of dependent members = \_\_\_\_\_
8. Income per month = \_\_\_\_\_ETB

**Table 1: Information about contextual factors (availability, accessibility, affordability, acceptability, adequacy and ability) of rural public infrastructures.**

**Note:** Roa/km = all season road and distance from households' house; Elec = electricity; ICT = Information and Communication technologies (radio, TV, and mobile- the existence of three of them); water = protected water sources and distance from households' house; IDIK = idiir and ikkub; irr = irrigation; school = school types and distance from households house; and health = health center types and distance from households house; for the purpose of this study.

No.	Items	<i>I: Write "1" if your answer is Yes and "0" if your answer is No in a given box for each respective infrastructure</i>							
		Road/km	Elec	AgriEx	ICT/types	Water/km/types	IDIK	Irrigation	School /km/types
1	Do you have an access to these infrastructures?								
2	If Q No. 1 is yes, Is there enough skilled personnel?								
3	If Q No. 1 is yes, do offered services of a given infrastructure correspond with your needs?								
4	If Q No. 1 is yes, are the facilities clean and well kept?								
5	If Q No. 1 is yes, do you trust in the competence of the service providers?								
6	If Q No. 1 is yes, do you feel welcome and cared for?								
7	If Q No. 1 is yes, do you think that there is a problem with a given infrastructures?								
		<i>II: Please give an specific answer in a given blank place in respective to a given infrastructure</i>							

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**8** If your answer for Q No.1 of table 1 is yes, What types of services are you getting? (be specific for each infrastructure)

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**9** If your answer for Q No.7 of table 1 is yes, What are those specific problems? (be specific for each infrastructure)

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**10** What is the geographical distance between the services and your home? (be specific for each infrastructure)

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**11** If your answer for Q No 1 of table 1 is yes, by what means of transport can they be reached? (be specific for each infrastructure)

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**12** If your answer for Q No 1 of table 1 is yes, how many time it takes to get a services of an infrastructures?

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**13** If your answer for Q No 1 of table 1 is yes, What are the factors initiate you to use a given infrastructure? (be specific for each infrastructure)

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**14** If your answer for Q No of table 1 is yes, What are the factors hinder you in utilizing a given infrastructure? (be specific for each infrastructure)

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**Table 2: Questions about livelihood diversification strategies, assets and outcomes of rural households**

S. No	Items	Responses of households	
		Yes/increasing	No/otherwise
1	Do you engage in farming?		
2	Do you have a livestock? (please specify)		
3	Do you engage in off farm activities?		
4	Do you engage in non-farm activities?		
5	Is there another sources of your income?		
6	Do you believe that your income is adequate to fulfill your basic needs? Adequate house?		
7	What do you think about female participation in your household's members within the past five years?		
8	What do you think about job opportunities among your household members within the past five years?		
9	What do you think about property related crimes within the past five years?		
10	What do you think about respect in your household's members within the past five years?		
11	What do you think about trust in your household's members within the past five years?		
12	What do you think about helping each other among your neighbors within the past five years?		
13	Are there school age children, in your household members, out of school/s?		
14	Do you contact and consult formal health professionals as soon as you household members feel ill?		
15	If your answer for Q No.14 is yes, within how many hours?		
16	If your answer for Q No.14 is No, what are the reasons?		
17	Do you participate in various social activities in your community?		
18	Do you think that you have available food throughout a year?		
19	Do you think that an access to a given specific public infrastructures helped you in improvement of food security?		

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**20** If yes for Q no 16, how many times do your household members eat per day?

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**21** If yes for Q no 16, how many varieties of foods do you use per week?

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**22** Do you think that all of your household members can get an access to food at normal time throughout the year?

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**23** How many hectares do you have for agricultural purpose?

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**24** Do you think that an access to a given specific public infrastructures helped you increment of farming land size?

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**25** How many hectares have you irrigated?

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**26** If your answer for Q No. 3 in the table 2 is Yes, what are those off farm activities?

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**27** If your answer for Q No. 4 in the table 2 is Yes, what are those non-farm activities?

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**28** If your answer for Q No. 15 in the table 2 is Yes, what are those social activities?

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**29** If your answer for Q No. 5 in the table 2 is yes, what are those activities?

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## **Annex- 3b: Interview guideline**

**Jimma University**

**College of Social Sciences and Humanities**

**Department of Sociology and Social Work**

Dear respondents! The main objective of this study is to investigate the effect of public rural infrastructures on the rural livelihood outcomes. The information you provide will have a paramount importance for the success of the study. All information you provide will be kept in secret. To this end, your name will not be mentioned in any part of the study.

### **Interview Guideline for key informants and in-depth interview**

1. Is there (specific to sector) infrastructure is accessible for all people of woreda? (How? Level? Why? Where? Whom?)
2. Do you believe that there is a change in private assets after access to a given public infrastructure? (How? Why? By whom? When? What?)
3. Do you believe that there is a change in livelihood diversification strategies after access to a given public infrastructure? (How? Why? By whom? When? What?)
4. Are there changes of livelihood outcomes after access to a given public infrastructure? (When? How? Why? What? By whom?)
5. How do you describe the relationships between livelihood diversification strategies and livelihood outcomes?

**Annex-3c: Observation guideline**

The observation checklists stated below were employed for the entry points to carry out observations during the entire fieldwork.

1. The location of the establishments of public infrastructures.
2. Behaviors of local people in utilizing public infrastructures – transportation, water, electricity, health centers, education centers, agricultural extension services, irrigation and ICT.
3. Standard of households' house

**ITEMS**

**'1' IF YES AND '0' IF NO**

ITEMS	'1' IF YES AND '0' IF NO
Separate sleeping rooms from domestic animals	
Sanitary facilities	
Fences	
Durable building materials of house	