ASSESSMENT OF THE CONTRIBUTION OF MULLO WOREDA RURAL ROAD:

A LOCAL COMMUNITY PERCEPTION

BY

ALEMAYEHU BEKELE

FEBRUARY, 2019

ADDIS ABABA, ETHIOPIA

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DECLARATION

I hereby declare that this thesis is my own work and has never been presented in any other university or I have not plagiarized in the preparation of this assignment and have not allowed anyone to copy my work. All sources of materials used for this thesis has been appropriately Acknowledged.

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ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of graduate studies for examination with my approval as a University advisor.

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APPROVAL OF BOARD EXAMINERS

As members of Board Examiners of the master thesis open defense examination, we certify that we have read and evaluated the thesis prepared by Alemayehu Bekele and examined the candidate. We recommend that this thesis be accepted as fulfilling the thesis requirement for the Degree of Master in Development Economics.

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ACCRONYMS AND ABBREVIATIONS

AWR	All Weather Roads
CDI	Community Development Index
CIDA	Canada International Development Agency
CSA	Central Statistical Authority
DFR	Department of Feeder Roads
ERA	Ethiopian Roads Authority
GTP	Growth and Transformation Plan
IFAD	International Fund for Agricultural Development
MDG	Millennium Development Goals
MFIs	Micro Finance Institutions
OLS	Ordinary Least Square
RAI	Rural Access Index
RIPA	Roads Improvement for Poverty Alleviation
RSDP	Road Sector Development Program
Sacco	Savings and Credit Cooperative Organization
TLU	Tropical Livestock Unit
VPD	Vehicle Per Day

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ABSTRACT

Rural areas in developing countries do not have a minimum of reliable and efficient access to roads. They are also characterized by poor socioeconomic transformations. The relationship between rural roads and socio-economic development is still one of the major research fields in developing countries. This study, therefore, aimed to identify the socio-economic contribution of rural roads. The study adopted a "before and after" approach to assess the socio-economic impact of rural roads. Primary data were collected from 120 sample households using survey questionnaire and interview which was designed to generate a data on some household, farm and institutional characteristics that are related to road users in Oromia Regional State at Mullo woreda. Descriptive statistics were applied to describe, compare and contrast different categories of sample units with respect to the desired characteristics. As observed from the results, before the road was constructed, it was often difficult for pedestrians and animals to pass due to low-lying swampy areas and there was no access for motorized vehicles. Now the travel time has been reduced from over an hour to 10- 15 minutes. After the construction of the road, a large number of pedestrians and animal carts as well as some motorized vehicles are used. In other words, the construction of the road is improved the day to day activity of households in the study area. As far as the average time taken to reach the main destinations using different modes of transport is concerned, it takes travelers below 30 minutes to reach farm land, fetch water, school, and nearest health center by walking. Based on the analysis made the average time taken (in minutes) to reach the main destination by means of transport used is improved after the construction of the road. There is also a significant positive correlation between distance to nearest road and distance to nearest schools, health centers and water sources. The study found overall positive social impacts after the construction of the road compared to before the road indicating that road accessibility crowds in other basic social services. Generally,

in order to ensure the maximum impact of rural roads in the coming years, current constraints to agricultural production and productivity should be improved.

Key Words: Rural areas, access to road, socio-economic transformations

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Physical infrastructure is often indicated as a key input to economic growth both in developed and developing countries (Roberts et al, 2006). In many developing countries especially in Sub Saharan African transport sector and infrastructure fall far behind that of developed countries. Recently, enhancing transport infrastructures has been a vital strategy for sustainable development and poverty reduction in developing regions. In Sub-Sahara Africa about 38 countries are currently involved in transport sector development by endorsing the Sub-Saharan African Transport Policy Program (SSATP) in 2014/2015. The major objective of this program is to harmonize transport policies and strategies to facilitate economic growth and poverty reduction which is consistent with the pro-poor growth initiative (SSATP, 2015). There is wide recognition that the poor not only have low level consumption but they are also less connected with inadequate access to basic services. The international community has thus been providing considerable support to build roads, rail ways, bridges, power plants, and some basic infrastructures with the objective of promoting economic growth. It is therefore very important to assess the contributions of rural road on of local communities.

Rural roads provide basic inputs for all-round socio-economic development of the rural areas. Jalan and Ravallion (2001) indicated that provision and construction of roads and road links brings multiple socio-economic benefits to the rural areas and results in forming a strong backbone for the agro-based economy. The importance of the rural roads has been emphasized in various documents. Among these, creation of market access opportunities for agricultural products is the major one. Moreover, road transport facilities play a role in both the production and consumption decisions of every household in their day-to-day activities. Besides, road transport facilities are essential for expanding education, health service provision, trade facilitation – both within the country

and the export market, and better public as well as private service provisions, including banking and insurance services, to the destitute and marginalized rural dweller. Likewise, roads serve as key infrastructural units, which provide linkages to other modes of transportation like railways, shipping, and airways.

Ethiopia is the second most populous Sub-Saharan African country characterized by land lockedness, mountainous terrain with relatively high poverty rate. Hence, rural road transport infrastructure is expected to play a critical role for the socio-economic development in the country and to reduce poverty. Ethiopia has experienced rapid expansion in road infrastructure since 1997 as the result of the Road Sector Development Program. Massive amount of capital has been invested by the government with the support of international donors for the provision of all-weather roads that improve socio-economic status of the country (ERA, 2015).

In Ethiopia, Rural road is one of the main priorities as it is considered as a mechanism towards reducing poverty (ERA, 2017). It is also an important aspect considered by the development community in the poverty alleviation process and the provision of more equitable opportunities for rural communities. To this end, the Government has a set vision to make public, economic and social services physically more accessible to the rural population. There remains a critical need to provide rural communities with transportation infrastructure and services that ensures permanent accessibility to social and government services, economic and business services, and better opportunities for employment and income generation (ERA, 2011).

Although rural roads are thus arguably a major topic in development, so far very little systematic qualitative or quantitative research has been conducted to study the perceived impacts of rural roads and increased mobility potential. This is the case for the commonly assumed economic benefits, but this lack of evidence is even more persistent for social networks in relation to increasing rural mobility potential through rural road construction.

In changing contexts of increasing accessibility and (potential) mobility such as described above, it is thus interesting to see in more detail how social economic impacts shape the lives of people and how this relates to rural road infrastructure.

1.2 Statement of the Problem

In Ethiopia the major share of passenger and freight movement is by means of road transport and where the transport network is recognized as a major bottleneck. In the 1990's, due to civil war, financial constraints and limited capacity for planning and maintenance, much of the road infrastructure deteriorated. Recognizing the seriousness of the problem, since 1997 the government launched a road sector development program (RSDP) with the objective of improving transport operating efficiency and reduce road transport costs for freight and passengers so as to encourage production, distribution and export; developing adequate institutional capacity of the road sub-sector both at central as well as regional level and providing access to previously neglected food deficit rural areas to support efficient production, exchange and distribution throughout the country (ERA, 2016)

Over the nineteen years of the RSDP, the country's road network has increased from 26,550 km in 1997 to 120,066 km in 2018 (an increase of 330 percent). As a result, the road density per 1000 sq. km has increased from 24.1 km in 1997 to 103 km in 2018. Also, substantial improvement has been registered in the condition of the country's road network. The proportion of road network in good condition increased from 22% in 1997 to 75% in 2018 (ibid).

As a result of this, accessibility measured in terms of average distance from the road network and proportion of area farther than 5 km from an all-weather road, shows substantial progress in expanding the road network. Specifically, due to the construction of new roads, the average distance from a road has been reduced from 21 km in 1997 to 4.9 km in 2018. The proportion of area farther than 5 km from an all-weather road, which was 79% in 1997, has been reduced to 35.8% in 2018(ibid).

Despite of significant improvements on road length, accessibility and quality of roads, few researches were conducted on the socio-economic contributions of rural roads.

The general gaps in those researches were the inability to address the long term contributions of the rural road infrastructure and failed to assess the local community's perceptions. In addition some of these studies were done for a specific road sector

development programs which neglects the socio-economic contributions of rural roads in Ethiopia (Wondimu (2010) ,Lulit (2012), Dercon (2008 and ERA(2014)).

Therefore, this study aims to fill this gap by trying to assess the contributions of rural road and local community perceptions on the contributions of rural roads on different socio-economic indicators.

1.3 Research Questions

This study answered the following basic and interrelated research questions that are central to the topic.

- What are the major impacts or contributions of rural road networks construction and its use?
- Did rural roads decrease or increase socio-economic development in the study areas?

By answering these questions, local people's perception of rural roads impact on local socio-economic development is evaluated.

1.4 Objectives of the Study

1.4.1 General Objectives of the Study

The general objective of the study is to assess the contributions of rural roads on the livelihood of Mullo Woreda.

1.4.2 Specific Objectives of the study

1. To assess the major contributions of rural roads in the study area.
2. To investigate the changes happened due to the construction of rural road and local community perceptions on the use of rural roads.

1.5 Significance of the Study

The study will help the government of Ethiopia in general and Roads Authority in Ethiopia in particular to point out some of the socio-economic contributions of rural road construction. From the policy point of view it will also help ERA to promote more

evidence based policy making and decision making towards the identified impacts. The study will also have a contribution to the regional road Authorities and promote appropriate intervention mechanism.

1.6 The Scope of the Study

The scope of the study will focus on to understand the socio-economic contributions rural roads in Mullo Woreda, Oromia regional state.

1.7 Limitation of the Study

The lack of concrete data has limited the efforts at assessing the contributions of rural roads in Ethiopia. This makes difficult to separate the effects from other interventions and the overall development of the economy. The other major limitation of the study is financial challenges & time constraints to make the study.

1.8 Organization of the Study

The research paper has five chapters. The first chapter as shown above discussed deals with introduction, problem statement, objectives, research question, significance, scope & limitation of the study while the second chapter provides an in-depth review of literature on socio-economic impacts from different countries. The Third chapter presents the methodology used for conducting this research; the fourth chapter presents results and discussion and fifth chapter presents conclusion & recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Literature

The theoretical foundation underlying the study under rural road that provision or improvement of transport service results in reduction of transport cost and/or travel time which in turn lead to increased production. Improved transport, therefore, promote social and economic development by increasing mobility and improving physical access to resources and markets. World Bank (1994) treated transport as one of the factors of production.

It is universally accepted that the provision or improvement of transport services results in reduction of transport costs. As transport cost decreases, the factor prices fall resulting in the increased demand for input use or more output supply according to microeconomic theory (Varian, 1992, 1999) and Bhalla (2000) has similar argument.

As the cost of transport declines, the production cost falls which may result in increased production. Similarly when travel time is saved, more labor is available for production, which is the same as an increase in labor supply, resulting in increased production. So, the overall activities expand with the provision of transport services. Investment in the transport sector can improve access to economic opportunities by reducing transport costs and travel time. If markets are reasonably competitive, this can result in lower prices for freight and passenger services. This in turn, can lead to lower prices for product and consumer goods, a spatial extension of the market for production and consumption goods, higher personal mobility, and a general higher level of socio-economic activities (Guild, 1998).

Physical isolation is a strong contributor to poverty. Populations without reliable access to social and economic services are poorer than those with reliable access (World Bank, 2006). In addition to the more direct inputs to the production process such as human capital, physical capital and intermediate inputs, road infrastructure plays a crucial role for economic development. Road creates favorable condition for resource mobilization

and efficient allocation of resources through better connection of centers of demand and production.

2.1.1 Channels of Road Access Impacts

Road is one of the prominent inputs for production process. Few scholarly contributions have been made to emphasize the mechanisms through which the benefits from road access are realized. Understanding channels through which road access reduces poverty and bring economic growth is essential for policy makers and development practitioners. There are various channels through which roads benefit rural households. The effect of roads on poverty and economic growth is transmitted through reducing transportation cost, improving the connectivity of rural households to different markets and urban centers. Farm households who have poor road access are likely to sell their outputs at lower price at the farm gate.

In addition, roads empower farmers by giving them access to better technologies, lower input costs, higher output prices and off-farm employment opportunities. In addition, roads contribute to consumption smoothing during shock periods and also plays important role on income distribution. However, none of these studies provide empirical evidence on the proposed mechanisms through which road affects rural welfare.

Another perspective is that road can benefit rural households by enhancing the value of their asset. A study by Jacoby (2000) examined the distributional effects of rural roads in Nepal and estimates the outcomes of low transportation cost. He argued that road access decreases transport cost which in turn increases non-farm wages and land values. The study also tries to examine the distribution of road benefit across different income groups in Nepal and found much of rural benefit accrues to the poor households but the extent is not large enough to reduce the income inequality. It is difficult to explore this channel of transmission in countries like Ethiopia where there is no land market.

It is better to see some examples of the impact on the lives of certain communities or individuals in the rural areas of the developing world.

2.1.1.1 Positive and Negative Impacts of Rural Roads

It has been argued that communities receive both positive and negative impacts from road access. Positive impacts of the construction, maintenance and upgrading of rural roads in the developing world include the improved supply of and access to education, health care (World Bank, 1996), employment, the markets, technology and government officials. The construction and upgrading of rural roads also brings benefits such as shorter travel times, cheaper transport costs and lower vehicle operating expenditure. Rural roads can reduce the price of inputs, increase the market size of rural communities and increase the quantity and choice of goods and services that are available to the rural communities.

The construction or upgrading of rural roads in the developing world can also have negative social and economic impacts including the reduction of the labour force in rural areas, the increasing inequality between the wealthy and the poor and extra strains on household budgets. Negative social impacts include the creating of gender and age structure imbalances in the rural communities, health issues such as the spread of disease, the introduction or supply of undesired products such as drugs and alcohol, undesired behaviors such as theft and discipline issues, increased traffic congestion and vehicle accidents, and environmental problems, In addition to the undesired products and behaviors that have come to view due to increased accessibility, there is a major concern that many traditional rural cultures are being lost to a more modern urban culture as a consequence of increased accessibility.

Economic Impacts

Road networks can set up a process that will see increased input procurement and makes the marketing of produce easier. As accessibility to the rural community's increases, the cost of inputs to those rural communities should reduce as a consequence of cheaper transportation costs. Lower input costs should then ensure that the rural farmers serviced by road networks can acquire an increased quantity of inputs or will enable the rural farmers to invest in other ventures. In addition to the cheaper transportation costs, those suppliers that had once had the monopolies over the sale of inputs to the rural communities before the road network improvements will now have competition as alternative suppliers become accessible. With greater levels of competition in the sale of

inputs to the rural communities, it would be expected that the prices of inputs will reduce. As well as the reduction in the costs involved in importing inputs into rural communities, the costs of exporting goods from the rural communities to the market will be reduced with new or improved roads. Road networks will allow rural farmers to use new modes of transportation to move their exportable goods more efficiently, at a higher frequency and at cheaper prices. The quantity and diversity of goods arriving at the markets will increase and there will be an increase in the geographical size of the markets. When rural farmers have larger markets in which to sale their goods, the farmers will have greater power to negotiate the price of their goods. Another economic benefit that rural farmers may gain as a result of improved accessibility and the increase in the size of the markets is that rural farmers can start to diversify and experiment with their crops and even begin to introduce cash crops for the first time. Over time, the farmers can start to specialize in the higher value crops that grow well in their specific area. This in turn should lead to an increase in farmers' incomes (Grootaert, 2002).Lucas et al (1995) examined the participation of vendors at local markets in Tanzania and found that after road upgrades were completed on the feeder roads that connected the rural communities in the Iringa region to the markets, the number of vendors at the local markets increased and the variety of goods expanded. Vendors subsequently came from further away to sell their produce. It was stated earlier that the quality of the road network plays a major role. If the quality of the road networks is so influential in establishing the level of benefits a community receives, then it would be expected that upgrading road networks would also benefit the rural community. The literature supports this argument.

The upgrading of the road networks decreases vehicle operating costs and reduces travel time. In the Philippines, Olsson (2009) carried out a study that looked at how the upgrading of a road (63km in length) which linked a study village to its major markets and found that the average fuel consumption was reduced by 35% and vehicle maintenance costs reduced by 44%. Before the upgrading of the road, the average travel time for a return trip between the study village and the major markets was 12-16 hours.

After the upgrading of the road was finished, the average time for a return trip was reduced to 7-10 hours. In addition to the reduced travel times and vehicle operating costs,

the upgrading meant that the road was usable by all motorized vehicles and could be used all year round. Olsson (2009) also found that when the upgraded roads reduced the vehicle operating costs of transport services, the price of inputs become cheaper and the cost of sending outputs to market decreased.

The World Bank (1996) study of an upgraded road network in Morocco found very similar results to Olsson (2009) but also reported that the lower operating costs meant lower fares for the consumers. Furthermore, new transport services were established and private vehicle ownership increased. In Peru, roads helped in closing the gender gap at the markets. Bravo (2002) states that after road upgrades were made in her study in Peru, the number of women visiting the markets (whether selling or purchasing) increased.

Rural Roads have also been shown to have detrimental effects on the demand for local goods and services. (Bravo (2002) points out that porters must compete with intermediate means of transport and motorized vehicles. The poorest porters run the risk of losing their livelihoods as they can often not afford to purchase or hire the equipment needed to compete with new transport services and privately owned intermediate means of transport and motorized vehicles.

Molesworth's (2005) study that demonstrates how roads facilitated the importation of outside products and how the importation of outside products damaged a community by reducing the sale of locally produced products. Molesworth explained how local Tamang women of Nepal brew beer, distil alcohol and weave cloth for the local marketbut with the introduction of the new road, the local Tamang women had to compete with mass produced beers, alcohols and cloth from India and China resulting in lower incomes which made the women more dependent on men for financial assistance. As a result women found they had less decision-making autonomy over household financial matters.On the other hand, road construction or improvement can lead to an increase in thedemand for local produce and as a consequence, it can result in resource reallocation that as road networks in Northern Pakistan spread to formally remote areas, land usage would be converted from the traditional subsistence farming practices which supplied food products for the local communities to profitable cash crops. This meant that food products for the local communities had to be sought from outside of the region and

therefore at a financial cost to the local communities. The World Bank (1996) also found resource reallocation in their study in Morocco. Two out of the three research locations in their study experienced a conversion from low value crops to high value crops after improvements to the road network ensured that the crops would arrive at the market undamaged.

Off-farm employment

For most residents of rural areas, farming still remains the main form of employment or survival strategy. The percentage of people in Sarawak working in the agriculture, forestry, livestock and fishing industries dropped from 56.5% in 1980 to only 29.1% in 1999. Meanwhile, during the same period other industries such as manufacturing (16.2% to 22.6%) and construction (14.6% to 27.8%) grew (Malaysian Government, 2000). There are many reasons for the departure from farming. One of the main reasons is that off-farm employment generally has better pay and usually involves less demanding work and shorter hours (Rigg, 1998). In addition to better paid jobs, off-farm employment allows rural households to diversify their income activities and therefore diversify their survival strategies (Grootaert, 2002).

For rural communities that live close to urban centers, roads and transport services provide a channel that allows them to work in the urban centers during their working hours and still return home at the end of each working day. However, large proportions of rural residents do not live near an urban centre and may need to migrate to the urban centers to find off-farm employment.

The construction or the upgrading of roads can facilitate the gaining of off-farm employment. Roads allow rural residents access to the urban centers where the majority of off-farm employment exist but also have the potential to create off-farm employment within the rural communities. Off-farm employment can be created with the construction of the road itself and any corresponding infrastructure. The World Bank (1996) compared three project zones (zones with upgraded roads) and a control zone (zone without upgraded roads) in Morocco to see whether there was a difference between the average number of days worked outside the household farm in each zone before and after the

upgrading of the roads. The number of days worked outside of the household farm in all three of the project zones had risen by six times compared to before the roads were upgraded. The number of days worked outside of the household farm in the control zone only increased by three times during the same period. Bravo (2002) also presents evidence to support the theory that upgraded roads facilitate off-farm employment. Bravo states that upgraded roads facilitated the movement of rural seasonal workers in Peru. She also found that as a consequence of easier transportation to seasonal jobs, the number of rural seasonal workers travelling on their own increased.

Education

Education is believed to be an important tool in alleviating poverty but education can be hard to access when there are no roads or road quality is poor. Accessing education can also be very difficult when large distances must be travelled or transportation services are too expensive and inefficient.

It is very common for rural children in the developing world to have to walk for hours to get to school or they have to board in school supplied accommodation. It is therefore, not surprising that dropout rates and absenteeism are high in many rural communities. Other reasons such as farm and household workloads, cultural beliefs and financial limitations may also play a large role in school dropout rates and absenteeism (Molesworth, 2005). Within the literature there are studies that show that the creation or the upgrading of road networks is a pre-requisite to increasing enrolments, reducing drop-out rates and decreasing absenteeism at rural schools for example villages without road access have lower rates of attendance and lower per captia expenditure on education than villages with road access. Rural roadside communities in Sri Lanka, Indonesia and the Philippines had higher education attainment than off-roadside communities. Hettige also found that on average, the heads of the rural households and their spouses from the roadside communities had completed 6.4 years of schooling, whereas the heads of the households and their spouses from communities without road access only had an average of 5.2 years of schooling.

In 1996, the World Bank carried out a study in Morocco which looked at how roads affected three rural villages. In all three villages, the number of schools and satellite classrooms increased and the recruitment of teachers became easier after road construction and rehabilitation was completed. Additionally, better qualified teachers are more willing to work in areas with road access.

As it was stated above, the road quality has a detrimental effect on the accessibility of education. A study by Gibson and Rozelle (2003) found that the areas of Papua New Guinea that had the poorest road quality and the longest travel times to reach the schools also had the highest number of residents who never attended school and the lowest levels of literacy and educational attainment. Both the World Bank (1996) and Khandker et al (2009) found that school enrolments increased after the upgrading of the roads in their studies in Morocco and Bangladesh. Khandker et al (2009) study in Bangladesh showed that the increased enrolment was more pronounced in the secondary schools than the primary schools. This was because primary schools were generally closer to rural community's than secondary schools. While travelling to primary schools is often done by walking short distances (often without the use of the road), travelling to secondary schools involved travelling by foot for up to several hours or travelling along the road with the use of intermediate means of transport or motorized vehicles. Once travelling along the roads became easier, cheaper and more reliable, the prospect of sending children to secondary school became more attractive and worthwhile. Another significant observation in Khandker et al study is that the increase in girl's enrolment was significantly higher than that of increased boy's enrolment. The World Bank (1996) revealed comparable findings in Morocco. In fact, it was discovered that girls enrolment at primary school increased by 300% after the upgrading of the road network.

The World Bank (1996) also found that after the road networks were upgraded, the quality of education in the rural primary schools improved as a consequence of increased recruitment of qualified teachers and a decrease in absenteeism of both teachers and students.

In summary, educational facilities and their users have benefited from road construction and upgrading. It was found that the construction and upgrading of roads in rural areas

increased the enrolment, decreased the drop-out rates and reduced the absenteeism of both students and teachers. Rural residents that had road access to the schools generally had higher educational attainment than those rural residents with no road access. For the schools in areas that have just received road access or road access has been improved, the supply of teachers, school resources and school infrastructure was facilitated.

Health and Safety

Health care is an essential basic social service and good quality access and transportation play a key role in the staffing and equipping of health centers. The largest barrier for rural residents to access health care is the distance and time it takes to reach health clinics. For many rural residents without roads or transportation, the distances to health clinics are too long and time-consuming. Those that do make the journeys have to forego are often removed from their subsistence activities or employment for extended periods of time. A World Bank (2001) study in Mozambique found that 38% of respondents did not seek treatment due to the distance they had to travel to reach the nearest health centre. Downing and Sethi (2001) claim that road access facilitates the provision of health care in rural areas in three ways. Firstly, the local communities have easier access to the health centers. Secondly, mobile health care workers have easier access to the communities. Thirdly, health care services become more sustainable as supplying and staffing rural health care facilities becomes easier with road access.

Downing and Sethi also state that disease management programmes can be implemented faster and more efficiently when there is sufficient transportation. Additionally, the health services provided by outreach workers in rural Bangladesh were improved by all-weather roads. Health care services not only witnessed an increase in the number of people using their services but also experienced a higher frequency of use after the upgrading of rural roads (World Bank, 1996). In the World Bank (1996) study in Morocco, the number of rural residents who used the health care services after the upgrading of the road networks nearly doubled. Furthermore, health care services experienced an increase in professional staff, a more reliable supply of medications and the implementation of health prevention programs. There is also an argument that states that there are also many harmful health

effects that arise from the construction or upgrading of rural roads and the increase in the number of transport services and private vehicles using the road.

In summary, healthcare facilities were found to benefit from the construction and the upgrading of the roads. The staffing and the supplying of rural health clinics were facilitated by the roads. The roads also helped patients to access the health clinics and helped the mobile healthcare workers to attend to patients that still could not access the health clinics. Negative health impacts were also found to be caused by the roads. Many health and safety problems started or increased as a result of the roads. These problems include deforestation and pollution, increased road accidents and the spread of infectious diseases, increased access to undesired or unhealthy goods and services, and undesired behaviors.

2.1.2 Socio-Economic Impact of Rural Roads – Different Country Experiences

India: road planning is exceptional in that it has always been based on a mixture of socio-economic criteria that sought to achieve economic growth with equity. This started as early as 1943 under the Nagpur Plan and has been a continuous feature until the present, however, individual benefits were not identified and actual achievements have differed significantly from plans (Thomas, 1984; Sikdar, 2000).

Indian financing to be provided by the World Bank to improve the networks in three poor districts of Andhra Pradesh state has led to innovations in the way road improvements are traditionally selected and justified in India (Lebo and Schelling, 2001). To improve the road networks to at least a basic, all-weather passable standard. Traditional Indian notions of equity were evident in the focus on the improvement of a core network that ensures minimum connectivity for each village to a nearby main road or market centre.

The main justification for the adoption of the basic accessibility principle rests on a comparison of various socio-economic indicators among sample households in connected and unconnected villages. This showed that connected villages had a significantly higher household incomes, literacy rates (especially female), and lower distances to outlets for

fertilizer, seeds and pesticides, as well as lower transport costs and distance to a secondary school.

China: For almost two decades China has invested massive resources in public works for the express purpose of poverty alleviation. It has resulted in rural road investments that dwarf those of any other country with some 131,000 kms constructed or improved between 1985-1990 and a similar amount since (Ling and Zhongyi, 1996). However, only recently have details emerged of the selection procedures used for investment covering the period 1995-1998 with World Bank CIDA and World Bank sources give a somewhat lower figure, 110,000 km, over a slightly longer period 1985-1992, but it is still a massive total assistance under a Roads Improvement for Poverty Alleviation (RIPA) project linked to on-going poverty alleviation programmes. (Hajj and Pendakur, 2000).Government of Ghana, 2001 although the original reference is given (Nahem, 1996).

Vietnam: A recent project in Vietnam used a variant on the cost-effectiveness approach developed in India (Lebo and Schelling, 2001). Socio-economic benefits were not specifically identified; rather they were subsumed in an overall objective to contribute to poverty reduction. This was again linked to the notion of providing 'basic road access' to all communes in participating provinces.

South Africa: Social benefits were invoked as a partial means of allocating funds for rural road improvements among the 24 districts of Kwazulu-Natal province. A district's fund allocation factor was calculated as its population multiplied by the sum of three weighted indices representing development potential, community development and accessibility. Each index could potentially have a zero value i.e. no investment in that aspect required. The Community Development Index (CDI) for each district was a composite of social needs and was the reciprocal of its Human Development Index, which had three elements: life expectancy at birth; education attainment, comprising adult literacy and a combined primary, secondary and tertiary enrolment ratio; and income. Subjective weightings were assigned such that the CDI contributed a sixth, the accessibility index a third, and development potential index a half to the combined district factor (Kwazulu-Natal Department of Transport, 1997).

Uganda: The proposals by Airey and Taylor are of interest because; (i) their focus is very low-volume roads carrying less than 25 vpd; (ii) the method has also been applied in Tanzania and Zimbabwe; and (iii) they eschew the use of socio-economic benefits in deciding investment priorities (Airey and Taylor, 1999). The authors estimate that 25 vpd is the threshold below which vehicle operating cost benefits are insufficient to justify even low-cost improvements i.e. such roads clearly perform mainly strategic and social functions rather than economic.

In Uganda the methodology was applied at district level. A preliminary screening to focus planning efforts on roads that would maximise the level of benefits preceded prioritisation. This was done by excluding roads that had poor access to the higher levels of the district road network, were more than 25 km long, or formed a loop or link between two major roads.

Ghana: The approach adopted by the Department of Feeder Roads (DFR) in Ghana is unusual in that it was based on both participatory and technical selection processes (Government of Ghana, 2001). The first was pursued through a process of community consultation. This was followed by a series of ranking workshops, at steadily ascending levels of local government, until a ranked list of district level priorities resulted, based on local criteria.

The Ghana prioritisation index was designed to permit a consistent assessment of road improvements across the country according to various engineering, economic and social criteria. The index is in the form of a benefit cost ratio. Benefits comprise those due to: (i) motorised transport; (ii) non-motorised transport; and (iii) the community as a result of better access to transport services.

2.2 Empirical Literature

Several studies have investigated the contribution of rural road on socio-economic impact of local communities. These studies confirm that road infrastructure can have a direct and an indirect effect on reducing poverty.

Direct contribution is evidenced by studies undertaken by Barro (1990) in which he considers production function where aggregate output is produced by utilizing

capital, labor and infrastructure as production inputs. Likewise Morrison and Schwartz (1996) argue that infrastructure provision improves the productivity of private firms and does contribute to output.

The indirect channels reveal that beyond the direct inclusion of infrastructure in production function, there are also transmissions channels through which infrastructure can affect growth. Hanna (2014), considered road infrastructure as enhancing indirectly the productivity of workers through reduction in adjustment costs (2002). Different empirical studies in the past have produced diverse results based on the methodologies used and data employed.

The impact of infrastructure in general and road infrastructure in particular can also be modeled using different econometric techniques. Some of them are reviewed below.

Shenggen and Connie (2005) assess the impact of public infrastructure on growth and poverty reduction in China, paying particular attention to the contribution of roads and using econometric model. The most significant finding of this study is that low-quality (mostly rural) roads have benefit–cost ratios for national GDP that are about four times greater than the benefit–cost ratios for high-quality roads. In terms of poverty reduction, low-quality roads raise far more rural and urban poor above the poverty line per yuan invested than do high-quality roads.

Similarly, but using household level panel data, Khandker et al. (2009) assess the impacts of two road projects in Bangladesh (RDP and RRMIMP) on a range of household outcomes. They apply a fixed effect estimation approach to control for heterogeneity among households and among communities. The results reveal that rural road infrastructure can promote poverty reduction through higher prices of agricultural products, lower input prices and transportation costs, higher men's agricultural wages and increased agricultural production.

Khandker and Koolwal (2010) also examines the impact of rural roads using household level panel data from Bangladesh between 1997and 2005. They estimate the benefit of road projects on consumption expenditure before and after the project in control and treatment villages. Results from GMM estimation show positive and

significant outcomes of roads on per capita expenditure in the short-run especially for extremely poor households. However, in the long-run large benefit will be accrued to higher-income groups due to the increasing rate of return to rural investments and expansion of non-farm employments.

Renkow et al (2004) by using maximum likelihood technic to estimate how transaction costs and market participation is responsive to rural infrastructure. They showed that physical remoteness brings economic isolation and this increases fixed transaction cost incurred by farm households in Kenya. Therefore, they underline public infrastructure facilitate market integration and minimize the transaction cost. Fan and Zhang (2008) provides evidence on the importance of the market access channel in alleviating poverty in poor countries. Using a full information maximum likelihood technique applied to a simultaneous equations model, the authors examine the poverty impacts of road infrastructure by analyzing the marginal returns to public investment of different types of roads. Their calculations indicate that, among the different types of roads, feeder (dirt) roads have the largest impact on poverty reduction across Uganda, such that an additional million shillings invested in building feeder roads would allow 33 persons to escape poverty in Uganda. For murram (gravel) and tarmac (tarred) roads, the authors' estimate that nine persons would be able to rise above the poverty line for each additional million shillings spent on these roads.

Fan et al. (2002) carry out a similar study using Tanzanian household level data. Their calculations of marginal returns to public investment in road infrastructure indicate that for every shilling invested, household income rises by 9.13 shillings. The authors also estimate that for every one million shillings invested in roads, on average, 27 persons are lifted out of poverty.

Worku (2011) analyze the impact of roads sector development on economic growth in Ethiopia. The study use time series data on the country's road network and GDP growth over the period 1971-2009. Results from a two-step GMM estimator show that paved roads have positive and significant impact on economic growth while gravel roads do not. He adopt an extended Cobb Douglas production function and an OLS estimation technique to investigate the Ethiopian economy in the specified period.

Lulit (2012) on her study to identify the impact of road on rural poverty by taking fifteen rural villages in Ethiopia show that the poverty head count ratio declines with improvement in road accessibility of rural villages. She used econometric techniques using GMM to assess the robustness of the association between road infrastructure and rural wellbeing. The study shows that better road connectivity not only increases the likelihood of crossing over the poverty line but also enhances the rate of consumption growth significantly. In addition she found that rural households with better road network are not only more likely to use modern fertilizers but they also make intensive use of fertilizers. Moreover, the study finds evidence that the overall productivity of farm households increases significantly with the degree of road access.

Wondimu (2010) studies the link between road infrastructure and rural poverty in Ethiopia. He empirically substantiate if there is a robust link between farm income and the quality of road infrastructure farm households have access to as well as the pathways through which the effects of road on rural income are felt. The mechanisms by which road boosts rural income and reduce poverty are also found to work through narrowing down spatial price gaps, promoting technology adoption, boosting resource allocation efficiency and raising the market return to land and labour. The result also shows that the rural poor benefits from road induced income growth.

Dercon et al. (2009) use panel data from fifteen rural villages in Ethiopia and examine the impact of agricultural extension program and roads access on poverty and consumption growth. The study finds based on GMM estimation that access to all-weather roads reduces poverty by 6.9% and it increases average consumption growth by 16.3% after controlling for regional fixed effects and seasonal shocks.

In general the empirical literatures of the study indicates that road infrastructure investment has positive effects in economic growth, welfare effect and poverty reduction. Few of them also indicated that investment in road infrastructure alone does not give the targeted growth of economy, reduce poverty and positive welfare effect. To bring such growth, it has to be coupled with human capital (Balisacan and Pernia (2002))

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Approach & Sample Size

The study adopted a "before and after" approach to assess the socio-economic impact of rural roads. Assessing the impact of an intervention necessitates answering the counter factual question, viz. what would have happened in the absence of road (before construction of the road).

This study therefore followed the studies undertaken by Liu (2000) and Operations Evaluation Department of the World Bank (1996). The study attempted to identify whether it was the road or other things else that made them differ (if they were different). Since this is the first study of this kind undertaken so far in this study area, this will serve as the baseline study.

In trying to draw the sample of households, simple random sampling method is used after identifying the target groups. Accordingly , 120 households were taken based on a formula provided by Glenn (2005) to determine the minimum required, sample size at 95% confidence level, degree of variability =0.5 and level of precision(e)= 10%.

$$n = \frac{N}{1+N\,(e)^2}$$

Where n is sample size, N is the number of study population and e is the level of precision. In order to see the impact of rural roads, the indicators on a comparison on before and after the construction of the road has been made.

3.2 Data Source and Type

The study is based on both primary and secondary sources of information. However, the use of primary information is dominant in the study.

3.2.1 Primary Source

Primary data were collected from 120 sample household using survey questionnaire and interview which was designed to generate a data on some household, farm and institutional characteristics that are related to road users.

Focus Group Discussions: Focus Groups discussion enable the collection of general information, clarify details or gather opinions about basic services relating to the availability frequency and quality of transport services, as well as education, health and other related services.

Key Informant Interviews: From the participants that took part in the research, there were 6 participants that were considered as key informants. The key informants were individuals on behalf of government organizations and from within the individual community interviews who were identified as having specific knowledge that was required to enable the completion of this research. The purpose of the Survey Instrument is to track the Impact Indicators from the main sources of secondary data. Administering of this Survey Instrument was helpful in gathering data regarding demographic characteristics (population by gender and age group, and settlement pattern), health (patient visits to health service centers and distances), schools, social interaction etc. Data was also collected on the use of transport vehicles (motorized and non-motorized and other means of transport), as well as average distances travelled.

3.2.2 Secondary Source

The study also used secondary information to complement the primary information in the study. The secondary sources of information included feasibility study reports, statistical compilations, evaluation reports, etc. Secondary information from various institutions including Ethiopian Roads Authority, Oromia Regional Roads Authority and Oromia Bureau of Finance & Economic Cooperation were collected. Moreover, the data published in different research journals (both national and international), books and documents from research projects were also important to accomplish the research task.

3.3 Method of Data Analysis and Information Synthesis

3.3.1 Data Entry and Management

The quantitative and qualitative data collected through the questionnaire was statistically analyzed and interpreted to establish the research problems. A summary sheet containing all the questions as listed in the questionnaire was completed based on the respondents

perceptions. The data gathered was statistically interpreted and various ratios, percentages and relationships, were established which were used to write up the analysis.

The amount of detail and the accuracy was such that it enabled an analysis that would provide sufficient information to solve each research problem.

The data collected was used to identify socio-economic impact of rural road in the case of Mullo Woreda, Oromia Regional state and has also been used to identify before and after the construction of the road. The results from the data collected in the survey are presented in the next chapter.

3.3.2 Qualitative Data Analysis

All the collected qualitative data and information analyzed by using concepts and opinions interpretation, and compare and contrast methods.

3.3.3 Quantitative Data Analysis

Descriptive statistics and t-test analysis were applied to describe, compare and contrast different categories of sample units with respect to the desired characteristics. The method used for quantitative data analysis were, mean, percentages, graphs and tables. The data analysis was conducted using Excel and SPSS software.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1 Descriptive statistics

4.1.1 Description of the Study area

Mullo woreda is one of the woredas in the Oromia Region of Ethiopia. It was part of the former Mulona Sululta woreda. It is part of the Oromia Special Zone Surrounding Finfinne. According to CSA (2012), population for this woreda of 71,831, of whom 39,508 were men and32, 323 were women. The majority of the inhabitants said they practiced Ethiopian Orthodox Christianity, with 99.27% of the population reporting they practiced that belief.

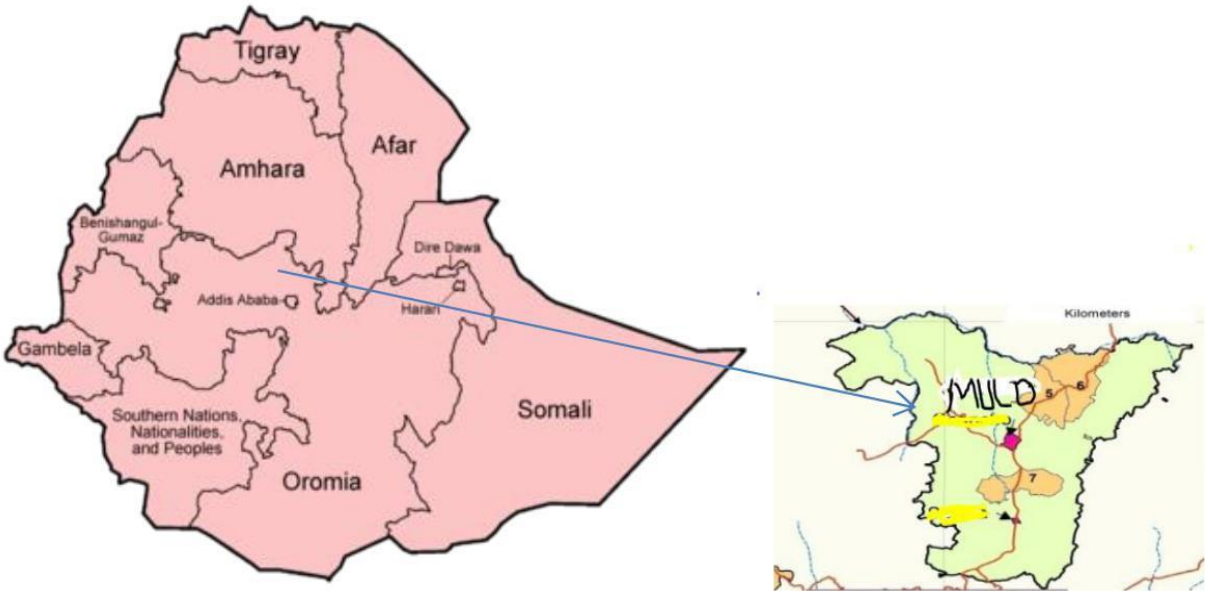
Mullo is bordered on the south by the city of Addis Ababa, on the west by the Mulo and Mirab Shewa Zone, on the north by Semien Shewa Zone, and on the east by Sululta.

Sululta woreda is surrounding Finfine of Oromia National Regional state.According to CSA (2012), population of the Sululta woreda was estimated at about 149,494 (male 74,753 and female 74,741). Concerning the land use pattern, out of the land area of the district which is 109,269ha, about 26,662 ha (24.4%) is cultivated land, and 15,145ha (13.9%) is covered by forest, bush and shrub land, 38,720 ha (35.4%) is grassland, and 28,742 (26.3%) are other land use types.

This woreda is characterized by the Sululta plain, which is a wide, shallow valley with an elevation of 2500 meters above sea level, almost completely surrounded by mountains with numerous small rivers which drain into the Muger. The plain is swampy with some quite large areas of open water in the rainy season, but it reverts to grazing land during the dry months. The surrounding mountainsides were covered with forest dominated by Juniperus procera, and the lower slopes supported groves of Acacia, but now most of the

hillsides are covered with plantations of Eucalyptus with only the odd native tree remaining.

Figure 1: Map of the study Woreda



4.1.2 Demographic characteristics of Respondents

4.1.2.1 House Hold Size

Questionnaires were distributed for different types of respondents, However 120 responses were received out of the targeted respondents, which can be categorized under a big response.

4.1.2.2 Sex Composition

Of the total sample population, about 51.7 percent were male and the rest 48.3 percent were females. Similarly, the male: female ratio (the sex ratio) is about 1:07.

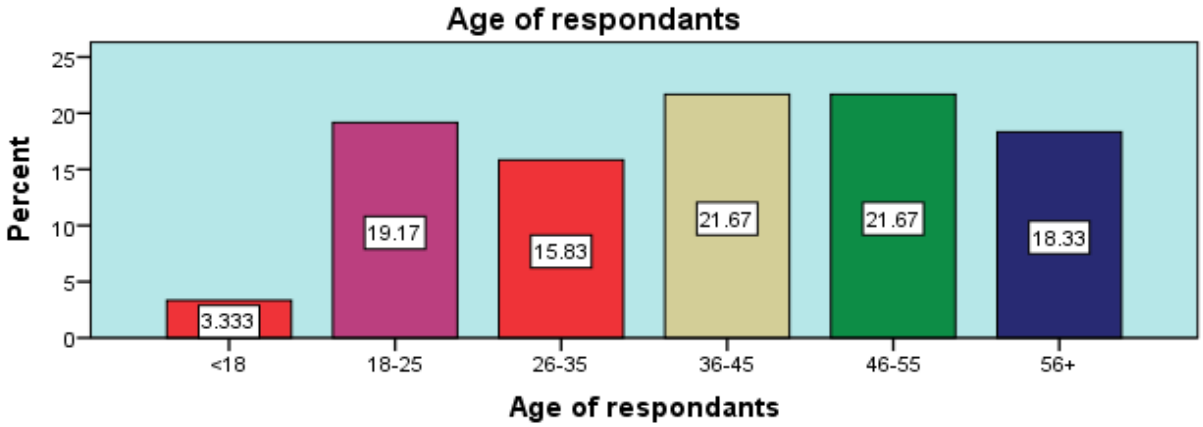
Across ages however, there is significant differences in the composition of sample population. In children (below the age of 20), the proportion of female population is

lower than males while between the age of 20-39 the proportion of female population is higher than males. From the age of 40-44 to above 65 years, the proportion of male population rises from nearly 50% to 67%. The old age population (above 64 years) have the highest male population (66.9%) mainly attributed to high mortality rate of female population in this age group.

4.1.2.3 Age composition

From the graph below, it is observed that the major respondents between 36-45, 21.67% and 46-55, 21.67% is very high involvement to fill the questionnaire the other respondents' are less than 18 age group. 3.3% of the respondents are less than 18, age group 19.17% of the respondents are between the age group 18-25, 15.83% of the respondents' are between the age group 26-35, 21.67% of the respondents are between the age group 36-45,21.67% of the respondents are between the age group 46-55, 18.83% of the respondents are above 56 years of age.

Figure 2: Age of respondents



Source: Own survey

4.1.2.4 Educational Status

The table below indicates that the greater percentage of respondents 15.4% fill within read and write only, (14%).fill within primary school, (12.6%) fill within illiterate, (5.6%) fill within university (3.3%).fill within High school, (2.8%) fill within other different back ground, (2.3%) fill within Junior secondary school.

Table 1: Educational status of the respondents

Education	Frequency	Percent	Valid Percent	Cumulative Percent
Illiterate	27	12.6	12.6	56.5
read & write only	33	15.4	15.4	72.0
primary school	30	14.0	14.0	86.0
Junior secondary school.	5	2.3	2.3	88.3
High School	7	3.3	3.3	91.6
University	12	5.6	5.6	97.2
Other	6	2.8	2.8	100.0
Total	120	100.0	100.0	

Source: Own survey

4.1.3 Transport User Survey

The transport user survey provides the changes after the construction of the road from surveying of the vehicles using the rural roads. As observed from the results of transport users, there is no difference in the ownership of cars before and after the construction of the road in the household on average.

However, ownership of pick-ups has increased from 1 per household to 1.25. Similarly, there had been also an increase in the ownership of bus.

Nonetheless, there is no difference in the ownership of 2-axle truck after the construction of the road in the study woreda, however; there is an increase of ownership of 3-axle truck. The following graph depicts the changes due to the construction.

Table 2: Change in the ownership of vehicles due to construction of the road

Types of vehicles	ownership of vehicles		
	Before	After	Difference
Cars	0.75	0.75	0.00
Pickups	1	1.25	0.25
Minibus	0.83	1.00	0.17
Bus	1.25	1.75	0.50
2-Axle Truck	0.97	0.97	0.00
3-Axle Truck	0.78	1.11	0.33

Source: Own survey

To assess whether there is really a change in the availability of mode of transportation before and after the construction, analyses of the mobility pattern (means of transport) in the study woreda was performed. As table 3 depicts, there are a significant differences in the average number of mode of transport before and after the construction of the road on major types of transport. However, both animal drawn carts and Medium Track Isuzu, N3 have significantly decreased in the study woreda.

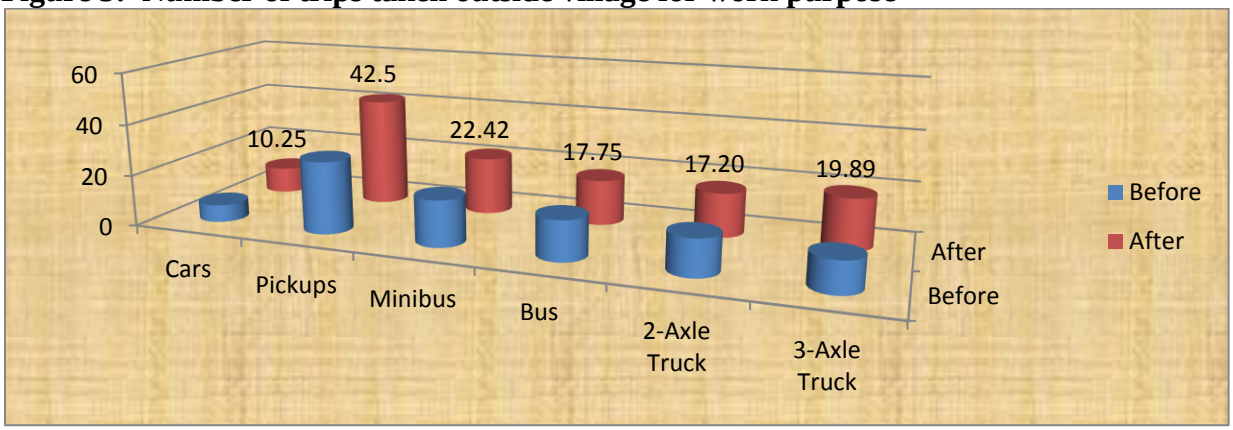
Table 3: Availability of mode of transports in the woreda

Mode of transport	**Numbers**		**change**
	Before	After	
Motor Cycle	325	438	113
Bajaj	785	1845	1060
Automobile/ Taxi	32	45	13
Utilities (Pick up, Jeep, 4WD)	18	18	0
Minibus, Coater	21	28	7
large Bus	7	9	2
Small Truck	12	21	9
Medium Track Isuzu, N3	33	22	-11
Heavy Truck	0	1	1
Truck & Trailer	2	1	-1
Bicycle	89	121	32
Animal carts	37	12	-25

Source: Own source &Transport Bureau of Oromia (2016)

The number of trips on rural roads has increased for all vehicles. As one of benefits of roads' condition; this further results in the generation of more traffic on the roads. Detailed result is shown in the following graph.

Figure 3: Number of trips taken outside village for work purpose



Source: Own survey

As the above table shows, In line with the number of trips taken outside village for work purpose by vehicles; the average frequency of trip travelled increased after the road is constructed. This implies that the demand to travel has increased as the access is created and the vehicles 'movement increased in order to meet the demand of the people.

Table 4: Average number of trips taken outside the village for non work purpose

Types of vehicles	Avg. Frequency of trip per day		
	Before	After	Difference
Cars	16	28.75	12.75
Pickups	57.75	37.25	-20.5
Minibus	18.17	20.67	2.5
Bus	9.88	11.25	1.37
2-Axle Truck	8.17	10.93	2.76
3-Axle Truck	8.67	13.44	4.77

Source: Own survey

As the above table shows, Average number of trips taken outside village for non-work purpose has increased for all vehicles except for pickups. It seems from the survey results

that as the access to road increased and condition improved; the people's demand for more movement outside to their village increased. Thus it results in the increase of trip length on average.

Table 5: Average Trip Length (km) and Average Trip Time

Types of Vehicles	Average Trip Length (Km)		
	Before	After	Difference
Cars	9.5	13	3.5
Pickups	41	63	22
Minibus	21.17	22.25	1.08
Bus	15.87	17.75	1.88
2-Axle Truck	15.87	16.60	0.73
3-Axle Truck	14.44	15.22	0.78

Source: Own survey

As the above table shows Similar to the number of trips time made; the average length of kilometer travelled by all vehicles increased after the construction of the road compared to the status before the construction.

As of trip length in km, average trip time in minutes increased after the construction of the road for all vehicles except for 3-axle truck as can be seen in the following table. Indeed, average trip time is directly proportional to the average trip length travelled. As trip length travelled increases, the average time travelled also increase.

Table 6: Change in trip time travelled

Types of Vehicles	Avg. Trip Time (minute)		
	Before	After	Difference
Cars	14.25	36	21.75
Pickups	17.75	18.25	0.5
Minibus	8.25	8.44	0.19
Bus	5.5	6.25	0.75
2-Axle Truck	5.00	5.21	0.21
3-Axle Truck	4.70	3.48	-1.22

Source: Own survey

The number of passengers per vehicle per trip has shown a significant increase after the construction of the road compared to before the construction. This, as the other factors above has a direct relationship to the increase in demand to travel as a result of the access created. Coming to the load of freight, the result is mixed; it increased for cars, bus and trucks after the construction of the road and decreased for pickups and minibus. The explanation could be as the demand for frequent public transport; the more the minibus carries more people than goods. And another explanation could be the load on pickups decreased as the road is more accessible to other type of vehicles. Detailed result is shown in the following table.

Table 7: Change in passenger and freight load

Type of Vehicle	Avg. Number of Passenger per Trip			Avg. Load per Trip (ton)		
	Before	After	Difference	Before	After	Difference
Cars	16	37.3	21.3	10.8	20.8	10
Pickups	20.3	24.3	4	44.8	44.5	-0.3
Minibus	21.9	26.5	4.6	49.5	42.1	-7.4
Bus	20	22.12	2.12	17.1	19.9	2.8
2-Axle Truck	17.0	21.3	4.3	16.1	17.9	1.8
3-Axle Truck	18.7	21.7	3	15.3	19.9	4.6

Source: Own survey

As the below table Shows, the fare on passengers for one-way trip decreased for cars, similar for pickups but increased for all other vehicles after the road is accessible. On the other hand, the fare on freight load decreased for cars and increased for all other vehicles.

Table 8: Transport Fare for Passenger and cost

Type of Vehicle	Avg. Fare for one-way trip (per passenger)			Avg. charge for one-way trip (per ton of goods)		
	Before	After	Difference	Before	After	Difference
Cars	26.5	21.75	-4.75	22.5	19.5	-3
Pickups	25	26	1	25.5	30	4.5
Minibus	20	24.42	4.42	13.85	17.5	3.65
Bus	16.5	20.38	3.88	13.38	17.75	4.37
2-Axle Truck	14.67	17.03	2.36	18.30	17.63	-0.67
3-Axle Truck	13.67	22.56	8.89	13.67	22.6	8.93

Source: Own survey

Transport cost for seeds and fertilizers and seeds increased for those using cars and minibus and decreased for other vehicle types. Meanwhile, the transport cost of agriculture products has shown a decrease for pickups and trucks and increased for all other vehicles after the construction compared to before construction of the rural road.

Table 9: Change in Transport cost of Agricultural inputs and outputs

Type of Vehicle	Transport cost of farming inputs (seeds, fertilizers) -			Transport cost of agricultural products		
	Before	After	Difference	Before	After	Difference
Cars	8.25	11.75	3.5	9.75	12.5	2.75
Pickups	47.25	37.5	-9.75	23.5	17.5	-6
Minibus	20.25	24.25	4	14	14.75	0.75
Bus	10.38	13.88	3.5	11.625	13.125	1.5
2-Axle Truck	32.43	23.6	-8.83	23.17	18.03	-5.14
3-Axle Truck	36.2	28	-8.2	26.4	20	-6.4

The time and distance travelled has also shown a change following the construction of the road. As can be seen in the table below, the working hours of all vehicles except car increased after the construction of the road. Similarly, the working distance travelled by vehicles decreased for cars and trucks and increased for others.

Table 10: Change in vehicles' working distance and hour

Type of Vehicle	Avg. working hours per day (hr)			Avg. working distance per day (km)		
	Before	After	Difference	Before	After	Difference
Cars	2.5	2.5	0	4.75	3	-1.75
Pickups	7	10	3	11	15.75	4.75
Minibus	5.5	6.42	0.92	8.4	9.7	1.3
Bus	4.25	5.75	1.5	8.8	9.5	0.7
2-Axle Truck	4.08	4.8	0.72	5.92	4.5	-1.42
3-Axle Truck	4.1	5.6	1.5	6.44	2.67	-3.77

Source: Own survey

4.1.4 Impact on Access to Health Services

Access to road and transportation is a critically important aspect of health care utilization. This is particularly true in rural areas where individuals often have to travel long distances to access health care services. It is believed that increased distance between households and health care providers decreases utilization of health care services. The impacts of better connectivity on improvement in health have been well established in many studies. The benefit may not be equally distributed since a lot depends on availability of health facilities and other socio-economic factors which affect the health indicators of the society..

This section provides an overview of the frequency of visit, distance to health institutions, means of transport used to reach to health facilities.

Table 11: means of transport to go to health center

Means of transport	**Before**	**After**
Walking	46	58
Bicycle	0	0
Non motorized	12	6
not going to health center	42	25
Other	0	0

Source: Own survey

The above table shows that, means/modality of going to health center varies and shows a change following the construction of the road. Hence, those households that walking increased from 46 to 58 and, bicycle the same to 0 following the construction of the road. Meanwhile, those who use non- motorized decreased from 12 to 6, other means of transport like minibus, buses or other vehicles did not bring a change.

Table 12: Reasons for not-going to Health Center

Reasons	**Before**	**After**
Lack of awareness	25	14
unavailability of health center	0	0
unavailability of roads	0	0
Other	0	0

Source: Own survey

As indicated in the above table; most households responded lack of awareness is decreased before the construction of the road has shown a significant increase in their view of changing the attitude of going to health center after the construction.

Another reason for not attending to school could be far distance to an availability of health center and un unavailability of road; have not chosen by both respondents, in this

case; those families who did not go to health center because of lack of awareness and fare of the distance of the health center and there were no comfortable roads before.

Table 13: Average distance in KM to health facilities

Health Institutions	Avg. Distance(Km)		
	Before	After	Difference
Clinic	12.30	9.95	2.35
Health post	3.31	4.26	-0.95
Health Center	6.92	5.20	1.72
Pharmacy	13.33	8.00	5.33

Source: Own survey

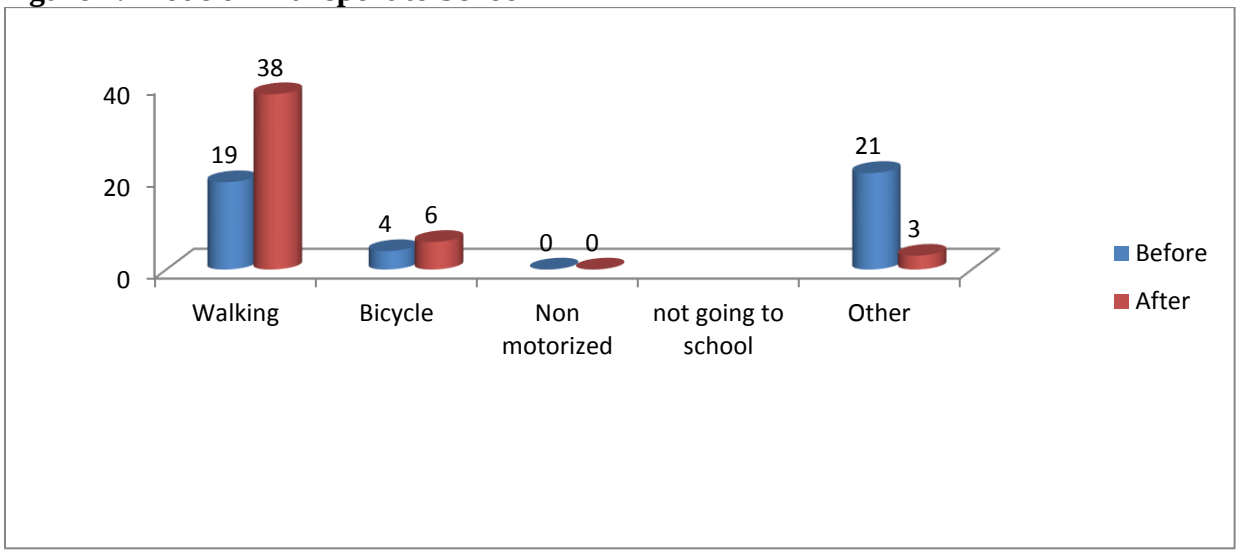
The above figure shows that, the distance taken to travel by the respondents (in km) to the health institutions are decreased for all categories except for the health posts after the construction of the road.

4.1.5 Impact on Access to Education

Rural roads essentially play a crucial role in facilitating access to basic education for rural households. Evidences suggest that better access will lead to better supervision of schools and hence better educational outcomes. To assess the impact of the rural access roads on access to education, changes in average distance to school were used as one of the indicator, among others. Construction of roads is mainly expected to change the outcome education in a way that the students would not take unreasonably too much time to get to school. However, problem of transportation is not necessarily the main factor that is impeding progress in access to schools.

The means/modality of going to school varies and shown a change following the construction of the road. Hence, those students who walk use bicycle and, non-motorized increased following the construction of the road. Meanwhile, those who use other means of transport like minibus, buses or other vehicles decreased

Figure 4: Mode of Transport to School



Source: Own Survey

The respondents responded that they do not go to school for the following reasons in the following table.

Table 14: Reasons for not-going to school (Change in Dropout to school)

Reasons	Before	After	Diff (%)
Education is not considered	11.1%	14.2%	3.1%
school is too far	39.4%	31.3%	-8.1%
unavailability of roads	3.3%	29.2%	26.0%
Transportation is costly	25.9%	11.5%	-14.4%
Other/no student in the household	17.3%	16.9%	-0.4%

Source: Own Survey

As can be seen in the above table; most children with families where education is not considered before construction has shown a significant increase in their view of sending children school.

Another reason for not attending school could be far distance to school; in this case; those families who did not send their children because of the distance before construction are

now sending their kids to school. Thirdly, the absence of roads also contributes to less-attendance.

Hence, the families who did not have school attending kids because of lack of access are increased from 3.3% to 29.2% after the construction of the road. Fourthly, families who did not send kids to school because of expensive transportation cost decreased from 25.9% before construction to 11.5% after construction. Last, those families with other reasons or with no school-age kids have decreased from 17.3% before construction to 16.9% after construction.

Table 15: Time taking to go to School (Hr)

School Type	Before	After
Primary school cycle 1(grade1 - 4)	1-2hrs	15 to 30minute
Primary school cycle 2 (grade5 - 8)	1-2hrs	30minute to1hr
Secondary school (grade 9 & 10)	1-2hrs	1-2hrs
Preparatory school (grade 11 & 12)	1-2hrs	1-2hrs
TVET	1-2hrs	1-2hrs

Source: Own Survey

As shown in the above table, those who said it takes 1-2 hours to go to Primary school cycle 1(grade1 - 4) before the construction has shown a time decrease to 15 to 30 minutes after the construction of the road; this may be because families got different school options when access is created. Secondly, other respondents who replied 30 min to 1 hr for Primary school cycle 2 (grade5 - 8) after the construction of the road.

Meanwhile, for those who replied Secondary school (grade 9 & 10), Secondary school (grade 9 & 10) and TVET have not changed the time taken before and after the construction of the road.

Table 16: Number of school change

School Type	Before	After	Difference
Primary school cycle 1(grade1 - 4)	8	11	2
Primary school cycle 2 (grade5 - 8)	8	11	2
Secondary school (grade 9 & 10)	5	6	1
Preparatory school (grade 11 & 12)	3	3	0
TVET	1	1	0

Source: Own Survey

The above table shows that, in the areas surveyed the presence of schools before and after the construction of the road has shown an increase except for preparatory and TVET schools which shows a decrease.

Table 17: Average distance (in km) to schools

Distance of school (km)	Before	After
2-5km	112	7
5-10km	7	7
15-20km	75	11
above20km	4	0

Source: Own Survey

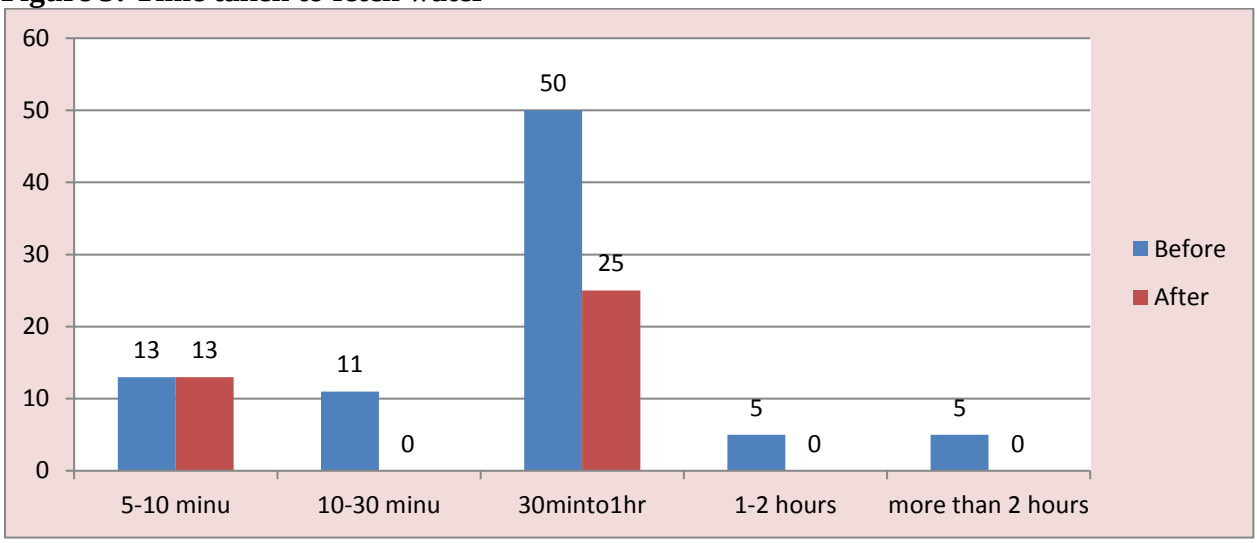
Coming to the average distance to school, the above table shows that those who said it takes 2-5 km to reach schools, decreased from 112 before to 7 after the construction of roads; those who responded 5-10 km remain the same before & after the construction.

While those who replied 15-20 km decreased from 75 before to 11 after the construction of the road. Similarly, those who responded above 20 km decreased from 4 before to 0 after the construction. The results in all distance categories show that the travelling distance to school decreased.

4.1.6 Impact on Access to Water

According to the United Nations Children's Fund (UNICEF), in some countries access to safe water and sanitation facilities for rural population without road access is much less than that of rural areas with road access (UNICEF, 2012). Data on the distance to water points had been collected to determine the average distance traveled by households to access potable water.

Figure 5: Time taken to fetch water



Source: Own Survey

The above figure shows that, the time taken to travel to the nearest fetch water decreased after the construction of the road for those in the category of 30 min to 1hrs compared to before the construction of the road.

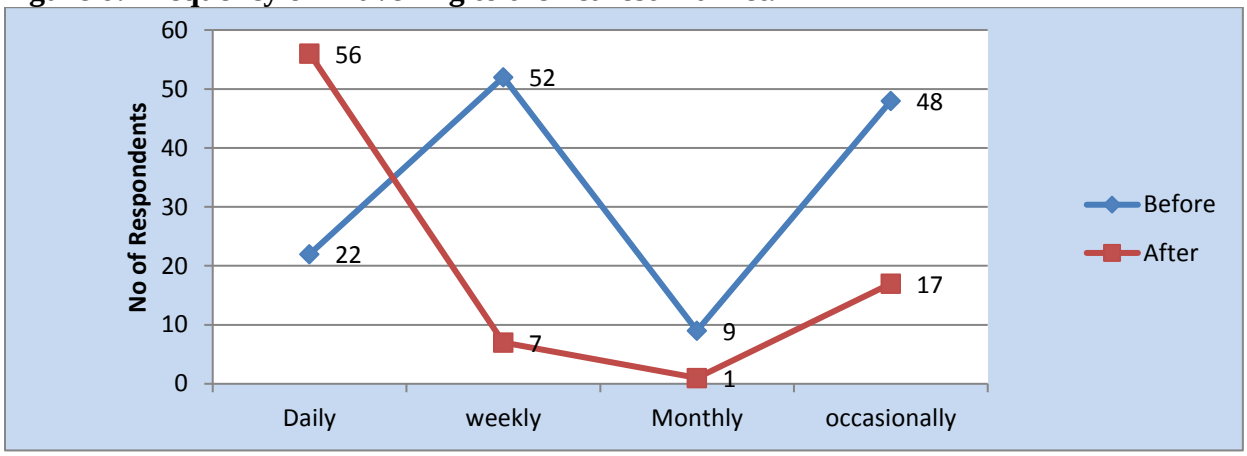
The travel time remained similar for those who take 5-10 minutes, 10-30 minutes no change after the construction, for the rest who responded in the 1-2 hour and more than 2 hour category. Most of the respondents responded that after the construction of the road the time taken to travel to fetch water is no change.

4.1.7 Impact on Access to Market

According to ogunsanya (1998) there is strong relationship among transportation, underdevelopment and rurality. He stated that the greater the degree of the rurality, the lower the level of transport development. When distance of farm to the market is far and

the access to the road is poor, perishable crops may be destroyed and farmers may run a loss. Moreover people in poor access areas constrained by lack of information about markets. Hence distance to markets and lack of the roads is the central concern through-out the developing world.

Figure 6: Frequency of Travelling to the nearest Market.



Source: Own Survey

As seen the above graph, the result of the market survey shows that the frequency of going to the market decreased after the construction of the road compared to before construction of the road for those who responded weekly, monthly and occasionally. On the other hand, those who responded that they are going daily increased by 56% after the construction of the road. The explanation could be as the access is created; the people tended to move on daily basis than weekly, monthly and occasionally.

Table 18: Distance taken to the Market

Distance of market (km)	Before	After
2-5km	92	53
5-10km	51	10
15-20km	9	1
Above 20km	5	6

Source: Own Survey

The above table shows that, the distance taken to travel by the respondents (in km) to the market decreased after the construction of the road for all categories except for those travelling above 20 km.

Table 19: Mode of transportation to the market

Means of transportation	**Before**	**After**
Walk	71	19
by pack animals	29	0
by animal drawn carts	23	23
by Car/taxi	8	31
other/Bus	7	7

Source: Own Survey

As seen on the above table, the result of the survey shows that the people who walk to the nearest road decreased from 71 to 19; those using pack animals like horse/donkey decrease from 29 to 0, and animal driven carts also the same level before and after construction of the road; whereas those using cars/taxi increased from 8 to 31 after the construction of the road compared to before the construction, and other bus are the same level 7 before and after the construction of the road.

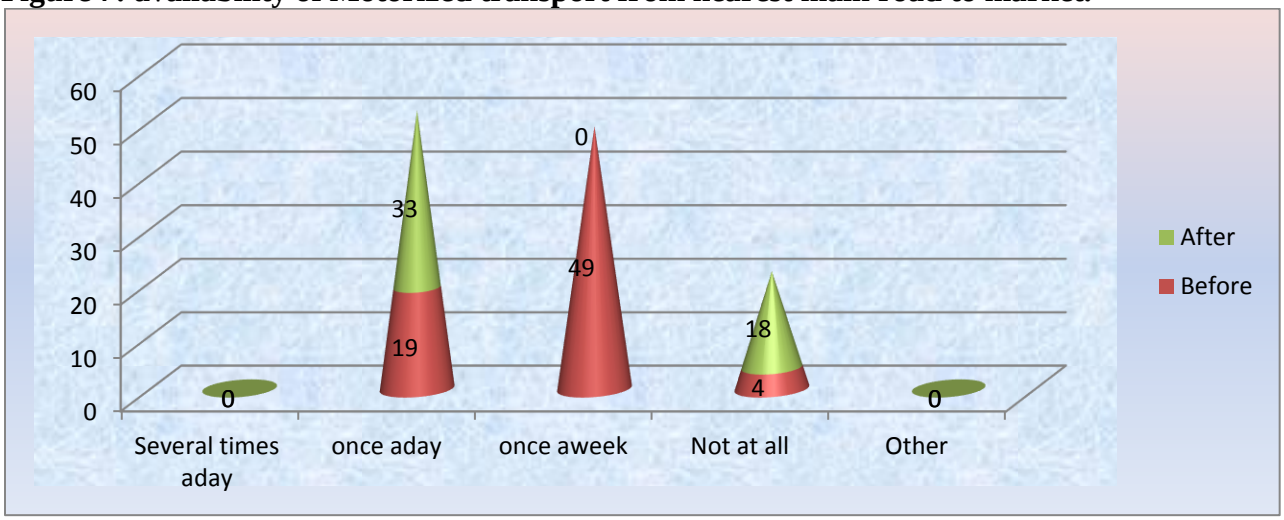
Table 20: Travelling Time to the Market

Travelling time to market (hrs)	Before	After
2-3hrs	63	24
1-2hrs	42	27
30 min to 1hr	23	23
15-30 min	4	18
Less than15 minutes	7	8

Source: Own Survey

On the other hand, the above table shows that, the time taken to travel to the nearest market decreased after the construction of the road for those in the category of 2-3 hrs and 1-2 hrs compared to before the construction of the roads. The travel time remained similar for those who takes 30 min to 1 hour and decreased for the rest who responded in the 15-30 min and less than 15 minutes category. Most of the respondents said that after the construction of the road, the time taken to traveling to market is decreased.

Figure 7: availability of Motorized transport from nearest main road to market.



Source: Own Survey

The above graph shows that the availability of Motorized transport from nearest main road to market before the construction of the road said by 38 respondents increased once a day, and said decrease once a week by 100% of the respondents.

Table 21: Area of buying and selling agricultural product.

Area of buy /sell products	**Before**	**After**
at the nearest market	84	97
At your nearest village	32	24
To middle man who come to farm	0	0
On(specify)	0	0

Source: Own Survey

The above table shows that, the area of selling and buying their product saying increased 97 of respondents at the nearest market, and decrease from 32 to 24 respondents nearest their village, this shows the market place has developed after the construction from nearest village change to other wide area and it lead in to a wide spread of agricultural products.

4.1.8 Impact on Social Interaction

Rural roads facilitate family and community development by providing necessary access to social interactions outside of the locality. Improved access to rural road infrastructure improves mobility and social interaction, which are important for social and economic development. A recent study (Bryceson, 2006) investigated how road investment facilitates mobility and social interaction in rural areas. The study indicated that roads enhance mobility by providing easier access to motorized transport, saving travel time and cost, which in turn improve social interactions.

The below table illustrates an aggregated picture of the percentage of households who visited or being visited by people outside the community and attending festivals/social events.

Table 22:Frequency of visits

Frequency of visits	Before	After	% change
Visiting people	93.30%	52.70%	-40.60%
Been visited by people	92.30%	38.00%	-54.30%
Attending festival & social events	38.50%	50.00%	11.50%

Source: Own Survey

As shown in the table above, over 52 percent of the households after the construction of road and about 93 percent before the construction of the road reported that they have visited people who live outside the community in the past 3 months. There is also variation after (38%) and before (92.3%) with regard to proportion of households being visited by people who live outside the community, whereas proportion of households who attended festivals and social events are higher after the construction (50.7%) compared to before the construction (38.5%).

Table 23:Means of transport used to visit people

Mode of transport	Before	After	% change
On foot	100%	83.3%	-16.70%
Bajaj	0.0%	0.0%	0.00%
Minibus	0.0%	7.1%	7.10%
Buses	0.0%	6.1%	6.10%
Small Trucks	0.0%	3.0%	3.00%

Source: Own Survey

Respondents were also asked about the means of transport they used to visit people who live outside the community (table 19). As shown in the figure, walking is the dominant means of transportation (83.8%), followed by minibuses (7.1%), buses (6.1%) and small truck (3.0%) after the construction, and while before the construction of the road, walking is the only means of transportation. Other means of transportation is not reported before and after the construction of the road.

4.2 Determinants and likely impacts of roads and other indicators (Statistical tests)

4.2.1 Agricultural Input Use

Where access to road and transportation services are lacking, prices of agricultural inputs will increase and become unaffordable to farmers. Improved roads therefore improve access to transportation, lower cost of providing inputs at farm level and hence lower transaction costs and fertilizer prices. Thus, improved access to roads has direct impact when road access and transportation costs determine prices of fertilizer. As indicated in table 24, the determinants of fertilizer in addition to access to roads and institutions, size of land cultivated, income levels, consumption level, asset values and livestock contribute to changes in fertilizer use.

Table below shows that among the basic indicators of fertilizer use distance from institutions, size of cultivated land, income, and expenditure on food positively and

significantly influence the amount of fertilizer used. Increasing distance from input suppliers (by 1 kms) reduces the amount of fertilizer used by 0.79 kg after the construction and by 0.46 kg before the construction of the road (significant at 100% and 98% confidence level respectively). Distance from all-weather roads has also the same contribution but the contribution of road is not statistically significant. This is true that currently farmers in Ethiopia obtain most of agricultural inputs from cooperative societies at village level than markets located in cities. Hence, distance from institutions matters than roads.

The size of cultivated land has also a positive and direct contribution to level of fertilizer used. The degree of contribution of cultivated land is high after the construction of the road than before the road, signifying the importance of roads, transportation and access to institutions. Furthermore, increased cultivated land is the characteristics of better off households and thus related to wealth status.

Table 24:Determinants and Likely Impacts of Road and Other Indicators on Agricultural Input Use

Variable	After			Before		
	β	t	Sig.	β	t	Sig.
(Constant)	45.692	2.547	0.011	66.04	3.691	0
Value of asset owned	1.00E-05	0.126	0.9	1.00E-05	0.181	0.856
Crop seeds (kg)	0.04	1.086	0.278	0.019	0.783	0.434
Distance from institutions (km)	-0.796	-4.925	0	-0.461	-3.153	0.002
Cultivated land (ha)	7.289	2.599	0.01	5.234	1.83	0.068
Total income (Birr)	-0.001	-2.701	0.007	7.00E-05	0.524	0.601
Yield of all crops kg	-5.00E-05	-0.6	0.548	0	0.58	0.562
Total food expenditure	0.002	6.497	0	0	2.144	0.032
Distance from AWR (km)	-0.249	-1.565	0.118	-0.502	-2.138	0.033
R2	0.364			0.247		

Source: Own Survey

4.2.2 Mean Change in Vital Indicators of Access to Road

In general, the construction of roads have significant impact in reducing costs of transportation, transport expenses, access to institutions, reduced travel time and rate of use of modern transport services. However, the impact of roads will be observed over longer period particularly with regard to mode of transportation, travel time and frequency given the need for regular and scheduled fleets on these roads, setting fair and competitive prices, capacitating institutions of priority to rural households.

Table 25: Mean Change in Vital Indicators of Access to Road

	t-test for Equality of Means						
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% CI**	
						Lower	**Upper**
Average distance from institution	.400	4190	.689	.44	1.10	-1.72	2.60
Frequency of visit to institution	.563	4184	.573	1.22	2.16	-3.02	5.46
Time taken to institution	-2.663	3972.651	.008	-.96	.36	-1.66	-.25
Cost of transport to institution	3.795	2072	.000	7.53	1.98	3.64	11.42
Use Motorized transport to travel to destination freq/month	0.0	5017.0	.965	0.25	5.74	-11.01	11.50
Monthly transport expense	-.260	370	.795	-7.50	28.90	-64.34	49.33
Road type	-10.677	4023.361	.000	-.34	.03	-.40	-.28

Source: Derived from Sample Household Survey

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The lack of transportation contributes to social and economic underdevelopment. Rural areas in developing countries do not have a reliable and efficient access to roads. Socioeconomic underdevelopment and poor road accessibility are major concerns for rural areas in developing countries. This study, therefore, attempted to explore the socioeconomic contribution of rural road in Mullo Woreda, Oromia regional state of Ethiopia, in order to recommend measures that could contribute to socioeconomic impacts.

Before the road was constructed it was often difficult for pedestrians and animals to pass due to low-lying swampy areas and there was no access for motorised vehicles. Now the travel time has been reduced from over an hour to from 10- 15 minutes. After the construction of the road, a large number of pedestrians and animal carts as well as some motorised vehicles are used.

In other words, the construction of the road is improved the day to day activity of households in the study area. As far as the average time taken to reach the main destinations using different modes of transport is concerned, it takes travelers below 30 minutes to reach farm land, fetch water, school, and nearest health center by walking. Based on the analysis made the average time taken (in minutes) to reach the main destination by means of transport used is improved after the construction of the road.

As observed from the results of transport users, there is no difference in the ownership of cars before and after the construction of the road in the household on average. However, ownership of pick-ups has increased from 1 per household to 1.25. Similarly, there had been also an increase in the ownership of bus. Nonetheless, there is no difference in the ownership of 2-axle truck after the construction, however; there is an increase of ownership of 3-axle truck after the construction of the road.

The transport vehicles that are available once a week for market place however; decreased from 49 before to 6 after the construction of the road.

In other words, those who sell their products at the nearest market increased from 84 before the construction of the road to 97 after the construction. Meanwhile, those who sell in the nearest village decreased from 32 before to 24 after the construction. This may be due to the access created and people sell their products in the market.

The respondents who responded that they go to the health center by walking increased from 46 before the construction to 58 after the construction of the road. Meanwhile, those who use other non-motorized transport decreased after the construction of the road.

The literature study suggested that rural roads have contributions and effects to the rural house hold in increasing agricultural productivity, market access, school and health institution.

Generally, there is a significant positive correlation between distance to nearest road and distance to nearest schools, health centers and water sources. The study found overall positive social impacts after the construction of the road compared to before the road indicating that road accessibility crowds in other basic social services.

5.2 Recommendation

- Raising the human capital base and access to other productive resources, such as education and health services, will be necessary for rural road infrastructure to raise household income in general and the income of the poor in particular.
- For the economy of Ethiopia to be transformed from agricultural to Industrial, the integration of efficient market will be critical. In this case it requires all markets in any regions to be interconnected so that there will be aback ward and forward linkage between agricultural and industrial sectors. This implies that the government of Ethiopia should continue its effort in rural road development.
- In order to ensure the maximum impact of rural roads in the coming years, current constraints to agricultural production and productivity should be improved.

- Construction of rural roads alone cannot improve supply of agricultural inputs. There must be an environment that encourages access by introducing competitive transportation services and reducing transportation costs.
- Access to health centers and hospitals and consequently reduced morbidity and mortality rate as well as changing health seeking behavior of communities should be improved in parallel, to observe substantial impacts due to the construction of roads.
- Environmental considerations during the design and construction of these roads are necessary to reduce poverty and increasing the welfare of the rural societies.

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APPENDIX: QUESTIONNAIRE

A.General

You are not obliged to answer any of the questions which you do not want to. Since this survey is required for academic research, your prompt response is highly appreciated.

1. Gender of respondent

a. Male b. female

2. Age group

a. < 18 b. 18-25 c. 26-35 d.36-45 e. 46-55 f. 56+

3. Educational status of the respondent?

a. illiterate b. read & write only c. primary school. d. junior secondary school. e. high school. f. TVET g. university h. other (specify)

4. Do you use the rural road project?

a. Yes b. No

5. If "Yes" frequently for what purpose do you use the project?

a. for work b. for schooling c. to go to market places d. visiting

6. How far is the nearest all-season road that is used frequently by motorized vehicles from your residence?

a. 0-2km b. 2-5km c. 5-10km d. above 10km

7. How long does it take for you to walk or reach by non-motorized transport to the nearest all-season road project?

a. 5-10minutes b. 10-30minutes c. 30minutes to 1hr d. 1-2hours e. more than 2 hours

8. How would the rural road project affect you? (More than one response can be marked)

a. easier movement b. reduction in transportation cost c. increased trips to social institutions (such as hospitals, clinics, schools, markets, banks) d. increased sales of products in market places e. more job opportunities f. increased in income sources g. Other, explain_____

This questionnaire aims at determining the travel benefit before and after the construction of the Road. The information supplied by the respondents is only to be used for the above mentioned purpose and has nothing to do with any other business.

B. Education

Question	**Before**	**After**
1. By what means of transport do you go to school?	a. Walking b. bicycle c. non-motorized d. not going to school e. other_____	a. walking b. bicycle c. non-motorized. d. not going to school another_____
2. If your children do not go to school, is it because?	a. Education is not considered important b. school is too far c. unavailability of roads d. transportation is costy e. other_____	a. Education is not considered important b. school is too far c. unavailability of roads d. transportation is costy e. other_____
3. How long does it take for the children to go to school?	a. 2-3hrs b. 1-2hrs c. 30minutes to 1hr d. 15 to 30 minutes e. less than 15 minutes	a. 2-3hrs b. 1-2hrs c. 30minutes to 1hr d. 15 to 30 minutes e. less than 15 minutes
4. How many schools are there in your village?	a.1 b.2 c. 3 d.4 e. 5 f. more than 5	a.1 b.2 c. 3 d.4 e. 5 f. more than 5
5. How far is the school from your residence?	a. 2-5km b.5-10km c.15-20km d. above 20km	a. 0-2km b. 2-5km c. 5-10km d. above 10km

C. Market

19. Do you use the rural road to transport your goods for sale or/& buy?

    a. Yes b. No.

Question	Before	After
1. How often do you travel to your nearest market places?	a. Daily b. weekly c. monthly d. occasionally	a. Daily b. weekly c. monthly d. occasionally
2. How far is the nearest market place from your residence?	a. 2-5km b.5-10km c.15-20km d. above 20km	a. 2-5km b.5-10km c.15-20km d. above 20km
3. What are the transport methods do you use most frequently to reach the nearest market? (circle more than one)	a. Walk b. by pack animals c. by animal drawn carts d. by car/taxi e. other (specify)___	a. Walk b. by pack animals c. by animal drawn carts d. by car/taxi e. other (specify)_____
4. How long does it take you to get to your nearest market place using the methods you identified on Q3 above?	a. 2-3hrs b. 1-2hrs c. 30minutes to 1hr d. 15 to 30 minutes e. less than 15 minutes	a. 2-3hrs b. 1-2hrs c. 30minutes to 1hr d. 15 to 30 minutes e. less than 15 minutes
5. How often is motorized transport available from your nearest road to your nearest market place?	a. Several times a day b. once a day c. once a week d. not at all e. other (specify)_____	a. Several times a day b. once a day c. once a week d. not at all e. other (specify)_____
6. Where do you buy/sell	a. at the nearest market b. at	a. at the nearest market b. at

your products?	your nearest village c. at your nearest village d. to middlemen who come to your farm e. none(specify)	your nearest village c. at your nearest village d. to middlemen who come to your farm e. none(specify)
7. Would you go to other market places?	a. Yes b. No	a. Yes b. No
8. If your answer is "yes" above, why?	a. the rural roads are in better condition b. transportation is less expensive d. the other market places are closer e. other reasons	a. The rural roads are in better condition b. transportation is less expensive d. the other market places are closer e. other reasons

D. Health Center

Question	**Before**	**After**
1. By what means of transport do you go to health center?	a. walking b. bicycle c. non-motorized d. not going to health centers e. other_____	a. walking b. bicycle c. non-motorized d. not going to health centers e. other_____
2. If you are not going to health centers mostly, because of?	a. lack of awareness b. unavailability of health centers c. unavailability of roads reaching to health centers d. other(specify)_____	a. lack of awareness b. unavailability of health centers c. unavailability of roads reaching to health centers d. other(specify)_____
3. How far is the nearest health center from your residence?	a. 2-5km b.5-10km c.15-20km d. above 20km	a. 2-5km b.5-10km c.15-20km d. above 20km

E. Water

Question	Before	After
1. How long does it take to fetch the water?	a. 5-10minutes b. 10-30minutes c. 30minutes to 1hr d. 1-2hours e. more than 2 hours	a. 5-10minutes b. 10-30minutes c. 30minutes to 1hr d. 1-2hours e. more than 2 hours

F. Travel Characteristics Before and After Construction of the Road

Travel Attributes	Before	After
Ownership of motor vehicles (by type and number) in household		
Ownership of bicycles in household (by number)		
Average number of trips taken outside village, for work purpose (per month)		
Average number of trips taken outside village, for non-work purpose (per month)		
Average Trip Length (km)		
Average Trip Time (hour and minute)		
Average Number of Passenger per Trip		
Average Load per Trip (ton)		
Average Frequency of trip per day		
Average Fare for one-way trip (per passenger)		
Average charge for one-way trip (per ton of goods)		
Transport cost of farming inputs (seeds, fertilizers)		
Transport cost of agricultural products		
Average working hours per day (hour)		
Average working distance per day (km)		