AN EVALUATION OF RURAL ROAD MANAGEMENT AS A DRIVER OF ECONOMIC DEVELOPMENT: A CASE STUDY OF KABAROLE DISTRICT

BY

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17/U/14631/GMET/PE

A DISSERTATION SUBMITTED TO KYAMBOGO UNIVERSITY GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF SCIENCE DEGREE IN CONSTRUCTION TECHNOLOGY AND MANAGEMENT OF KYAMBOGO UNIVERSITY

August 2021

CERTIFICATION

The undersigned, certify that they have read and hereby recommend for acceptance by Kyambogo University a dissertation titled **"An Evaluation of rural road networks management as a driver of economic development: A case study of Kabarole District,"** in fulfillment of the requirements for the award of a degree of Master of Science in Construction Technology and Management of Kyambogo University.

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DECLARATION

I, Kamwaka Naome Basoona, do hereby declare that this dissertation is my original work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree of the university or other institute of higher learning, except where due acknowledgement has been made in the text and reference list.

Signature: ……. …….. …….. …….. …. ….. Date: …… …. . …….

KAMWAKA NAOME BASOONA

DEDICATION

I dedicate this research work to my lovely departed parents Mr. and Mrs. Leonard Basoona for their tireless efforts in upbringing and changing life of our family.

Also, this work is dedicated to all my fellow Ugandans who work vigorously to transform our Country for a better place.

ACKNOWLEDGEMENT

I am very grateful to all those persons, organizations and institutions that have helped me with their material support, moral encouragement, cooperation and positive criticism which led to the success and production of this dissertation.

Special thanks goes to my supervisors Dr. Muhwezi Lawrence and Mr. Acai Joseph for their guidance, advice, encouragement and according me time for consultation at every stage of this project.

I also appreciate the staff of Kabarole District Local Government and Uganda National Roads Authority (UNRA) Fort Portal station for their cooperation especially during the data collection surveys.

To Mr. Tusiime Venali, my husband, thank you for letting me further my education. Many thanks to Mr. Mugisa John Bixs, Mr. Kankya Blaise and Dr. Mugume Sam Koojo for the tireless help rendered to me whenever need arose. Not forgetting my family and relatives who stood by me to provide what was required for the success of this research.

I must acknowledge the contribution of my fellow course mates and Lecturers whose advice and encouragement made me complete this project.

Thank you all.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

ADB	African Development Bank
BADEA	Arab Bank for Economic Development
CARs	Community Access Roads
CVR	Content Validity Ratio
DLGs	District Local Governments
DUCAR	District, Urban and Community Access Roads
EIA	Environmental Impact Assessment
ERD	Economics and Research Department
Et al.	And others
F/P	Fort Portal
FY	Financial Year
GDRC	Global Development Research Centre
GIS	Geographical Information System
GoU	Government of Uganda
IDB	Islamic Development Bank
KM	Kilometre
MCs	Municipal Councils
MDG	Millennium Development Goal
MoLG	Ministry of Local Government
MoWHC	Ministry of Works, Housing and Communications
MoWT	Ministry of Works and Transport
MS	Microsoft

NAADS	National Agricultural Advisory Services
NDP	National Development Plan
NGO	Non- Government Organisation
NRRDA	National Rural Roads Development Agency
NSDS	National Service Delivery Survey
OAG	Office of the Auditor General
ONS	Office of the National Statistics
OWC	Operational Wealth Creation
PDE	Procuring and Disposal Entity
PPDA	Public Procurement and Disposal of Public Assets Authority
PPP	Public Private Partnership
RAI	Rural Access Index
SDG	Sustainable Development Goals
SDIs	Sustainable Development Indicators
SPSS	Statistical Package for the Social Science
UBoS	Uganda Bureau of Statistics
UGX	Uganda Shillings
UNCRD	United Nations Centre for Regional Development
UNDP	United Nations Development Programme
UNEC	United Nations Economic Commission
UNICEF	United Nations International Children's Emergency Fund
UNRA	Uganda National Roads Authority
URF	Uganda Road Fund

ABSTRACT

Rural roads form the largest part of the road network and the main form of access to the rural communities. The poor state of rural road networks not only affects transport of goods and services but also the economic growth. This study sought to evaluate rural road network management as a driver of economic development using Kabarole District as a case study. A mixed design method was used where qualitative and quantitative data were collected by use of interviews, visual inspection and questionnaire. The population composed political and technical staff involved in rural road management represented by a sample size of 95 people. Data was analysed using SPSS and Ms Excel spreadsheet and mean values computed. Factors above the mean of means were considered the most significant. Findings established that high construction costs (μ=4.22), delayed releases (μ=3.91), insufficient funding (μ=3.79), bad weather (μ=4.0) and inadequate equipment (μ=3.56) are the major factors affecting effective rural road management. A framework was developed considering roads as capital investment where maintenance will be valued above new construction. The study recommends application of the framework emphasizing an effective maintenance culture, introduction of public private partnerships in the road maintenance works and encouragement of public participation in the provision of basic facilities through various community self-help developments to reduce dependence on central government. If equal attention was paid to the development and maintenance of the rural roads there would be sufficient, safe and reliable physical access to social services; reduced travel time that would be used for wealth creation.

Key Words: ***Road networks, economic development, road management.***

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Rural roads are the backbone of the transportation system in the world. They are critically important to residents, recreationists and resource managers. Rural roads are also associated with environmental impacts on water quality, fisheries and wildlife. Rural roads are no longer a feature of agricultural policy but they have become a critical headline indicator of development at global level. Eighty-five percent of classified rural roads in the world are low volume roads with average traffic of less than 1000 vehicles per day (Faiz et. al., 2012). According to World Highways, (2014) Rural Access Index is used to measure the percentage of rural population with "access" to the transport network.

Important to note also is that physical access through improvement of rural roads is one of the seventeen Sustainable Development Goals (SDGs) covered under SDG Number 9; Industry, innovation and infrastructure (UNDP, 2015). Uganda ratified this as a means to improve on people's livelihood. It is one of the key factors to achieving most of the other SDGs, especially ending poverty in all its forms. Therefore, the importance of rural roads extends to all aspects of economic and social development of rural communities and the entire country of Uganda (World Bank Group, 2016).

There has been significant increase in mileage of rural road system during the last 20 years mainly as a result of increment in funding of the road sector and acquisition of

modern machines (Odong, 2017). In addition, there is a range of government agencies which construct or improve rural roads such as Ministries of Agriculture, Defence, Mining, Tourism and Lands, Housing & Urban Development. Maintenance of different categories of roads is done by different organs such as Uganda National Roads Authority (UNRA) and others (MoWT, 2018) and supervision over compliance with the requirements established by legislation and keeping road data bank (Mikolaj, 2016).

The road network is a collection of various types of roads ranging from national (trunk) to community roads which connect at different points. Rural roads are a road network that is not in an urban setting with a low traffic volume, which connect different communities, provide market access to farms and farmland and have lower design speed, owned by local authorities (Bhandari, 2013). There is evidenced by the increase in network from 78,000km in 2008 to 144,785km in 2016 (MoWT, 2018).

Sustainable development is the kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Jones, et al., 2017). A sustainable or green highway is a system of roads which limit their impact on the environment to a minimum through different sustainable practices (World Highways, 2015).Sustainability is not just about the environmental considerations associated with energy conservation and alternative energy generation; it is the inseparable integration of the environmental, community and society, and economic attributes that need to be managed at the project level to be effective and successful (Montgomery, et. al.,2015).

1.2 Problem statement

The quality and usability of this road system has a number of issues leading to being impassable most of the time. The MoWT report 2018 put it that in the FY 2017/18, heavy rains in the upcountry regions especially in Kabale, Mbale, Kotido, Buvuma, Alebtong cut off roads and washed away bridges, which required emergency interventions. Equally, study area is crossed by many streams and rivers whose bridges are often washed off in the wet season causing transportation problems and emergency scenarios.

Furthermore, the urban and city dwellers whose food basket is in the rural villages do not receive fresh food stuffs due to delays in transportation (Udessa, 2018). The study area is also famous for growing banana, tea and vegetables which are perishable and may rot especially with delayed transportation. This affects not only the consumer but economically impact the supply and the farmer.

Besides, there is information about network development and its problems. But there is insufficient information documented on the rural road networks management and its trends for administrator to use for decision making. In addition, less data on the application of the rural road network management for sustainable development.

1.3 Objectives of the study

1.3.1 Main objective

The main objective of the study was to evaluate the rural roads networks management as a driver of economic development.

1.3.2. Specific objectives

Four specific objectives of the study were:

i. To examine the current status of rural road networks;

ii. To establish the impact of rural road networks on economic development;

iii. To establish the factors that affect effective rural road networks management;

iv. To develop a framework of improving the rural road networks management for sustainable development.

1.4 Research questions

i. What is the status of rural road network with respect to availability, condition and quality?

ii. What is the impact of rural road networks management on economic development?

iii. What factors hinder effective rural road networks management?

iv. How can the rural roads be improved for sustainable development?

1.5 Justification

Road infrastructure remains the main mode of transport within Uganda (MoWT, 2017) therefore the quantity and quality of roads impacts greatly on economic activities in the country accounting for 99% of the total passenger flow and 95% of total goods cargo in the country (MoWT, 2016). Like in most parts of the country, agriculture is the backbone of the district's economy, with a large percentage of the population involved in the sector. The main cash crops grown in the district include: tea, bananas, passion fruits and rice. Additionally, a number of farmers are engaged in dairy and poultry farming. Poor road infrastructure has a negative effect on the production of goods and delivery of services especially for Kabarole District which is an agricultural area. This retards the rate of economic growth and may impact negatively on the achievement of the SDGs final target of ending poverty in all its form. The study hence seeks to establish and document the management of rural road networks which are the majority in Uganda as a driver to economic development and suggest measures to improve rural road networks for sustainable development.

1.6 Significance

The study findings will be used in policy formulation on issues related to rural road network development, agricultural marketing and rural urban transformation. The information documented in the study will be used by managers of roads and other economic development agencies to fast track the required changes in the road network system. It will also add to the existing knowledge concerning construction and maintenance of rural road networks of economic development.

1.7 Scope of the study

1.7.1 Geographical scope

The study sought to evaluate the rural road networks management as a key driver of economic development and considered Kabarole District whose map is in Figure1.1,due to data availability and the multiplier effects associated with these roads towards economic development. The District is located in Western Uganda approximately 320 km (200 miles), by road, west of Kampala. The coordinates of the district are: 00 36N, 30 18E (Latitude:0.6000; Longitude:30.3000) with mountainous to flat rolling terrain characterised by black cotton soils suitable for agriculture but poor in road construction. It is traversed by many rivers, swamps and a number of creator lakes. The District which has a total of 295.6km network of feeder roads, of which 45km are gravel, while 250.6km are earth roads. The total length of community access roads in the district is about 800km and all earth surfaced. Most of the road surface deteriorates fast especially during the rainy season. All these pose a challenge to road construction and maintenance yet there are numerous economic activities practiced by the community such as commercial agriculture and tourism.

1.7.2 Content scope

The study was limited to the rural road networks management status for the last five years (2014-2019), its impact on the economic development, factors that hinder effective rural road networks management and the suitable method of improving road networks management for sustainable development.

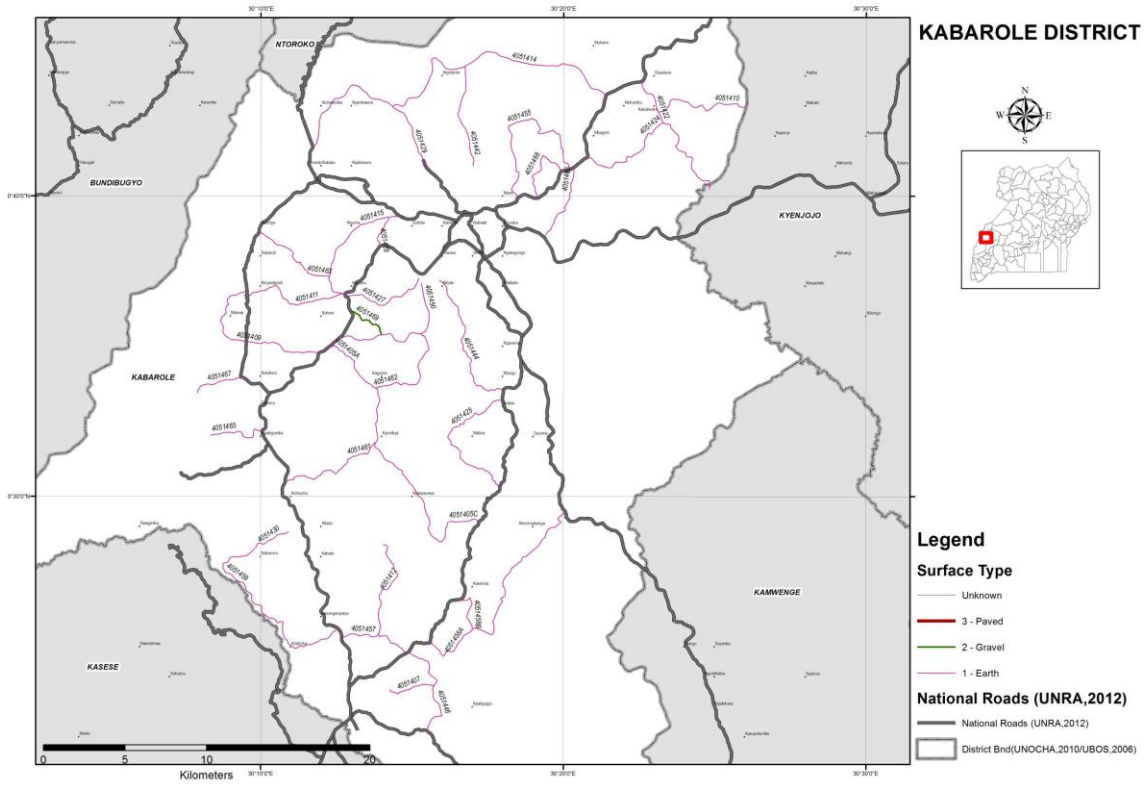

Figure 1.1: Map of Kabarole District roads.

Source: *Kabarole district Atlas, (2012)*

1.7.3 Time scope

Shortage of time and funding are expected to be limiting factors as the research had to be carried out within one academic year (August 2018- August 2019) as required by the University. The researcher therefore worked very hard within the limited time and resources to distribute the questionnaires to respondents and conduct interview with the target group who responded very well.

1.8 Conceptual framework

i. Condition survey of the rural road network: Road condition survey is the process of collecting data on the geometric and operational condition of the road way to determine the structural integrity, distresses, skid resistance, and overall riding quality of the pavement (MoWT, 2002). The level of repair and rehabilitation done on the roads depends on the physical condition of the road at a particular time in relation to its acceptable and operable condition.

ii. Cost factors: Equipment, labour and material required for road construction were considered. Equipment in terms of machinery such as graders, bull dozer, rollers, lorries and many others are to be borne in mind. Their absence or availability directly influences the construction and development of rural roads. The skilled and unskilled labourers have also to be considered as a cost factor. Under materials, cement, culverts, aggregates, gravel and many others all are considered.

iii. Technology: Here innovations and expertise come into play. Construction of a road in a wetland or a mountainous area has several challenges and these innovations may be lacking in developing economies.

iv. Funding: Resources allocated for rural road construction and maintenance are little compared to the demand and community priority. There are also very few Non-Government Organizations (NGO) and private sector interested in investing in rural roads network.

v. Time: the planning and implementation of roads activities are greatly affected by time. The project duration, season changes and the funding should be considered while scheduling roads activities (Pan, 2005).

vi. Political leadership: there is a lot of bureaucracy when it comes to setting up a road. Politics come into play, fund diversion and interference both at local and national level (Mushemeza, 2019).

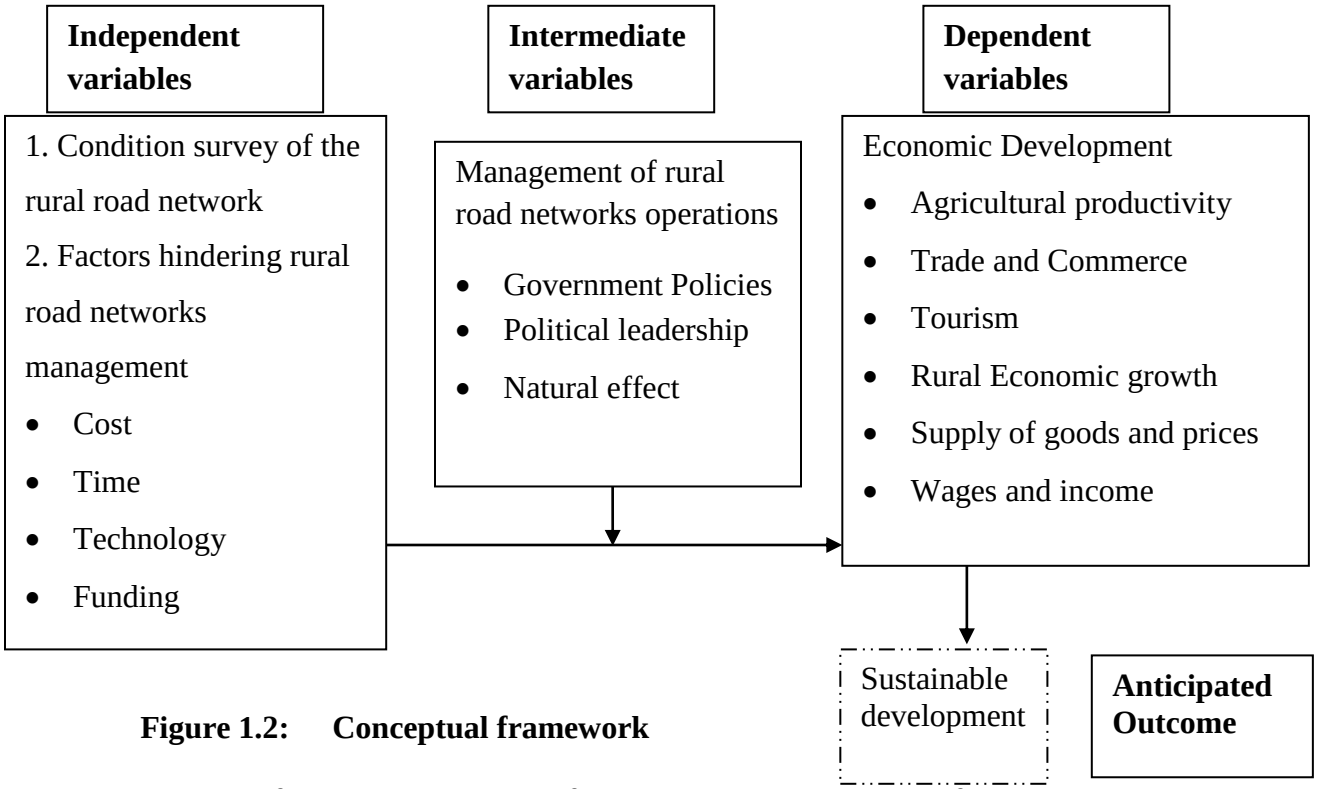

Figure 1.2: Conceptual framework

Source: *Adopted from ERD- Policy Brief series: ADB (2003)and modified by researcher*

vii. Nature effects: in relation to time we consider the weather condition that may favour or hinder road construction and development, the citation of a road construction may not fall in the set contact time which may be an inconvenience to development. Road damages like landslides and flooding and eruptions resulting from natural causes.

viii. Government policies on roads may not be in harmony with practically what is on ground and policies take long to be designed, reviewed and implemented.

ix. Economic Development: good roads as a link to economic development in form of improved agricultural productivity, increase employment, increased access to medical services, improvement in tourism, trade and commerce and improved standards of education. When all is done, safe, reliable, motorable and sustainable rural road network will be achieved.

Implication of the conceptual framework in relation to the evaluation of rural road networks management as a key driver of economic development is that, the factors that hinder rural road network management as an independent variable influences the rural economic development as a dependent variable through the Indirect effects on the management of rural road network operations. It also results in improved agricultural productivity by influencing on price, transportation costs reduction, farm inputs, markets and other social services. The framework anticipates that resultant effect of the above is sustainable development.

1.9 Chapter Summary

Chapter one of this study introduced the background of the study, problem statement which described the specific objectives addressed, the purpose of the study, research objectives and questions, significance of the study and definition of key terms. With this coverage, one can proceed to review of the study related literature which is covered in Chapter Two.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This review of related literature was intended to lay a foundation for the study by relating to similar studies done on effective rural road networks management impacts in development programs of any given developing economy.

2.2 Status of rural road networks

2.2.1 Global perspective on the rural roads network

Transport access to local communities consists of the combined services of major roads and the rural road network. Rural roads provide the last section of access to local communities. Often, it is the only connection available (Burrow, 2015). Rural roads stimulate overall development by providing access to social infrastructure and facilities hence increasing economic opportunities (Faiz, et al., 2012 and Porter, 2014).

Rural road network connectivity is perceived as one of the prime components in increasing the agricultural output and earning capacity of the rural population (Kamlesh and Ramesh, 2017). One billion people, which is 31% of the world's rural population still live more than 2 km from an all-weather road, isolated from markets and services. Accessibility, which is measured with the Rural Access Index (RAI) (that is the population within 2 km of an all-weather road), varies greatly between developed and developing countries (World highways, 2013).

2.2.2 Sub Saharan perspective on rural roads networks

Studies indicate that more than half of the population in Africa still resides in rural area and most African countries fall below the 50% margin for the RAI (Beegle et. al., 2016 and Nkomo, 2013). More still, field studies of immobility among women and men in rural settlements in Africa with poor road access illustrate the frustrations and the high costs of living due to poor road infrastructure (Mukiibi, 2012).

In the 1990s, a number of countries within Sub-Saharan Africa (SSA), took on various road sector reforms including the development of road funds and semi-autonomous road authorities which reforms are regarded as least partially successful in the recognition of the benefits of commercial management practices, reducing under-funding of maintenance, partial arrest of declines in the quality of road networks and, the efficiency and effectiveness of road management services (Pinard, 2012). This can be attributed to a number of interrelated reasons including political factors (e.g. preference for new construction over maintenance), insufficient road maintenance budgets, lack of a maintenance culture, institutional arrangements, lack of a suitable means of motivating a strong case for funds for maintenance and ineffective rural road asset management (Burrow et. al., 2016).

Sub-Saharan Africa (SSA) has approximately 700,000 kilometres of rural roads, with half of them in poor condition (Riverson and Carapetis, 1991). Low population densities, low levels of income and weak road planning and maintenance capabilities combine to make Sub-Saharan Africa altogether under-equipped and overburdened in terms of rural

road infrastructure. Total needs for rehabilitation of existing roads and for expansion of rural road networks are enormous and have generally not been recognized by planners and policy-makers (The World Bank Group, 2015). Further, the report considers that earth road improvements have a life span of three to five years.

The poor road infrastructure in the East African region has devastated business in perishable goods since time after time such goods get spoiled on the way as the drivers strive to cope with the numerous bottlenecks and bureaucratic procedures "trucks, lorries, buses, pickups and small cars use in transportation of goods and cargo from the port to the market by road travel at an estimated speed of 8 km per hour throughout East Africa, compared to 12 Kph in Southern Africa and 6 Kph in West Africa (Udessa, 2018).

2.2.3 Ugandan perspective on rural roads networks

In Uganda, road transport is the most commonly used means of communication throughout the country which stands at 21,000km (30%) of national roads, 17, 000km (24%) of district roads; 2,800km of urban roads and about 30,000km (42.4%) of community roads used to connect communities to social and economic centres and services (UNRA, 2018). Road development still takes the biggest share of the budget, at 90% while road maintenance is still at 7% of the total budget. This imbalance results into unsustainable development of the network while the backlog maintenance is growing and will result in higher replacement costs of the road asset in future (MoWT, 2018).

According to the MoWT, (2016), in 1986 the total national road network was 7,900Km. Of the 1,900Km that had been tarmacked, only 114km (6 per cent) was in fair condition. The remaining 1,786km was in poor motorable state. The 6,000km of gravel roads were in dire need of repair and so were the 22,000km of district feeder roads and 15,000km of urban roads and about 30,000km of community roads had become foot paths. According to the MoWT, 2017 the national roads network totals to 20,544km consisting of paved and unpaved roads. As of June 2017, the paved road network was 4,257km while the unpaved was 16,388km. District road network was around 35,566 km and Community access roads are estimated at 78,000 km (MoWT, 2018).

National Service Delivery Survey (NSDS) (2015) reported that at national level, 62 percent of households reported Community road as the nearest type of road to their households in 2015 compared to 64 percent who reported in 2008. However, the majority of respondents in all the regions indicated community road as the nearest type of road (62%) followed by District road (26%) with the highest proportions reporting community roads. The same survey of 2015 indicate that Tooro region where Kabarole belong had 67% respondents near CARs, 23% near feeder roads and 3.7% trunk roads of gravel surface forming part of the rural road network. The report further cited poor maintenance (42%) to be the major reason for the poor state of roads/bridges/culvert crossings for all types by the highest proportion of respondents. A notable proportion of respondents (16%) cited bad weather as the reason for poor state of bridges/culverts.

Lack of engineers was cited by the least proportion of respondents as the main reason for the poor state of roads/bridges/culvert crossings for all types of roads (NSDS, 2015).

Under the Strategy for Rural Feeder Roads Rehabilitation and Maintenance Programme in the 1990s Uganda improved rural access as a catalyst to agricultural production and by 2004 the rural feeder roads had improved significantly from 15% to 60% in good condition. The 2004 Government "Strategy for Sustainable Maintenance of District, Urban and Community Access Roads (DUCAR)" was launched. The DUCAR strategy was however, undermined by inadequate budget allocations to support the maintenance works and local authority revenue streams were cut by the abolition of the Graduation Tax in the mid-2000s. In 2008, the government changed its approach to the maintenance of district roads through the reintroduction of force account and direct labour road gangs for routine maintenance (MFPED, 2017). This was as a result of continued poor condition of district roads and demonstrated a lack of confidence in the private sector to implement the works efficiently and at cost effective rates. To date, district local government councils continued to manage most of rural road network which are reported to be in fair or poor condition regardless of receiving maintenance allocation from Uganda Road Fund (URF) (Geddes, et. al., 2016).

Road maintenance in Uganda is undertaken through direct labour (force account).

Force Account (FA) mechanism is a means of undertaking works by a Procuring and Disposing Entity (PDE) using its own personnel and equipment or of another PDE (PPDA, 2014). Central to this policy shift was to prevent premature deterioration, accord the roads a longer service life and save the agencies high rehabilitation/reconstruction

costs. The force account policy tended to undermine the experience of the local firms and the low capacity of the local governments. Some districts already operated road construction equipment, yet their roads were in poor condition as a result of insufficient funds for purchase of fuel, lubricants and spare parts, lack of capacity to maintain construction equipment and abuse of equipment and illegal hiring to the private sector (AOG, 2018). It also seemed to contradict the government's Construction Industry Policy which aimed to reduce direct labour units employed by government to 10%, leaving the 90% of all work implemented by the private sector by 2013 (UBoS, 2018).

The Inspector of Government, (2012) reported that performance of the road sector continues to lose billions of shillings in shoddy works and services. However, the goal to optimize the quality, timeliness, cost effectiveness in road delivery so as to guarantee safe and efficient movement of people is still difficult to achieve (MoWT, 2011). Many road projects awarded delay at implementation, and others face cost overruns and complaints of poor quality of works (Alinaitwe, et al., 2013) and incomplete or collapsing road infrastructure projects attributed to poor supervision (URF,2015; OAG, 2010) while Byaruhanga and Basheka, (2017) indicate that over 50 road projects in Uganda were either delayed or poorly constructed.

Routine road maintenance usually involves keeping roads clear of debris, pothole filling and clearing roadside drains. Periodic maintenance is done once in a while and it involves surface reshaping by light grading, re-gravelling, minor culvert and bridge repairs and replacement (Kabasweka, 2016).Although there is theoretical and practical

recognition that the public is more involved in public decisions (MoLG, 2014), the Government of Uganda needs to find better ways to engender citizen participation through application of Labour-based methods in road maintenance programs. Labour-based methods help grassroots people organise themselves and negotiate for a greater share and more control over national infrastructure investment resources (Kabasweka, 2016).

2.3. Factors that hinder rural road networks management

2.3.1 Influence of cost on rural road networks

Uganda Vision 2040 emphasizes the urgent need for an integrated transport infrastructure network to be put in place to spur the country's economic growth. It states that efficient transport infrastructure and services ease domestic and international trade, and contribute to national integration (MoWT, 2017; UNEC for Africa 2018).Research by Memon et. al., (2014) points out fluctuation in price of the material, cash flow and financial difficulties faced by contractors, shortage of site workers and lack of communication between parties as some of the factors affecting road project management. According to Rajakumar,(2016) and Nallathiga,(2017),cost overruns are more common in infrastructure projects especially road construction activities. The impacts of cost overruns are very high in developing countries compared to developed countries. In fact, 100% of projects are affected by cost overruns in developing countries (Coffie H and Aigbavboa C., 2019).

Despite an increase in the road construction and maintenance projects by various agencies and the overwhelming evidence of the available literature, many sources agree that the road construction and maintenance backlog is caused by shortage of funding or lack of proper management that is strategic planning, programming, preparation and operations. In any country, a good economic situation can be efficient in transportation and also the maintenance of transport system (Tatari,2013).According to Salih et al., (2016) one of the most critical aspects of the management of infrastructure is the type and scale of maintenance system adopted and the consequence of their inadequacy. The performance of road maintenance systems can be assessed by the number of important indicators such as cost, safety, environment impact and level of complaints by the users.

Fazekas and Toth, (2018) findings indicated that corruption steers infrastructure spending towards high value as opposed to small value investment projects. It also inflates prices by 30–35% on average with largest excesses in high corruption risk regions. Contrary to perceptions, corruption risks in infrastructure are decoupled to a considerable extent from the national corruption environment.

From the study conducted by the Office of Auditor General (OAG), it was found that the costs incurred in road maintenance for certain interventions in certain municipalities were much higher than in other municipalities. Some municipalities spend much more on road maintenance due to higher costs of inputs. Special cases include Jinja and Bushenyi Municipal Councils (MCs) which spend considerably much higher for mechanized maintenance of paved roads and unpaved roads respectively (OAG, 2015).

2.3.2 Influence of technology on rural road networks

It takes more engineering and managerial expertise to construct sustainable infrastructure by going back to analysing options that are available locally rather than relying on a design manual and conventional construction. For instance, the rural engineer needs to know how to convert a local material to a suitable road construction material, and assess the design limitations and durability. He or she needs to understand the complexities of the local watershed and construction capability limitations (O'Neil, 2011).

According to Bhandari (2013), Rural Road Development work should involve a blend of three basic components for its sustainability:

(i) Application of basic civil engineering and design concepts, including good planning and location, drainage analysis, stable slopes, and proper use of roadway materials;

(ii) Environmental awareness and application of practical environmental mitigation measures, such as erosion and sediment control, water quality protection, fish passage and wildlife crossings, and invasive species control, climate change adaptation; and

(iii) Use of appropriate, innovative technologies to facilitate the work and make it more cost-effective, such as Geographical Information Systems (GIS) Mapping, use of geosynthetics, mechanically stabilized earth structures, use of locally available and cheap materials for pavements and simple in-situ site characterization tools.

The major constraint with developing and maintaining rural roads is the fact that they are, unfortunately, rural. The areas where they are needed are often difficult to access,

logistics become complicated, local contracting capability is limited, engineers are few and far between, and younger engineers especially, are not keen to leave the urban environment (O'Neil, 2011).

NRRDA, (2015) stated that technology depends on the nature of the work, the availability of labour and equipment in the area. Certain maintenance tasks are more effectively carried out using machines, while others work activities are best carried out using manual labour. A combined use of labour and machines often provides the most appropriate solution.

2.3.3 Funding factors influencing rural road network

Road development still takes the biggest share of the budget, at 90% while road maintenance is still a 7% of the total budget. This imbalance is resulting in unsustainable development of the network while the backlog maintenance is growing and will result in higher replacement costs of the road asset in future (MoWT, 2018). In FY 2017/18 URF was allocated a total of UGX 417.394 billion under the Medium Term Expenditure Framework (METF), of which net allocation to road maintenance needs was UGX 406.776 billion against total requirements estimated at UGX 1.76 trillion and therefore leaving a shortfall of UGX 1.35 Trillion (76.8% of total (URF, 2018).This under-funding of road maintenance is partly responsible for the road maintenance backlog because the maintenance regime is not being followed (UNRA, 2017; MoWT, 2018; AOG, 2018).

In his state of Nation address on June 6th, 2018, Uganda's President Yoweri Kaguta Museveni stated that 58% of Uganda's roads have been done or are being done with Government of Uganda money and donors or development partners (State of the Nation Address Uganda, 2018). The data collected from UNRA's Development Projects database show that of the 48 construction projects, 17 were solely government-funded, while 13 were funded in partnership with development partners, and 18 were funded entirely by donors, including the Arab Bank for Economic Development (BADEA) and the Islamic Development Bank (IDB) (UNRA, 2018).

GOU established a fund to cover the maintenance requirements for all public roads. Road Fund based on road user charges is expected to guarantee a regular and steady flow of funds for maintenance. However, the revenue from the excise duty on fuel has been channeled to the consolidated fund and apportioned through the normal budget process and hence reducing the percentage that would be released if the collection was done under Road Fund (Mukiibi, 2012).

Trunk roads always receive the highest priority when allocating funding for maintenance. Highways and major roads are more expensive to build and therefore justify higher priority when allocating maintenance budgets (URF, 2017). Due to the high levels of traffic, they are costly to maintain and also deteriorate faster when provided inadequate maintenance. Similarly, priority is given to maintaining secondary roads before the requirements of rural roads are addressed. The danger with this

approach is that when resources are scarce, most funding tends to end up being spent on the main roads leaving little to maintain rural roads (NRRDA, 2015).

When maintenance funding is limited, this also implies that some hard decisions need to be taken by the technical staff in charge. Rather than embarking on costly repair works on roads in a poor condition, the available budgets are used for protecting infrastructure assets that are still in a good condition. Such priorities form the basis for a sound asset management system (NRRDA, 2015).

Financing is often a binding constraint on securing the sustainability of infrastructure investments. The very notion of 'rehabilitation' is often indicative of failed maintenance practices except when a road has reached the end of its design life. In order to avoid such scenarios, sound road management strategies should be adopted to give priority to the conservation of the inherent asset value of existing road infrastructure (Hine, et al., 2015).

2.3.4 Time factors influencing rural road network

Institutional capacity to perform efficient and timely maintenance involves the capacity to plan and carry out the works at the right time, preserving investments with cost-effective solutions and thereby utilizing available funding resources in the most efficient manner. This requires: competent technical staff, a thorough knowledge of the road network, sound procedures for road condition inventories, efficient planning procedures, effective procurement systems, good supervision, adequate logistical support,

transparent and up-to-date reporting and reliable financial management (Chamorro, 2012) Effective and timely road asset management is of key importance to retain the value of the rural road networks and keep them fit for their intended purpose under wide ranging conditions. Effective asset management requires the efficient use of available funding, feeding into appropriate planning and prioritization of interventions (Cook, et al., 2017).

The expected benefits in terms of social and economic development will be achieved with good transport infrastructure that requires regular and timely maintenance in order to achieve a reasonable lifetime. Timely maintenance also includes the upkeep of signage and road markings which contribute to road safety (NRRDA, 2015).In terms of securing a long lifetime for rural roads, the most important type of maintenance is related to protecting the drainage system - most of which is found outside the carriageway. Improved rural transportation reduces travel time thereby, increasing the time available (Donnges, 2007).

2.3.5 Political leadership in rural road networks

World over, politicians influence the allocation and funding of projects. Experience based on the findings of Lehne et al., (2017) on corruption and political influence in the roads that politically-driven corruption is a pervasive challenge for development, but evidence of its welfare effects are scarce. The roads allocated to politically connected contractors are significantly more likely never to be constructed.

Parliament, whose influence is growing following enactment of the 2015 Public Finance Management Act, is also likely to be receptive to a narrative highlighting the importance of social expenditures for achieving the broader NDP priorities through advocating for improved resource allocation for social expenditures (UNICEF, 2016). In a democratic country, citizens are the power centre and ideally the ultimate source of authority. Through a delicately balanced system of incentives and sanctions, citizens are able to influence the conduct of politicians in their favour i.e. actions of politicians are aligned with the interests of the citizens (Bashaasha et al., 2011). The public hold political individual and parties responsible for delivery of social or public services in the area. Other prominent innovations for public services including corporatization, contracting out and public private partnerships are equally counted on as political outputs. Examination of road works shows that direct provision of road works by the districts is characterized by complications in monitoring and quality assurance, given the non-separation of roles (Bogere et al., 2013).

The strength of demand for construction relative to maintenance also provides a strong additional explanation for the neglect of the latter task. If there are perceived to be few political rewards for investing resources in maintenance then it will be in the interests of the government to allocate a greater share to high profile construction and rehabilitation projects in key regions, and emphasizing maintenance only where consistently good quality roads are vital to their broad economic or strategic interests (Wales and Wild 2012).

2.3.6 Institution policy in rural road network

Stoker, (1998); Bogere, et al., (2013) argues that governance challenges the notion of a unitary centre of power and recognizes that there are several power centres. In reality there are many centres at the national, local and regional levels with diverse links that form a complex system of government. Bogere, et al., (2013) advances five propositions about various aspects of governance: (i) there is increasingly greater involvement of non-state actors in the provision of social services that was previously the preserve of government-governance, therefore, draws from institutions within and outside government; (ii) the recognition of the blurring of boundaries and responsibilities of tackling social and economic issues, with the state stepping back and the private and voluntary sectors, together with the citizens taking on greater responsibilities; (iii) the recognition of interdependence of organizations committed to collective action through the exchange of resources and negotiation of common purposes; (iv) the recognition of the capacity to get things done through means other than power and command; and (v) self- regulation of actors.

The problems of rural road maintenance are not uniquely related to financing. Studies show that institutional factors relating to the lack of clear responsibility at different decentralized levels for maintenance planning, budgeting and implementation also explains the poor condition of the roads in Uganda (OAG 2012; URF 2013). Furthermore, there is over reliance on heavy machinery which is usually manned by personnel who are not capable of using it or carrying out repairs whenever the machines break down (OAG, 2012).

A primary institutional aspect in developing countries is the limited technical preparation of rural road managers. Critical issues when implementing technical tools that are adaptable to different scenarios and by prospective users. The usable tool should be easily implemented, updated, calibrated and operated by possible users (Chamorro, 2012).

MoWT is responsible for one of the important sectors that have a responsibility to plan, develop, and maintain transport infrastructure and engineering works in the country. LGs need to embrace the policy for rural development which aims at efficiently and effectively developing and managing rural transport infrastructure, modes and services in a sustainable way; policy lays down the basic rules and requirements that can guide all decisions and actions that need to be taken with regard to rural transport infrastructure and transportation (MoWT, 2015).

2.3.7 Nature effects on rural road networks

Guidance is needed for road authorities to identify the threats that are posed by climate change, to develop adaptation approaches to the predicted changes, to incorporate changes into mid-range and long-term development plans, and to secure funding for the proposed and necessary adaptation (UNDP, 2012). Odong, (2017) noted the rains that were responsible for the mudslides, embankment washout, pavement submergence, bridge and culvert failure and other related damages. The rains expose and exacerbate

latent weakness in the network, especially those due to backlog of maintenance, which has depressed network performance indicators.

However, Njangu, (2015) noted that improving these roads needs so many considerations like climate and the seasonal pattern although the rural roads might not require heavy machinery they too are equally hectic to maintain and even worse considering the terrains that are encountered. When comparing two scenarios it is argue that the cost of maintaining a mountain and a plain road cannot be the same. Mountain roads experience landslides, very steep slopes considered unlike the plain roads (Odongo, 2017).

Roads have both positive and negative effects. On one hand, roads are important for socioeconomic development, especially in developing countries (Faiz, et al., 2012). On the other hand, small portion of the landscape occupied by roads cause several impacts on the geo-ecosystem such as changes in hydro-geomorphological processes, i.e., runoff generation, subsurface interception, sediment production, and sediment transfer into aquatic systems (Ziegler et al., 2001a; Luce, 2002; Rijsdijk et al., 2007; Thomaz et al., 2014).

Mobilizing sufficient financing remains a major challenge in implementing the 2030 Agenda for Sustainable Development. Despite signs of progress, investments that are critical to achieving the SDGs remain underfunded (Inter–agent Task Force on Financing for Development, 2019). Given that approximately 50 percent of greenhouse

gas emissions come from infrastructure, with the road transport accounting for 503g/km in 2014of total transport carbon dioxide emissions in Uganda (Mutenyo et al.,2015). Failure to build infrastructure that is sustainable will lock the world into a high-carbon pathway inconsistent with achieving the 2-degree climate goal (Meltzer, 2016).

2.4 Rural road networks and economic development

Truck transportation infrastructure has been shown to raise the value of agriculture land (Donaldson and Hornbeck, 2016), increase agricultural trade and income, and reduce the risk of famine (Burgess and Donaldson, 2012), increase migration (Morten and Oliveria, 2017) and accelerated urban decentralization (Baum-Snow, et al., 2017). Results on growth have proven somewhat mixed: there is evidence that reducing transportation costs can increase (Ghani et al., 2015; Storeygard, 2016), decrease (Faber, 2014) or leave unchanged (Banerjee et al., 2012) growth rates in local economic activity.

According to Sieber and Allen, (2016) and KfW, (2013)rural roads infrastructure resulted in Transport Improvements: Improved access to markets, health services, school enrolment and completion, visit of other social services, increased transport services and lower transport costs and Social and economic impacts increased market activity with increased farm gate and market returns, income, wages, consumption, non-farm employment, agricultural production and less waste, poverty alleviation and some positive impacts on women.

Bulus and Adafila, (2014) states that “rural population has limited access to modern farming inputs, productive resources and basic infrastructures such as good feeder roads and that rural communities are facing inadequate and low qualities of infrastructures which have a serious implication for welfare and persistent poverty”. Therefore, it is obvious that one cannot expect rapid socio-economic development in the rural areas without adequate provision of roads. Research has shown that several important indicators of economy like trade, electricity, communication, health are positive correlated with the road infrastructure. So, it is a today’s essence to invest in road infrastructure for future prospects of the country with the best possible way (Mulmi, 2009).

According to Asher and Novosad, (2020) there are, many other ways a road can affect village production. There may be increases in demand for local non-tradable goods if any of the changes above cause in-creases in income. Improved access to capital could raise investment in productive activities; alternately, access to better savings options could reduce local investment. Or improved information alone could shift prices and investments. Hicks et al., (2017) suggest an alternative explanation: rural-urban wage gaps are not as large as previously thought, at least for workers able to change occupation.

There is an impact of the road condition and trip distance on the transport price and cost of agricultural products. The very high transport price over short distances can be attributed to the poor condition of rural roads and low vehicle utilisation. Longer

distance trips are expected following rural road improvement resulting in higher vehicle utilisation. Competition within the transport market is also expected to increase. These benefits impact on the transport price and will ultimately increase the productivity of the agricultural sector (Fungo and Krygsman, 2017).

2.5 Sustainable development

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland Report, 1987;Emus, 2015; Biswas, 2017;Jones, et al., 2017). New Zealand Resource Management Act (RMA) 1991, defines sustainable development as "...managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while:

i. Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations;
ii. Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
iii. Avoiding, remedying, or mitigating any adverse effects of activities on the environment…" (Saunders, et al., 2007).

2.5.1 Sustainable development indicators

The Sustainable Development Indicators (SDIs) provide an overview of progress towards a sustainable economy, society and environment (GDRC, 2015) assessed over the long-term and short-term (ONS, 2015, 2016, 2017). Sustainable development also

depends fundamentally on upholding human rights and ensuring peace and security (General Assembly and Security Council, 2015). The SDIs contain 12 headline and 23 supplementary indicators as shown below:

(i) **Headline indicators:**these includeeconomicprosperity,long-term unemployment, poverty, knowledge and skills, healthy life expectancy, social capital, social mobility in adulthood, housing provision, greenhouse gas emissions, natural resource use, wildlife and water Quality. (ONS, 2015; 2016; 2017). Whereas rural road networks management impact negatively on a number of sustainable development indicators, studies indicate positive outcomes on poverty reduction and provision of employment (Njangu, 2015; Odongo, 2017).

(ii) **Supplementary Indicators include:** population demographics, debt, pension provision, physical infrastructure, research and development, environmental goods and services sector, avoidable mortality, obesity, lifestyles, infant health, air quality, noise, fuel poverty, Carbon Dioxide emissions by sector, energy from renewable sources, land use, origins of food consumed, Protected species and habitats and Sustainable fisheries (ONS, 2015; 2016; 2017). A "sustainable" transportation infrastructure implies that all the sustainability objectives (i.e., mobility, safety, resource efficiency, economy, ecological protection, environmental quality) are adequately met during the infrastructure life cycle (Umer et. al., 2016).

2.5.2 Vientiane Declaration on Sustainable Rural Transport

The role of rural transport in achieving the SDGs is reflected in the Vientiane Declaration on Sustainable Rural Transport towards achieving the 2030 Agenda for

Sustainable Development (Cook, et al., 2015). The declaration advocated for a collective commitment of government authorities, development agencies, civil society and other relevant stakeholders to promote inclusive, affordable, accessible and sustainable rural transport infrastructure and services, in order to facilitate improved access to basic utilities and services of the rural poor and vulnerable groups (UNCRD, 2017).

2.5.3 Sustainable development in road works

A sustainable or green highway is a system of roads which limit their impact on the environment to a minimum through different sustainable practices. The goal is to maximize the lifetime of a highway while restricting its emissions. Amongst the different construction techniques, we find the use of recycled materials, the establishment of an ecosystem management, and the implementation of energy reduction actions or storm water retrieval systems (World Highways, 2015).

The road sector produces the highest level of greenhouse gas, directly, through fossil energy used in mining, transportation, paving works and indirectly through the emissions coming from vehicles. Indeed, the constant increase in the number of road vehicles and therefore of the traffic generates a substantial increase in pollution and noise disturbances (World Highway, 2015).Also road construction consumes a large amount of non-renewable resources.However, huge challenges arise as raw materials are becoming scarce and the environmental laws are getting stricter regarding air pollution and noise disturbances. Like the rest of the sectors, the road construction sector needs to face the challenge of sustainability (Montoya-Alcaraz et al., 2020).

First and foremost, all projects involving roadway construction are subject to the mandatory Environmental Impact Assessment (EIA) procedure by the Ministry of Environment (MoWT, 2018).Other practices include; Recycling on-site debris, Training road construction workers to identify the potential environmental issues and therefore the best practices to adopt, decreasing the fossil fuel energy consumption by non-road construction equipment, using dust control measures and using design to realize energy savings (World Highways, 2015).

According to Faiz et al., (2012) rural road must fulfill two conditions to be sustainable: first, it must contribute to and enhance rural livelihoods and livability, and secondly, its planning and design must be context sensitive to ensure a balance among economic, social and environmental objectives, that is reflective of community values, aspirations, and needs. The quality of a rural road is generally measured by the surface type and condition of the pavement surfacing. The selection of cost-effective and sustainable pavements for rural roads is also influenced by the reliability and quality of road maintenance and the associated funding arrangements (Sarkar, 2011). This requires a long-term budgetary strategy and keeping in view the usual funding constraints in the developing countries, proper plan must be prepared to educate the decision makers to make them aware about the importance of developing a maintenance management system for rural roads (Sarkar, 2011).

When developing a sustainable system of road maintenance, Merrilees and Huong, (2003) suggested attacking the problem from two directions simultaneously; (a) top down support to the agencies towards improving guidelines, standards and policies, (b) bottom up support in building the ability of agencies to manage rural road networks. Montoya- Alcaraz et al., (2020) proposedimplementation of sustainable strategies for maintenance and rehabilitation of roads, based on pavement management systems

By providing access to opportunity, rural roads contribute to making a livelihood sustainable through job creation in rural road construction and maintenance which is highly cost-effective as compared to other infrastructure interventions (Montgomery, et al., 2015; Faiz, et al., 2012).

2.6 Summary of the Chapter

Chapter two is a review of literature and relevant research associated with the problem addressed in this study. Bearing the above in mind, this chapter introduces the methodology of the research. The research gaps identified were in resource allocation, road network maintenance prioritisation, stakeholder involvement in project selection and implementation that are addressed in the Chapter Three.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the procedures that were used in conducting the study, it focused on research design, target population, sample and sampling procedures, research instruments, data collection and analysis procedures.

3.2 Research Design

There are a number of research designs such as exploratory, experimental, descriptive, case and many others (Taherdoost, 2016). However, for this particular research the suitable one was mixed method research design that was adopted because it offers the best approach to deal with qualitative and quantitative data in the study. The method permitted in depth investigation on the study subject where data collection methods and tools used were triangulated to collect both quantitative and qualitative data within the stipulated time allowable by the University. Johnson, et al. (2007) also describe the aim and motivation underlying the mixed method approach as the combination of elements e.g., the use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques for the purpose of breadth and depth of understanding and corroboration. The study involved collection and analysing of data in order to answer questions concerning the current rural road network status, the factors that hinder rural road management, impact on economic development and a framework of improving the rural road networks for sustainable development. Descriptive survey was used to

describe the range and distribution of some social characteristics, such as accessibility, rate of deterioration of the rural road network as a driver to economic development.

3.3 Research approach

The researcher used a quantitative approach with numerical and categorical variables as an inquiry into a social problem as described by Aliaga and Gunderson (2002). This approach was used to explain the rural roads importance to economic development by gathering numerical data that was analysed using mathematically based methods. According to Matthews & Ross (2010), quantitative research methods are basically applied to the collection of data that is structured and which could be represented numerically. The researcher agrees with Creswell, (2003) on primarily using post-positivist approach to develop knowledge when quantitative research is selected, employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data. Qualitative method was also used to capture the data that quantitative methods would not pick by the questionnaire and for triangulation.

3.4 Study Population

Population can be defined as all people that will be involved in the study (Rahi, 2017). Target population is defined as all the members of the area of the study to which the researcher wishes to interact. The most important thing to take into consideration is that the sample drawn from the population was representative because it allowed the

researcher to make inferences or generalisation from the sample statistics to the topic under study (Maleske, 1995).

However, for this study, the target population considered was181 technical and political leaders at the District and in the eleven Sub Counties of Kabarole District involved in rural road network construction and management and UNRA Fort Portal station staff as per the details in Table 3.1. The targeted members were sampled based on their direct role in the road management and knowledgeable information on the developments on the study area.

Table 3.1: Population details

Item	**Description**	**Number**
1	Engineering staff at the District and UNRA F/P station	18
2	Other support Departments at District such as Planning, Finance and Management	23
3	Works committee members –Political leaders at District and Sub County level	36
4	Technical staff at Sub County level	104
	Total	**181**

Source: (Human resource – Kabarole District, 2019; UNRA F/P station, 2019).

3.5 Sample Size determination

Estimating an adequate number of respondents was critical to the success of this research. According to High (2000), the size of the study sample is critical to producing meaningful

results. Conducting a study, which involves too many subjects than what is deemed necessary will mean that valuable time and resources are not used efficiently and economically (Chuan, 2006). Using online sample calculator (www.bncdnet.ku.edu/cml/info_ccc.vi) taking the confidence level of 95% and margin error of 7% on a population of 181 gave a sample size of 95, which sample size is sufficient based on Krejcie and Morgan (1970) who stated that the sampling size can range from a minimum of 85 for performing correlation analysis to a maximum of 217. Table 3.2 shows respondents' categories that were purposively and randomly selected.

Table 3.2: Sample size detail

S/n	Sample area	Number	Sample size	Percentage
1	Engineering staff at the District	8	**8**	**100**
2	Engineering staff at UNRA F/P station	10	**10**	**100**
3	Other support Departments at District such as Planning, Finance and Management	23	**12**	**50**
4	Works committee members –Political leaders at District and Sub County level	36	**18**	**50**
5	Technical staff at Sub County level	104	**45**	**43**
	Total	**181**	**95**	

Source: Primary source

3.6 Source of data

The study used data from both primary and secondary sources.

3.6.1 Primary data source

The primary data was collected using structured questionnaires. According to Wilkinson and Birmingham, (2003) questionnaires can be designed and used to collect vast quantities of data from a variety of respondents. They have a number of benefits over other forms of data collection: they are usually inexpensive to administer, very little training to develop them, and they can be easily and quickly analysed once completed. The primary data required for this study was about accessibility, road deteriorations and public opinion on rural road management in economic development.

3.6.2 Secondary data source

Secondary data was obtained from the organizations' records such as the District roads data base, work plans, performance reports, Development Plan and related research works.Secondary data was on the maintenance plans and schedules, road network coverage, challenges and related economic development. Information here was used in drawing inference with the study findings to derive conclusions.

3.7 Data collection instruments

Questionnaires and interviews were used for data collection to achieve the objectives. Field visit for physical visual inspection were also done to validate the field data collected. All the data collected was analyzed to identify the contribution of the rural road networks management in the economic development.

3.7.1 Questionnaires

A questionnaire is a group or sequence of questions designed to elicit information from an informant or respondent when asked by an interviewer or completed unaided by the respondent (Mcleod, 2018 and Van, et al., 2017). Structured questions were used in the design of study which required a lower cognitive load on the respondent and reduced the amount of thinking that a respondent needed to undertake to complete the task. This generally leads to higher response and more accurate data. The questionnaires were used to collect data from non-engineering personnel who participate in road management. Information obtained using the questionnaire targeted to answer objective one to three.

3.7.2 Interview guides

Questions were used and analysed to help to arrive at proper presentation of data. The interviews were conducted on engineering personnel of UNRA Fort Portal station and Works Department of Kabarole District to collect data and verify information obtained from literature.Data obtained answered objective one to three and generated proposal for objective four.

3.7.3 Documentary review

Various sources of data both published and unpublished were reviewed in order to come up with independent and verifiable data. Information related to economic development, road condition and road management were used to develop results in comparison with the primary generated data.

3.8 Visual inspection

Roads constructed at various times which were under rural road management were visited by the researcher to assess the engineering features. The categories of roads randomly sampled and visited include;

- 2 out of 4no.rehabilitated 4years ago. One in each of the two project sub counties;
- 2 out of 3no upgraded 2years ago. One in each of the two project sub counties;
- 1 out of 1 number newly opened community access road; and
- 2 newly rehabilitated bridge and installed culvert along the sampled roads.

The researcher examined the physical condition of the randomly selected rural roads in various categories to assess the technical engineering components such as surface material, drainage system and the maintenance activities.

3.9 Data Quality Control

In order to ensure that the instruments used for data collection were devoid of inconsistence, tests were conducted.

3.9.1 Validity

Validity is the degree to which a test measures what it purports and consequently permits appropriate interpretations of scores (Frankfort-Nachmias and Nachmias, 1996). In quantitative research validity is the extent to which any measuring instrument measures what it is intended to measure (Thatcher, 2010). To access the validity of the

instrument; the researcher conducted Content Validity Ratio (CVR) by using Lawshe's formula in equation 3.1.

$$\text{CVR} = \left[\frac{\left(\text{E} - \left(\frac{\text{N}}{2}\right)\right)}{\left(\frac{\text{N}}{2}\right)}\right] \quad \text{(Equation 3.1)}$$

Where the total -number of experts (N) and the number who rated the object as essential (E): CVR can measure between -1.0 and 1.0. The closer to 1.0 the CVR is, the more essential the object is considered to be. Conversely, the closer to -1.0 the CVR is, the more non-essential it is. The study used 10 questionnaires to check whether the contents were valid and validity was estimated to be 0.8 calculated which is above 0.5 as recommended by Lawshe, (1975).

$$\text{CVR} = \left[\frac{\left(\text{E} - \left(\frac{\text{N}}{2}\right)\right)}{\left(\frac{\text{N}}{2}\right)}\right] \qquad \text{Where by N=10, then E=9}$$

$$\text{CVR} = \left[\frac{\left(9 - \left(\frac{10}{2}\right)\right)}{\left(\frac{10}{2}\right)}\right]$$

CVR= 4/5

CVR=0.8

Since CVR is greater than the recommended 0.7 the content is acceptable.

3.9.2 Reliability

Reliability refers to a measurement that supplies consistent results with equal values (Blumberg et al., 2005). It measures consistency, precision, repeatability, and trustworthiness of a research (Chakrabartty, 2013). It indicates the extent to which it is

without bias (error free), and hence insures consistent measurement time and across the various items in the instruments (the observed scores).

In order to measure reliability, a score obtained in one item was correlated with scores obtained from other items in the instrument. To test for the internal consistencies of the scales used to measure the variables, the alphas are expected to score above Cronbach's alpha of 0.7 or 70% test (Nunnally, 1978). Therefore, this indicates that the instrument used to collect data from the respondents was dependable and reliable as indicated in Table 3.3.

Table 3.3: Reliability analysis

No	**Objectives**	**Chronbach's Alpha coefficient**
1	Current status	0.965
2	Impact of rural road networks on economic development	0.882
3	Factors that hinder effective rural road network	0.856
4	Methodology for improving the rural road networks	0.782
	Average Chronbach Alpha for the instrument	0.871

Source: Primary source

3.10 Achievement of specific objectives

3.10.1 To examine the current status of rural road networks

The first specific objective one was to examine the current status of rural road networks.

Procedure:

Physical observation and visual inspection on the engineering components of the road such as drainage system considering the flow of runoff from the camber to side, catch water and mitre drain) and surface condition (material of the pavement and its behaviour). Conducted interviews which were used to solicit information on availability of access within specified distance, their condition and durability, and opinions of the respondents were also sought using the questionnaire.

To examine the current status of the rural road network in terms of accessibility, condition and rate of deterioration. The standard accessibility measure is determined by how far an individual lives from an all-weather road (World Highways, 2013). An index of within 2km implies that the community is accessing the road network. In addition, accessibility was measured by how far one is to the social service facility such as school, health centre, market and trading centre. For this study, all rural roads that form part of the network were considered as a factor for accessibility. The condition of the road was assessed using four scales; Good, Fair, Poor and Bad. Good condition to mean good shape, drains allowing easy runoff and surface wears steadily; Fair condition to mean uneven shape of the road, drains allowing most water off and surface wears quickly; Poor condition to mean poor shape and seriously restricting traffic, much water on the road during rains and surface damages steadily; Bad condition meant that drainage and shoulder are non-functional, has lost shape and greatly damaged (MoWHC, 2002). Rate of deterioration was determined by considering the deteriorating period and the major factors that contributed to the road deterioration. Data were collected from all the ninety

respondents except for the road network coverage that was generated from key respondents. In addition, a physical inspection for 20km was made specifically looking at the road condition. Data were analysed using Ms Excel to generate descriptive results and SPSS to generate tables. A report of physical inspection was used to interpret the results.

3.10.2 To establish the impact of rural road networks on economic development

The second specific objective was to establish the impact of rural road networks on economic development.

Procedure:

While its common practice to measure economic development by trucking the Gross Domestic Product (GDP) per capita, this study measured economic development as a result of rural road networks management by considering the outcomes of economic development indicators which are improved standards of living, improved distribution of wealth, increased standard of education, access to health facilities, population growth, increased agricultural productivity, improved tourism, increased employment, access to technical service provider, urbanisation, improved infrastructure and reduced infant mortality. The negative or positive changes observed on such indicators of economic development in the area of study would reflect the same impact. The respondents rated on a scale of 1 to 5 the perceived way in which rural roads impacted on the economic development in the last ten years, (1-being very low, 2- Low, 3- moderate, 4- high and 5- very high impact). Data from the ninety respondents were entered into the computer using excel and exported to SPSS for statistical analysis. Mean values and standard

deviation were generated from the data of those who took the role of implementers in the rural road network management. The mean values were ranked in descending order to indicate the perceived high to low impacted economic indicator. The standard deviation was used to determine how far the individual responses to question vary or deviate from the mean. The study further considered the social economic benefits of an improved rural road networks management indicated by extension of social services like water, electricity, evenly distributed education centres, improved medical services among others as another measure of economic development. This was graphically presented using Ms excel software. The researcher considered the factors with values above mean value to be those significant indicators of economic development. This is highlighted by the thick horizontal line and blue shaded in the table of results in Chapter Four.

Also benefits that accrue from the existence of a well-managed rural road network such as development of trading centres, extension of electricity and water, to mention but a few, were also looked at. The presence of such development indicators in the study area was used to measure the impact. Data were analysed and documented. Also during the site inspections some observations were recorded and presented in the report.

3.10.3 To establish the factors that hinder effective rural road networks management

The third specific objective was to establish the factors that hinder effective rural road networks management.

Procedure:

The researcher extracted this information from literature. The information was validated by conducting interviews with the technical personnel who directly manage road works on the current status of roads, the factors that hinder effective road networks management and the possible methods to improve road network management for sustainable development.

The researcher also sought the methods of maintenance that were being applied in the area as to identify the missing gaps and whether there was need to introduce any new method that was not being used. The identified factors used in the structured questionnaire where respondents were requested to rank on a scale of 1-5 (1-being very low, 2- Low, 3- moderate, 4- high and 5- very high impact) in their opinion how these factors hindered effective rural road networks management. Interviews were conducted on technical staff from UNRA Fort Portal station and Works Department Kabarole District on factors which hindered rural road management. Technical personnel were also requested to suggest on what could be done to achieve effective rural road management. The data generated from the questionnaire were entered in Ms excel and imported to SPSS software where it was analyzed and presented in form of descriptive statistics and correlation to establish the significance of relationship between items. Data from the interviews was analysed and presented in study. Means and standard deviation were computed; mean of means of factors that hinder effective rural road networks management was established. The researcher considered the factors with values above mean value to be those with a significant impact on rural roads management. This is

highlighted by the thick horizontal line and blue shaded in the table of results in Chapter Four. The results from this data were used to generate a framework to improve rural road networks management which is specific objective four.

3.10.4 To develop a framework for improving the rural road networks for sustainable development.

The fourth specific objective was to develop a framework for improving the rural road networks for sustainable development.

Procedure:

From the information gathered from the questionnaires, interviews, visual inspection and reviewed literature on the factors hindering effective rural road networks management, the current methods of management and the suggested methods of management, the researcher was able to develop a system that would be used to effectively plan, manage and develop the rural road network. The researcher considered the factors with values above mean value marked by thick horizontal line in the table of results in chapter four to develop a methodology to improve rural road management for sustainable development.

3.11 Data Analysis and Presentation

The data collected for the purpose of the study were adopted and coded for completeness and accuracy of information at the end of every field data collection day and before storage. The data from the completed questionnaires were studied, recoded and fed into the computer using the Ms Excel and Statistical Package for Social Science (SPSS)

statistics Version 20 package. Descriptive statistics was employed to analyse quantitative data. The descriptive statistics included frequency counts, means and percentages. Quantitative data was presented using frequency tables, bar graphs and pie charts.

3.12 Measurement of variables

Variables are the elements that the researcher measures, controls and manipulates. In this study the researcher used ordinal scale to measure variables. Ordinal scale was used to represent relative position or order among the values of the variables. The numerical scale was also used to help minimize subjectivity and make it possible to use quantitative analysis that employed a five point-Likert scale. According to Mugenda and Mugenda, (1999), these types of scale are used to measure perception, attitude, values and behaviour. In this study, the variables were dependent, independent and moderating.

Levels of measurement in the data collection tools considered the use of the following:

The nominal scale was applied to variables that were mutually exclusive and exhaustive and where there was no order of category that suggested one category to be better than the other and this category had variables like gender of respondents.

The ordinal scale was used to order or rank categories to imply order of importance and was applied to variables such as level of education, duration lived in the area, distance covered by respondent to access services like education and health. A 5 point Likert scale was used in the study and encompassed all the above scales. The Likert scale had the options of 5, 4, 3, 2 and 1 which were used to measure various variables in the

study;Very high, Medium, Moderate, Low, or Very low. The specific responses to the items a recombined so that individuals with the most favourable attitudes will have the highest scores while individuals with the least favourable (or unfavourable) attitudes will have the lowest scores. While not all summated scales are created according to Likert's specific procedures, all such scales share the basic logic associated with Likert scaling.

3.13 Ethical consideration

Participants were made aware of the purpose of the study, how the findings will be used, impacts of their participation and who will have access to the findings. Documents accessed were only those components that were of relevance to the study. The respect for the dignity of research participants was prioritized by balancing against the ethical interests in respecting the autonomy of the person affected, and their choice about whether to know or not. Full consent was obtained from the participants prior to the study on what information to disclose and how to disclose it.

3.14 Summary of Chapter Three

Chapter three presented the research design, target population, sampling procedure, and data collection instrument and analysis techniques. The research methodology described in this chapter was used to collect data that will be analysed and discussed in Chapter Four

CHAPTER FOUR

DATA ANALYSIS, DISCUSSION AND PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents the analysis, discussion and findings on the evaluation of rural road networks management as a driver of economic development: A case study of Kabarole District. The study concentrated on the specific objectives as listed in chapter one. The researcher did site visits, physical observation, administered questionnaires and used interviews to key respondents to collect the data. Key respondents included staff of UNRA Fort Portal station, staff and politician of Kabarole District. The data was analysed and the findings are presented here under.

4.2 Response rate

The questionnaires were distributed to Kabarole DLG officers, UNRA staff Fort Portal station and Sub County representatives. 90 questionnaires were completed and returned, giving a response rate of 95%.The collection procedures involved personal administration, reminder and personal collection.

4.3 Information about respondents

Information about respondents was collected from a total of ninety people. This information included their gender profile, level of education, their role in rural road network management and the duration they have lived in the area of the research. The information collected was to inform on respondents' role, experience and capacity in road management, so as to understand the influence of the community and perception on

the role of rural road management on economic development. This information was entered in excel where graphs were prepared. The data was there after imported to Statistical Package for Social Science (SPSS) for descriptive statistical analysis. The results about respondents are presented in this section.

4.3.1 Gender

In making an evaluation of rural road networks management as a driver of economic development, the issues of gender distribution is very important. The findings showed that the majority of the respondents were male (64%) while the female were only 36%as presented in Figure 4.1 indicating a non- biased gender representation.

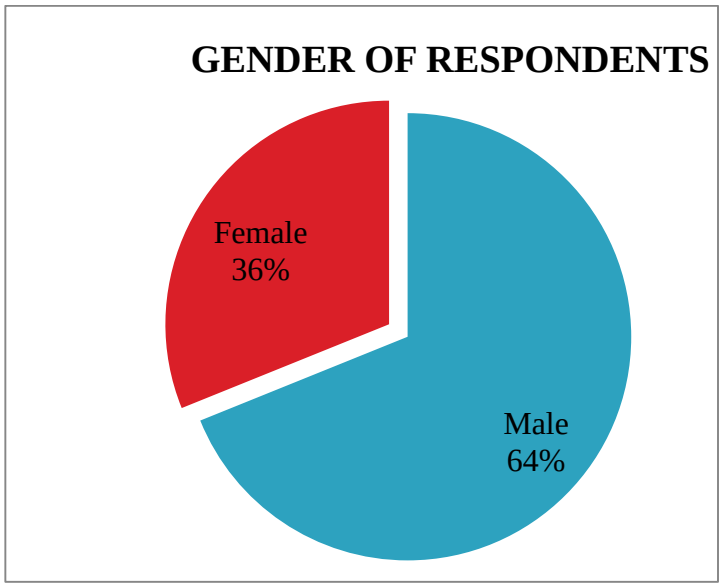

Figure 4.1: Gender of respondents

4.3.2 Level of education

The research showed that majority of the respondents had attained Bachelor's Degree (50%), Diploma holders were 34% and lower certificates (10%) with different levels of

competencies. Other qualifications at Post graduate Diplomas, Higher Diploma and Masters' Degree were6%. The findings given in Table 4.1 indicate that the respondentswere educated enough to understand and answer to questionnaire.

Table 4.1: Education level of respondents

	Education level				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelor's degree	45	50	50.0	50.0
	Diplomas	31	34	34.4	84.4
	Certificate	9	10	10.0	94.4
	Others (specified)	5	6	5.6	100.0
	Total	**90**	**100**	**100.0**	

4.3.3 Role of respondents in the rural road network management

Findings showedthat the bigger numbers of respondents were implementers (47%) of activities in road management systems, while planners comprised of 30% and policy makers were 13% as presented inFigure 4.2. This implies that the respondents actually participated in road management and were knowledgeable.Roles in road management differ based on gender and level of education (Tanzan, 2017; Bravo, 2002 and Rural Travel and Transport, 2001). In this study the researcher used cross tabulation to determine the number of respondents in different categories of gender and level of education that are within each of the roles as defined in the study.

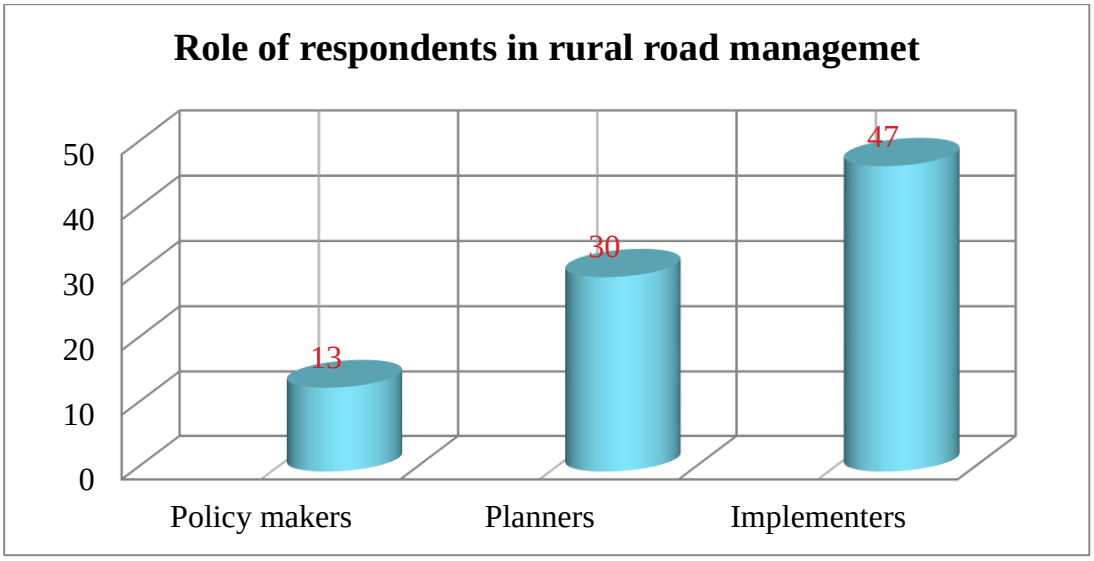

Figure 4.2: Role of respondents in road management

This helped in determining whether the level of education and gender have an influence in the rural road management.The results from the cross tabulation showed respondents at different levels of education performed roles in rural road management of each category. It was found that 58% of male with Bachelor's Degree were implementers, 29% planners and only 13% policy makers while 38%, 38 % and 25% of female with Bachelor's Degree were implementers, planners and policy makers respectively. At Diploma level 10%, 39% and 48% participated as policy makers, planners and implementers respectively. 50% of certificate holders were in the implementing category were male compared to 66% Female. A total of 58 males participated in the study of which 8 were policy makers, 19 planners and 30 implementers while 32 females participated with 5 policy markers, 12 planners and 15 implementers. Details are presented in Table 4.2.

Table 4.2: Respondents' participation in rural road network management

Crosstab								
				Role in the road management				
Education level				Policy maker	Planner	Implementer	invalid	Total
Bachelor's Degree	Gender	Male	Count	3	7	14		24
			% within Gender	13%	29%	58%		100%
		Female	Count	5	8	8		21
			% within Gender	24%	38%	38%		100%
	Total		Count	8	15	22		45
			% within Gender	18%	33%	49%		100%
Diploma	Gender	Male	Count	3	9	11	1	24
			% within Gender	13%	37%	46%	4%	100%
		Female	Count	0	3	4	0	7
			% within Gender	0.0%	43%	57%	0%	100%
	Total		Count	3	12	15	1	31
			% within Gender	10%	39%	48%	3%	100%
Certificate	Gender	Male	Count	2	1	3		6
			% within Gender	33%	17%	50%		100%
		Female	Count	0	1	2		3
			% within Gender	0.0%	33%	67%		100%
	Total		Count	2	2	5		9
			% within Gender	22%	22%	56%		100.0%

4.3.4 Duration lived in the area

From findings, it was observed that 61% which is over half of the respondents having resided in the area for over six years, the assumption therefore is that they should be able to compare road network over a long time span and related information regarding rural road management. Figure 4.3 shows the duration respondents had lived in the study area.

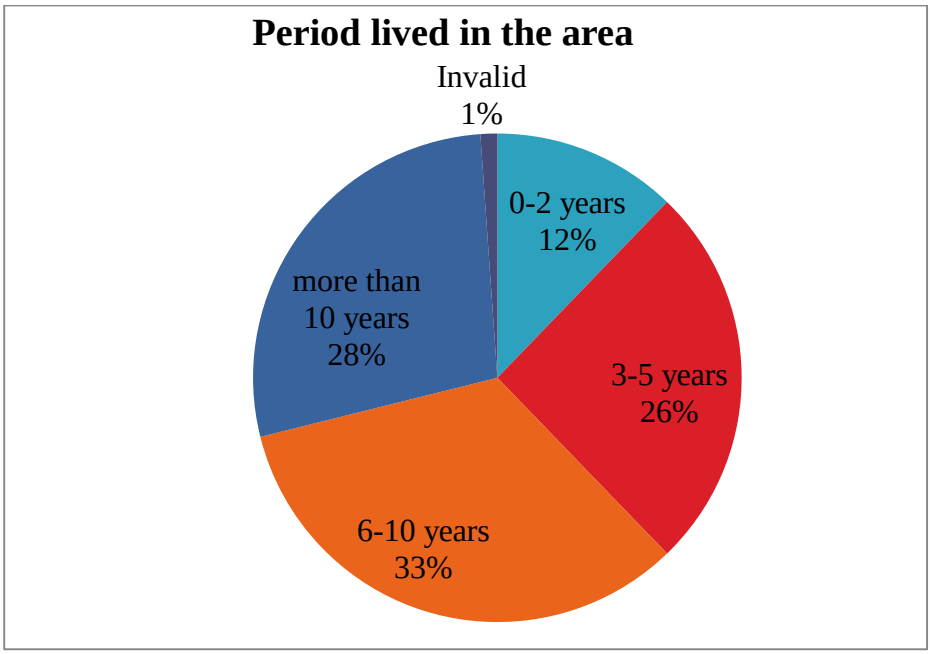

Figure 4.3: Period respondents had lived in the study area

4.4 Empirical findings

The study sought to evaluate the rural road network management as a driver of economic development: A case study of Kabarole District. In order to establish this, quantitative data were obtained using the questionnaires and the qualitative data was generated from the interviews so as to present evidence. Four specific objectives were

set to guide the study and the analysis has been carried out on an objective by objective basis with descriptive results presented first followed by inferential statistics

4.4.1 The current status of the rural road networks

4.4.1.1 Accessibility to the rural road network

About 58% of the study population lived within 2km to the rural road whereas 42% lived a distance over 2km, implying that the study area was fairly connected as indicated in Figure 4.4.

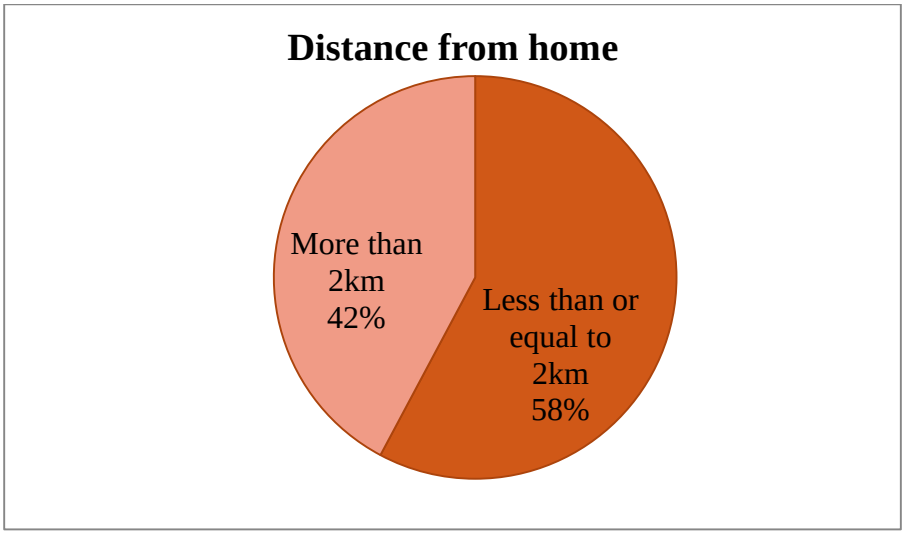

Figure 4.4: Respondents distance from home to the rural road network

Results from key respondents showed that the study areahas more than 1039.8km of rural roads. The surveyed network composed of 193.7 km of tertiary roads, 229.8km feeder road and 616.8km of Community Access Roads. Of this coverage, only 56km

(5.4%) are paved while the remaining 983.8km (95.6%) are gravel or earth surfaced.However, the key respondents reported additional un-surveyed network.

4.4.1.2 Accessibility to the social economic centres

The research sought to establish the state of accessibility by considering how much distance was there from home to the road and social centres. Accessibility was determined using RAI as describedin World highways, (2013) however not considering whether the road is all-weather or not.

Findings indicate that 68 (76%) of the respondents have access to an education centre within 2km, while 22 (24%) were in more than 2km; 55(61%) respondents accessed Health Centre within 2km while 35 (39%) were in a distance greater than 2km. Over 50% of the respondents were within 2km access to a school or health unit implying that to all respondents there is accessibility to these social amenities. Tables 4.3 and 4.4 respectively give details on accessibility to school and health centre.

Table 4.3: Distance of respondents' home to School

Distance of respondents to School					
		Frequency	Percent	Valid Percent	Cumulative Percent
Distance from home to the road	≤ 2km	68	75.6	75.6	75.6
	>2km	22	24.4	24.4	100.0
	Total	**90**	**100.0**	**100.0**	

Table 4.4: Distance of respondents' home to Health Unit

Distance of respondents' home to Health facility					
		Frequency	Percent	Valid Percent	Cumulative Percent
Distance from home to the road	≤ 2km	55	61	61.1	61.1
	>2km	35	39	38.9	100.0
	Total	**90**	**100.0**	**100.0**	

Tables 4.5 and 4.6show respondents' home access to rural road in relation to the Market and Trading Centre. These are the common areas for economic activities such as exchange of agricultural products and other transactions; therefore, accessibility. From the responses;24 out of 49 respondents were within 2km access to rural road network as well as to the markets and the 25 were more than 2km away to the market. 26 out of 41 their homes were more than 2km to road and more than 2km to the markets.

Table 4.5: Respondents home to the rural road network and market

Distance from home to the road against Market Cross tabulation				
		Market		Total
		≤ 2km	> 2km	
Distance from home to the road	≤ 2km	24	25	49
	>2km	15	26	41
Total		**39**	**51**	**90**

36 of the 48 (75%) respondents' home were within 2km to the road and trading centrewhereas 15 out of 41 respondents' home remained more than 2km from the rural roads and to the Trading Centre.

Table 4.6: Respondents home to the rural road network and Trading Centre

Distance home to the road against Trading Centre Cross tabulation				
		Trading Centre		Total
		≤ 2km	> 2km	
Distance home to the road	≤ 2km	36	12	48
	>2km	26	15	41
Total		**62**	**27**	**89**

The report findings are in agreement with earlier studies of Beegle et al., (2016) and Nkomo, (2013) that indicated that more than half of the populations in Africa live in rural area. The results confirm the NSDS, (2015) survey that showed that 83.7% of the community in Tooro region resided near a form of rural road network.

From the study findings; 59% of the respondents live within 2km radius to the rural road and social centres. It therefore implies that they can easily access improved social infrastructure and economic development. Results relates to Faiz, et al., (2012) and Porter, (2014) who stated that a well-managed rural road network stimulates development and improved social infrastructure.

4.4.1.3 Road condition

Road condition was assessed in terms of engineering features such as road surface shape, shoulders, performance of surface material and drainage condition. Good condition to mean good shape, drains allowing easy runoff and surface wears steadily;Fair-uneven shape of the road, drains allowing most water off and surface wears

quickly;Poor- poor shape and seriously restricting traffic, much water on the road during rains and surface damages steadily, Bad - drainage and shoulder are non-functional, has lost shape and greatly damaged (MoWHC, 2002).

Figure 4.5 shows that11% reported that their road network was good, 52% reported that the road network being fair, 22% had their roads in a poor state while 5% used bad roads.The results showed that the bigger percentage of the population consider the road network to be fair and poor (82%) implying that the road network is motorable but starting to lose or have lost the engineering features such as road shape, drainage system and clearance view.

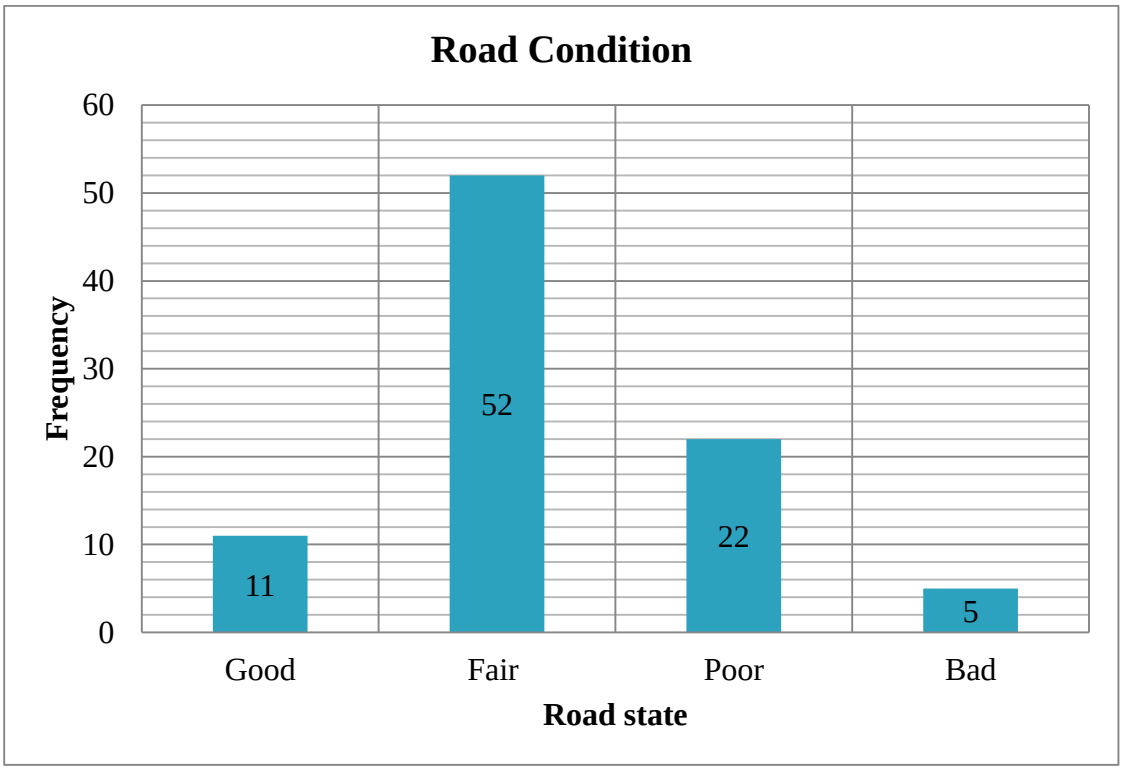

Figure 4.5: Road condition

On the condition of the rural road network, The World Bank Group, (2015)reported that 35000km of the rural road network in Sub Sahara Africais in poor condition; Tatari, (2013) also observed that the road construction and maintenance backlog is caused by shortage of expenditure or lack of proper management that is strategic planning, programming, preparation and operations.

4.4.1.4 Rate of deterioration

Majority respondents (52 %) rated 1-2 years as the duration the road lasted as shown in Table 4.7. About 30% of the respondentsindicated that roads deteriorate within 6 months after construction, 13% indicated 3-4 years while only 4% reported that roads lasted more than 4 years. Records of feeder roads at the District Works Department indicate that most feeder roads had been reshaped within 2 years after construction an indication that the rate of deterioration is 1-2years.

Table 4.7: Rate of road deterioration

Rate of road deterioration	**Frequency**	**Percent**
Within 6 months after construction	27	30.0
1 – 2 years	47	52.2
3- 4 years	12	13.3
More than 4 years	4	4.4
Total	**90**	**100**

4.4.1.5 Major factorsresponsible for rural road deterioration

The findings revealed that 45% of the respondents showed that roads deteriorated due to heavy rains, 29% responded that roads deteriorated due to lack of or poor maintenance, 19% stated poor soils and only 7% indicated heavy traffic. Under others;erosion, blockage of drainage system, livestock crossing the road were identified. Figure 4.6 shows this detail. Key informants reported of the scarcity of gravel and long haulage distances as a limitation to full gravelling of the road network.

The study findings are in agreement with Odongo, (2017) who indicated heavy rains as the major cause of road deterioration and NSDS, (2015) who cited poor maintenance as the major reason for the poor state of the rural roads.

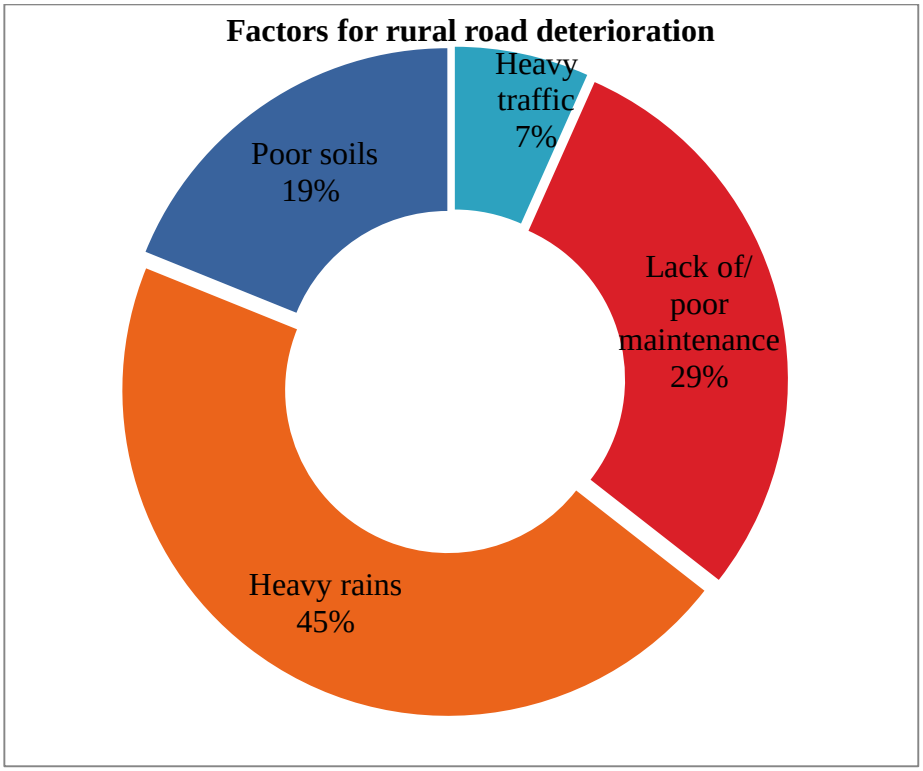

Figure 4.6: Response on factors for rural road deterioration

4.4.1.6 Physical inspection

Five roadswere surveyed for physical acquaintance of the roads' condition, namelyLyantonde – Kida (4.4km) Kyakaigo-Kikonge-Harugongo (5.0km),Kichwamba – Kiburara (4km), Kimuhonde-Kasusu5km, and Kinyankende-Mugusu road (5km).

Lyantonde – Kidaand Kyakaigo-Kikonge-Harugongoconstructed four years back (2015) was observedto be in a fair and poor state (pothole, rutting and gulliesdevelopingalong these roads)respectively as shown inFigure 4.7, confirming the respondents' perception where majority (82%) stated the roads were in a fair and poor condition in section 4.4.1.3.

Figure 4.7: Kida- Lyantonde road section

Kichwamba-Kiburara and Kimuhonde-Kasusu (Figure 4.8) roads along which existed Wamikira and Mahoma Rivers respectively had been maintained in years back (Kabarole DLGRoads and Engineering report, 2016;2017 and 2018). Sand stone mining

and farming were the major economic activities along the roads. The roads conditions were averagely fair and the bridges had been decked with concrete.

Kinyankende-Mugusu road had been upgraded, though motorable, it was evident that the soils were hard to compress and slippery if not gravelled.It was observed that some manual routine maintenance had been done on all the roads visited, however, it was not sufficient; potholes and gullies were seen to have developed on the road surface.

Figure 4.8: Kasusu-Kimuhonde road sections starting to deteriorate

Whereas most respondents from the questionnaire administered reported heavy rains and lack of maintenance, physical inspection revealed that on some section drainages were seen to have been intentionally blocked as the residents created access to their homes hence diverting the surface water flow on the road. As a result of this action, potholes developed due to the staggering water that could not automatically be shed off as seen in Figure4.7 and water crossing the road as in Figure 4.8.

From the findings, it is evident that rural road networks lead population to social services as indicated by Fiaz, (2012) and Porter, (2014). However, these road networks are in poor condition because of poor surface material where most of it is cotton black soils, heavy rains, inadequate to none maintenance resulting from limited financial resources and deliberate blockage of drainage system as the locals create home entrance and reject road run off to their plantations.

4.4.2 Impact of rural road networks on economic development

4.4.2.1 Rural road network on economic development

Majority respondents 67(74%) indicated that roads had impacted on economic developmentby rating the indicators of economic development between 5-3 (very high–moderate) while the minimal number23 (26%)rated them low and very low as observed in Table 4.8.

Any challenge or obstacle to road management has a direct impact on economic development; like increase travel time and cost, delayed deliveries of goods and services and retardation in other developments like the general infrastructure. Beegle, et al., (2016) put it that about half of the population live in rural areas with poor road access.

This was associated with frustration and high cost of living due to poor road infrastructure as noted by Mukiibi, (2012). Kamleh and Remash, (2017); Donaldson and Hornbeck, (2016); Morten and Oliveria, (2017) and Baum-Snow, et al., (2017) confirm

that when the challenges of rural road management have been overcome, there is economic development.

Table 4.8: Frequency rating on economic development indicators

Economic Development Measures	**5 (Very High)**	**4 (High)**	**3 (Moderate)**	**2 (Low)**	**1 (Very low)**
Improved standard of living	42	32	16		
Improved distribution of wealth	22	20	36	10	1
Increased standard of education	28	25	28	9	
Access to health facilities	28	32	27	3	
Population growth	13	24	32	18	3
Increased agriculture productivity	36	31	23		
Improved Tourism	18	19	18	15	20
Increased trade and commerce	24	34	20	9	3
Increased employment	10	17	29	17	17
Access to technical service providers	12	14	25	19	19
Urbanization	25	28	25	12	0
Improved infrastructure	26	28	30	5	1
Reduced infant mortality	18	22	22	17	11
Average respondent	**22**	**22**	**23**	**15**	**8**

The study considered those respondents who took on the role of the implementer on their views on economic development and Table 4.9 shows descending order of the descriptive statistics using mean as the scale of measure; access to medical services being the first (Mean (μ) = 4.0), improved standards of living (μ=3.98),Increased agricultural production (μ=3.89),improved distribution of wealth (μ=3.64),Increased

standard of education (μ=3.62), up to the least ranked access to technical service providers (such as teachers, health workers, parish chiefs, production staff among others) with μ=2.93.

Table 4.9: Mean and standard deviation economic development indicator

Indicators of economic development	**N**	**Standard Deviation**	**Mean** μ	**Ranking**
Access to health services	45	0.98	4.00	1
Improved standard of living	45	1.01	3.98	2
Increased agricultural production	45	1.11	3.89	3
Improved distribution of wealth	44	1.08	3.64	4
Increased standard of education	45	1.09	3.62	5
Improved Infrastructure	45	1.16	3.58	6
Increased trade and commerce	44	1.37	3.57	7
Urbanization	44	1.33	3.39	8
Population growth	45	1.14	3.38	9
Improved Tourism	45	1.51	3.11	10
Increased employment	44	1.33	3.11	11
Reduced infant mortality	45	1.24	3.09	12
Access to technical service providers	45	1.37	2.93	13
Average mean value			**3.48**	

Since the standard deviations are all close to one, this indicates that the respondents were more in agreement that actually road management had an impact on economic development. It was also evident that Access to health services, improved standards of living, increased agricultural production, improved distribution of wealth, increased standard of education, increased infrastructure and increased trade and commerce were

scored above the item's average mean of 3.48 therefore concluded as the major indicators of economic development in the study area.

These findings agreewith World Bank, (2015) stating that roads are vital to any development. The study results indicated a correlation with Burgess and Donaldson, (2012)that noted improvement of road infrastructure increases agricultural trade and income, and reduce the risk of famine. Also Ghani, et al.,(2015) and Stoyeygard, (2016)indicated that reducing transportation cost increased growth rates in local economic activities leading to increase demand for local non-tradable goods and increase in income. Ghani, et al., (2015) and Stoyeygard, (2016) further noted that rural roads improve access to capital which in turnraises investment in productive activities.

4.4.2.2 Other social benefits of rural road availability

Respondents reportedas indicated in Figure 4.9 that it is true roads come with amenities such as extension of electricity grid, extension of safe piped water, evenly distributed education centres, improved medical services on top of others which include Agricultural services such as NAADS and Operation Wealth Creation (OWC), growth of administrative units with associated services, increased investment opportunities and security services.

On top of the above, what was obtained from the study was purchasing agricultural produce from farm gate, collection centres and improved transport means. The findings relate with the earlier report by Mulmi, (2009) that showed several important indicators

of economy like trade, electricity, communication, health as positive correlation with the road infrastructure.

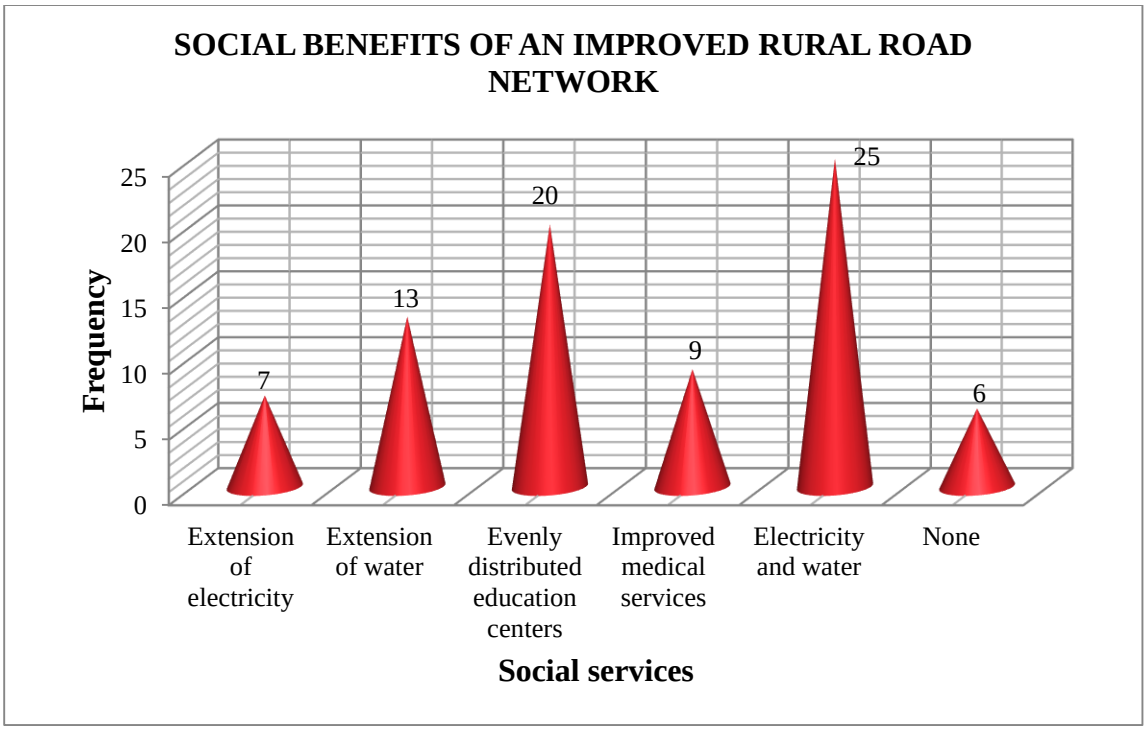

Figure 4.9: Social benefits of an improved rural road network

Visual inspection indicated that some buying centres had been created on the road side as seen in Figure 4.10. This is a social benefit to the local communities who are able to sell their produce near their home and save time for other development activities. However, it was also observed that there was poor management of waste material which is not good for the road surface if the trash is left to rot in the drains and on the carriageway as observed in Figure 4.10. There is also high risk of accidents as the packaging is done on the carriageway.

Figure 4.10: Road side buying centres

The findings agree with Niklas and Heather, (2016)and KfW, (2013)that rural roads infrastructure results in Transport Improvements: Improved access to markets, health services, school enrolment and completion, visit of other social services, increased transport services and lower transport costs and social and economic impacts increased market activity with increased farm gate and market returns, income, wages, consumption, non-farm employment, agricultural production and less waste, poverty alleviation and some positive impacts on women.

4.4.3 Factors hindering effective rural road networks management

Table 4.10shows the mean and standard deviations of the factors hindering effective road management.It showed that high construction cost (μ=4.22) wasperceived as the biggest hindrance as far as effective rural road networks is concerned and seasonal unskilled labour (μ=2.48, S.D=1.298) also hinder effective rural road network

management to a small extent.This is in agreement withNallatginga, (2017)and NRRDA, (2015) who also found out that high cost of construction and maintenance as the major factors hindering the rural road network management.

Table 4.10: Response on the factor hindering rural road networks management

Factors hindering rural road networks management	Std. Deviation	Mean μ	Ranking
High construction cost	1.074	4.22	1
Bad weather	1.234	4.00	2
Delayed release of funds	1.151	3.91	3
Insufficient funds	1.457	3.79	4
Inadequate equipment	1.194	3.56	5
Lack of materials	1.343	3.49	6
Price fluctuation	1.415	3.46	7
Geographical terrain	1.308	3.46	8
Political influence	1.466	3.39	9
Conditional fund	1.436	3.27	10
Poor construction	1.376	3.06	11
Insufficient technology	1.410	3.03	12
Institutional policy	1.259	2.99	13
Poor planning	1.364	2.84	12
Mismanaged funds	1.567	2.80	15
Absence of technical personnel	1.413	2.57	16
Seasonal unskilled labour	1.298	2.48	17
Average mean score		**3.31**	

The study observed that bad weather with mean μ= 4 highly affected rural road management as validated by Odongo, (2017) who noted that rains were responsible for

mudslides, embankment washout, pavement submergence, bridge and culvert failure and other related damages. Similarly, Oxfam, (2013) also observed that bad weather caused weather related emergencies on rural roads.

The study results further indicated that construction materials (μ=3.49) and inadequate equipment (μ =3.56) as the major factors hindering rural road management which are in agreement with an earlier study of Njangu, (2015) who stated construction materials and machinery affect rural road network management.

Furthermore, this study sought to identify to what extent funding was pertinent to rural road management. Delayed releases of funds (μ= 3.91) and insufficient funding (μ=3.79) rated above and mismanagement of funds (μ=2.8) fairly close to the average mean score (μ=3.31) an indication that these factors still affect rural road network management even to the present today as pointed out by Burrow et al., (2016); Odongo, (2016; 2017) and Pinard, (2012) as a problem in form of reduced budget, delayed releases, insufficient funding and lack of a strong case for funds for maintenance.

In addition, respondents reported that roads with mountainous terrain (μ=3.46)were expensive to manage compared to low land roads. This result is similar to that of Njangu,(2015) which stated that roads in mountainous terrains cost high to manage compared to the plain terrain. Also O'Neil, (2011), Odongo, (2017) and NRRDA, (2015) indicated in their earlier studies that geographical terrain hindered rural road

management by causing landslides, falling debris and flooding spring among others. Their findings are in agreement with this study's results.

Results indicate political influence (μ=3.39) as another factor majorly hindering effective management of rural roads as reported by UNICEF, (2016) that politicians influence the allocation and funding of projects. Findings by Lehne, et al., (2017) also indicated that politically driven corruption is a pervasive challenge for development and that roads allocated to politically connected contractors are significantly more likely never to be constructed. Singahakye, (2016) also observed that political interference from leaders affects project implementation by producing shoddy works.

However, results also indicated a low rate in mismanagement of funds of mean μ=2.80 as reflected in Uganda's President Yoweri Kaguta Museveni, (2018) national address where he highlighted that 35% of the roads under construction were being funded by GoU. The low level mismanagement of funds still agrees with Mukiibi, (2012) who stated that the revenue from the excise duty on fuel was channeled to the consolidated fund and apportioned through the normal budget process and hence reducing the percentage that would be released if the collection was done under Road Fund.

District recordsshowed that the study area had 80% of the Works Department structure positions filled with a substantive District Engineer, implying that there were minimal issues of human resource gaps compared to other districts in Uganda. This is also reflected in the study where absence of technical personnel and seasonal unskilled

labour affects rural road network management ranked the least (μ =2.57, S.D=1.413 and μ =2.48, S.D=1.298 respectively) which results were much lower than the mean value of 3.31. Findings are contrary to Njangu, (2015) findings which indicate limited skilled labour as a major constraint in rural road management and NSDS, (2015) report that indicated lack of engineers as the main reason for the poor state of all types of roads. However, the study results indicate that this factor does not greatly impact as a challenge.

Using Pearson correlation at 0.01 level (2- tailed) significance level, the results indicate that price fluctuation had a positive significanceon high costs of construction (P= 0.29, N=89), Political influence (P=0.416, N=89), Mismanagement of fund (P=0.3, N=90), poor planning (P=0.342, N=89), and geographical terrain(0.218, N=90). Whereas at Pearson correlation of 0.05significancelevel, price fluctuation and insufficient funding were found to be positively significant with lack of materials (P=0.218, N=90) and (P=0.214, N=90). Similar to price fluctuation,Table 4.11 shows the positive significances of different factors as they affect each other. The findings indicate that there is some dependence of factors hence affecting each other in one form or other. This agreement with AOG, (2015) report that stated that roads infrastructure cost much more due to higher costs of inputs.While Fazekas and Toth, (2018) and Sangahakye, (2016) noted that political influence coupled with corruption steered infrastructure expenditures towards high values.Tatari, (2013) also points out shortage of expenditure or lack of proper management as the cause of road construction and maintenance backlog leading to high cost of construction.

Table 4.11: Correlation table

Correlations

		Price fluctuation	High construction cost	Political influence	Insufficient funds	seasonal unskilled labour	absence of technical personnel	bad weather	lack of materials	geographical terrain	Institutional policy
Price fluctuation	Pearson Correlation	1	.290**	.416**	-.002	.195	.181	.188	.218*	.324**	.173
	Sig. (2-tailed)		.006	.000	.986	.067	.091	.078	.039	.002	.103
	N	90	89	89	90	89	88	89	90	90	90
High construction cost	Pearson Correlation	.290**	1	.371**	.145	.009	.091	.005	.003	.014	.255*
	Sig. (2-tailed)	.006		.000	.177	.930	.403	.965	.980	.894	.016
	N	89	89	88	89	88	87	88	89	89	89
Political influence	Pearson Correlation	.416**	.371**	1	.041	.038	.245*	.097	-.059	.027	.266*
	Sig. (2-tailed)	.000	.000		.703	.722	.022	.368	.582	.805	.012
	N	89	88	89	89	88	87	88	89	89	89
Insufficient funds	Pearson Correlation	-.002	.145	.041	1	.130	-.012	.302**	.214*	.234*	.213*
	Sig. (2-tailed)	.986	.177	.703		.225	.910	.004	.043	.027	.044
	N	90	89	89	90	89	88	89	90	90	90
seasonal unskilled labour	Pearson Correlation	.195	.009	.038	.130	1	.382**	.135	.237*	.194	.349**
	Sig. (2-tailed)	.067	.930	.722	.225		.000	.210	.026	.068	.001
	N	89	88	88	89	89	87	88	89	89	89
absence of technical personnel	Pearson Correlation	.181	.091	.245*	-.012	.382**	1	.282**	.154	.147	.361**
	Sig. (2-tailed)	.091	.403	.022	.910	.000		.008	.153	.172	.001
	N	88	87	87	88	87	88	87	88	88	88
bad weather	Pearson Correlation	.188	.005	.097	.302**	.135	.282**	1	.446**	.504**	.218*
	Sig. (2-tailed)	.078	.965	.368	.004	.210	.008		.000	.000	.040
	N	89	88	88	89	88	87	89	89	89	89
lack of materials	Pearson Correlation	.218*	.003	-.059	.214*	.237*	.154	.446**	1	.339**	.203
	Sig. (2-tailed)	.039	.980	.582	.043	.026	.153	.000		.001	.055
	N	90	89	89	90	89	88	89	90	90	90
geographical terrain	Pearson Correlation	.324**	.014	.027	.234*	.194	.147	.504**	.339**	1	.167
	Sig. (2-tailed)	.002	.894	.805	.027	.068	.172	.000	.001		.116
	N	90	89	89	90	89	88	89	90	90	90
Institutional policy	Pearson Correlation	.173	.255*	.266*	.213*	.349**	.361**	.218*	.203	.167	1
	Sig. (2-tailed)	.103	.016	.012	.044	.001	.001	.040	.055	.116	
	N	90	89	89	90	89	88	89	90	90	90

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.4.3.1 Methods of road management

The methods of road management identified in the study area were communal work, gang system, mechanized maintenance, periodic maintenanceand rehabilitation. Periodic maintenance was reported by21% of the respondents while routine mechanized maintenance and manual maintenance (gang systems)were reported by 44%as a combination of road management methods(Table 4.12). According to the interviews communal/ labour based was more common in the mountainous areas where mechanised equipment cannot easily access, whereas routine manual and mechanized maintenance covered much of the study area plans due to the limited resources. These findings are similar to those by NRRDA, (2015) where it was reported that technology employed depends to the nature of work, availability of labour and equipment in the areas. Also that a combination of labour and machine often provide the most appropriate solution. O'Neil, (2011) recommended engineers to analyse the locally available options using their experience and expertise.

Table 4.12: Road management methods

Road Maintenance application	**Score**	**Percentage (%)**	**Ranking**
Combination of Labour and Mechanised	40	44	1
Periodic maintenance	19	21	2
Mechanized routine maintenance	12	13	3
Communal labour/ System	11	12	4
Rehabilitation	8	9	5
Total	**90**		

As a government policy CARs never receive routine manual maintenance but District roads received manual routine maintenance by gang system for duration ranging between six to nine months. This depends on the budget as evidenced in the district records. From District records and study interviews, traffic and road condition survey is annually conducted on feeder and Central roads; the data is used for the annual and quarterly plans for routine manual and mechanized maintenance, periodic maintenance, up-grading and road rehabilitation. However,Kabarole DLG Roads and Engineering report, (2018) reveal that there has been little to none rehabilitation of District roads due to lack of funds, the roads have been on maintenance for more than seven years another reason for the poor state of some roads.

Study findings indicated that most roads of rural networks are unpaved and earth surface. Through field visit it was observed that roads were made of cotton black soils which can be dusty in the dry season, slippery and impassable in the wet season. This nature of soils,easily block water drainage channels especially under heavy traffic and rainy period when there is a lot of soil erosion. It is also noted that the rate of deterioration is very high if the road is not surfaced with gravel.This is a big challenge in the study area because there is scarcityof gravel (Kabarole DLG Roads and Engineering reports,2016; 2017 and 2018).

4.4.3.2 Community participation in rural road networks management

During interviews majority of respondents (76%) reported that communities were actively involved in road management as members of road committee.The participation

was mostly participating in labour based system and contracts, reporting the defects and obstacles on the road to relevant authorities, monitoring the road maintenance and construction activities and voluntarily participating in road communal works. Respondents also reported that communal working on the roads was getting more difficult because community people expect payments for every input.Thiscontradicts Kabaswaka's, (2016)findings that noted community participation creates a sense of ownership.

4.4.3.3 Planning process

68% of respondents at district level reported that the planning process drags on for long (8-16 months) and thereby causing delay in actual implementation. As a result of this, deterioration effect becomes much more exceeding the resources earlier allocated. This is in agreement with findings by NRRDA, (2015)where it was stated that the planning processes normally commence a year in advance thereby securing the inputs of all stakeholders and also allowing for the assembly of necessary data to support the cost projections in the budget. Contrary to the District, UNRA respondents (10%) said the budgeting process was effective and reliable.In reflection to the findings, NRRDA, (2015) stated that implementation of a road works programme is regulated by a series of procedures and guidelines including thosedeveloped by the funder and the specific sector. It is of such reasons that the planning cycle receives different opinion by the two implementing organisation in the study area.

4.4.4 Proposed methodology for effective rural road networks management

Objective four aimed at establishing a methodology to improve rural road networks management for sustainable development. This will give a solution to the findings for objective threewhere it was established that bad weather and finance related factors such as high construction cost, insufficient funding, delayed releases of funds; price fluctuation and conditional funding majorly hinder effective road networks management. Inadequate equipment, geographical terrain, lack of materials and political influence also affect rural road network management to an extent. The proposed methodology in Figure 4.11 is developed to address the factors which are considered to make a great impact which israted above the mean value of 3.31. These are high construction cost, bad weather, delayed release of funds, insufficient funding, inadequate equipment, lack of materials, price fluctuation, geographical terrain and political influence.

4.5 Components of the proposed framework

4.5.1 Rural road networks framework

While developing this framework for improving rural road networks management, three operational levels were considered; Strategic, Network and Project. At strategic level, the missions and vision statement are developed aimed at connectivity of the rural area to the social centers and main roads.At tactical (network) level,the mission and vision are translated into objectives.It is also at this level that the rural road administration is developed to undertaken a self- assessment of the organisation structural capacity and performance. Development and performance of road

administrations should be dependent of: the technical ability to undertake engineering activities, the institutional, organisational and managerial arrangements, finance and human resources and external factors which the organisation has no direct control over, but which may constrain the way in which the organisation operates. While at project level, standards andinterventionsare selected to meet the needs of local rural road authorities as demonstrated in Figure 4.11. The agents' ability to make sustainable improvements to road management is linked to external factors that need to be addressed before institutional arrangements are dealt with and later technical capability is developed.

4.5.2 Commercialisation of Roads

This study recommends management of rural roads by commercialisation, which entails management of rural roads as an asset or a business not a social service. This method is also closely related to the known Asset Management Approach. Road construction, maintenance and finance are not market-driven and there is no clear price for roads as road expenditures are usually financed through general tax revenue. Roads can be commercialised by fully enforcing the Uganda Road Fund Act, 2008. This will motivate the road agency to cut on waste, improve operational performance and allocate resources efficiently. Commercialization of roads clarifies responsibility by assigning roles that creates ownership through road users' involvement in the road management to encourage better management; win public support for road funding, and to constrain spending to what is affordable. This results in stabilizing road financing by securing an adequate and stable flow of funds; and strengthening rural road networks management.

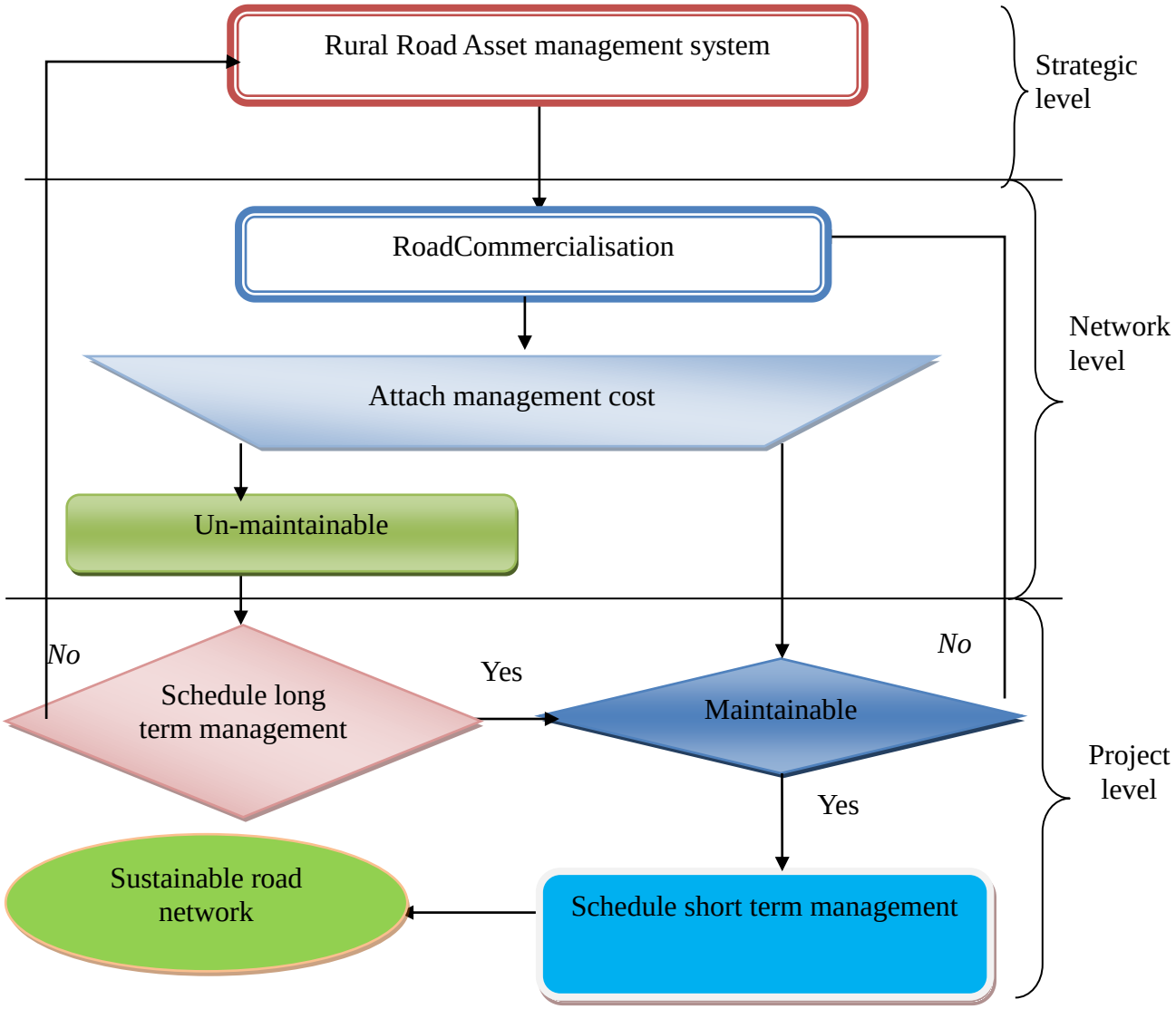

Figure 4.11: Proposed Rural Road Network Management Framework

To achieve this a comprehensive inventory of the existing infrastructures; conditions and data collection and evaluation of the assets which will provide crucial historical information that include the cost and year of construction, materials used, design for reconstruction and repair will be generated. Local decision makers themselves should be involved in assessing the results of different allocations in terms of value of the

overhead cost. Involvement of all stakeholders in the road management will minimised political influence, mismanagement of funds, poor planning and construction.

Findings of the study indicated that rural road networksbenefits less tangible investment in maintenance which is attributed political preference for new construction over maintenance. However, ifrural road networksmanagement can be locally driven, improvement in performance can be realised.This is achievedthrough:

i) Regular inspection (condition survey), maintenance planning and immediate response to any emergency. This curtails further damage on the road which reduces on the cost of maintenance and construction.
ii) Regular inspection of the road sections and effective supervision of routine and periodic maintenance works done and the resulting outputs and quality. Maximising the use of local agency resources in form of Force Account will reduce on the construction cost this will result in long service life of the road asset.
iii) Arrange procurement and supply of adequate quantities of materials. This will help on prioritising of resources and locating the relevant material and quantities.
iv) Preparation of bills of quantities and cost estimates forroad works. Timely completion of the procurement process, preparation of bills of quantities and cost estimates for road works will minimize implementation delays when funds are availed taking into account price fluctuation.
v) Conduct of regular recurrent and periodic programming activities, necessary budgeting and financial management. Regular inspection ensures proper maintenance planning taking into account the season of time together with the

available sources. To this effect the bad weather, geographical terrain, material and equipment are taken into proper use.

These activities do require technical expertise. The agency given the responsibility must have this competenceby recruiting the required human resourceas observed in the study area. However, the duration of planning and implementation should also be put into consideration along with the road deterioration effects.

4.5.3 Attach the management costs of the roads

Using the road condition data, maintenance costs for road sections are calculated and annual road works expenditure is developed by prioritising of the roads to be managed. Using the available funds which are less than the required, engineers will use the collected data and their expertise to make decisions and follow up activities to manage the maintainable and plan for un-maintainable road sections. A plan should be designed to manage the various levels of deterioration and attach the appropriate costs. At the beginning, only the maintainable roads should be prioritized, but over a time the full core network should be put in maintainable condition.

4. 5.4Maintainable and un-maintainable roads

Prioritasation is based on the cost of maintenance, nature of maintenance, population served and the purpose of the road to determine the maintainable and un- maintainable road sections. Maintainable referring to where preventive measures are applicable, otherwise un-maintainable.Through cost effective ranking of road sections which match the budget ceiling,the rural road networks management plansare developed.

4.5.5 Schedule short and long term management

In ensuring that strategic targets for road network performance are realized, detailed comprehensive data are used to plan physical maintenance, rehabilitation and development work activities. Of such, short term should include emergency, routine and periodic maintenance while long term to cover rehabilitation, upgrading and new or re-constructions. Generally the maintenance plan will define responsibilities for providing the resources, and be the basis for preparing the annual maintenance plan and budget and for implementing the works.Other effortsshould bemade to identify additional sources of funds such as introduction of Public Private Partnership (PPP), community self-management among others to manage the un-maintainable to maintainable state. When all is done the network can be expanded.

4.5.6 Sustainable road network

A sustainable road network will be achieved only when the entire defined road network is put under maintainable condition and its operations managed within the available resources.

4.6 Summary of ChapterFour

Chapter four presented the data analysis, discussion and presentation of results. Based on the results a methodology to improve rural roads management was developed. It is also from these results that conclusions and recommendations were drawn in Chapter Five.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents conclusions and recommendations of the study. Without maintenance, roads can quickly fall into disrepair leading to increased costs for road users in vehicle operations, longer travel time, reliability and safety. If the road deterioration goes too far, users will be reluctant to use the road with attendant losses of economic and social variables.

5.2 Conclusions

From the study findings, it was concluded that the rural road networks in Kabarole were in passable state with the majority respondents accessing social economic services. Rural roads deteriorate as a result of heavy rain, poor soils and lack of maintenance.

The study also concluded that rural road management has a significantimpact on economic development and social services such as extension of electricity and water,improvement in service delivery.

A number of factors affected effective road networks management.These included the high costs on construction and maintenance through procurement of materials and services, bad weather, insufficient funding, delayed releases, inadequate equipment, lack of materials, price fluctuation, geographical terrain and political influence majorly

hinder effective road networks management.Corruption, mismanagement of funds and political interference were among the factors.

In order to manage the rural road network, there is need to prioritize maintenance over new construction and generate options for the maintainable and un-maintainable roads. To achieve results and attract funding,stakeholders' involvement is of importance.

5.3 Recommendations

The most important aspect of ensuring effective rural road management is to develop sense of ownership among the road users by involving them in all aspects such as planning, designing, upgrading, rehabilitation and maintenance. This will also help in monitoring and reporting the defects on the road. Therefore, a need for continuous sensitisation of the public on road use and management.

From the study, it was evident that the major cause of road deterioration was heavy rains and poor or lack of maintenance. The researcher wishes to suggest utilization of the developed framework with emphasis on the following;

(i) An effective maintenance culture. To ensure that existing roads are kept in motorable condition, there is need to set up maintenance units within the communities responsible for rural road maintenance. Maintenance units will cover routine manual maintenance activities such as de-silting and opening drainage, vegetation clearance, culvert and bridge cleaning.

(ii) Public Private Partnership programme is also another means of ensuring sustainable rural road maintenance. The study reveals that seasonal unskilled labour was rated low and inadequate equipment rated high, this implies a possibility of labour based road maintenance should be encouraged.

(iii) There is need to encourage public participation in provision of basic facilities through various community self-help development of their community to reduce on central governmentdependence.

The study indicated positive results to economic development, however to have sustainable development, roads need to be improved from fair or poor to good status. There is need for improvement in rural road networks management financing and to empower the grassroots governments of the importance to the fact that the biggest part of rural roads fall within their jurisdiction.

5.4 Areas for further research

This study has evaluated the rural road networks management as a driver of economic development: A case study in Kabarole District. In establishing the factors influencing effective rural road networks management, the study did not assess the technical engineering components such as the quality of road material, type of machinery used, designs and expertise of the engineers which are the essential components of road construction. The researcher recommends this area studied on in future.

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APPENDICES

Appendix 1

QUESTIONNAIRE

The researcher wishes to carry out an assessment of rural road networks management in Uganda as a driver of economic development. This information will be documented and used by managers of roads and other economic development agencies to fast track the required changes in the road network system.

Please kindly respond to these questions in relation to road management in your locality. Your response will be treated as confidential but will greatly influence the outcomes of the improved and maintained road network systems as a key driver of economic development. The results of this research can be share with you on request.

(Please tick where applicable)

Section A: General information

a) What is your gender?

i. Male ☐

ii. Female ☐

b) What is your level of education?

i. Bachelors Degree ☐

ii. Diploma ☐

iii. Certificate ☐

iv. If others, specify ……..

c) What is your role in rural road networks management?

i. Policy maker ☐

ii. Planner ☐

iii. Implementer ☐

iv. If others specify ……..

d) How many years have you lived in the area?

4) 0-2 ☐

3) 3-5 ☐

2) 6 - 10 ☐

1) More than 10 ☐

Section B: Items as per the objectives

1) The current status of the rural road networks

e) What is the distance from your home to the rural road network?

i. Less than or equal to 2km ☐

ii. Greater than 2km ☐

f) How is your area linked with roads to the following socio economic centres

Distance	**School**	**Health Centre**	**Market**	**Trading centre**
i. Less than or equal to 2km				
ii. Greater than 2km				

g) Kindly rate the condition of the roads in your communities?

A. Good - Has all the engineering features in place ☐

B. Fair - Passable but has started losing its engineering features ☐

C. Poor - Defected and passable with hardship ☐

D. Bad - Has deteriorated and almost impassable ☐

(*Engineering features include; road shape, drainage system and clearance view*)

h) At what rate do roads in your area deteriorate?

i. Within 6 months ☐

ii. ii. 1 -2 year(s) ☐

iii. 3- 4 years ☐

iv. More than 4 years ☐

i) What is the major contributing factor to rural road deterioration?

i. Heavy traffic ☐

ii. Lack of/ poor maintenance ☐

iii. Heavy rains ☐

iv. Poor soils ☐

v. If others specify ……

ii) The impact of rural road networks on economic development

j) Humbly rate the way in which rural road networks has impacted on the economic development indicators in your area in the last ten years. Using the following scale:

5 - Very high, 4 - high, 3 - Moderate, 2 - Low, 1 - Very low

Economic Development Measures	**5**	**4**	**3**	**2**	**1**
Improved standard of living					
Improved distribution of wealth					
Increased standard of education					
Access to health facilities					
Population growth					
Increased agriculture productivity					
Improved Tourism					
Increased trade and commerce					
Increased employment					
Access to technical service providers					
Urbanisation					
Improved infrastructure					
Reduced infant mortality					

k) What are the social economic benefits that have been experienced as a result of rural road management?

i. Extension of electricity ☐

ii. Extension of water ☐

iii. Evenly distributed education centres ☐

iv. Improved medical services ☐

v. If others specify ……..

iii) Factors that hinder effective rural road network management

l) What kind of maintenance is applied to the rural road networks in your locality?

i. Communal labour/ System ☐

ii. Gang system ☐

iii. Periodic maintenance ☐

iv. Mechanized routine maintenance ☐

v. If others specify ……..

m) Of the factors hindering rural road networks management, in your opinion which is the major one in your area. Using the following scale

5 - Very high, 4 - Medium, 3 - Moderate, 2 - Low, 1 - Very low

Factors hindering rural road network management	**5**	**4**	**3**	**2**	**1**
Price fluctuations					
High construction / maintenance costs					
Political influence and interference					
Delayed release of funds					
Mismanaged funds					
Conditional funding					
Insufficient funds					
Inefficient technology					
Seasonal unskilled labour					
Absence of technical personnel					
Poor quality of construction					
Unavailability of / Inadequate equipment					
Poor planning					
Bad weather					
Lack of materials					
Geographical terrain					
Institutional policies					

Thank you.

Appendix 2

INTERVIEW GUIDE

(Interest is drawn to UNRA and Works Department technical staffs who are involved in planning and execution of road works).

1. What is the status of the rural roads in your locality?

   ……

   ……

2. What is the coverage of your road network and the surface type?

   ……

   ……

3. How has rural road management contributed to the economic development of the area in the last ten years and give some examples?

   …….....

   ……

4. What is the major contributing factor to rural road deterioration?

   ……

……

5. What are the major factors hindering rural road networks management?

   …….....

   ……

6. How often do you do maintenance on your roads and what is the mode of implementation?

   ……

7. How often do you carryout traffic and road condition surveys and how is this data utilized in road management?

   ……

   ……

8. How effective do you feel your local government planning process is with regards to road interventions?

   ……

   ……..

9. How active are local communities in undertaking basic road maintenance?

   ……

   ……

10. Suggest ways on how rural road networks can be improved for sustainable development?

    ……

    ……

Thank you for sharing your knowledge and time