

FWC BENEFICIARIES 2013 EuropeAid/132633/C/SER/multi

LOT 2: Transport & Infrastructures

FEEDER ROADS PRIORITIZATION STUDY

Contract No. 2015/365195

Final Report

March 2016

Project financed by



Project implemented by



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Project Title: FEEDER ROADS PRIORITIZATION STUDY

Project Number: Framework Contract Beneficiaries 2013,
EuropeAid/132633/C/SER/multi
Lot N°2: Transport and Infrastructures,
Specific Contract Nr. 2015/365195

Country: RWANDA

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Date of Report: 07 April 2016

Planning Period: 13 October 2015 – 30 March 2016

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ABBREVIATIONS AND ACRONYMS

Acronym	Description
ADT	Average Daily Traffic
AfDB	African Development Bank
AHP	Analytic Hierarchy Process
AoI	Area of Impact
AT	Attribute Table
CEA	Cost Effectiveness Analysis
CEI	Cost Effectiveness Indicator
CFE	Common Framework Of Engagement
DPs	Development Partners
DR	District Road
EDPRS 2	Economic Development and Poverty Reduction Strategy 2013 – 2018
EU	European Union
FR	Feeder Roads
FRDPS	Feeder Roads Development Policy and Strategy
FY	For Year
GIS	Geographic Information System
GoR	Government of Rwanda
GPS	Global Positioning System
IFAD	International Fund for Agricultural Development
KE	Key Expert
Km	Kilometer
LWH	Land husbandry Water Harvesting and Hillside irrigation
MCA	Multi-Criteria Analysis
MINAGRI	Ministry of Agriculture and Animal Resources
MINALOC	Ministry of Local Government
MININFRA	Ministry of Infrastructure
NISR	National Institute of Statistics of Rwanda
NPHSCS	National Post-Harvest Staple Crop Strategy
NR	National Road
RFRDP	Rwanda Feeder Roads Development Project
RFRIP	Rural Feeder Roads Improvement Program

RICA	Road Inventory and Condition Assessment
RSB	Rwanda Standards Board
RSSP	Rural Sector Support Program
RSSWG	Roads Sub-Sector Working Group
RTDA	Rwanda Transportation Development Agency
RWF	RWanda Francs
SPSP	Sector Policy Support Program
SToRs	Specific Terms of References
USAID	United States Agency for International Development
USD or \$ US	United States Dollar
UTM	Universal Transverse Mercator
WB	World Bank

EXECUTIVE SUMMARY

In the framework of feeder roads program funded by the European Union, the consulting firm PLANET S.A. was contracted to conduct the Prioritization study for the seven (7) Districts, namely Muhanga, Huye, Ngoma, Bugesera, Rulindo and Rubavu, covered by the program. This is the draft version of the Final Report. It summarizes the activities of the study, a short description of achievements including problems encountered, and presents results of the prioritization analysis and finally provided recommendations.

At the beginning of the study and through the assignment, multiple consultation meetings were held with Government of Rwanda (GoR) stakeholders and Development Partners (DPs). In order to assess of existing situation related to feeder roads prioritization in Rwanda and collect data needed to carry out the study, Consultant compiled reference and policy documents, collected data needed, and performed desk reviews. Several interviews were conducted as well as field trips in each of the seven (7) target districts.

It is important to stress that, regardless of the hierarchal classification of roads in Rwanda, roads linking agricultural areas with commercial centers and/or processing plants either paved or unpaved are defined as “Feeder roads”.

Consultant developed a prioritization methodology of feeder roads rehabilitation or upgrade based on a Multi-Criteria Analysis, which evaluates each road segment on a set of criteria /indicators: - Road Network Technical Parameters (Connectivity, Road Condition Assessment, Traffic Assessment); - Economic Efficiency (Agricultural Benefit Indicator, Connection to markets and key infrastructures, and Connection to other Economic Infrastructures), - and Social Impact (Cost Effectiveness Indicator, Community Priority for road improvement, Access to social facilities, and Impact on vulnerable sector). The criteria and indicators were derived from the various national and local goals and objectives. The key elements of the guiding approach are: - give a precise score for each indicator based on a shared understanding and consensus, - simple enough for stakeholders to understand, and implement the method in the future, but not losing precision by been too simplistic, - transparency, - and data availability, easy collection of data needed.

The Multi-Criteria Analysis Methodology (Annex 10 of the Final Inception Report) developed by the Consultant and approved on January 20, 2016 was used for the prioritization of feeder roads

rehabilitation or upgrade as stated in the Specific Terms of References. The whole process is supported by a Geographical Information System (GIS).

The summary information on prioritized feeder roads proposed for rehabilitation/upgrade in seven (7) Districts supported by European Union are the following.

Table 1: Total Length of Feeder Roads proposed for improvement in Target Districts.

#	District	Total Length (Km)	Number of Segments
1	Bugesera	623.6	78
2	Huye	550.7	100
3	Muhanga	389.1	75
4	Ngoma	476.4	65
5	Ngororero	397.3	48
6	Rubavu	421.5	128
7	Rulindo	391.3	79
	Total	3249.9	573

Table 2: Breakdown of Feeder Roads proposed for improvement by classification.

District	Length Segments by Classification (Km)					Total Length (Km)
	National Road Paved	National Road Unpaved	District Class 1	District Class 2	Unclassified	
Bugesera	-	-	38.4	340.7	244.5	623.6
Huye	-	-	38.4	171.5	340.8	550.7
Muhanga	-	-	23.1	180.6	185.5	389.1
Ngoma	-	2.8	0.0	304.5	169.1	476.4
Ngororero	-	-	69.8	150.9	176.7	397.4
Rubavu	-	0.5	29.6	85.4	306.1	421.5
Rulindo	-	-	9.6	155.4	226.3	391.3
Total (Km)	0.0	3.3	208.8	1,388.9	1,649.0	3,250.0

The cost estimates for at least 50 km of feeder roads to be developed over the next two FY 2016-17 (Phase 1) and 2017-18 (Phase 2) in each beneficiary district are presented in Chapter 6.

The complete lists of prioritized proposed feeder roads per District are presented in Chapter 6. The detailed computations of normalized rating (up to value of 3) for each indicator and criteria are shown in Annex 3.

Consultant recommended the MCA approach as it integrates multiple criteria/indicators which take into consideration goal and objectives of the feeder roads program in Rwanda. (See paragraph 3.3, MCA Methodology document) which is more relevant than the CEI. The CEI is not a multi-criteria approach with scores and weighting, it is a single equation.

The prioritization ranking of the feeder roads proposed for improvement is shown on A1 paper size format maps (Annex 4). The priority rankings presented on the maps are from the Multi-Criteria Analysis.

Most of feeder roads proposed for prioritization are in bad condition. When the rehabilitations and/or upgrade of the proposed prioritized feeder roads are completed, the road density and road ratio will reach the values presented on the Table 3.

Table 3: Road Density & Road Ratio in target Districts

#	District	District Area (Km ²)	Population (Base 2012 Census)	Classified Road Network Length within district ^(*) (Km)	Rehabilitated, on-going FR projects ^(**) (Km)	Feeder Roads Proposed for Prioritization (Km)	Total Road Network Length (Km)	Road Density (Km/ Km ²)	Road Ratio (Km/ 1000 habitants)
1	Bugesera	1291	363,339	683.8	87.4	623.6	1394.8	1.1	3.8
2	Huye	581	328,605	523.3	92.5	550.7	1166.5	2.0	3.5
3	Muhanga	646	318,965	536.2	164.9	389.1	1090.2	1.7	3.4
4	Ngoma	868	340,983	563.6	139.9	476.4	1179.9	1.4	3.5
5	Ngororero	676	334,413	416.9	129.4	397.3	943.6	1.4	2.8
6	Rubavu	339	404,278	289.2	119.1	421.5	829.8	2.4	2.1
7	Rulindo	567	288,452	540.4	170.4	391.3	1102.1	1.9	3.8
	Total	4,968.0	2,379,035	3,553.4	903.6	3,249.9	7,694.9		

(*) The classified roads network includes National roads paved, National roads unpaved, District class 1, and District class 2 roads.

(**) The feeder roads recently rehabilitated and on-going FR projects.

1.0 INTRODUCTION

In the framework of feeder roads program funded by the European Union, the consulting firm PLANET S.A. was contracted to conduct the Prioritization study for the seven (7) Districts, namely Muhanga, Huye, Ngoma, Bugesera, Rulindo and Rubavu, covered by the program. This is the final version of the Final Report for the Study, following the comments and remarks of the stakeholders on the draft Final Report, submitted on 09.03.2016. The Consultant presented the draft Final Report to the stakeholders during a one-day Workshop, which took place on the 16.03.2016 in MINAGRI premises. It summarizes the activities of the study, a short description of achievements including problems encountered, and presents results of the prioritization analysis and finally provided recommendations.

2.0 DESCRIPTION OF THE ASSIGNMENT

The description of the specific objectives for this assignment as stated in the SToRs is presented below:

- Assist concerned districts in selecting around 500 km feeder roads in each district to be upgraded during the next period starting from FY 2016-2017 with a target of enhancing agricultural markets;
- Assist concerned districts in prioritizing around 250 km feeder roads to be upgraded during the next period starting from FY 2016-2017 up to next 10 years with a target of enhancing agricultural markets.

2.1 Country Background

Rwanda, a land-locked country in Africa, is an agriculture-based society with occasional food insecurity and shortages. The Government of Rwanda (GoR) has clearly prioritized the development of the agriculture sector as a means of reducing poverty, which is predominantly localized in the rural areas, and driving economic growth. One of the main reasons for food insecurity and occasional food shortages is the poor accessibility to markets for agricultural products, as well as access to remote areas for basic community services.

2.2 Current Situation in the Roads Sector and Feeder Roads Sub-Sector

Rwanda has a road network of (officially) about 14,000 km, out of which about 6,600 km have been classified, as paved national roads (about 1,200 km), unpaved national roads (about 1,500 km) and unpaved district roads (about 3,900 km). The unclassified road network is about 9,000 km according to those data; however, it is expected to be more than double this length according to current estimates. Even using the official estimate, rural feeder roads account for at least two thirds of the total network.

The EU proposes a Sector Budget Support Program which has the potential to assist with the improvement of up to 700 km of feeder roads, together with a proposed capacity building program through this technical assistance, that will create a sustainable maintenance system and reinforce the implementation capacities of local government in the feeder road sub-sector, which is vital for food security.

The feeder road Sector Policy Support Program (SPSP), funded by the EU, has been formulated with the Government of Rwanda (GoR). It is aimed at tackling Millennium Development Goal (MDG) 1c (“halve the proportion of people suffering from hunger”) by addressing food security issues through improvement of the rural road network and thus providing accessibility to food. It

shall also help tackle the MDG 7a (“Integrate the principles of sustainable development into country policies and programs”). This follows the EU Commission’s initiative at the UN Millennium Summit of September 2010 to commit €1 billion for the achievement of the MDGs (particularly MDGs 1c, 4, 5 and 7).

The FA for the SPSP has been signed on 04 October 2013 and the Program is under implementation.

The objectives of the Sector Policy Support Program are in line with the current Poverty Reduction Strategy Paper “Economic Development and Poverty Reduction Strategy (EDPRS 2) 2013-2018” and the country’s overall strategy paper “Vision 2020”, as well as the National Post-Harvest Staple Crop Strategy (PHSCS), a five-year policy framework approved in March 2011, and the Transport Policy (December 2008). The feeder road SPSP supports the Road Maintenance Strategy (2008) and supports districts to undertake feeder road rehabilitation and maintenance, and therefore follows GoR’s Decentralization Policy/ Decentralization Implementation Plan (DIP).

The SPSP will take full consideration of cross-cutting issues such as gender equality (National Gender Policy 2004), community development (Community Development Policy 2008), rural employment through the National Labor-intensive Public Works Strategy (HIMO, April 2008), good governance, health and safety, HIV/AIDS, Youth, and Environment following the conclusions of a Strategic Environmental Assessment (SEA).

The main governmental stakeholders involved are: The Ministry of Agriculture and Animal Resources (MINAGRI), which owns the strategy; the District Administrations through which the budget is channeled and are also the implementing agencies, with the oversight of the Ministry of Local Government (MINALOC); technical responsibility is assigned to the Ministry of Infrastructure (MININFRA) through its Rwanda Transport Development Agency (RTDA).¹

2.3 Related Programs and Development Partners Activities

In 2010, the Government of Rwanda (GoR) started discussion with Development Partners for the implementation of the rural feeder roads development program. The GoR had committed to start the implementation of the program of rural feeder roads by fiscal year 2013/2014 while also addressing the Millennium Development Goal targets: making effective contributions to successful

¹ *Feeder Roads Prioritization study, FWC Beneficiaries 2013 -LOT 2: Transport and Infrastructure, EuropeAid/132633/C/SER/multi, Specific-Contact-ToRs.*

implementation of SPAT III, provision of rural employment as well as modernizing and commercializing agriculture for ultimately increased social, economic, and environmental transformation of Rwanda.

Currently the feeder roads sub-sector is supported by various Development Partners (DPs):

- The Netherlands Embassy has supported, through NGOs, rural feeder roads rehabilitation since 2002. A third phase of road rehabilitation, maintenance and capacity building in five districts (Gicumbi, Burera, Musanze, Nyamasheke and Rusizi) has been formulated, approved and is ongoing.
- The World Bank has funded studies and the rehabilitation and upgrading of around 270 km of rural feeder roads in four districts (Gisagara, Rwamagana, Karongi and Nyamasheke).
- United States Agency for International Development (USAID) has provided a basket fund of 50 million USD that is managed by the World Bank. The project will now be formulated with the launch of the feasibility study.
- International Fund for Agricultural Development (IFAD) supports Kirehe district to develop its rural feeder roads as part of Kirehe Community-based Watershed Management Project (KWAMP).
- African Development Bank (AfDB) supports multinational roads developments in Rwanda and as part of those projects the rehabilitation of surrounding rural feeder roads is also being taken up.

2.4 Project and Contract information

Under Contract Nr. 2015/365195, FWC BENEFICIARIES 2013 – LOT 2: Transport & Infrastructures, EuropeAid/132633/C/SER/multi, PLANET S.A. was selected by EU to conduct Feeder Roads Prioritization Study.

2.5 Description and Objectives of the Current Study

The description of the specific objectives for this assignment as stated in the SToRs is presented below:

- Assist concerned districts in selecting around 500 km feeder roads in each district to be upgraded during the next period starting from FY 2016-2017 with a target of enhancing agricultural markets;
- Assist concerned districts in prioritizing around 250 km feeder roads to be upgraded during the next period starting from FY 2016-2017 up to next 10 years with a target of enhancing agricultural markets.

2.6 Specific Terms of Reference and Study Objectives

The Consultant approaches this assignment with a clear understanding of the global and specific objectives outlined in the “Specific Terms of References (SToRs)”. The seven European Union (EU) Target Districts for the Study are Ngoma, Bugesera, Huye, Muhanga, Ngororero, Rulindo and Rubavu (Figure 1: Location Map).



Figure 1: Location Map

2.7 Scope of services

In compliance with the SToRs, the required outputs of the study are:

- Prioritization methodology of feeder roads based on a Multi-Criteria Analysis (MCA) and on a cost effectiveness analysis (CEA or cost per beneficiary);
- Short description of each district's geographic, agricultural, economic, transport and social characteristics;
- In each district, the definition in collaboration with the district authorities of a district priority network of about 500 km which will include all classified roads and a number of priority unclassified roads using GIS based maps;
- In each district, the selection based on the prioritization methodology of a programme of about 250 km of priority feeder roads to be developed over the next ten years;
- The preparation of a more detailed description and cost estimation for the development of at least 50 km of feeder roads to be implemented over the next two FY 2016-17 and 2017-18.

2.8 Rationale of the study

The current practice in Feeder Roads selection for rehabilitation or upgrade by Districts relies exclusively on providing access to remote local entities (land locked area) only or farming activities only without examining multiple objectives. There is not set of common criteria used with a standardized approach by all districts in the feeder roads prioritization for improvement.

The present study developed a prioritization methodology of feeder roads based on a Multi-Criteria Analysis, which evaluates each road segment on a set of criteria and indicators (Road Network Technical Parameters, Economic Efficiency, and Social Impact) derived from the various national and local goals and objectives.

The present study, by developing a prioritization methodology based on Multi-criteria Analysis Approach, will provide all districts and other key stakeholders a standardized planning tool which has the following advantages: - accommodate multiple criteria in the analysis, - incorporation of both qualitative and quantitative information, - allows the direct involvement of multiple experts, interest groups and stakeholders, - analysis is transparent to participants, and provide consistency of the judgements made.

3.0 STUDY IMPLEMENTATION AND ACTIVITIES

3.1 Project Team

The Study was carried out by Mr. Kinagoto Nanadoum, KE1/Team Leader, Road Engineer/GIS Analyst and Mr. David NKURUNZIZA, KE2/GIS Road Expert & Geomatics Engineer. Before returning to Kigali for the one-day Draft Final Report validation workshop which took place on March 16, 2016, the Team Leader was deployed to Rwanda from October 13, 2015 to February 5, 2016. Through the assignment, the Team Leader maintained open communication with the Project Manager, ensuring that EU's needs are met in a timely and effective manner. Mr. Stelios Logothetis, Project Manager–Infrastructure Development Services Group and other PLANET S.A. Greece-based staff provided home office support to the project.

3.2 Deliverables

Consistent with the Terms of the reference and PLANET S.A 's technical methodology, the following deliverables were submitted to the Client: Draft/Final Inception Report, Multi-Criteria Analysis Methodology Document, and Draft/Final Report.

3.2.1 Weekly Progress Reports

The Team Leader submitted to the Project Manager weekly project progress reports in order to keep EU and key stakeholders informed on the status of study and collect feedback on critical issues.

3.2.2 Multi-Criteria Analysis Methodology

The Consultant developed a prioritization methodology and the implementation of such an approach which uses a linear additive multi-criteria approach where the weights of the criteria are derived using the Analytic Hierarchy Process (AHP). The methodology of feeder roads prioritization is based on a Multi-Criteria Analysis (MCA) and on a Cost Effectiveness Analysis (CEA or cost per beneficiary). The draft MCA document (Annex 10 to the Inception Report) was submitted on November 13, 2015. The final version of the Multi-Criteria Analysis Methodology (which incorporated comments and revisions from stakeholders), submitted on December 14, 2015, was officially approved on January 20, 2016.

3.2.3 Inception Report

As required by the SToRs, the draft Inception Report submitted on November 11, 2015 was validated during a one-day Workshop hosted at MINAGRI, Kigali on November 17, 2015.

The Minutes of the Inception Report Workshop are presented in Annex A1. The final version of the Inception Report submitted on December 14, 2015, was officially approved on January 20, 2016.

3.2.4 Final Report

Consultant prepared and submitted a draft Final Report on 09.03.2016, which summarizes the activities of the study, a short description of achievements including problems encountered, and presents results of the analysis and finally provided recommendations. The Consultant presented the draft Final Report to the stakeholders during a one-day Workshop, which took place on the 16.03.2016 in MINAGRI premises. The Final Report is submitted one (1) week after the reception of comments from the EU Project Manager.

3.3 Implementation of the study

3.3.1 Kick-Off Meeting

The Kick-Off Meeting on Feeder Roads Prioritization Study was held on Tuesday, October 13, 2015. Due to flight delay, the Team Leader who arrived in Kigali on October 13, 2015 in the evening was not able to attend the meeting. The Consultant was represented by KE2/GIS Road Expert, Mr. David NKURUNZIZA.

3.3.2 Consultations with Key Stakeholders

The study was conducted in close collaboration with beneficiary districts through field visits, workshop, work sessions, exchange of data and documents (templates, work maps), and regular communications (e-mail, text-message, & phone calls).

In order to meet the objectives and deliver the requirements of the SToRs and ensure that all parties are kept fully-informed of decisions made, PLANET S.A. Team worked in close coordination with the main governmental stakeholders: Ministry of Agriculture and Animal Resources (MINAGRI), Ministry of Infrastructure (MININFRA), and Rwanda Transport Development Agency (RTDA) with whom multiple technical and briefing meetings were held. The consultant met and exchanged views with Development Partners in the feeder roads sub-sector: Netherlands Feeder Roads Program, World Bank and USAID.

3.3.3 Field Visits and work sessions in Districts

The Consultant conducted visits and held meetings with District Executive Secretary, Feeder Roads Engineer, and other Technical staff in the target districts. During the preliminary visits, the items covered are listed below:

- Presentation of the scope of study and specific objectives to the District.
- Discussion on the following items and data needed by the Consultant:
 - Reports, data, and map documents on social and economic infrastructures (school, health centers, markets, etc.) available;
 - Review of agricultural areas, future developments, and district master plan, if available;

- Agricultural and animal production data by sector, consumption & volume to market for the last 2 to 5 years;
- Environmental considerations (encroachment in historical/cultural areas, right-of-way acquisition, parks, protected areas, wetlands, etc.);
- Necessary information to be used to prepare a geographic, agricultural, economic, transport and social characteristics description of the district;
- District and community ranking and share views on how best the gender, and youth considerations can be included in this process (women and youth's prioritization of road segments);
- Overall objective of the project being to contribute to poverty reduction. Examined cells or sectors with vulnerable communities and discussed the way to integrate them in the roads prioritization exercise;
- Selection by District, with Consultant's assistance, of a priority network of about 500 km including all classified roads and a number of priority unclassified roads. The district road network was defined using GIS data or maps.

3.3.4 Technical Meeting & Workshops

The Inception Report was presented at a workshop in Kigali on November 17, 2015.

The workshop was aiming to validate the Inception Report. One of the key components of Inception Report is the multi criteria analysis (MCA) methodology used for the prioritization of feeder roads.

3.3.5 Methodology and Approach to the Assignment

Crucial to the success of this assignment was the involvement of all the stakeholders. In order to meet the objectives, deliver the requirements of the SToRs, and ensure that all parties are kept fully informed of decisions made, Consultant initiated and followed close:

- coordination with the main governmental stakeholders
- involvement of Rwanda Transport Development Agency (RTDA)
- consultation with development partners
- working relation with the seven (7) beneficiary districts.

3.3.6 Activities Performed

3.3.6.1 Policies and Keys Documents

Consultant compiled and performed desk review of Policies and Key Documents. MINAGRI and RTDA made available most of the documents. A non-exhaustive list of documents reviewed is shown in Annex 13.

3.3.6.2 Data Collection

Consultant acquired GIS data relevant to the study from GoR's institutions. The data layers compiled, in geodatabase, were used to develop the draft work maps submitted to districts. A "Facilitation Letter" provided to the Consultant by MINAGRI helped greatly in the contacts and data collection process.

3.3.6.3 Working documents

To assist districts in the selection of 500 km for the prioritization process, Consultant prepared a detailed road network GIS based map. Printed copies of the draft work map (on A0 size paper) were sent to District Feeder Roads Engineers. In order to ensure consistency in the format of data to be collected, Consultant submitted to districts the following templates: Status of recent, on-going, and planned Feeder Roads Rehabilitation Projects, List of District Proposed Road segments to be used for prioritization, Agricultural & livestock Production Data statistics.

A draft list of indicators for the Multi-Criteria Analysis, to be used in the feeder road prioritization prepared by the Consultant and submitted to districts and other stakeholders with expected feedback on the proposed draft list of indicators.

3.3.6.4 MCA Methodology document

The Multi-Criteria Analysis Methodology (Annex 10 of the Final Inception Report) developed by the Consultant and approved on January 20, 2016 was used for the prioritization of feeder roads rehabilitation or upgrade as stated in the Specific Terms of References.

3.3.6.5 GIS Database

Consultant collected from target District the inventory list of Feeder Roads and created a geodatabase with proposed FR feature class. GIS base map features relevant for the analysis were added to the geodatabase.

3.3.6.6 Data Processing, Inputs, Prioritization Computation and Analysis

Using data collected, Consultant performed prioritization using Multi-Criteria Analysis and Cost Effectiveness, as described in the approved MCA Methodology document.

3.3.7 Persons meet during Study

A non-exhaustive list of persons met during the course of the study is presented in Annex 12.

3.4 Milestones, revised work schedule, and keys Dates

The proposed work schedule submitted with the final inception report and revised in January 2016. The Milestones and key dates are listed below:

Table 4: Milestones/ Revised submission date of deliverables

Events/Deliverables	Submission/Date (Day, d-m-yy)	Responsibility	Approval Date (Day, d-m-yy)
Kick-off Meeting	Tuesday, 13-Oct-15	EU/MINAGRI/Consultant	
Draft Inception Report	Tuesday, 12-Nov-15	Consultant	
One-Day Draft Inception Report Validation Workshop	Thursday, 17-Nov-2015	EU/MINAGRI/Consultant	
Final Inception Report	Friday, 24-Nov-15	Consultant	20-Jan-2016
Draft Report	Monday, 10-March-16	Consultant	
One-Day- Draft Final Report Validation Workshop	Monday, 16-March-2016	EU/MINAGRI/Consultant	
Final Report	Thursday, 07-April-16	Consultant	

4.0 CONTEXT OF THE STUDY AND KEY CONCEPT

A Feeder Roads Development Policy and Strategy (FRDPS) is under development. Consultant has made all effort to align the “Feeder Roads Prioritization Study” with FRDPS. It is critical to mention that proposed changes such as, for example: road network hierarchy, design standards, which have not been adopted, is difficult to be implemented at this point in the current study.

4.1 Definition of Feeder Roads

Regardless of the hierarchal classification of roads in Rwanda, roads linking agricultural areas with commercial centers and/or processing plants either paved or unpaved are defined as “Feeder roads”¹

As indicated in the SToRs, in each district, in close collaboration with Feeder Roads Engineer, a district priority network of feeder roads which include classified roads and a number of priority unclassified roads was determined. The proposed feeder roads network in each district was defined using GIS based maps.

4.2 Prioritization & Type of Interventions

As stated by the SToRs, the purpose of the study is to prioritized feeder roads for rehabilitation and/or upgrading works. The feeder roads recently rehabilitated and on-going FR projects were not included in the analysis.

4.3 Design Guidelines & Standards

Consultant reviewed the following key documents: - RS 267-1 2015 Feeder Roads /Guidelines for design, - and RS 267-2 2015 Feeder Roads/Guidelines for maintenance published by Rwanda Standards Board (RSB). The current standards used in the technical engineering design feeder road projects were considered in this study.

4.4 Current Situation and Practice in Feeder Roads selection by Districts

The current practice in feeder roads selection for rehabilitation or upgrade by districts is described in paragraph 2.8.

The rehabilitation or upgrade of feeder roads in seven (7) target districts with EU funding is on-going.

¹ RS 267-1 2015 Feeder Roads - Guidelines for Design, Rwanda Standards Board (RSB), 2015.

A traffic counts on selected feeder roads upgraded /rehabilitated within all districts supported by EU were conducted in 2015. The total length covering is 203.52 Km. The final report on manual traffic counts conducted by ITEC ENGINEERING Rwanda was made available to the Consultant.

The RTDA conducted Road Inventory and Condition Assessment (RICA) on feeder roads to 768.93 Km, in total, in seven (7) districts. The final report was made available to the Consultant. The IRI values presented in the report were added to the feeder roads feature class developed by the Consultant.

5.0 FEEDER ROADS PRIORITIZATION APPROACH

5.1 Multi-Criteria Analysis (MCA) Methodology²

The consultant developed a prioritization methodology which uses a linear additive Multi-Criteria Analysis Approach where the weights of the criteria are derived using the Analytic Hierarchy Process (AHP).

As stipulated in the approved MCA Methodology document, the weighting of the criteria is critical to the analysis results. As the assignment of weights relies heavily on the judgment of the different key players (stakeholders and experts), methods have been developed to deal with the problem of subjectivity and to move away from open-biases towards certain criteria. Saaty's AHP/Eigenvector³ is a widely accepted method, which is based on the hierarchical representation of the criteria and on the comparison of these criteria in pairs ("pairwise comparison"). In order to create a broad consensus on the comparative importance among criteria, Consultant developed questionnaires with a document, which explained the concept and what is requested from the respondents. The Pairwise Comparison Questionnaire, appended to the MCA Methodology document, is presented in Annex 8 of this report. The MINAGRI decided do not follow the pairwise comparisons approach and instead of this to adopt MCA indicators, scoring and weighting (presented in MCA Methodology document) during technical meeting held at MINAGRI on December 3, 2015. Even now, it is important if MINAGRI decides to share the questionnaires for weighting of the criteria and indicators with all the stakeholders including the non-EU districts, provided that the analysis of data collected is useful for the future revision and update of the MCA Methodology or any related research papers.

The Multi-Criteria Analysis Methodology (Annex 10 of the Final Inception Report) developed by the Consultant and approved on January 20, 2016 was used for the prioritization of feeder roads rehabilitation and/or upgrade based of MCA and Cost Effectiveness or Cost Per Beneficiary Indicator, as stated in the Specific Terms of Reference. The whole process is supported by a Geographical Information System (GIS).

² Republic of Rwanda, Feeder Roads Prioritization Study, Contract No. 2015/365195, Multi-Criteria Analysis Methodology, EU-funded. December 2015, PLANET S.A.

³ Saaty, T. *The Analytic Hierarchy Process*. New York: McGraw-Hill, 1988.

Figure 2 on the next page shows the MCA Criteria/ Indicators, and Weighting Flowchart.

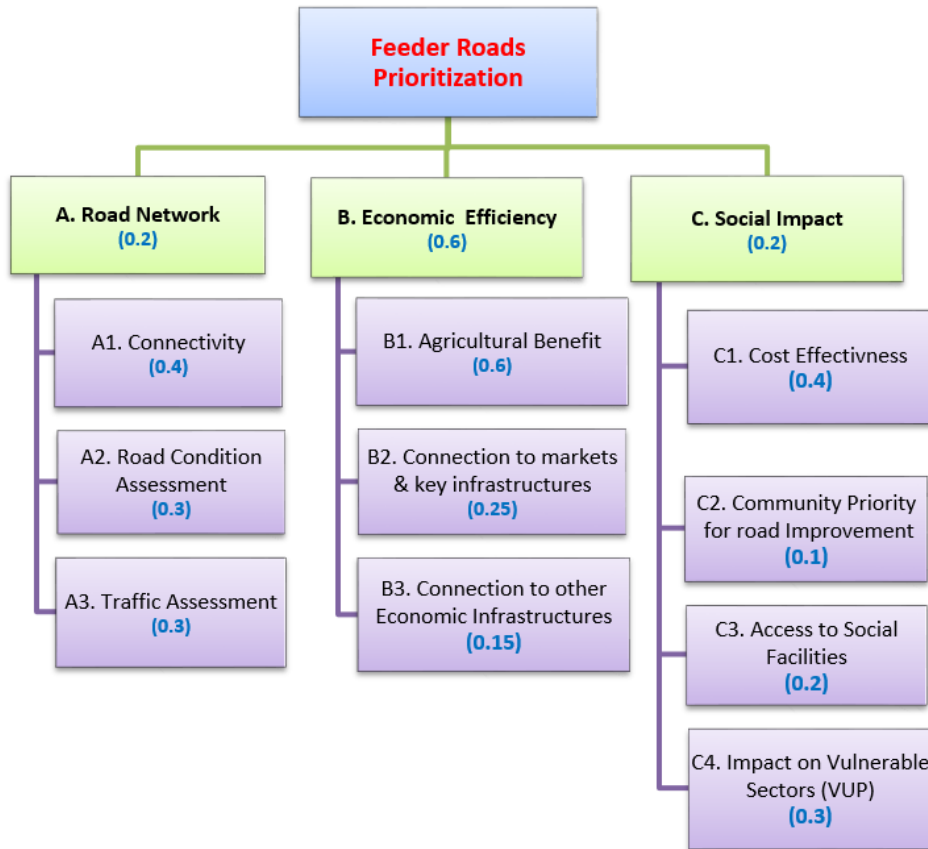


Figure 2: Criteria/ Indicators, and Weighting Flowchart

5.2 Feeder Roads Prioritization Analysis in EU Supported Districts

5.2.1 Feeder Roads under evaluation

It is important to stress the fact that, regardless of the hierarchal classification of roads in Rwanda, roads linking agricultural areas with commercial centers and/or processing plants either paved or unpaved are defined as “Feeder roads”.

In close collaboration with Feeder Roads Engineer, a district priority network of feeder roads which includes classified roads and a number of priority unclassified roads was determined using inventory lists of roads and GIS based A0 paper format maps provided by Planet SA.

5.2.2 Compliance with National Land Use as Government Policy

Using ArcGIS/ArcMap, each feeder road under evaluation was displayed over the Land Use image feature. The proposed feeder roads network does not conflict with the National Land Use Plan,

which is available to the Consultant. During appraisal, feasibility, and technical design, detailed environment study any non-compliance issues will identify and appropriate measures to be taken.

5.2.3 Creation of Feeder Roads Feature Class and Geodatabase

After a laborious and time consuming process, Consultant built for each District, a geodatabase of proposed feeder roads network, critical for spatial and geoprocessing analysis using GIS capabilities on which the Feeder Roads Master can be built. The database can be used in the future for feeder roads' asset management and maintenance plan by Districts and RTDA.

The proposed Feeder Roads feature class was created from *All_Roads* shapefile obtained by Consultant during the data collection phase of the study. The topology of the feeder roads under evaluation was reviewed and the connectivity of each segment to the road network verified and corrected when necessary. Among several attributes created for the road features, the Road_ID is essential for identification and spatial localization. The Feeder Road segment identifier is based on the FR-DIS-Unique Number format where FR stands for Feeder Road, DIS, the three first letters of the District name, and Unique Number an integer, unique number for a given District. For example, FR-HUY-37 where FR = Feeder Road, HUY = Huye District, and 37 is a unique identifier number.

Due to the fact that several road segments do not have names or the initial name became irrelevant because the topology of the feature was modified, Consultant generated automatically road name list based on the smallest administrative entity, Village GIS Layer.

The starting and ending points feature classes for each road segment was generated.

The list of all fields available in the Feeder Road Layers' Attribute Table (AT) is shown in Annex 6.

The reference classified roads network (national roads paved, national roads unpaved, district class 1, draft version of district class 2), provided by Rwanda Transport Development Agency (RTDA) was essential for the definition of the proposed Feeder Roads in each District. The feeder roads recently rehabilitated and on-going projects are recorded in the database but were not included in the prioritization analysis.

The geodatabase also contains the following base map data layers: - Administrative (Country border line, Provinces, Districts, Sectors, Cells, Imidugudu/ Villages, Local offices, Major cities, Land marks, Place names); - Economic infrastructures (Markets, Trade centers, Plants, Coffee washing stations, Milk collection centers, Metallic silos, Rice mills, Warehouses, Sugar factory,

Tea factories, LWH infrastructures, RSSP rice scheme, RSSP infrastructures...); - Social infrastructures (Education facilities, Health facilities); - Physical infrastructures (Powerlines, Power plants); - Environment, Physical infrastructures (National parks, Protected areas, Wetlands, Land use); - Climate & Hydrology (Rivers, Lakes, Aquatic lands, Weather stations, Watersheds, ...); - Thematic features (Geological features, Soil types/Depth); - Topographic (90 m Digital Elevation Model, Contour lines, Raster topographic maps).

In addition, the following tabular data collected were linked to proper GIS layers' attribute tables: Sectors' based census demographic data collected from National Institute of Statistics of Rwanda (NISR); Agricultural production by sectors provided by Districts; Feeder roads condition assessment, traffic assessment, Community's priority for feeder roads improvement, and vulnerable sectors data provided using survey forms provided by Consultant.

5.3. Data Collection, Process, Input and Assumptions

The data input required to perform the prioritization exercise are described on Table 3 (pages 15 to 18) of the approved MCA Methodology document. Table 3 (Annex 7) describes the concept/objective, method of assessment, sources of data & information, scores, and weighting of each indicator.

The data input used for the analysis are from information provided by Districts and derived from GIS data collected by Consultant.

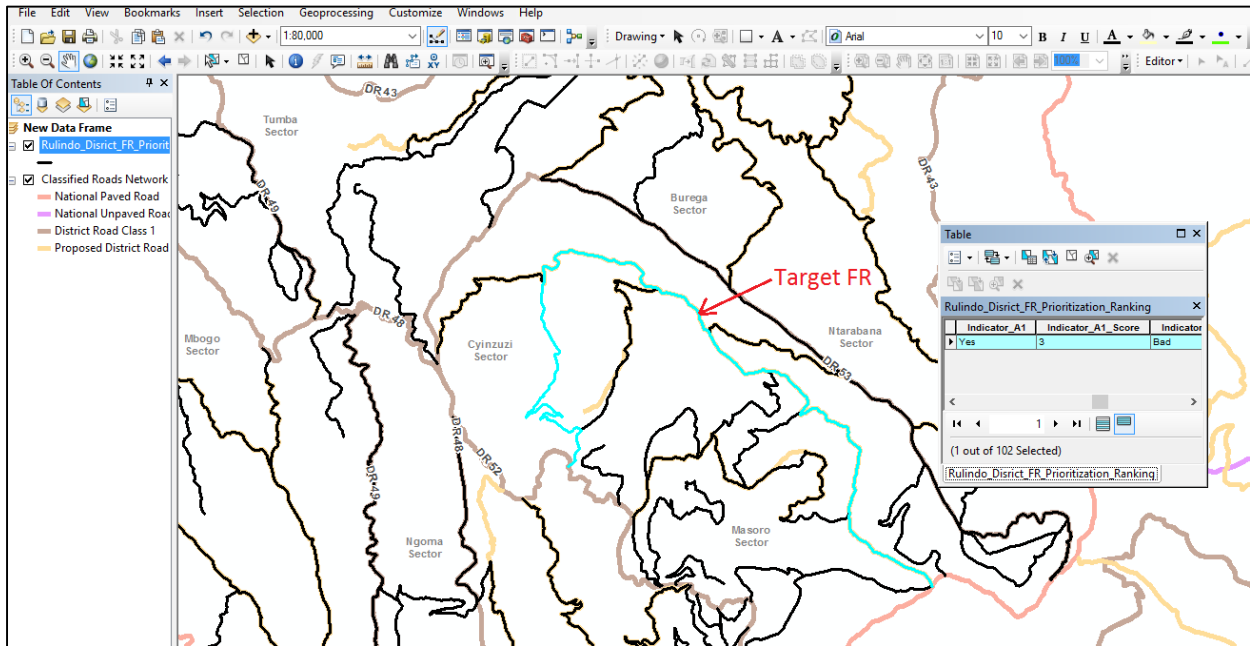
The data inputs used for the analysis are summarized below:

✓ **Criteria A: Road Network**

- *A1. Connectivity Indicator*

ArcGIS ArcMap was used to identify and determine the connectivity of each proposed feeder road segment in relation to other feeder roads and RTDA classified roads network. Is there one or more other roads intersecting or connecting to the road under evaluation? "Yes" or "No" is recorded in the Feeder Roads' Attribute Table (AT).

- If the answer is Yes, the value of 3 is assigned as a score.
- If the answer is no, it will be assigned the value 1.



Connectivity illustration

- *A2. Road Condition Assessment Indicator*

Consultant developed for district a survey form by using ArcGIS Intersect Geoprocessing tool with Feeder Roads Layers and Sector polygons as input, and generated the list of road segment in each sectors where the roads pass. The results were exported in MS Excel. A template of the Survey Form submitted to Districts is shown on Annex 1. The Road Condition Assessment data is Derived from information in filled survey form provided by Districts. The data is attached to the feeder roads feature class attribute table. The feeder road condition is classified and score as following:

- Class 1: $IRI \leq 8$ or Average Speed ≥ 60 km/h or Good condition, Score = 1
- Class 2: $8 < IRI \leq 12$ or $40 \leq$ Average speed < 60 km/h or Fair condition, Score = 2
- Class 3: $12 < IRI$ or Average Speed < 40 km/h or Bad condition, Score = 3.

- *A3. Traffic Assessment Indicator*

The information on Traffic Assessment is also collected from filled survey form provided by each District. The data is attached to the feeder roads feature class attribute table.

The volume of Vehicle Per day (VPD) is classified into four different classes and score values are assigned as following:

- $VPD = 0$, Score = 1
- $0 < VPD \leq 10$, Score = 2
- $10 < VPD \leq 50$, Score = 3
- $VPD > 50$, Score = 4

✓ Criteria B: Economic Efficiency

- *B1. Agricultural Benefits Indicator*

Market volume of major agricultural production data were provided by District. The average values, linked to the sector polygons, are used in the analysis. The volume to market per sectors surface area is computed. For a given FR under evaluation, the volume to market is computed by multiplying the volume to market density by the FR segment's Aol within the Sector. When the Feeder Road proposed for improvement crosses several Sectors, the total volume to market is obtained by adding the values for each Sector. The assumptions made by Consultant, when total production are available but not volume to market for a given District, are described in Chapter 6. The rehabilitation cost rate per kilometer, used for the evaluation of agricultural benefit and cost effectiveness indicators, is derived from historical prices of recent and on-going construction contracts in each district (Annex 2) for feeder roads as defined and based on design standards published by Rwanda Bureau of Standards (RBS)). Due to the fact that costs of feeder roads rehabilitation based of overall road condition assessment are not available, Consultant considered, for a given district, if CT1 is the rehabilitation/upgrage cost per km for a feeder road in "Bad condition", CT2 the cost rate of improvement for a road in "Fair Condition", and CT3 the cost rate of improvement for a road in "Good condition", CT2 and CT3 are evaluated as following: $CT2 = CT1 \times 80\%$ and $CT3 = CT1 \times 60\%$.

This indicator represents Agricultural Production to Market in Metric Tons in area along the road's Aol divided by the Cost of Road Improvement in \$US.

- *B2. Connection to Markets and Keys Infrastructures Indicator*

For each feeder segment proposed for improvement, the number of markets and keys infrastructures within the area of impact is determined by GIS geoprocessing (spatial join and dissolve tools) of data collected. The GIS point features used are market, minor market, trading post, MCC, rice mill, and warehouses. This indicator is related to staple crop production. The information is attached to the feeder road layers' AT. The connection to markets and key infrastructures' scores are determined, assigning values as following:

- Score = 3 if there is at least one market or key infrastructures within the Aol of feeder road to be improved
- Score =1, if not.

B3. Connection to other Economic Infrastructures Indicator

For each feeder segment proposed for improvement, the number of other economic infrastructures within the Aol is determined by geoprocessing (spatial join and dissolve tools) of GIS data collected. The GIS point features used are tea factory, coffee washing plant metallic silos ...). This indicator is related to cash crop.

The connection to other Economic Infrastructures score values are assigned as following:

- Score = 3, if the road will connect to at least one other Economic Infrastructures, and
- Score = 1, if the road will not connect to other Economic Infrastructure.

The information is attached to the feeder roads' AT.

✓ **Criteria C: Social Impact**

- *C1. Cost Effectiveness Indicator*

In order to estimate the population living within the Aol of each feeder road segment proposed for improvement, Consultant derived population density by sector from year 2012 census demographic data from National Institute of Statistics of Rwanda (NISR). The population within the Aol is computed by multiply the population density by the surface of the Aol. The total population impacted by the road under evaluation is obtained by adding the population of the sectors where the road passes. The demographic tabular data are linked to the attribute table of Sectors polygon feature class.

Cost Effectiveness Indicator = Cost of Road Improvement in \$US divided by Population living within the road's Aol. Lower value gives higher priority.

- *C2. Community Priority for Improvement Indicator*

Derived from information in filled survey forms provided by each District.

The community priority scores of road improvement are determined as following: - if the feeder road considered for improvement ranks among the 2 priorities, a score of 3 will be assigned; - if the feeder road ranks among the third or fourth, a score of 2 will be assigned if the feeder road is the last priority, a score of 1 will be assigned. If the road under evaluation traverses more than one sector, the length of the respective road stretches weights the responses of the local communities of each Sector. The data is attached to the sector polygon feature class' AT;

- *C3. Access to social facilities Indicator*

For each feeder segment proposed for improvement, the number of social facilities (Education and Health facilities) within the area of impact is determined by GIS geoprocessing of data collected. The scores are assigned as following: 3 if at least one facility is within the feeder road to be improved's Aol and 1 if there is not facility within the feeder road's Aol. The information is attached to the feeder roads' AT;

- *C4. Impact on Vulnerable Sectors Indicator*

Compiled from data provided by Districts. If the feeder road proposed for improvement passes through a vulnerable sector as decided by VUP, a score of 3 is assigned, if not a score of 1 will be assigned. If the road under evaluation traverses more than one Sector, the length of the respective road stretches weights the VUP's score for each sector. The data is attached to the sectors polygon feature class' AT.

Note: Feeder Roads Condition Assessment and traffic information collected by RTDA and ITEC ENGINEERING were not used in the analysis considering the following points: - different topology alignments of the roads survey by RTDA compare to the Feeder Roads proposed for prioritization; - localization of survey posts; - inconsistency between some findings in the RICA investigations compared to the information provided in the survey forms submitted to Consultant by Districts; -the limited segment surveyed (768.93 Km and 203.52 Km for RICA and Traffic count respectively) compared to the Feeder Roads network of 3,250 Km proposed for prioritization.

5.4. Indicator, Criteria rating Computation, and Prioritization Results

Consultant performed separately for each district, prioritization analysis and developed a list of prioritized road segments based on Multi-Criteria Analysis and Cost Effectiveness.

A Microsoft Excel Workbook was used for each District. Each Workbook contains four (4) Sheets:

- A Road Network

Collect input data, derive corresponding scores, multiply them by weight and perform computation of rating for Connectivity, Road Condition Assessment, Traffic Assessment Indicators; generate compound rating and for normalized (up to value of 3) of the compound rating for the Road Network Criteria.

- B Economic Efficiency

Entry of data and scores for Agricultural Benefit, Connection to markets/ key infrastructures, and Connection to other Economic Infrastructures Indicators, multiply by corresponding scores to get the ratings, then generate compound rating and for normalized (up to value of 3) of the compound rating for the Economic Efficiency Criteria.

- C Social Impact

Input data and scores for the following indicators: Cost Effectiveness Indicator, Community Priority for road improvement, Access to social facilities and Impact on vulnerable sector. The corresponding rating for these indicators are computed by being multiplied by the weight and then compound rating and normalized values up to 3. Based on these values the Social Impact Criteria are determined.

- MCA CEI

Summarized the normalized rating of the Road Network Criteria, the Economic Efficiency Criteria, and the Social Impact Criteria previously computed, assigned the corresponding weight, generated the compound rating. Based on the final normalized values of the compound rating, the road improvement MCA and Cost Effectiveness Indicator ranking are determined.

For the MCA, higher priority is attributed to greater final normalized compound rating. The smaller the ratio Road Improvement cost per beneficiary (\$US/ Population beneficiary) is, the higher the priority is for the Cost Effectiveness Indicator.

5.5. Sensitivity Analysis

The consequence of changes on inputs below was analyzed:

- Case 1 : Rehabilitation/Upgrade Costs Increase of 15%
- Case 2 : Decrease in Traffic Range
- Case 3 : Rehabilitation/Upgrade Costs Increase of 15% & Decrease in Traffic Range

A sample computation performed for Bugesera District (Annex 5) shows that the final ranking results are not very sensitive to the two inputs mentioned above.

5.6. Restitution and Validation

The results of the Multi-Criteria Analysis will be presented by MINAGRI (responsible for Prioritization of Feeder Roads Program) to the stakeholders and will be validated. The key stakeholders involved in that process are MINALOC/ LODA, MININFRA/ RTDA, beneficiary Districts, and Development Partners.

5.7. Phasing & Selection of feeder road segments in each district

Using the list of prioritized Feeder Roads in each target District, a subset of road segment of about 250 Km and about 50 Km of priority feeder roads to be developed over the next ten years and two fiscal years (Phase 1 & Phase 2) respectively is proposed based on the MCA ranking.

6.0 FEEDER ROADS PRIORITIZATION DEVELOPMENT

6.1 Bugesera District

6.1.1 Districts Brief Description

A short description of Bugesera District's geographic, agricultural, economic, transport infrastructure and social characteristics is presented in Annex 9.

6.1.2 Road Network and Feeder Roads Projects in the District

A road network of national road paved (48.5 Km), national road unpaved (46.9 Km), district class 1 (139.4 Km), and district class 2 (449 Km) run across the district.

6.1.3 Prioritization Analysis

6.1.3.1 Proposed Feeder Roads

A Feeder roads network of 78 segments total 623.6 Km was selected by District for the prioritization exercise. The breakdown by road classification is shown below.

District	Length Segments by Classification (Km)					Total Length (Km)
	National Road Paved	National Road Unpaved	District Class 1	District Class 2	Unclassified	
Bugesera	-	-	38.4	340.7	244.5	623.6

6.1.3.2 Data Input

The data input used for the analysis are from information provided by Bugesera District and derived from GIS data collected by Consultant, as described in paragraph 5.3.

6.1.3.3 Prioritization Analysis and Ranking Results

The prioritization list of proposed feeder roads for Bugesera District is presented on pages 37 to 42. The detailed computations of normalized rating (up to value of 3) for each indicator and criteria are shown in Annex 3.

6.1.3.4 Prioritized Feeder Roads Mapping

The prioritization ranking of the feeder roads proposed for improvement is shown on A1 format map (Annex 4). The priority rankings presented on the map are from the Multi-Criteria Analysis.

6.1.4 Subset of feeder road segments

6.1.4.1 Phasing & Selection

Subsets of prioritized feeder roads proposed are:

- for the next 10 years, 29 first ranking segments with length total 263.8 Km
- for next two fiscal years (Phase 1 & Phase 2), the 6 first segments with length total 53.9 Km. The list of these roads is presented in Table 3.1 below.

6.1.4.2 Short description of selected feeder roads

A brief description of 5 first rank Feeder Roads with length total 53.9 Km is presented below:

- The Feeder Road Rutare-Kamweru (FR-BUG-21), 9.4 km long it connects Kabasengerezi-Rutare-Ruvubu-Nyarugenge road with District Road Class 1: DR 74 in the North.
- With a length of 3.6 Km, FR-BUG-44 (Rwabusoro-Nyakabuye), connects NR7 to Kabasengerezi-Rutare-Ruvubu-Nyarugenge Road.
- FR-BUG-20 (Karambo-Byimana) has a length of 10.7 Km connects NR5 to DR74 at Byimana.
- The Feeder Road FR-BUG-22 (Kagarama-Nyabaguma) is 19.3 km long, link NR6 to DR 74.
- The Feeder Road FR-BUG-39 has a length of 5.8 km and connects Kaziramire to Rwintenderi.
- FR-BUG-38 (Rwavuningoma-Misatsi), 5.1 km links DR73 to DR74.

6.1.4.3 Cost estimate

In order to avoid underestimating the cost for rehabilitation and/or upgrading works, based on cost unit rates, this cost is derived from historical prices of recent construction contracts in the District. The estimates of the Feeder Roads Improvement' s cost for the selected about 50 km of Feeder Roads is presented in Table 5.

Table 5: Cost estimates for selected feeder roads in Bugesera District

#	Feeder Road ID	Road Name	Length (Km)	Cost/ Km (\$ US)	Estimate Cost (\$ US)	Phase
1	FR-BUG-21	Rutare - Kamweru	9.4	76,000	714,400	Phase 1 L = 23.7 Km
2	FR-BUG-44	Rwabusoro - Nyakabuye	3.6	60,800	218,880	
3	FR-BUG-20	Karambo - Byimana	10.7	60,800	650,560	
4	FR-BUG-22	Kagarama - Nyabaguma	19.3	76,000	1,466,800	Phase 2 L = 30.2 Km
5	FR-BUG-39	Kaziramire - Rwintenderi	5.8	60,800	352,640	
6	FR-BUG-38	Rwavuningoma - Misatsi	5.1	60,800	310,080	
	Total		53.9		3,713,360	

Table 6: LIST OF PRIORITIZED FEEDER ROADS/ BUGESERA DISTRICT

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-BUG-6	Kabasengerezi-Rutare-Ruvubu-Nyarugenge	1	2016/2017	Kabasengerezi-Rutare-Ruvubu-Nyarugenge	9.94	1	695,800	695,800	9.94	Phase 1 L = 23.0 Km
FR-BUG-21	Rutare-Kamweru			Rutare-Kabagugu-Ruvubu	9.41	2	658,700	1,354,500	19.35	
FR-BUG-44	Rwabusoro-Nyakabuye			Rwabusoro-Kiroba/Ruvubu	3.61	3	202,160	1,556,660	22.96	
FR-BUG-22	Kagarama-Nyabaguma	3	2018/2019	Rubwirwa-Nyamutiba-Muyenzi-Cyahafi	19.26	4	1,348,200	2,904,860	42.22	Phase 2 L = 29.0 Km
FR-BUG-7	Ruhuha-Nyaburiba-Nyarugenge	1	2016/2017	Ruhuha-Nyaburiba-Nyarugenge	9.70	5	679,000	3,583,860	51.92	
FR-BUG-20	Karambo-Byimana			Riziyeli-Nyabagendwa_Rilima	10.69	6	598,640	4,182,500	62.61	Next Phases
FR-BUG-43	Nyamirama-Nyabaguma	3	2017/2018	Kabasengerezi-Kinteko-Nyabaguma-Rubwirwa	11.61	7	812,700	4,995,200	74.22	Next Phases
FR-BUG-39	Kaziramire-Rwintenderi			Kaboshya-Gatare Rukoronko	5.83	8	326,480	5,321,680	80.05	Next Phases
FR-BUG-70	Rugarama-Biryogo	5	2019/2020		10.97	9	767,900	6,089,580	91.02	Next Phases
FR-BUG-51	Nyaruhuru-Karutabana				8.99	10	503,440	6,593,020	100.01	Next Phases
FR-BUG-62	Kabukuba-Cyingaju				6.92	11	484,400	7,077,420	106.93	Next Phases
FR-BUG-38	Rwavuningoma-Misatsi			Gatare-Mwesa-Rukoronko	5.13	12	287,280	7,364,700	112.06	Next Phases
FR-BUG-77	Gaharwa-Nemba	5	2019/2020		8.97	13	627,900	7,992,600	121.03	Next Phases
FR-BUG-23	Nyamirama-Ruhina			Kabasengerezi-Gahosha-Karwana	5.98	14	418,600	8,411,200	127.01	Next Phases
FR-BUG-35	Kamabare-Rwashangwe			Kamabare-Kidimbizi	3.43	15	240,100	8,651,300	130.44	Next Phases
FR-BUG-42	Nyabivumu-Gatare			Nyamata- Nyiramatumu-To School	13.69	16	766,640	9,417,940	144.13	Next Phases
FR-BUG-8	Gasenyi - Nemba	1	2016/2017	Gasenyi - Nemba	7.50	17	420,000	9,837,940	151.63	Next Phases
FR-BUG-10	Mareba ûRango	1	2016/2017	Mareba ΓÇôRango	8.02	18	561,400	10,399,340	159.65	Next Phases
FR-BUG-31	Runyonza-Rulindo			Cyanika-Kagunga Rulindo	5.27	19	295,120	10,694,460	164.92	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-BUG-37	Ruhuha li-Kamasonga			Ruhuha-Agatara-Kamasonga	5.48	20	383,600	11,078,060	170.40	Next Phases
FR-BUG-61	Murambi-Gakurazo				9.08	21	508,480	11,586,540	179.48	Next Phases
FR-BUG-47	Gasave-Kamabuye				8.02	22	449,120	12,035,660	187.50	Next Phases
FR-BUG-49	Kimaranzara-Rwakibirizi	5	2019/2020		12.60	23	705,600	12,741,260	200.10	Next Phases
FR-BUG-71	Rugarama-Kijuri				5.21	24	291,760	13,033,020	205.31	Next Phases
FR-BUG-58	Gihari-Cyarubazi				1.78	25	99,680	13,132,700	207.09	Next Phases
FR-BUG-15	Byimana-Nyakariba	3	2018/2019	Kamabuye-Biharagu-Murambo	16.71	26	935,760	14,068,460	223.80	Next Phases
FR-BUG-12	Kabagore-Katarara-Juru-Mugorore	1	2016/2017	Kabagore-Katarara-Juru-Mugorore	15.19	27	850,640	14,919,100	238.99	Next Phases
FR-BUG-25	Kiruhura-Karizinge			Ramiro-Mwendo-Gashora	7.74	28	433,440	15,352,540	246.73	Next Phases
FR-BUG-14	Karumuna-Nyarunazi	5	2019/2020	Karumuna-Uwarutimbo-Ntarama Sector	11.27	29	788,900	16,141,440	258.00	Next Phases
FR-BUG-69	Rwangara-Kagoma I	4	2018/2019	Rwangara/Arete-Ntarama-Kagoma	10.10	30	707,000	16,848,440	268.10	Next Phases
FR-BUG-67	Rubomborana-Rugunga			Ntarama-Rugarama-Rugunga-Gatoro-Ntarama	4.65	31	325,500	17,173,940	272.75	Next Phases
FR-BUG-50	Rugarama-Kurugenge				5.02	32	351,400	17,525,340	277.77	Next Phases
FR-BUG-19	Kanyonyomba-Mugorore	4	2018/2019	Gashora-Bisonga-Tabarari	11.29	33	632,240	18,157,580	289.06	Next Phases
FR-BUG-33	Rusagara-Nunga			Cyanika-Kidudu-Migina	9.63	34	539,280	18,696,860	298.69	Next Phases
FR-BUG-40	Cyeru-Kigarama			Bihari-Rugeyo-Kigarama	5.57	35	311,920	19,008,780	304.26	Next Phases
FR-BUG-18	Kagasera-Kagege	5	2019/2020	Kagesera-Gatanga-Shami-Rusamaza	10.03	36	702,100	19,710,880	314.29	Next Phases
FR-BUG-11	Gahembe-Kibenga -Gitagata-Nyagihunika	2	2017/2018	Gahembe-Kibenga -Gitagata-Nyagihunika	9.75	37	682,500	20,393,380	324.04	Next Phases
FR-BUG-45	Rwimikoni I-Kagomasi			Kabeza - Lanch	5.47	38	306,320	20,699,700	329.51	Next Phases
FR-BUG-56	Kagasa li-Gaharwa				4.43	39	248,080	20,947,780	333.94	Next Phases
FR-BUG-63	Cyeru-Karumuna				5.14	40	359,800	21,307,580	339.08	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-BUG-41	Rwangara-Rugunga			Rwangara-Kingabo-Kidudu	8.86	41	620,200	21,927,780	347.94	Next Phases
FR-BUG-30	Rwanza-Gatare	4	2018/2019	Rwanza-Karambi Kayumba	13.44	42	752,640	22,680,420	361.38	Next Phases
FR-BUG-34	Rusagara-Bihari				7.81	43	437,360	23,117,780	369.19	Next Phases
FR-BUG-29	Gakurazo-Nyakayenzi	4	2018/2019	Kibungo-Kivugiza-Muyange-Twimpara.	16.19	44	1,133,300	24,251,080	385.38	Next Phases
FR-BUG-17	Ikoni-Kagano			Kankoyingoma-Gatanga-Murama-Rutonde	5.75	45	402,500	24,653,580	391.13	Next Phases
FR-BUG-66	Gaharwa-Kimvubu				4.67	46	261,520	24,915,100	395.80	Next Phases
FR-BUG-60	Ngarama-Nyabivumu	4	2018/2019		17.57	47	983,920	25,899,020	413.37	Next Phases
FR-BUG-9	Nemba- Rwiminazi-Batima	2	2017/2018	Nemba- Rwiminazi-Batima	5.29	48	370,300	26,269,320	418.66	Next Phases
FR-BUG-27	Rucucu-Murambi			Nyamata-Rutobotobo-Bishweshwe	4.90	49	274,400	26,543,720	423.56	Next Phases
FR-BUG-55	Gatare-Nyiramatumu			Nyamata - Nyiramatumu	3.70	50	207,200	26,750,920	427.26	Next Phases
FR-BUG-57	Nyamata li-Gasenga I				2.87	51	160,720	26,911,640	430.13	Next Phases
FR-BUG-68	Musagara-Rusagara			Gahembe-Rusagara-Kiyogoma	6.57	52	367,920	27,279,560	436.70	Next Phases
FR-BUG-46	Gatare-Gatare				5.00	53	280,000	27,559,560	441.70	Next Phases
FR-BUG-78	Ubukoroco-Ubukoroco				4.29	54	300,300	27,859,860	445.99	Next Phases
FR-BUG-84	Nzangwa-Agahonnyo	5	2019/2020	Maburane-Nkanga-Agahonnyo	14.28	55	999,600	28,859,460	460.27	Next Phases
FR-BUG-32	Mbuganzeri-Agahonnyo	4	2018/2019	Maza-Gaharwa-Gikome-Agahonnyo	12.00	56	840,000	29,699,460	472.27	Next Phases
FR-BUG-26	Nyirarumboza-Ubukoroco			Kintambwe-Nemba	4.45	57	311,500	30,010,960	476.72	Next Phases
FR-BUG-76	Nyamata li-Gasenga I				2.34	58	131,040	30,142,000	479.06	Next Phases
FR-BUG-83	Nyamata li-Rusagara				4.29	59	240,240	30,382,240	483.35	Next Phases
FR-BUG-73	Rugando-Bihari				3.13	60	175,280	30,557,520	486.48	Next Phases
FR-BUG-82	Muyange-Nyarugati li				4.95	61	277,200	30,834,720	491.43	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-BUG-85	Rwakibirizi I-Rugando				2.26	62	126,560	30,961,280	493.69	Next Phases
FR-BUG-74	Gakurazo-Kinyovi				7.49	63	419,440	31,380,720	501.18	Next Phases
FR-BUG-16	Rusekera-Kiganwa			Rusekera-Nganwa-Ruhengeri	4.69	64	328,300	31,709,020	505.87	Next Phases
FR-BUG-75	Rusekera-Rugunga	5	2019/2020		9.90	65	693,000	32,402,020	515.77	Next Phases
FR-BUG-80	Pamba I-Kankuriyigoma				12.20	66	683,200	33,085,220	527.97	Next Phases
FR-BUG-36	Tetero-Gataraga			Gakindo-Gakamba-Bishweshwe	10.27	67	575,120	33,660,340	538.24	Next Phases
FR-BUG-28	Remera-Gasenga li	4	2018/2019	Rugazi-Muyenzi-Rwakibirizi-Kiyogoma	14.45	68	809,200	34,469,540	552.69	Next Phases
FR-BUG-59	Biryogo-Kiyogoma				9.11	69	637,700	35,107,240	561.80	Next Phases
FR-BUG-64	Cyuruhiririra-Cyuruhiririra				8.66	70	606,200	35,713,440	570.46	Next Phases
FR-BUG-54	Cyuruhiririra-Rwimikoni I	5	2019/2020		10.87	71	760,900	36,474,340	581.33	Next Phases
FR-BUG-53	Kindonyi-Gakindo	5	2019/2020		9.31	72	651,700	37,126,040	590.64	Next Phases
FR-BUG-81	Byimana-Pamba I				15.67	73	877,520	38,003,560	606.31	Next Phases
FR-BUG-24	Maburane-Ubukoroco			Rweru Maburane	4.84	74	271,040	38,274,600	611.15	Next Phases
FR-BUG-13	Batima-Mushyoroti	5	2019/2020	Batima-Mushyoroti	5.02	75	281,120	38,555,720	616.17	Next Phases
FR-BUG-79	Nemba-Ubukoroco				4.80	76	268,800	38,824,520	620.97	Next Phases
FR-BUG-65	Rutete-Kimvubu				6.22	77	348,320	39,172,840	627.19	Next Phases
FR-BUG-52	Majanja-Nyamigende				5.26	78	368,200	39,541,040	632.45	Next Phases
FR-BUG-72	Gahembe-Gahembe				4.09	79	229,040	39,770,080	636.54	Next Phases
FR-BUG-48	Kindonyi-Rwarusaku				6.64	80	371,840	40,141,920	643.18	Next Phases
					643.18					

6.2 Huye District

6.2.1 Districts Brief Description

A short description of Huye District's geographic, agricultural, economic, transport infrastructure and social characteristics is presented in Annex 9.

6.2.2 Road Network and Feeder Roads Projects in the District

A road network of national road paved (64.4 Km), national road unpaved (15.5 Km), district class 1 (117 Km), and district class 2 (312 Km) run across the district.

6.2.3 Prioritization Analysis

6.2.3.1 Proposed Feeder Roads

A Feeder roads network of 100 segments total 550.7 Km was selected by District for the prioritization exercise. The breakdown by road classification is shown below.

District	Length Segments by Classification (Km)					Total Length (Km)
	National Road Paved	National Road Unpaved	District Class 1	District Class 2	Unclassified	
Huye	-	-	38.4	171.5	340.8	550.7

6.2.3.2 Data Input & Assumption

The data input used for the analysis are from information provided by Huye District and generated from GIS data collected by Consultant, as described in paragraph 5.3.

The agricultural production data submitted by District to Consultant on February 11, 2016, did not provide volume to market except for rice for which the volume to market represents 95% of the production for a given year. Consultant assumed and used in the analysis a ratio of 0.95 (volume to market divided by total volume), by sector, for all the other products.

6.2.3.3 Prioritization Analysis and Ranking Results

The prioritization list of proposed feeder roads for Bugesera District is presented on pages 44 to 51. The detailed computations of normalized rating (up to value of 3) for each indicator and criteria are shown in Annex 3.

6.2.3.4 Prioritized Feeder Roads Mapping

The prioritization ranking of the feeder roads proposed for improvement is shown on A1 format map (Annex 4). The priority rankings presented on the map are from the Multi-Criteria Analysis.

6.2.4 Subset of feeder road segments

6.2.4.1 Phasing & Selection

Subsets of prioritized feeder roads proposed are:

- for the next 10 years, 45 first ranking segments with total length 251.2 Km
- for next two fiscal years (Phase 1 & Phase 2), the 9 first segments with total length 51.9 Km. The list of these roads is presented in Table 3.2 below.

6.2.4.2 Brief description of selected feeder roads

A brief description of 9 first rank Feeder Roads with length total 51.9 Km is presented below:

- FR-HUY-8, 5.9 km long connects Agakombe to Akakinka overlays in part on DR107.
- Feeder Road Agakombe-Ruhuha (FR-HUY-11), 2.6 km connects Rango to the District border.
- The road Kamwambi-Rugarama (FR-HUY-14) has a length of 7.3 Km links DR91 to DR94 in the North.
- FR-HUY-94, 2.5 Km long (Feeder Road Murambi-Kibirizi), connects Rubona-Nyabigugu to the District border.
- FR-HUY-101, 2.6 km long, links Mbagabaga to Rwamabare.
- FR-HUY-9 (Murambi-Cyahafi) is 12 Km long. It connects NR10 to NR1.
- Feeder Road FR-HUY-100, with a length of 5.2 km, it connects Murama to Karambo.
- FR-HUY-60 (Taba-Akagarama) has a length of 3.6 Km makes the connection between Akagarama and NR1.
- The road Bweramana-Rugerero (FR-HUY-81), 10.2 Km long, links Umuremera-Ruhinga Road to Rugerero Village.

6.2.4.3 Cost estimate

In order to avoid underestimating the cost for rehabilitation and/or upgrading works, based on cost unit rates, this cost is derived from historical prices of recent construction contracts in the District. The estimates of the Feeder Roads Improvement' s cost for the selected about 50 km of Feeder Roads is presented in Table 7.

Table 7: Cost estimates for selected feeder roads in Huye District

#	Feeder Road ID	Road Name	Length (Km)	Cost/ Km (\$ US)	Estimate Cost (\$ US)	Phase
1	FR-HUY-8	Agakombe - Akakinka	5.9	36,000	212,400	Phase 1 L = 20.9 Km
2	FR-HUY-11	Agakombe - Ruhuha	2.6	36,000	93,600	
3	FR-HUY-14	Kamwambi - Rugarama	7.3	72,000	525,600	
4	FR-HUY-94	Murambi - Kibirizi	2.5	90,000	225,000	
5	FR-HUY-101	Mbagabaga - Rwamabare	2.6	90,000	234,000	
6	FR-HUY-9	Murambi - Cyahafi	12.0	72,000	864,000	Phase 2 L = 31.0 Km
7	FR-HUY-100	Murama - Karambo	5.2	90,000	468,000	
8	FR-HUY-60	Taba - Akagarama	3.6	72,000	259,200	
9	FR-HUY-81	Bweramana - Rugerero	10.2	72,000	734,400	
	Total		51.90		2,784,600	

Table 8: LIST OF PRIORITIZED FEEDER ROADS/ HUYE DISTRICT

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-HUY-8	Agakombe-Akakinka	4	2017/2018	Rango-Kihene Bridge (Lot 2)	5.92	1	213,120	213,120	5.92	Phase 1 L = 26.02 Km
FR-HUY-14	Kamwambi-Rugarama			Kamwambi-Gasharu	7.26	2	522,720	735,840	13.18	
FR-HUY-11	Agakombe-Ruhuha	4	2017/2018	Rango-Kibirizi (Lot 1)	2.61	3	93,960	829,800	15.79	
FR-HUY-94	Murambi-Kibirizi			Murambi-Kabeza	2.45	4	220,500	1,050,300	18.24	
FR-HUY-101	Mbagabaga-Rwamabare			Mbagabaga-Rwamabare	2.61	5	234,900	1,285,200	20.85	
FR-HUY-100	Murama-Karambo			Gashikiri-Karambo	5.17	6	465,300	1,750,500	26.02	
FR-HUY-107	Mujyejuru-Butare			Bukinankwavu-Gahondo-Mujyejuru	6.79	7	611,100	2,361,600	32.81	Phase 2 L = 28.02 Km
FR-HUY-12	Rugarama-Nyagacyamu			Bweramana-Rugarama	3.77	8	339,300	2,700,900	36.58	
FR-HUY-9	Murambi-Cyahafi	4	2017/2018	Mwurire-Gako	12.03	9	866,160	3,567,060	48.61	
FR-HUY-19	Kamyuga-Mugobore			Kavumu-Nyamiyaga	5.43	10	488,700	4,055,760	54.04	
FR-HUY-16	Gakomeye-Rurembo			Gafuhisha-Kamwambi	2.37	11	213,300	4,269,060	56.41	Next Phases
FR-HUY-60	Taba-Akagarama			Mpinga-Remera-Taba	3.62	12	260,640	4,529,700	60.03	Next Phases
FR-HUY-81	Bweramana-Rugerero			Nyagacyamu-Giseke	10.21	13	735,120	5,264,820	70.24	Next Phases
FR-HUY-55	Kadahokwa-Agatovu			Agasharu-Kadahokwa-Musange	12.53	14	1,127,700	6,392,520	82.77	Next Phases
FR-HUY-29	Gikombe-Agasharu			Agasharu-Kinyinya-Karuhinda	8.82	15	793,800	7,186,320	91.59	Next Phases
FR-HUY-42	Serugenzi-Nyarunyinya			Serugenzi-Gituntu	3.43	16	308,700	7,495,020	95.02	Next Phases
FR-HUY-103	Igonde-Ntobwe			Igonde-Kirarambogo-Ntobwe	4.65	17	334,800	7,829,820	99.67	Next Phases
FR-HUY-102	Umurambi-Gitwa			Umurambi	7.44	18	669,600	8,499,420	107.11	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-HUY-96	Sogwe-Ruvugizo			Gasaka-Gihana-Sogwe	5.54	19	498,600	8,998,020	112.65	Next Phases
FR-HUY-34	Cyendajuru-Akanyana			Rugarama-Umurera-Rusuma-Ntobwe	8.75	20	787,500	9,785,520	121.40	Next Phases
FR-HUY-66	Karambo-Gasharu			Remera-Mwezi	2.43	21	218,700	10,004,220	123.83	Next Phases
FR-HUY-32	Ngobagoba-Karambi			Karambi-Karambo-Gako	5.10	22	459,000	10,463,220	128.93	Next Phases
FR-HUY-74	Rwambariro-Ruvugizo				3.27	23	294,300	10,757,520	132.20	Next Phases
FR-HUY-99	Rugarama-Murama			Rugarama-Dutare	6.85	24	493,200	11,250,720	139.05	Next Phases
FR-HUY-93	Kigarama-Karubondo			Kigarama	6.51	25	585,900	11,836,620	145.56	Next Phases
FR-HUY-86	Kigarama-Akabutora			Nyanza-Rusenyei-Rujumbura	2.47	26	222,300	12,058,920	148.03	Next Phases
FR-HUY-83	Kizi-Nyagasozzi			Mugobore-Nyamiyaga	3.54	27	318,600	12,377,520	151.57	Next Phases
FR-HUY-98	Rugarama-Nyarurama			Nyarutovu-Nyakabuye	5.73	28	412,560	12,790,080	157.30	Next Phases
FR-HUY-7	Umuyinza-Akanyana	3	2016/2017	Save-Rugogwe	7.64	29	687,600	13,477,680	164.94	Next Phases
FR-HUY-36	Karebero-Kigarama			Gasharu-Bamiro-Gihinga-Kigarama	4.91	30	441,900	13,919,580	169.85	Next Phases
FR-HUY-38	Bisambu-Ruhinga			Bisambu-Rwatsi-Ruhinga	4.06	31	292,320	14,211,900	173.91	Next Phases
FR-HUY-84	Kigarama-Rusasa			Busasa-Kinyovi-Kigarama	5.90	32	531,000	14,742,900	179.81	Next Phases
FR-HUY-108	Cyetete-Nyagatama			Cyetete-Rwezamenyo-Nyagatama	8.79	33	632,880	15,375,780	188.60	Next Phases
FR-HUY-40	Gitwa-Rupango			Rusuma-Maliza-Cyingoma	5.90	34	424,800	15,800,580	194.50	Next Phases
FR-HUY-41	Nyamirundi-Ntobwe			Gitwa-Kabakono	7.91	35	711,900	16,512,480	202.41	Next Phases
FR-HUY-10	Mujyejuru-Kigarama	4	2017/2018	Kiyovu-Cyili	7.89	36	568,080	17,080,560	210.30	Next Phases
FR-HUY-76	Shyinga-Murama				4.17	37	300,240	17,380,800	214.47	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-HUY-49	Busoro-Kamabuye			Busoro-Kamabuye	2.56	38	230,400	17,611,200	217.03	Next Phases
FR-HUY-82	Kigarama-Rubanga			Macunda-Rubanga	4.33	39	389,700	18,000,900	221.36	Next Phases
FR-HUY-39	Gatovu-Mubuga			Kabingo-Nyanzamura	8.37	40	753,300	18,754,200	229.73	Next Phases
FR-HUY-46	Nyagasozzi-Kavumu			Kabingo-Nyanzamura	6.05	41	544,500	19,298,700	235.78	Next Phases
FR-HUY-13	Rugarama-Gasharu			Gasharu-Mpaza	5.57	42	401,040	19,699,740	241.35	Next Phases
FR-HUY-79	Gakomeye-Kabirombe				3.60	43	324,000	20,023,740	244.95	Next Phases
FR-HUY-90	Karambo-Byimana			Byimana-Karambo	4.52	44	325,440	20,349,180	249.47	Next Phases
FR-HUY-30	Umuyange-Nyesonga			Nyarusange-Mavumba-Nyesonga	7.67	45	690,300	21,039,480	257.14	Next Phases
FR-HUY-69	Rwambariro-Giseke			Giseke-Gahondo-Nyabisindu	6.36	46	572,400	21,611,880	263.50	Next Phases
FR-HUY-57	Rubona-Rukubiro			Rukubiro-Rugarama-Gitwa	4.17	47	300,240	21,912,120	267.67	Next Phases
FR-HUY-33	Murambi-Rukubiro			Murambi-Gitwa	3.93	48	353,700	22,265,820	271.60	Next Phases
FR-HUY-89	Akabuga-Akagahaya			Kadahokwa-Akabuga	10.05	49	904,500	23,170,320	281.65	Next Phases
FR-HUY-71	Nyakabuye-Murango				13.55	50	1,219,500	24,389,820	295.20	Next Phases
FR-HUY-20	Nyarwumba-Nkoto			Nyarwumba-Karambi	4.59	51	413,100	24,802,920	299.79	Next Phases
FR-HUY-58	Nyamiyaga-Gatyazo			Bwegera-Nyamvumba-Nyarusange	10.78	52	970,200	25,773,120	310.57	Next Phases
FR-HUY-52	Rebo-Kabirizi			Rebo-Gituntu	7.92	53	570,240	26,343,360	318.49	Next Phases
FR-HUY-70	Ruyenzi-Rwimpundu				3.17	54	285,300	26,628,660	321.66	Next Phases
FR-HUY-25	Kavumu-Buremera				4.51	55	405,900	27,034,560	326.17	Next Phases
FR-HUY-97	Kigarama-Nyakabuye			Kagasa-Kavumu-Kamabuye	6.18	56	556,200	27,590,760	332.35	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-HUY-23	Kizi-Mpinga			Mpinga-Rutontwe-Kizi	5.81	57	418,320	28,009,080	338.16	Next Phases
FR-HUY-75	Nyarugunga-Gakoni				6.20	58	446,400	28,455,480	344.36	Next Phases
FR-HUY-24	Kagoma-Nkoto			Kangoma-Karambi	3.85	59	346,500	28,801,980	348.21	Next Phases
FR-HUY-109	Rugarama-Gakoni			Impinga-Gakoni	3.31	60	238,320	29,040,300	351.52	Next Phases
FR-HUY-26	Akaruzi-Karuhinda			Shuni-Kamunyinya	1.85	61	166,500	29,206,800	353.37	Next Phases
FR-HUY-65	Kizi-Kaburemera	3	2016/2017	Cyizi-Karama-Pont Gatobwe	25.48	62	2,293,200	31,500,000	378.85	Next Phases
FR-HUY-106	Rwambariro-Mukuzanyana			Mukuzanyana-Rwambariro	4.15	63	298,800	31,798,800	383.00	Next Phases
FR-HUY-105	Rubona-Murama			Murama-Karambo-Nyarugenge	5.78	64	520,200	32,319,000	388.78	Next Phases
FR-HUY-104	Nyamabuye-Gasharu			Gasharu-Nyamabuye	4.95	65	445,500	32,764,500	393.73	Next Phases
FR-HUY-87	Kinyovi-Kigarama			Kinyovi-Kigarama	1.81	66	162,900	32,927,400	395.54	Next Phases
FR-HUY-43	Rukubiro-Kanzeyi			Kigusa-Rukubiro	5.55	67	499,500	33,426,900	401.09	Next Phases
FR-HUY-72	Kanyurapfundo-Gasharu				3.74	68	269,280	33,696,180	404.83	Next Phases
FR-HUY-92	Rusasa-Umunyinya			Busasa-Umunyinya	2.96	69	213,120	33,909,300	407.79	Next Phases
FR-HUY-67	Nyarwumba-Rwezamenyo			Rwezamenyo-Nyarwumba	6.21	70	447,120	34,356,420	414.00	Next Phases
FR-HUY-61	Shuni-Runyinya			Nyarutovu-Rugerero-Runyinya	7.20	71	518,400	34,874,820	421.20	Next Phases
FR-HUY-88	Shingangabo-Gasunzwe			Gasunzwe-Kigarama	2.33	72	167,760	35,042,580	423.53	Next Phases
FR-HUY-35	Kabakobwa-Nyarurembo			Nyarurembo-Gasharu-Kabakobwa	4.44	73	319,680	35,362,260	427.97	Next Phases
FR-HUY-17	Kinyata-Karuhimbana			Kabakobwa-Kinyata	2.53	74	227,700	35,589,960	430.50	Next Phases
FR-HUY-48	Mubuga-Mbogo			Mbogo-Gafuhisha	3.54	75	318,600	35,908,560	434.04	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-HUY-85	Nyagisenyi-Akayenzi			Nyanza-Rusenyei-Rujumbura	3.73	76	335,700	36,244,260	437.77	Next Phases
FR-HUY-31	Kaburemera-Jali			Kigarama-Kaburemera	6.22	77	447,840	36,692,100	443.99	Next Phases
FR-HUY-91	Karubare-Shingangabo			Karubare-Bweramana	5.54	78	498,600	37,190,700	449.53	Next Phases
FR-HUY-77	Akabacura-Nyamikaba				8.50	79	765,000	37,955,700	458.03	Next Phases
FR-HUY-68	Nyarusiza-Kinombe			Nyarusange-Gasarabuye-Taba	8.77	80	789,300	38,745,000	466.80	Next Phases
FR-HUY-21	Birembo-Karebero			Birembo-Karuhimbana	3.79	81	272,880	39,017,880	470.59	Next Phases
FR-HUY-56	Karambi-Kinziramuhindo			Taba-Agasharu-Shyara	5.49	82	494,100	39,511,980	476.08	Next Phases
FR-HUY-51	Kabingo-Rebo			Kabingo-Rebo	3.23	83	290,700	39,802,680	479.31	Next Phases
FR-HUY-78	Mujyejuru-Rwambariro				3.70	84	333,000	40,135,680	483.01	Next Phases
FR-HUY-62	Shuni-Akabuga			Gatoki-Nyabubare-Agasharu	4.04	85	290,880	40,426,560	487.05	Next Phases
FR-HUY-15	Karambo-Kanyurapfundo			Karambo-Ruhinga-Kanyurapfundo	2.93	86	210,960	40,637,520	489.98	Next Phases
FR-HUY-44	Akaderege-Kagina			Ngiryi-Kagina	2.56	87	184,320	40,821,840	492.54	Next Phases
FR-HUY-47	Agahenerezo-Munanira			Kamucuzi-Karambo	4.25	88	306,000	41,127,840	496.79	Next Phases
FR-HUY-27	Gasharu-Kabicuki			Gaseke-Nyamirama	3.34	89	300,600	41,428,440	500.13	Next Phases
FR-HUY-45	Nyamirundi-Kigusa			Nyabisindu-Kanzezi	7.10	90	639,000	42,067,440	507.23	Next Phases
FR-HUY-73	Ruvugizo-Karambo				3.67	91	264,240	42,331,680	510.90	Next Phases
FR-HUY-22	Mpinga-Gatyazo			Kabirizi-Mpinga	3.32	92	239,040	42,570,720	514.22	Next Phases
FR-HUY-53	Kitazigurwa-Kabicuki			Ngiryi-Kabicuki	5.35	93	385,200	42,955,920	519.57	Next Phases
FR-HUY-59	Rugarama-Kiboga			Rugerero-Karugumya-Rugarama	7.04	94	506,880	43,462,800	526.61	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-HUY-80	Kigarama-Kiboga				8.17	95	588,240	44,051,040	534.78	Next Phases
FR-HUY-50	Rwabuye-Kagina			Ngiryi-Rwabuye	2.86	96	205,920	44,256,960	537.64	Next Phases
FR-HUY-28	Rwezamenyo-Kinyana			Magonde-Kinyana	4.42	97	318,240	44,575,200	542.06	Next Phases
FR-HUY-18	Nyamiyaga-Nyantende			Nyantende-Rebo	5.56	98	500,400	45,075,600	547.62	Next Phases
FR-HUY-63	Akabuga-Akakanyamanza			Akabuga-Akakanyamanza	3.83	99	275,760	45,351,360	551.45	Next Phases
FR-HUY-95	Kamabuye-Munyu			Kagasa-Kavumu-Kamabuye	3.85	100	346,500	45,697,860	555.30	Next Phases
FR-HUY-54	Gashikiri-Gahanga			Gahanga-Kigoma	3.07	101	221,040	45,918,900	558.37	Next Phases
					558.37					

6.3 Muhanga District

6.3.1 Districts Brief Description

A short description of Muhanga District's geographic, agricultural, economic, transport infrastructure and social characteristics is presented in Annex 9.

6.3.2 Road Network and Feeder Roads Projects in the District

A road network of national road paved (66.9 Km), national road unpaved (63.3 Km), district class 1 (150.9 Km), and district class 2 (255.1 Km) run across the district.

6.3.3 Prioritization Analysis

6.3.3.1 Proposed Feeder Roads

A Feeder roads network of 75 segments total 389.1 Km was selected by District for the prioritization exercise. The breakdown by road classification is shown below.

District	Length Segments by Classification (Km)					Total Length (Km)
	National Road Paved	National Road Unpaved	District Class 1	District Class 2	Unclassified	
Muhanga	-	-	23.1	180.6	185.5	389.1

6.3.3.2 Data Input

The data input used for the analysis are from information provided by Muhanga District and generated from GIS data collected by Consultant, as described in paragraph 5.3.

6.3.3.3 Prioritization Analysis and Ranking Results

The prioritization list of proposed feeder roads for Bugesera District is presented on pages 54 to 58. The detailed computations of normalized rating (up to value of 3) for each indicator and criteria are shown in Annex 3.

6.3.3.4 Prioritized Feeder Roads Mapping

The prioritization ranking of the feeder roads proposed for improvement is shown on A1 format map (Annex 4). The priority rankings presented on the map are from the Multi-Criteria Analysis.

6.3.4 Subset of feeder road segments

6.3.4.1 Phasing & Selection

Subsets of prioritized feeder roads proposed are:

- for the next 10 years, first 48 ranking segments with total length 250.0 Km

- for next two fiscal years (Phase 1 & Phase 2), the 8 first segments with total length 57.7 Km. The list of these roads is presented in Table 3.3 below.

6.3.4.2 Brief description of selected feeder roads

A short description of 8 first rank Feeder Roads with length total 57.7 Km is presented below:

- FR-MUH-35 Road, 2.2 Km long, connects Murambi to Nyagasozi.
- The Feeder Road Nyarusiza-Karama (FR-MUH-48) has a length of 2.1 Km links FR-MUH-4 to NR1.
- FR-MUH-46 (Biti-Gifumba), 4.3 km long, connects FR-MUH-53 to NR15.
- The Feeder Road Cyakabiri-Musenyi (FR-MUH-72), 11.7 Km long, links Mubuga-Ntwari Road to NR 17.
- The Feeder Road FR-MUH-40 (Kamazuru-Muremberi), 3.6 Km long, connects FR-MUH-4 to NR 1.
- FR-MUH-79, 8.9 Km long connects Gasharu to Karengye Village on NR1.
- FR-MUH-69 (Gifurwe to Rugogwe Road), 8.1 Km long, starts at Gifurwe on NR17, passes near Rubona then Rugogwe, and connect back to NR17.
- The Feeder Road Kabakungu-Rukoma (FR-MUH-11), has a length of 16.8 km, it connects FR-MUH-2 to NR17.

6.3.4.3 Cost estimate

In order to avoid underestimating the cost for rehabilitation and/or upgrading works, based on cost unit rates, this cost is derived from historical prices of recent construction contracts in the District. The estimates of the Feeder Roads Improvement' s cost for the selected 50 km of Feeder Roads is presented below.

Table 9: Cost estimates for selected feeder roads in Muhanga District

#	Feeder Road ID	Road Name	Length (Km)	Cost/ Km (\$ US)	Estimate Cost (\$ US)	Phase
1	FR-MUH-35	Murambi - Nyagasozi	2.2	45,600	100,320	Phase 1 L = 23.9 Km
2	FR-MUH-48	Nyarusiza - Karama	2.1	45,600	95,760	
3	FR-MUH-46	Biti - Gifumba	4.3	45,600	196,080	
4	FR-MUH-72	Cyakabiri - Musenyi	11.7	45,600	533,520	
5	FR-MUH-40	Kamazuru - Muremberi	3.6	45,600	164,160	Phase 2 L = 33.8 Km
6	FR-MUH-79	Karengye - Gasharu	8.9	91,200	811,680	
7	FR-MUH-69	Gifurwe - Rugogwe	8.1	91,200	738,720	
8	FR-MUH-11	Kabakungu - Rukoma	16.8	91,200	1,532,160	
		Total	57.7		4,172,400	

Table 10: LIST OF PRIORITIZED FEEDER ROADS/ MUHANGA DISTRICT

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-MUH-35	Murambi-Nyagasozi				2.22	1	101,342	101,342	2.22	Phase 1 L = 36.6 Km
FR-MUH-48	Nyarusiza-Karama				2.10	2	95,750	197,092	4.32	
FR-MUH-46	Biti-Gifumba				4.35	3	198,207	395,299	8.67	
FR-MUH-5	Rehabilitation Of Bakokwe-Kiyumba-Nyabarongo	1	2016-2017	Rehabilitation Of Bakokwe-Kiyumba-Nyabarongo	27.98	4	3,189,720	3,585,019	36.65	
FR-MUH-4	Miguramo-Mpanda-Gihuma, Kabgayi-Misizi	4	2017-2018	Miguramo-Mpanda-Gihuma, Kabgayi-Misizi	22.57	5	2,572,980	6,157,999	59.22	Phase 2 L = 22.6 Km
FR-MUH-72	Cyakabiri-Musenyi				11.69	6	532,940	6,690,939	70.91	Next Phases
FR-MUH-79	Kareng-Gasharu				8.89	7	810,396	7,501,336	79.79	Next Phases
FR-MUH-40	Kamazuru-Muremberu				3.62	8	164,861	7,666,197	83.41	Next Phases
FR-MUH-69	Gifurwe-Rugogwe				8.06	9	735,352	8,401,549	91.47	Next Phases
FR-MUH-11	Kabakungu-Rukoma				16.82	10	1,533,621	9,935,170	108.29	Next Phases
FR-MUH-3	Rugeramigozi-Kinini-Ramba	3	2017-2018	Rugeramigozi-Kinini-Ramba	8.05	11	917,700	10,852,870	116.34	Next Phases
FR-MUH-58	Gatika-Kamugina				3.88	12	353,454	11,206,324	120.21	Next Phases
FR-MUH-36	Matoshya-Musekera				5.91	13	538,658	11,744,982	126.12	Next Phases
FR-MUH-60	Nyarucyamu Iii-Rutenga				1.85	14	168,794	11,913,776	127.97	Next Phases
FR-MUH-42	Gasenyi-Nyakabingo				2.40	15	218,530	12,132,306	130.37	Next Phases
FR-MUH-13	Kamazuru-Kavumu				2.48	16	226,574	12,358,880	132.85	Next Phases
FR-MUH-71	Cyakabiri-Gatwa				3.03	17	276,733	12,635,612	135.88	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-MUH-22	Rushenyi-Nyabikenke				4.71	18	536,653	13,172,265	140.59	Next Phases
FR-MUH-41	Kabakungu-Rugogwe				2.76	19	315,138	13,487,404	143.36	Next Phases
FR-MUH-6	District Office-Gatenzi Valley	2	2017-2018	District Office-Gatenzi Valley	16.64	20	1,896,960	15,384,364	160.00	Next Phases
FR-MUH-7	Karenge-Musezero				3.34	21	304,831	15,689,195	163.34	Next Phases
FR-MUH-38	Nyagacyamu-Ruhina				8.23	22	750,860	16,440,054	171.57	Next Phases
FR-MUH-33	Mugwato-Kidahwe				6.38	23	727,070	17,167,125	177.95	Next Phases
FR-MUH-28	Gifurwe-Musenye				4.40	24	501,475	17,668,599	182.35	Next Phases
FR-MUH-30	Kabeza-Kanyanza				2.08	25	189,937	17,858,537	184.43	Next Phases
FR-MUH-37	Kaziba-Kaziba				1.78	26	203,203	18,061,740	186.21	Next Phases
FR-MUH-18	Nete-Kinyenkanda				2.50	27	228,452	18,290,192	188.72	Next Phases
FR-MUH-47	Biti-Gasharu				2.31	28	210,626	18,500,819	191.03	Next Phases
FR-MUH-67	Gihuma-Gifumba				6.63	29	604,512	19,105,331	197.66	Next Phases
FR-MUH-32	Gasharu-Kirenge				2.96	30	270,385	19,375,715	200.62	Next Phases
FR-MUH-29	Ruvumera-Kinyenkanda				2.08	31	189,988	19,565,703	202.70	Next Phases
FR-MUH-14	Nyarucyamu Iii-Rugarama				2.65	32	241,647	19,807,350	205.35	Next Phases
FR-MUH-44	Fumbwe-Musagara				3.69	33	420,128	20,227,478	209.04	Next Phases
FR-MUH-53	Kumukenke-Gifumba				4.46	34	407,055	20,634,533	213.50	Next Phases
FR-MUH-45	Buhoro-Rubona				7.72	35	879,715	21,514,248	221.22	Next Phases
FR-MUH-23	Rubona-Kaziba				5.67	36	646,345	22,160,593	226.89	Next Phases
FR-MUH-68	Kamazuru-Gifumba				4.21	37	384,056	22,544,649	231.10	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-MUH-70	Mubuga-Musagara				6.85	38	780,873	23,325,522	237.95	Next Phases
FR-MUH-56	Mubuga-Ntwari				11.35	39	1,293,864	24,619,386	249.30	Next Phases
FR-MUH-19	Cyakabiri-Nundwe				6.40	40	729,754	25,349,140	255.70	Next Phases
FR-MUH-16	Rwinkindi-Kabare				9.37	41	854,872	26,204,012	265.07	Next Phases
FR-MUH-21	Kabimbura-Nyanza				5.58	42	508,903	26,712,915	270.65	Next Phases
FR-MUH-20	Nyanza-Kagitaba				3.88	43	353,420	27,066,335	274.53	Next Phases
FR-MUH-43	Kibumba-Nyarubuye				8.41	44	766,733	27,833,068	282.94	Next Phases
FR-MUH-26	Remera-Mapfundo				7.11	45	648,111	28,481,179	290.04	Next Phases
FR-MUH-66	Musasa-Munzereri				3.98	46	453,442	28,934,621	294.02	Next Phases
FR-MUH-17	Peru-Cyakabiri				10.73	47	489,113	29,423,734	304.75	Next Phases
FR-MUH-27	Rwigerero-Muremberu				3.52	48	320,692	29,744,426	308.26	Next Phases
FR-MUH-81	Cyanika-Nyabuhoro				5.15	49	469,992	30,214,418	313.42	Next Phases
FR-MUH-73	Kumukenke-Kabingo				4.94	50	450,333	30,664,751	318.35	Next Phases
FR-MUH-80	Nyarugenge-Mbirizi				3.40	51	310,309	30,975,059	321.76	Next Phases
FR-MUH-55	Musengo-Bwiza				3.90	52	355,279	31,330,338	325.65	Next Phases
FR-MUH-75	Takwe-Munini				3.56	53	324,515	31,654,853	329.21	Next Phases
FR-MUH-62	Bwiza-Nyabisindu				2.74	54	312,824	31,967,677	331.96	Next Phases
FR-MUH-34	Jabiro-Cyiciro				3.97	55	362,289	32,329,966	335.93	Next Phases
FR-MUH-50	Kanyungura-Mataba				4.90	56	446,807	32,776,773	340.83	Next Phases
FR-MUH-82	Karama-Murama				8.22	57	749,234	33,526,007	349.04	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-MUH-61	Naganiro-Munzereri				4.19	58	381,861	33,907,868	353.23	Next Phases
FR-MUH-76	Gitima-Munzereri				10.17	59	927,547	34,835,415	363.40	Next Phases
FR-MUH-51	Rwabagenzi-Gakomeye				6.75	60	615,480	35,450,895	370.15	Next Phases
FR-MUH-57	Nyahinda-Gitima				2.77	61	252,718	35,703,613	372.92	Next Phases
FR-MUH-74	Munazi-Jandari				12.95	62	1,181,040	36,884,653	385.87	Next Phases
FR-MUH-25	Mucyamo-Karambo				4.97	63	453,257	37,337,910	390.84	Next Phases
FR-MUH-31	Namankurwe-Gasaka				1.79	64	163,589	37,501,499	392.63	Next Phases
FR-MUH-39	Kivomo-Nyahinda				2.52	65	230,149	37,731,648	395.16	Next Phases
FR-MUH-59	Gahabwa-Murama				4.83	66	440,725	38,172,372	399.99	Next Phases
FR-MUH-64	Gitima-Ruhuha				3.15	67	287,010	38,459,382	403.14	Next Phases
FR-MUH-15	Kiyoro-Kabeza				16.20	68	738,851	39,198,233	419.34	Next Phases
FR-MUH-77	Kanyungura-Mataba				4.02	69	366,439	39,564,672	423.36	Next Phases
FR-MUH-52	Nyarushora-Gasave				5.10	70	464,667	40,029,339	428.45	Next Phases
FR-MUH-8	Murambi-Rukamiro				2.77	71	252,758	40,282,097	431.22	Next Phases
FR-MUH-9	Rukamiro-Murambi				4.26	72	388,691	40,670,788	435.49	Next Phases
FR-MUH-65	Kanka-Muheta				4.72	73	430,528	41,101,316	440.21	Next Phases
FR-MUH-54	Nyirabwayi-Kinyoni				6.01	74	548,389	41,649,705	446.22	Next Phases
FR-MUH-12	Rukamiro-Murambi				3.75	75	427,526	42,077,231	449.97	Next Phases
FR-MUH-63	Kanyungura-Ntenderi				2.76	76	125,676	42,202,907	452.73	Next Phases
FR-MUH-49	Rwambariro-Kagarama				2.01	77	229,197	42,432,103	454.74	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-MUH-10	Remera-Gitega				2.67	78	243,546	42,675,650	457.41	Next Phases
FR-MUH-24	Vugo-Rukurazo				6.92	79	630,932	43,306,581	464.32	Next Phases
					464.32					

6.4 Ngoma District

6.4.1 Districts Brief Description

A short description of Ngoma District's geographic, agricultural, economic, transport infrastructure and social characteristics is presented in Annex 9.

6.4.2 Road Network and Feeder Roads Projects in the District

A road network of national road paved (33.5 Km), national road unpaved (42.9 Km), district class 1 (71.8 Km), and district class 2 (415.4 Km) run across the district.

6.4.3 Prioritization Analysis

6.4.3.1 Proposed Feeder Roads

A Feeder roads network of 65 segments total 476.4 Km was selected by District for the prioritization exercise. The breakdown by road classification is shown below.

District	Length Segments by Classification (Km)					Total Length (Km)
	National Road Paved	National Road Unpaved	District Class 1	District Class 2	Unclassified	
Ngoma	-	2.8	0.0	304.5	169.1	476.4

6.4.3.2 Data Input

The data input used for the analysis are from information provided by Ngoma District and derived from GIS data collected by Consultant, as described in paragraph 5.3.

6.4.3.3 Prioritization Analysis and Ranking Results

The prioritization list of proposed feeder roads for Bugesera District is presented on pages 61 to 64. The detailed computations of normalized rating (up to value of 3) for each indicator and criteria are shown in Annex 3.

6.4.3.4 Prioritized Feeder Roads Mapping

The prioritization ranking of the feeder roads proposed for improvement is shown on A1 format map (Annex 4). The priority rankings presented on the map are from the Multi-Criteria Analysis.

6.4.4 Subset of feeder road segments

6.4.4.1 Phasing & Selection

Subsets of prioritized feeder roads proposed are:

- for the next 10 years, first 34 ranking segments with total length 254.3 Km

- for next two fiscal years (Phase 1 & Phase 2), the 6 first segments with total length 50 Km. The list of these roads is presented in Table 3.4 below.

6.4.4.2 Short description of selected feeder roads

A brief description of 6 first rank Feeder Roads with length total 50 Km is presented below:

- FR-NGO-50, 5.6 km, starts at Nkingi connects to NR 6 at Rwanyabiranga.
- FR-NGO-40 is 5.7 Km long, it links Umucyo to Rwanyabiranga, it makes a loop that starts at NR 6, pass at Kumureng and connect back to NR6.
- The Feeder Road Iryarurengo-Ruyema I (FR-NGO-16), 4.9 Km long, connets NR 6 to Gako – Amabumba Road (FR-NGO-42).
- FR-NGO-54 (Rurama-Nyaruhanga), 4.2 Km connects FR-NGO-59 to Gitesanyi – Gituku (FR-NGO-4).
- The Feeder Road FR-NGO-59 has a length of 10.3 Km. It links Sake to Gashanga on NR4.
- The Feeder Road Nyagataba-Kabeza (FR-NGO-63), 19.3 Km long connects NR 4 to NR 25 on the North.

6.4.4.3 Cost estimate

In order to avoid underestimating the cost for rehabilitation and/or upgrading works, based on cost unit rates, this cost is derived from historical prices of recent construction contracts in the District. The estimates of the Feeder Roads Improvement' s cost for the selected 50 km of Feeder Roads is presented below.

Table 11: Cost estimates for selected feeder roads in Ngoma District

#	Feeder Road ID	Road Name	Length (Km)	Cost/ Km (\$ US)	Estimate Cost (\$ US)	Phase
1	FR-NGO-50	Rwanyabiranga - Nkingi	5.6	28,000	156,800	Phase 1 L = 20.4 Km
2	FR-NGO-40	Umucyo - Rwanyabiranga	5.7	56,000	319,200	
3	FR-NGO-16	Iryarurengo - Ruyema I	4.9	28,000	137,200	
4	FR-NGO-54	Rurama - Nyaruhanga	4.2	70,000	294,000	Phase 2 L = 29.6 Km
5	FR-NGO-59	Gashanga - Sake	10.3	70,000	721,000	
6	FR-NGO-63	Nyagataba - Kabeza	19.3	70,000	1,351,000	
		Total	50.0		2,979,200	

Table 12: LIST OF PRIORITIZED FEEDER ROADS/ NGOMA DISTRICT

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-NGO-50	Rwanyabiranga - Nkingi				5.63	1	157,640	157,640	5.63	Phase 1 L = 39.5 Km
FR-NGO-59	Gashanga - Sake		2017/2018	Kigabiro-Rurenge	10.29	2	720,300	877,940	15.92	
FR-NGO-54	Rurama - Nyaruhanga				4.22	3	295,400	1,173,340	20.14	
FR-NGO-63	Nyagataba - Kabeza				19.33	4	1,353,100	2,526,440	39.47	
FR-NGO-40	Umucyo - Rwanyabiranga				5.70	5	319,200	2,845,640	45.17	Phase 2 L = 24.66 Km
FR-NGO-55	Rukizi - Kigabiro				4.93	6	345,100	3,190,740	50.10	
FR-NGO-3	Rwakandari - Rango		2016/2017	Kazo-Mutenderi	14.03	7	982,100	4,172,840	64.13	
FR-NGO-73	Cyanyunga - Mutukura				10.92	8	764,400	4,937,240	75.05	Next Phases
FR-NGO-1	Kabimba - Ruhama		2016/2017	Gakuto-Nyinya	5.90	9	413,000	5,350,240	80.95	Next Phases
FR-NGO-75	Cyabayagara - Ruhama				10.13	10	709,100	6,059,340	91.08	Next Phases
FR-NGO-64	Kanzenze - Gatare				12.60	11	882,000	6,941,340	103.68	Next Phases
FR-NGO-16	Iryarurenge - Ruyema I				4.92	12	137,760	7,079,100	108.60	Next Phases
FR-NGO-58	Kanyinya - Rukizi				9.39	13	657,300	7,736,400	117.99	Next Phases
FR-NGO-20	Cyanyunga - Kibaya				3.73	14	208,880	7,945,280	121.72	Next Phases
FR-NGO-49	Kigobe - Gashekasheke li				5.79	15	405,300	8,350,580	127.51	Next Phases
FR-NGO-65	Mabuga I - Isovu				2.30	16	128,800	8,479,380	129.81	Next Phases
FR-NGO-60	Nyagataba - Mpandu				6.69	17	468,300	8,947,680	136.50	Next Phases
FR-NGO-39	Gitesanyi - Nyagasozzi				13.37	18	935,900	9,883,580	149.87	Next Phases
FR-NGO-23	Gakuto - Akabakanda				9.83	19	550,480	10,434,060	159.70	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-NGO-62	Sagatare - Rwabuconco				2.86	20	200,200	10,634,260	162.56	Next Phases
FR-NGO-74	Ryinteko - Murambi				8.29	21	580,300	11,214,560	170.85	Next Phases
FR-NGO-72	Kirundo - Kigarama				10.31	22	721,700	11,936,260	181.16	Next Phases
FR-NGO-38	Kacyiru - Cyizihira				2.67	23	186,900	12,123,160	183.83	Next Phases
FR-NGO-13	Nyamata - Icyakabiri				12.25	24	686,000	12,809,160	196.08	Next Phases
FR-NGO-10	Rwakanuma - Karama		2017/2018	Karama-Kirwa-Musya	15.76	25	1,103,200	13,912,360	211.84	Next Phases
FR-NGO-21	Nyakagezi - Cyanyunga		2017/2018	Birenga-Tunduti	8.16	26	571,200	14,483,560	220.00	Next Phases
FR-NGO-69	Kamwiru - Rugarika				2.70	27	189,000	14,672,560	222.70	Next Phases
FR-NGO-53	Isangano - Urukoki				10.32	28	722,400	15,394,960	233.02	Next Phases
FR-NGO-45	Kaguruka - Kabimba				9.02	29	631,400	16,026,360	242.04	Next Phases
FR-NGO-17	Agatonde - Nyagasozzi				10.61	30	742,700	16,769,060	252.65	Next Phases
FR-NGO-27	Gasebeya - Rugando				3.45	31	241,500	17,010,560	256.10	Next Phases
FR-NGO-48	Kabeza - Gisunzu				6.86	32	480,200	17,490,760	262.96	Next Phases
FR-NGO-36	Gasebeya - Rugando				5.68	33	397,600	17,888,360	268.64	Next Phases
FR-NGO-24	Gitesanyi - Ntovi				4.71	34	131,880	18,020,240	273.35	Next Phases
FR-NGO-61	Rugenge - Nyamirembe				6.00	35	420,000	18,440,240	279.35	Next Phases
FR-NGO-68	Kamwiru - Rwakanuma				3.38	36	236,600	18,676,840	282.73	Next Phases
FR-NGO-6	Jyambere - Mpembwe		2017/2018	Zaza-Sangaza	6.87	37	480,900	19,157,740	289.60	Next Phases
FR-NGO-67	Rango - Shyagashya				7.79	38	545,300	19,703,040	297.39	Next Phases
FR-NGO-70	Akabaya - Umurambi				7.59	39	425,040	20,128,080	304.98	Next Phases
FR-NGO-56	Rango - Karama				2.81	40	196,700	20,324,780	307.79	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-NGO-22	Rebero - Gahondo				4.80	41	336,000	20,660,780	312.59	Next Phases
FR-NGO-29	Mpandu - Rugenge				8.97	42	627,900	21,288,680	321.56	Next Phases
FR-NGO-18	Murindwa - Karisizo				3.93	43	275,100	21,563,780	325.49	Next Phases
FR-NGO-51	Rwamuhimbura - Umusebeya				6.05	44	423,500	21,987,280	331.54	Next Phases
FR-NGO-46	Rusumbantwari - Karibu				7.47	45	522,900	22,510,180	339.01	Next Phases
FR-NGO-41	Gashekasheke li - Karibu				5.70	46	399,000	22,909,180	344.71	Next Phases
FR-NGO-30	Kamvumba - Rugazi				3.80	47	266,000	23,175,180	348.51	Next Phases
FR-NGO-57	Rwamutabazi - Icyakabiri				5.53	48	387,100	23,562,280	354.04	Next Phases
FR-NGO-42	Gako - Amabumba				14.90	49	1,043,000	24,605,280	368.94	Next Phases
FR-NGO-14	Kabeza - Sugira				7.80	50	546,000	25,151,280	376.74	Next Phases
FR-NGO-11	Ngara - Kanega				4.34	51	243,040	25,394,320	381.08	Next Phases
FR-NGO-19	Nyarurembo - Umukoni				3.07	52	171,920	25,566,240	384.15	Next Phases
FR-NGO-71	Kazo - Rwamuhimbura				10.24	53	716,800	26,283,040	394.39	Next Phases
FR-NGO-12	Kabeza - Makoma				6.01	54	420,700	26,703,740	400.40	Next Phases
FR-NGO-33	Nyamabuye - Cyizihira				9.88	55	553,280	27,257,020	410.28	Next Phases
FR-NGO-34	Nyamabuye - Kinihira				7.44	56	520,800	27,777,820	417.72	Next Phases
FR-NGO-44	Kaguruka - Bukiranzuki				1.11	57	77,700	27,855,520	418.83	Next Phases
FR-NGO-31	Ntovi - Vunga				30.16	58	1,688,960	29,544,480	448.99	Next Phases
FR-NGO-15	Agasave - Ruyema li				4.29	59	240,240	29,784,720	453.28	Next Phases
FR-NGO-28	Umuka - Murama				5.89	60	412,300	30,197,020	459.17	Next Phases
FR-NGO-47	Rukumberi - Kagarama				20.86	61	1,460,200	31,657,220	480.03	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-NGO-25	Mfune - Ruyenzi				3.80	62	266,000	31,923,220	483.83	Next Phases
FR-NGO-26	Rugarama - Umukoma				8.40	63	588,000	32,511,220	492.23	Next Phases
FR-NGO-52	Rusave - Rugaju				5.38	64	376,600	32,887,820	497.61	Next Phases
FR-NGO-35	Karambi - Bwiza				2.18	65	122,080	33,009,900	499.79	Next Phases
FR-NGO-37	Kigoma - Uruhuha				3.41	66	238,700	33,248,600	503.20	Next Phases
FR-NGO-43	Ruyema li - Rukizi				4.63	67	324,100	33,572,700	507.83	Next Phases
FR-NGO-66	Rebezo - Misange		2017/2018	Rubona-Gatonde	7.56	68	529,200	34,101,900	515.39	Next Phases
FR-NGO-32	Irarire - Akagoma				3.56	69	249,200	34,351,100	518.95	Next Phases
					518.95					

6.5 Ngororero District

6.5.1 Districts Brief Description

A short description of Ngororero District's geographic, agricultural, economic, transport infrastructure and social characteristics is presented in Annex 9.

6.5.2 Road Network and Feeder Roads Projects in the District

A road network of national road paved (57.8 Km), national road unpaved (0 Km), district class 1 (191.3 Km), and district class 2 (167.8 Km) run across the district.

6.5.3 Prioritization Analysis

6.5.3.1 Proposed Feeder Roads

A Feeder roads network of 48 segments total 397.3 Km was selected by District for the prioritization exercise. The breakdown by road classification is shown below.

District	Length Segments by Classification (Km)					Total Length (Km)
	National Road Paved	National Road Unpaved	District Class 1	District Class 2	Unclassified	
Ngororero	-	-	69.8	150.9	176.7	397.4

6.5.3.2 Data Input & Assumption

The data input used for the analysis are from information provided by Ngororero District and derived from GIS data collected by Consultant, as described in paragraph 5.3.

6.5.3.3 Prioritization Analysis and Ranking Results

The prioritization list of proposed feeder roads for Bugesera District is presented on pages 67 to 69. The detailed computations of normalized rating (up to value of 3) for each indicator and criteria are shown in Annex 3.

6.5.3.4 Prioritized Feeder Roads Mapping

The prioritization ranking of the feeder roads proposed for improvement is shown on A1 format map (Annex 4). The priority rankings presented on the map are from the Multi-Criteria Analysis.

6.5.4 Subset of feeder road segments

6.5.4.1 Phasing & Selection

Subsets of prioritized feeder roads proposed are:

- for the next 10 years, 26 first ranking segments with total length 254.2 Km

- for next two fiscal years (Phase 1 & Phase 2), the 4 first segments with total length 59.3 Km. The list of these roads is presented in Table 3.5 below.

6.5.4.2 Brief description of selected feeder roads

A short description of 4 first rank Feeder Roads segments with length total 59.3 Km is presented below:

- The Feeder Road Nshano-Mugobati (FR-NGR-15), 9.4 Km long, links DR19 to the District border.
- FR-NGR-48 (Butezi-Murimba Road) has a length of 18 Km. It connects Kiregamazi-Kimisagara Road (FR-NGR-4) to NR 16.
- FR-NGR-37, 10.5 km long, connects Sanzare to Ruherahere on both sides of Nshano-Kazuba (FR-NGR-2) Road.
- The Feeder Road FR-NGR-33 (Nshano-Murambi) is 21.4 Km long. It connects....DR24 TO NR16.

6.5.4.3 Cost estimate

In order to avoid underestimating the cost for rehabilitation and/or upgrading works, based on cost unit rates, this cost is derived from historical prices of recent construction contracts in the District. The estimates of the Feeder Roads Improvement' s cost for the selected 50 km of Feeder Roads is presented below.

Table 13: Cost estimates for selected feeder roads in Ngororero District

#	Feeder Road ID	Road Name	Length (Km)	Cost/ Km (\$ US)	Estimate Cost (\$ US)	Phase
1	FR-NGR-15	Nshano - Mugobati	9.4	149,000	1,400,600	Phase 1 L = 27.4 Km
2	FR-NGR-48	Butezi - Murimba	18.0	119,200	2,145,600	
3	FR-NGR-37	Sanzare - Ruherahere	10.5	119,200	1,251,600	Phase 2 L = 31.9 Km
4	FR-NGR-33	Nshano - Murambi	21.4	149,000	3,188,600	
		Total	59.3		7,986,400	

Table 14: LIST OF PRIORITIZED FEEDER ROADS/ NGORORERO DISTRICT

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-NGR-15	Nshano-Mugobati			Mahembe-Mugogo	9.41	1	1,402,090	1,402,090	9.41	Phase 1 L = 30.85 Km given that FR-NGR-4 is on-going and will extend in FY 2016-2017.
FR-NGR-4	Kiregamazi-Kimisagara	2	On-going: 2015-2016-2017	Kazabe-Rubaya-Kabaya	58.10	2	6,925,520	8,327,610	67.51	
FR-NGR-33	Nshano-Murambi				21.44	3	3,194,560	11,522,170	88.95	
FR-NGR-37	Sanzare-Ruherahere				10.49	4	1,250,408	12,772,578	99.44	Phase 2 L = 28.53 Km
FR-NGR-48	Butezi-Murimba				18.04	5	2,150,368	14,922,946	117.48	
FR-NGR-40	Gitarama-Kirwa				3.57	6	531,930	15,454,876	121.05	Next Phases
FR-NGR-19	Rugeyo-Nkuri				5.86	7	873,140	16,328,016	126.91	Next Phases
FR-NGR-2	Nshano-Kazuba	2	On-going: 2015-2016-2017	Muhanda-Rutagara-Mutake	30.36	8	3,618,912	19,946,928	157.27	Next Phases
FR-NGR-25	Rugarambiro-Kaseke			Nyange-Kibanda-Gashubi	12.40	9	1,847,600	21,794,528	169.67	Next Phases
FR-NGR-20	Mukaragata-Kiregamazi			Kanogo-Kibingo-Butiza-Kiregamazi-Muhororo Hospital	5.38	10	801,620	22,596,148	175.05	Next Phases
FR-NGR-49	Kansi-Bushyogero				9.70	11	1,156,240	23,752,388	184.75	Next Phases
FR-NGR-5	Nkuri-Karehe	3	2017-2018	Gatumba-Bwira	6.53	12	972,970	24,725,358	191.28	Next Phases
FR-NGR-42	Rukeri-Ruhuha				3.47	13	517,030	25,242,388	194.75	Next Phases
FR-NGR-41	Murambi-Nkuri				27.65	14	3,295,880	28,538,268	222.40	Next Phases
FR-NGR-10	Mukaragata-Gatwa	3	2017-2018		6.57	15	978,930	29,517,198	228.97	Next Phases
FR-NGR-44	Nyamatanga-Ntebeyinuma				5.84	16	870,160	30,387,358	234.81	Next Phases
FR-NGR-18	Kabuga-Gasasa				17.91	17	2,668,590	33,055,948	252.72	Next Phases
FR-NGR-35	Kabuga-Mukaka				8.80	18	1,311,200	34,367,148	261.52	Next Phases
FR-NGR-26	Muturagara-Kazuba			Cyasenge-Bukunzi	7.27	19	1,083,230	35,450,378	268.79	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-NGR-43	Mitabo-Bwoga			Mwendo-Muhanda	8.50	20	1,266,500	36,716,878	277.29	Next Phases
FR-NGR-52	Murambi-Kabasare				3.78	21	563,220	37,280,098	281.07	Next Phases
FR-NGR-36	Buyungu-Kabeza				11.70	22	1,743,300	39,023,398	292.77	Next Phases
FR-NGR-14	Bugobora-Merabuye			Mwendo-Muhanda	9.74	23	1,451,260	40,474,658	302.51	Next Phases
FR-NGR-29	Kanyinya-Rukaragata			Kagogo-Mubuga	14.21	24	2,117,290	42,591,948	316.72	Next Phases
FR-NGR-13	Nyamugari-Kabingo			Kinanira-Muramba	7.40	25	1,102,600	43,694,548	324.12	Next Phases
FR-NGR-12	Rebero-Nyamweru	3	2017-2018		3.24	26	482,760	44,177,308	327.36	Next Phases
FR-NGR-28	Kibingo-Kiregamazi				3.98	27	593,020	44,770,328	331.34	Next Phases
FR-NGR-8	Nganzo-Buhiro				5.42	28	807,580	45,577,908	336.76	Next Phases
FR-NGR-53	Rubaya-Rubaya				9.31	29	1,387,190	46,965,098	346.07	Next Phases
FR-NGR-31	Nyakagezi-Kabeza			Rutenga-Rubona	6.56	30	977,440	47,942,538	352.63	Next Phases
FR-NGR-21	Kabagari-Nyamiyaga			Gahenerezo-Gitwa	7.81	31	1,163,690	49,106,228	360.44	Next Phases
FR-NGR-23	Kigarama-Rutsiro			Hindiro-Muramba	6.37	32	949,130	50,055,358	366.81	Next Phases
FR-NGR-27	Gasumo-Kasumo			Rutoyi-Gashubi	8.74	33	1,041,808	51,097,166	375.55	Next Phases
FR-NGR-38	Burorero-Gatomvu				6.77	34	1,008,730	52,105,896	382.32	Next Phases
FR-NGR-46	Kazuba-Ntaruko				5.35	35	797,150	52,903,046	387.67	Next Phases
FR-NGR-6	Butare-Kimisagara	3	2017-2018		4.26	36	634,740	53,537,786	391.93	Next Phases
FR-NGR-3	Huriro-Kaseke	2	On-going: 2015-2016-2017	Gatega-Gashonyi-Rubagabaga	14.74	37	1,757,008	55,294,794	406.67	Next Phases
FR-NGR-16	Kabuga-Kabuga			Ruhanga-Rukubi	13.33	38	1,986,170	57,280,964	420.00	Next Phases
FR-NGR-11	Zegenya-Muzi	4	2018-2019		4.81	39	716,690	57,997,654	424.81	Next Phases
FR-NGR-39	Bugobora-Gaseke	4	2018-2019	Nyange-Gashubi	9.51	40	1,416,990	59,414,644	434.32	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-NGR-50	Nyarusange-Vungu			Gasesa-Memorial Site	3.39	41	505,110	59,919,754	437.71	Next Phases
FR-NGR-9	Bwihe-Karambo			Kivumu-Nyamirambo	8.09	42	1,205,410	61,125,164	445.80	Next Phases
FR-NGR-22	Karama-Nyange			Turamigina-Karama	5.67	43	844,830	61,969,994	451.47	Next Phases
FR-NGR-47	Karama-Kabusunzu				7.08	44	1,054,920	63,024,914	458.55	Next Phases
FR-NGR-34	Ngugu-Gasharu				5.21	45	776,290	63,801,204	463.76	Next Phases
FR-NGR-32	Mpara-Nyabigogoro	3	2017-2018	Kesho-Gapfunsi-Bweru	6.81	46	1,014,690	64,815,894	470.57	Next Phases
FR-NGR-45	Birambo-Muzi			Ruhunga-Muzi	4.93	47	734,570	65,550,464	475.50	Next Phases
FR-NGR-54	Rwamiko-Kaseke				6.57	48	978,930	66,529,394	482.07	Next Phases
FR-NGR-30	Giko-Giko				7.43	49	1,107,070	67,636,464	489.50	Next Phases
FR-NGR-51	Giko-Gaseke				3.23	50	481,270	68,117,734	492.73	Next Phases
FR-NGR-17	Rutonde-Cyajongo			Rutonde-Runyoni	7.79	51	1,160,710	69,278,444	500.52	Next Phases
					500.52					

6.6 Rubavu District

6.6.1 Districts Brief Description

A short description of Rubavu District's geographic, agricultural, economic, transport infrastructure and social characteristics is shown in Annex 9.

6.6.2 Road Network and Feeder Roads Projects in the District

A road network of national road paved (32.1 Km), national road unpaved (41.5 Km), district class 1 (85.9 Km), and district class 2 (129.7 Km) run across the district.

6.6.3 Prioritization Analysis

6.6.3.1 Proposed Feeder Roads

A Feeder roads network of 128 segments total 421.5 Km was selected by District for the prioritization exercise. The breakdown by road classification is shown below.

District	Length Segments by Classification (Km)					Total Length (Km)
	National Road Paved	National Road Unpaved	District Class 1	District Class 2	Unclassified	
Rubavu	-	0.5	29.6	85.4	306.1	421.5

6.6.3.2 Data Input & Assumption

The data input used for the analysis are from information provided by Rubavu District and derived from GIS data collected by Consultant, as described in paragraph 5.3.

Rubavu district did not provide market volume of the agricultural data. The analysis of agricultural production data for Ngororero District (close to Rubavu District) shows that 70% of the production goes to market. This ratio was used to estimate the market volume of the agricultural production for Rubavu District.

6.6.3.3 Prioritization Analysis and Ranking Results

The prioritization list of proposed feeder roads for Bugesera District is presented on pages 76 to 79. The detailed computations of normalized rating (up to value of 3) for each indicator and criteria are shown in Annex 3.

6.6.3.4 Prioritized Feeder Roads Mapping

The prioritization ranking of the feeder roads proposed for improvement is shown on A1 format map (Annex 4). The priority rankings presented on the map are from the Multi-Criteria Analysis.

6.6.4 Subset of feeder road segments

6.6.4.1 Phasing & Selection

Subsets of prioritized feeder roads proposed are:

- for the next 10 years, 73 first ranking segments with total length 253.6 Km
- for next two fiscal years (Phase 1 & Phase 2), the 12 first segments with total length 50.2 Km. The list of these roads is presented in Table 3.6 below.

6.6.4.2 Short description of selected feeder roads

A short description of 12 first rank Feeder Roads segments with length total 50.2 Km is presented below:

- FR-RUB-38 (Mizingo-Nyabishongo Road) 3.9 Km, connects DR32 to NR2.
- FR-RUB-100 (Mareru-Nyamikongi) has a length of 2.3 Km. It links DR32 to NR2.
- The Feeder Road FR-RUB-84 only 1.9 Km long, connects Tamira to Nangurubibi.
- FR-RUB-82, 2.2 length, connects.... Tetero to DR 32 (Rebero).
- The Feeder Road Kabumba-Ryarukara (FR-RUB-43) 4.1 Km long links DR 32 to the District border.
- FR-RUB-22 has a length of 2.4 Km. It connects Kanyamitura to DR 33 (Marumba).
- FR-RUB-47, 4.3 Km long connects Gisura to DR32 (Gahanika).
- The Feeder Road FR-RUB-20 (Mutegengeri-Kabumba), 3.8 km long, connects DR32 to NR18.
- FR-RUB-2 named Kavumu-Kabumba Feeder Road is 15.4 km long. It links NR 18 in the South to DR 32.
- FR-RUB-108 (Kitagabwa-Gihira Road), 1.7 Km long, connects NR18 to DR32.
- The Feeder Road Gakomero-Kabumba (FR-RUB-41) has a length of 4.5 Km, links NR18 to DR 32.
- The Feeder Road FR-RUB-37, 3.7 Km long, links Gitega to DR32 at Karagarago.

6.6.4.3 Cost estimate

In order to avoid underestimating the cost for rehabilitation and/or upgrading works, based on cost unit rates, this cost is derived from historical prices of recent construction contracts in the District. The estimates of the Feeder Roads Improvement' s cost for the selected 50 km of Feeder Roads is presented in Table 15.

Table 15: Cost estimates for selected of feeder roads in Rubavu District

#	Feeder Road ID	Road Name	Length (Km)	Cost/ Km (\$ US)	Estimate Cost (\$ US)	Phase
1	FR-RUB-38	Mizingo - Nyabishongo	3.9	133,600	521,040	Phase 1 L = 24.9 Km
2	FR-RUB-100	Mareru - Nyamikongi	2.3	66,800	153,640	
3	FR-RUB-84	Tamira - Nangurubibi	1.9	167,000	317,300	
4	FR-RUB-82	Rebero - Tetero	2.2	167,000	367,400	
5	FR-RUB-43	Kabumba - Ryarukara	4.1	167,000	684,700	
6	FR-RUB-22	Marumba - Kanyamitura	2.4	167,000	400,800	
7	FR-RUB-47	Gahanika - Gisura	4.3	167,000	718,100	
8	FR-RUB-20	Mutegengeri - Kabumba	3.8	167,000	634,600	
9	FR-RUB-2	Kavumu - Kabumba	15.4	167,000	2,571,800	Phase 2 L = 25.3 Km
10	FR-RUB-108	Kitagabwa - Gihira	1.7	167,000	283,900	
11	FR-RUB-41	Gakomero - Kabumba	4.5	167,000	751,500	
12	FR-RUB-37	Karagarago - Gitega	3.7	133,600	494,320	
	Total		50.2		7,899,100	

Table 16: LIST OF PRIORITIZED FEEDER ROADS/ RUBAVU DISTRICT

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUB-135	Kabana-Mudende	1	2016-2017	Kabana-Mudende	5.67	1	946,890	946,890	5.67	Phase 1 L = 24.44 Km
FR-RUB-38	Mizingo-Nyabishongo				3.92	2	523,712	1,470,602	9.59	
FR-RUB-84	Tamira-Nangurubibi				1.92	3	320,640	1,791,242	11.51	
FR-RUB-82	Rebero-Tetero				2.16	4	360,720	2,151,962	13.67	
FR-RUB-43	Kabumba-Ryarukara				4.11	5	686,370	2,838,332	17.78	
FR-RUB-22	Marumba-Kanyamitura				2.39	6	399,130	3,237,462	20.17	
FR-RUB-47	Gahanika-Gisura				4.27	7	713,090	3,950,552	24.44	
FR-RUB-133	Kabumba-ISAR-Kabatwa	4	2016-2017	Kabumba-ISAR-Kabatwa	2.86	8	477,620	4,428,172	27.30	Phase 2 L = 28.27 Km
FR-RUB-20	Mutegengeri-Kabumba				3.77	9	629,590	5,057,762	31.07	
FR-RUB-108	Kitagabwa-Gihira				1.71	10	285,570	5,343,332	32.78	
FR-RUB-41	Gakomero-Kabumba				4.49	11	749,830	6,093,162	37.27	
FR-RUB-2	Kavumu-Kabumba				15.44	12	2,578,480	8,671,642	52.71	
FR-RUB-3	Kavumu-Nyarubuye				4.82	13	804,940	9,476,582	57.53	Next Phases
FR-RUB-37	Karagarago-Gitega				3.74	14	499,664	9,976,246	61.27	Next Phases
FR-RUB-100	Mareru-Nyamikongi				2.31	15	154,308	10,130,554	63.58	Next Phases
FR-RUB-10	Gashuha-Marumba				5.16	16	861,720	10,992,274	68.74	Next Phases
FR-RUB-36	Gahenerezo-Bihe				1.53	17	255,510	11,247,784	70.27	Next Phases
FR-RUB-1	Buringo-Jenda				1.81	18	302,270	11,550,054	72.08	Next Phases
FR-RUB-86	Jenda-Kabingo				2.05	19	273,880	11,823,934	74.13	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUB-50	Musene-Kinyamiyaga				5.23	20	698,728	12,522,662	79.36	Next Phases
FR-RUB-39	Nyabishongo-Gahanika				7.75	21	1,294,250	13,816,912	87.11	Next Phases
FR-RUB-87	Buringo-Kabingo				2.63	22	439,210	14,256,122	89.74	Next Phases
FR-RUB-88	Micinyiro-Rebero				2.54	23	424,180	14,680,302	92.28	Next Phases
FR-RUB-80	Ndiza-Ndiza				0.73	24	121,910	14,802,212	93.01	Next Phases
FR-RUB-95	Bivumu-Gasiza				2.77	25	462,590	15,264,802	95.78	Next Phases
FR-RUB-81	Ndiza-Ndiza				1.81	26	302,270	15,567,072	97.59	Next Phases
FR-RUB-92	Bihe-Kanombe				4.15	27	693,050	16,260,122	101.74	Next Phases
FR-RUB-55	Bivumu-Gatovu				3.78	28	631,260	16,891,382	105.52	Next Phases
FR-RUB-45	Murambi-Bihungwe				1.04	29	173,680	17,065,062	106.56	Next Phases
FR-RUB-79	Kabere-Nyabishongo				2.85	30	475,950	17,541,012	109.41	Next Phases
FR-RUB-130	Ryabizige-Ntango	5	2016-2017	Ryabizige-Ntango	3.45	31	576,150	18,117,162	112.86	Next Phases
FR-RUB-89	Mburamazi-Kanombe				5.64	32	941,880	19,059,042	118.50	Next Phases
FR-RUB-107	Ryarugamba-Bigaragara				1.39	33	232,130	19,291,172	119.89	Next Phases
FR-RUB-128	Butaka-Jenda				4.49	34	749,830	20,041,002	124.38	Next Phases
FR-RUB-6	Buringo-Bweza				3.00	35	501,000	20,542,002	127.38	Next Phases
FR-RUB-83	Tamira-Nyagisozi				3.41	36	569,470	21,111,472	130.79	Next Phases
FR-RUB-48	Bivumu-Mwirima				1.71	37	285,570	21,397,042	132.50	Next Phases
FR-RUB-40	Bihungwe-Micinyiro				4.30	38	718,100	22,115,142	136.80	Next Phases
FR-RUB-49	Gasumba-Bihungwe				3.42	39	571,140	22,686,282	140.22	Next Phases
FR-RUB-91	Kacyiru-Rugendabari				3.64	40	607,880	23,294,162	143.86	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUB-16	Kiraro-Rwashungwe				4.61	41	769,870	24,064,032	148.47	Next Phases
FR-RUB-54	Kamuzamuzi-Kidadi				1.38	42	230,460	24,294,492	149.85	Next Phases
FR-RUB-93	Kinyababa-Mashinga				2.34	43	390,780	24,685,272	152.19	Next Phases
FR-RUB-112	Bunyogwe-Munanira				6.56	44	1,095,520	25,780,792	158.75	Next Phases
FR-RUB-4	Rwagare-Nyarubuye				3.07	45	512,690	26,293,482	161.82	Next Phases
FR-RUB-90	Bunyogwe-Gasenyi				2.25	46	375,750	26,669,232	164.07	Next Phases
FR-RUB-34	Nyamikongi-Tubindi				6.96	47	1,162,320	27,831,552	171.03	Next Phases
FR-RUB-85	Busanganya-Gasenyi				3.49	48	582,830	28,414,382	174.52	Next Phases
FR-RUB-109	Mburamazi-Humure				1.50	49	250,500	28,664,882	176.02	Next Phases
FR-RUB-7	Bugeshi-Gaheriheri				3.44	50	574,480	29,239,362	179.46	Next Phases
FR-RUB-5	Bigaragara-Bweza				5.76	51	961,920	30,201,282	185.22	Next Phases
FR-RUB-96	Rindiro-Bweramana				2.58	52	430,860	30,632,142	187.80	Next Phases
FR-RUB-111	Mutegengeri-Kabingo				4.51	53	753,170	31,385,312	192.31	Next Phases
FR-RUB-110	Rugendabari-Bigaragara				2.25	54	375,750	31,761,062	194.56	Next Phases
FR-RUB-97	Rindiro-Gasizi				2.61	55	435,870	32,196,932	197.17	Next Phases
FR-RUB-8	Gasizi-Gaheriheri				1.67	56	278,890	32,475,822	198.84	Next Phases
FR-RUB-44	Kitagabwa-Gakomero				1.27	57	212,090	32,687,912	200.11	Next Phases
FR-RUB-60	Mashinga-Kanyamitura				1.05	58	175,350	32,863,262	201.16	Next Phases
FR-RUB-26	Karambi-Sabushengo				1.77	59	295,590	33,158,852	202.93	Next Phases
FR-RUB-132	Kamuhoza-Musabike	3	2016-2017	Kamuhoza-Musabike	4.85	60	647,960	33,806,812	207.78	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUB-42	Busanganya-Kageyo				4.23	61	706,410	34,513,222	212.01	Next Phases
FR-RUB-13	Muti-Nganzo				1.46	62	243,820	34,757,042	213.47	Next Phases
FR-RUB-28	Gashuha-Ruvuzananga				1.15	63	153,640	34,910,682	214.62	Next Phases
FR-RUB-94	Munanira-Nyamugari				1.69	64	282,230	35,192,912	216.31	Next Phases
FR-RUB-29	Gashuha-Gashuha				0.94	65	156,980	35,349,892	217.25	Next Phases
FR-RUB-9	Gatebe I-Bazirete				12.64	66	1,688,704	37,038,596	229.89	Next Phases
FR-RUB-52	Nyamyumba-Mubona				1.43	67	238,810	37,277,406	231.32	Next Phases
FR-RUB-106	Marumba-Rwangara				0.97	68	161,990	37,439,396	232.29	Next Phases
FR-RUB-57	Rusamaza-Gahama				5.02	69	670,672	38,110,068	237.31	Next Phases
FR-RUB-134	Mahoko-Nyabirasi	2	2016-2017	Mahoko-Nyabirasi	7.48	70	1,249,160	39,359,228	244.79	Next Phases
FR-RUB-72	Wintwari-Rambo				3.47	71	579,490	39,938,718	248.26	Next Phases
FR-RUB-69	Kigufi-Karuvugiro				5.84	72	975,280	40,913,998	254.10	Next Phases
FR-RUB-23	Nganzo-Rambo				5.23	73	873,410	41,787,408	259.33	Next Phases
FR-RUB-51	Gora-Nyamyumba				3.07	74	512,690	42,300,098	262.40	Next Phases
FR-RUB-56	Nyamirambo-Nkora				4.59	75	766,530	43,066,628	266.99	Next Phases
FR-RUB-65	Hanika-Kiyovu				2.67	76	445,890	43,512,518	269.66	Next Phases
FR-RUB-99	Bazirete-Bisesero				1.77	77	295,590	43,808,108	271.43	Next Phases
FR-RUB-121	Bisesero-Nyabibuye				3.92	78	654,640	44,462,748	275.35	Next Phases
FR-RUB-103	Gora-Rugali				2.06	79	344,020	44,806,768	277.41	Next Phases
FR-RUB-15	Hanika-Kibaya				1.60	80	213,760	45,020,528	279.01	Next Phases
FR-RUB-35	Giramata-Rwamikungu				2.07	81	345,690	45,366,218	281.08	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUB-104	Karangara-Rukorakore				1.38	82	230,460	45,596,678	282.46	Next Phases
FR-RUB-12	Hanika-Buramazi				0.75	83	125,250	45,721,928	283.21	Next Phases
FR-RUB-14	Buramazi-Rwashingtonwe				3.98	84	664,660	46,386,588	287.19	Next Phases
FR-RUB-126	Buhuru-Murambi				2.65	85	442,550	46,829,138	289.84	Next Phases
FR-RUB-125	Ngugo-Murambi				2.39	86	399,130	47,228,268	292.23	Next Phases
FR-RUB-105	Nganzo-Karangara				1.64	87	273,880	47,502,148	293.87	Next Phases
FR-RUB-123	Kamakinga-Rwankomo				5.79	88	966,930	48,469,078	299.66	Next Phases
FR-RUB-102	Karagarago-Rushasho				1.32	89	220,440	48,689,518	300.98	Next Phases
FR-RUB-25	Bugu-Rwangara				4.53	90	605,208	49,294,726	305.51	Next Phases
FR-RUB-53	Kanyamagare-Muhuhuri				1.21	91	202,070	49,496,796	306.72	Next Phases
FR-RUB-30	Mukingo-Makurizo				1.37	92	228,790	49,725,586	308.09	Next Phases
FR-RUB-64	Ruhango-Nyantomvu				3.55	93	592,850	50,318,436	311.64	Next Phases
FR-RUB-101	Mareru-Mizingo				2.34	94	312,624	50,631,060	313.98	Next Phases
FR-RUB-27	Gikombe-Bisizi-Ruvuzananga	6	2016-2017	Gikombe-Bisizi-Ruvuzananga	6.75	95	1,127,250	51,758,310	320.73	Next Phases
FR-RUB-70	Kiguri-Kagera				2.44	96	407,480	52,165,790	323.17	Next Phases
FR-RUB-115	Bushengo I-Bugu				3.48	97	581,160	52,746,950	326.65	Next Phases
FR-RUB-24	Kagera-Buvano				2.44	98	407,480	53,154,430	329.09	Next Phases
FR-RUB-21	Bushengo I-Bisizi				4.56	99	761,520	53,915,950	333.65	Next Phases
FR-RUB-19	Kitarimwa-Kivumu				4.12	100	688,040	54,603,990	337.77	Next Phases
FR-RUB-11	Rebero-Rutagara				5.92	101	988,640	55,592,630	343.69	Next Phases
FR-RUB-18	Kabashanja-Kivumu				9.53	102	1,591,510	57,184,140	353.22	Next Phases
FR-RUB-61	Gitebe Ii-Ngege				8.78	103	1,466,260	58,650,400	362.00	Next Phases
FR-RUB-63	Pfunda-Kanyamatembe				2.65	104	442,550	59,092,950	364.65	Next Phases
FR-RUB-120	Kitarimwa-Nyamwishyura				3.26	105	544,420	59,637,370	367.91	Next Phases
FR-RUB-122	Rushubi-Kitarimwa				3.53	106	589,510	60,226,880	371.44	Next Phases
FR-RUB-98	Rugerero-Kivumu				3.03	107	506,010	60,732,890	374.47	Next Phases
FR-RUB-131	Rugerero-Rubavu	8	2016-2017	Rugerero-Rubavu	3.22	108	537,740	61,270,630	377.69	Next Phases
FR-RUB-59	Kiruhura-Nyaruhengeri				4.36	109	728,120	61,998,750	382.05	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUB-129	Ruvumbu-Rugerero	7	2016-2017	Ruvumbu-Rugerero	4.18	110	698,060	62,696,810	386.23	Next Phases
FR-RUB-58	Kabeza-Ruhangiro				2.62	111	437,540	63,134,350	388.85	Next Phases
FR-RUB-114	Gafuku-Murambi				2.83	112	378,088	63,512,438	391.68	Next Phases
FR-RUB-113	Gitebe I-Kanyukiro				4.80	113	801,600	64,314,038	396.48	Next Phases
FR-RUB-117	Gashovu-Rusongati				2.44	114	407,480	64,721,518	398.92	Next Phases
FR-RUB-77	Burevu-Nkama				5.03	115	840,010	65,561,528	403.95	Next Phases
FR-RUB-17	Kanyukiro-Ruvuzananga				1.14	116	190,380	65,751,908	405.09	Next Phases
FR-RUB-71	Kiguri-Bugoma				1.07	117	178,690	65,930,598	406.16	Next Phases
FR-RUB-32	Bushengo-Kabere li				0.90	118	120,240	66,050,838	407.06	Next Phases
FR-RUB-31	Bushengo I-Gahinga				1.51	119	201,736	66,252,574	408.57	Next Phases
FR-RUB-124	Rutagara-Murambi				1.98	120	264,528	66,517,102	410.55	Next Phases
FR-RUB-127	Rutagara-Isangano				1.95	121	260,520	66,777,622	412.50	Next Phases
FR-RUB-33	Gasenyi-Gasenyi				1.16	122	154,976	66,932,598	413.66	Next Phases
FR-RUB-118	Shwemu-Gasayo				1.37	123	228,790	67,161,388	415.03	Next Phases
FR-RUB-62	Kinihira-Pfunda				4.75	124	793,250	67,954,638	419.78	Next Phases
FR-RUB-119	Bubaji-Kanyukiro				2.25	125	375,750	68,330,388	422.03	Next Phases
FR-RUB-78	Gihira-Nkama				3.41	126	569,470	68,899,858	425.44	Next Phases
FR-RUB-75	Butumba-Bugarura				5.12	127	855,040	69,754,898	430.56	Next Phases
FR-RUB-66	Ruhango-Nyamyiri				4.22	128	704,740	70,459,638	434.78	Next Phases
FR-RUB-74	Kabiza-Burevu				6.29	129	1,050,430	71,510,068	441.07	Next Phases
FR-RUB-76	Pfunda-Rukukumbo				2.77	130	462,590	71,972,658	443.84	Next Phases
FR-RUB-73	Burevu-Burevu				1.34	131	223,780	72,196,438	445.18	Next Phases
FR-RUB-68	Bushagi-Buvano				1.19	132	198,730	72,395,168	446.37	Next Phases
FR-RUB-116	Bambiro-Munini				2.74	133	366,064	72,761,232	449.11	Next Phases
FR-RUB-67	Buhanga-Buhanga				1.21	134	202,070	72,963,302	450.32	Next Phases
					450.32					

6.7 Rulindo District

6.7.1 Districts Brief Description

A short description of Rulindo District's geographic, agricultural, economic, transport infrastructure and social characteristics is presented in Annex .9

6.7.2 Road Network and Feeder Roads Projects in the District

A road network of national road paved (42.3 Km), national road unpaved (28.9 Km), district class 1 (186.3 Km), and district class 2 (282.9 Km) run across the district.

6.7.3 Prioritization Analysis

6.7.3.1 Proposed Feeder Roads

A Feeder roads network of 79 segments total 391.3 Km was selected by District for the prioritization exercise. The breakdown by road classification is shown below.

District	Length Segments by Classification (Km)					Total Length (Km)
	National Road Paved	National Road Unpaved	District Class 1	District Class 2	Unclassified	
Rulindo	-	-	9.6	155.4	226.3	391.3

6.7.3.2 Data Input & Assumption

The data input used for the analysis are from information provided by Rulindo District and generated from GIS data collected by Consultant, as described in paragraph 5.3.

6.7.3.3 Prioritization Analysis and Ranking Results

The prioritization list of proposed feeder roads for Bugesera District is presented on pages 83 to 87. The detailed computations of normalized rating (up to value of 3) for each indicator and criteria are shown in Annex 3.

6.7.3.4 Prioritized Feeder Roads Mapping

The prioritization ranking of the feeder roads proposed for improvement is shown on A1 format map (Annex 4). The priority rankings presented on the map are from the Multi-Criteria Analysis.

6.7.4 Subset of feeder road segments

6.7.4.1 Phasing & Selection

Subsets of prioritized feeder roads proposed are:

- for the next 10 years, 52 first ranking segments with total length 253.1 Km
- for next two fiscal years (Phase 1 & Phase 2), the 12 first segments with total length 53.9 Km. The list of these roads is presented in Table 3.7 below.

6.7.4.2 Brief description of selected feeder roads

A short description of 12 first rank Feeder Roads segments with total length 53.9 Km is presented below:

- The Feeder Road Sove-Gakubo (FR-RUL-88), 3.3 Km long, connects DR42 to Gatwa Gakubo Road.
- The Feeder Road FR-RUL-87 is 3.5 Km long. It links to Karambo to DR 42 (Kibogora).
- The Feeder Road FR-RUL-29 (Nturo-Sove), has a length of 4.5 Km. It links DR42 to NR19.
- The Feeder Road FR-RUL-47 (Gatwa-Gakubo), 6.4 Km long, connects DR42 to Gakubo school and Health Center.
- The Feeder Road FR-RUL-57, 2.9 km long, connects Nturo to NR19 (Sakara).
- The Feeder Road FR-RUL-89, 2.1 Km long, starts at Nyagatovu, passes through Sove, Kibande and ends at Gitandi on DR42.
- The Feeder Road Nturo-Kivumu (FR-RUL-58) has a length of 6 Km. It is a loop which connects to DR42 twice, connects Nturo to Kivumu on the North.
- The Feeder Road Kibingwe-Karambi (FR-RUL-97), 2.7 Km long, links DR 43 to NR 19.
- FR-RUL-36 (Gatsinde-Bukinga Road), 6.1 Km long, connects DR42 to DR43.
- FR-RUL-35 Road, has a length of 3.9 km, connects Gaseke to DR43 at Bukinga.
- FR-RUL-82 Road, 2.4 Km long, connects Nyangoyi to NR20 at Kabahama
- The Feeder Road FR-RUL-31, 10.1 Km long, links Rwambogo to Rulindo and connects twice to DR48.

6.7.4.3 Cost estimate

In order to avoid underestimating the cost for rehabilitation and/or upgrading works, based on cost unit rates, this cost is derived from historical prices of recent construction contracts in the District. The estimates of the Feeder Roads Improvement' s cost for the selected about 54 km of Feeder Roads is presented in Table 17.

Table 17: Cost estimates for selected feeder roads in Rulindo District

#	Feeder Road ID	Road Name	Length (Km)	Cost/ Km (\$ US)	Estimate Cost (\$ US)	Phase
1	FR-RUL-88	Sove - Gakubo	3.3	76,000	250,800	Phase 1 L = 28.7 Km
2	FR-RUL-87	Kibogora - Karambo	3.5	76,000	266,000	
3	FR-RUL-29	Nturo - Sove	4.5	76,000	342,000	
4	FR-RUL-47	Gatwa - Gakubo	6.4	76,000	486,400	
5	FR-RUL-57	Sakara - Nturo	2.9	76,000	220,400	
6	FR-RUL-89	Gitandi - Nyagatovu	2.1	76,000	159,600	
7	FR-RUL-58	Nturo - Kivumu	6.0	76,000	456,000	
8	FR-RUL-97	Kibingwe - Karambi	2.7	76,000	205,200	Phase 2 L = 25.2 Km
9	FR-RUL-36	Gatsinde - Bukinga	6.1	76,000	463,600	
10	FR-RUL-35	Bukinga - Gaseke	3.9	76,000	296,400	
11	FR-RUL-82	Kabahama - Nyangoyi	2.4	76,000	182,400	
12	FR-RUL-31	Rwambogo - Rulindo	10.1	76,000	767,600	
		Total	53.9		4,096,400	

Table 18: LIST OF PRIORITIZED FEEDER ROADS/ RULINDO DISTRICT

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUL-88	Sove-Gakubo				3.25	1	247,000	247,000	3.25	Phase 1 L = 35.05 Km
FR-RUL-29	Nturo-Sove				4.47	2	339,720	586,720	7.72	
FR-RUL-87	Kibogora-Karambo				3.48	3	264,480	851,200	11.20	
FR-RUL-19	Rwili-Nganzo-Buyaga	3		Rwili-Nganzo-Buyaga	23.85	4	1,812,600	2,663,800	35.05	
FR-RUL-47	Gatwa-Gakubo				6.42	5	487,920	3,151,720	41.47	Phase 2 L = 17.34 Km
FR-RUL-57	Sakara-Nturo				2.85	6	216,600	3,368,320	44.32	
FR-RUL-89	Gitandi-Nyagatovu				2.10	7	159,600	3,527,920	46.42	
FR-RUL-58	Nturo-Kivumu				5.97	8	453,720	3,981,640	52.39	
FR-RUL-97	Kibingwe-Karambi				2.68	9	203,680	4,185,320	55.07	Next Phases
FR-RUL-36	Gatsinde-Bukinga				6.12	10	465,120	4,650,440	61.19	Next Phases
FR-RUL-35	Bukinga-Gaseke				3.94	11	299,440	4,949,880	65.13	Next Phases
FR-RUL-16	Busoro- Kinihira			Busoro- Kinihira	8.07	12	613,320	5,563,200	73.20	Next Phases
FR-RUL-82	Kabahama-Nyangoyi				2.37	13	180,120	5,743,320	75.57	Next Phases
FR-RUL-31	Rwambogo-Rulindo				10.08	14	766,080	6,509,400	85.65	Next Phases
FR-RUL-83	Wamahoro-Kibingwe				5.06	15	384,560	6,893,960	90.71	Next Phases
FR-RUL-93	Kibingwe-Ryarubuguza				1.62	16	123,120	7,017,080	92.33	Next Phases
FR-RUL-22	Base-Tumba	1	2016/2017	Base-Tumba	13.03	17	990,280	8,007,360	105.36	Next Phases
FR-RUL-32	Gihonga-Mwili				6.91	18	525,160	8,532,520	112.27	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUL-91	Gihemba-Kabera				2.68	19	203,680	8,736,200	114.95	Next Phases
FR-RUL-1	Kirenge - Nyirangarama	1		Kirenge-Nyirangarama	18.10	20	1,100,480	9,836,680	133.05	Next Phases
FR-RUL-17	Kisaro-Ryarubuguza-Kabuga ka Muriza	3		Kisaro-Ryarubuguza-Kabuga Ka Muriza	4.91	21	373,160	10,209,840	137.96	Next Phases
FR-RUL-21	Ngiramazi-Gaseke	1	2016/2017	Ngiramazi-Gaseke	20.03	22	1,522,280	11,732,120	157.99	Next Phases
FR-RUL-54	Misezera-Rusura				5.69	23	432,440	12,164,560	163.68	Next Phases
FR-RUL-59	Yaramba-Yaramba				3.30	24	250,800	12,415,360	166.98	Next Phases
FR-RUL-44	Kivumu-Ruhanga				2.98	25	226,480	12,641,840	169.96	Next Phases
FR-RUL-38	Kabingo-Gatwa				0.99	26	75,240	12,717,080	170.95	Next Phases
FR-RUL-74	Cyanya-Nyamwiza				14.30	27	1,086,800	13,803,880	185.25	Next Phases
FR-RUL-45	Gatagara-Kavumu				5.45	28	414,200	14,218,080	190.70	Next Phases
FR-RUL-25	Butangampundu- Kizuba	1		Butangampundu-Kizuba	9.90	29	752,400	14,970,480	200.60	Next Phases
FR-RUL-70	Rusasa-Bikamba				2.34	30	177,840	15,148,320	202.94	Next Phases
FR-RUL-71	Rusasa-Bikamba				3.96	31	300,960	15,449,280	206.90	Next Phases
FR-RUL-28	Gihemba-Nganzo				2.96	32	224,960	15,674,240	209.86	Next Phases
FR-RUL-49	Base-Mugano				6.92	33	525,920	16,200,160	216.78	Next Phases
FR-RUL-37	Rulindo-Gaseke				5.30	34	402,800	16,602,960	222.08	Next Phases
FR-RUL-51	Munini-Kirambo				4.22	35	320,720	16,923,680	226.30	Next Phases
FR-RUL-78	Ruri-Nyarurembo				1.93	36	146,680	17,070,360	228.23	Next Phases
FR-RUL-48	Rulindo-Murambi				4.19	37	318,440	17,388,800	232.42	Next Phases
FR-RUL-77	Gashinge-Kanunga				3.32	38	252,320	17,641,120	235.74	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUL-30	Kabuga-Agatare				10.19	39	774,440	18,415,560	245.93	Next Phases
FR-RUL-99	Rwintare-Gaseke				2.95	40	224,200	18,639,760	248.88	Next Phases
FR-RUL-55	Cyamutara-Kayenzi				4.51	41	342,760	18,982,520	253.39	Next Phases
FR-RUL-67	Nyakagezi-Gasekabuye				9.44	42	717,440	19,699,960	262.83	Next Phases
FR-RUL-60	Kivomo-Gatsinde				2.75	43	209,000	19,908,960	265.58	Next Phases
FR-RUL-100	Kamaganga-Gasharu				2.62	44	159,296	20,068,256	268.20	Next Phases
FR-RUL-101	Gitabage-Cyanya				5.95	45	452,200	20,520,456	274.15	Next Phases
FR-RUL-50	Gasama-Gicumbi				4.20	46	319,200	20,839,656	278.35	Next Phases
FR-RUL-85	Gihonga-Buhira				6.11	47	464,360	21,304,016	284.46	Next Phases
FR-RUL-96	Songa-Gatete				2.19	48	166,440	21,470,456	286.65	Next Phases
FR-RUL-61	Gihanga-Bukinga				3.71	49	281,960	21,752,416	290.36	Next Phases
FR-RUL-84	Gatwa-Barayi				5.11	50	388,360	22,140,776	295.47	Next Phases
FR-RUL-43	Ntunguru-Kivomo				2.68	51	203,680	22,344,456	298.15	Next Phases
FR-RUL-20	Rutabo-Sayo-Gabiro	3		Rutabo-Sayo-Gabiro	9.75	52	741,000	23,085,456	307.90	Next Phases
FR-RUL-64	Kabaraza-Muyange				6.23	53	378,784	23,464,240	314.13	Next Phases
FR-RUL-63	Rwintare-Rwahi				7.31	54	555,560	24,019,800	321.44	Next Phases
FR-RUL-14	Rutabo-Kabere-Nturo	1		Rutabo-Kabere-Nturo	10.06	55	764,560	24,784,360	331.50	Next Phases
FR-RUL-41	Gacyamo-Kabuga				1.65	56	125,400	24,909,760	333.15	Next Phases
FR-RUL-39	Kinunga-Nyaruvumu				9.59	57	728,840	25,638,600	342.74	Next Phases
FR-RUL-90	Gahama-Munyinya				2.39	58	181,640	25,820,240	345.13	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUL-95	Mugomero-Gatete				1.58	59	120,080	25,940,320	346.71	Next Phases
FR-RUL-62	Nyabubare-Nyarunyinya				6.81	60	517,560	26,457,880	353.52	Next Phases
FR-RUL-68	Kabuga-Nyenyeri				5.67	61	430,920	26,888,800	359.19	Next Phases
FR-RUL-81	Ryinzovu-Kivomo				5.61	62	426,360	27,315,160	364.80	Next Phases
FR-RUL-86	Maremba-Umubuga				2.84	63	215,840	27,531,000	367.64	Next Phases
FR-RUL-56	Kabuga-Gisiza				7.25	64	551,000	28,082,000	374.89	Next Phases
FR-RUL-7	Rusine - Sanzare - Budakiranga	1	2015/2016	Rusine-Sanzare-Budakiranya	22.06	65	1,676,560	29,758,560	396.95	Next Phases
FR-RUL-65	Rwintare-Nkanga				2.94	66	223,440	29,982,000	399.89	Next Phases
FR-RUL-92	Irasaniro-Gatare				10.36	67	787,360	30,769,360	410.25	Next Phases
FR-RUL-72	Buhita-Kirwa				7.52	68	571,520	31,340,880	417.77	Next Phases
FR-RUL-26	Gako-Gitanda-Muvumo- Muhondo			Gako-Gitanda-Muvumo- Muhondo	9.81	69	596,448	31,937,328	427.58	Next Phases
FR-RUL-33	Gicumbi-Munini				3.54	70	269,040	32,206,368	431.12	Next Phases
FR-RUL-94	Mugomero-Ryarubuguzi				0.96	71	72,960	32,279,328	432.08	Next Phases
FR-RUL-98	Karambi-Rwintare				1.68	72	127,680	32,407,008	433.76	Next Phases
FR-RUL-73	Nyarubuye-Karambi				13.44	73	1,021,440	33,428,448	447.20	Next Phases
FR-RUL-53	Rutabo-Gatare	2		Rutabo-Gatare	9.57	74	727,320	34,155,768	456.77	Next Phases
FR-RUL-79	Rusasa-Rusekabuye				5.76	75	437,760	34,593,528	462.53	Next Phases
FR-RUL-75	Ruri-Nyarurembo				6.42	76	487,920	35,081,448	468.95	Next Phases
FR-RUL-24	Gako-Gitanda-Muvumo- Muhondo			Gako-Gitanda-Muvumo- Muhondo	4.83	77	367,080	35,448,528	473.78	Next Phases
FR-RUL-102	Kabuga-Kabuga				3.17	78	240,920	35,689,448	476.95	Next Phases

Feeder Road ID	Road Name	District Priority	District Planned Fiscal Year	District Road Name	Approximate GIS Length (Km)	MCA Ranking	Investment cost (\$ US)	Cumulative Investment Cost (\$ US)	Cumulative Length (Km)	Priority class
FR-RUL-18	Ngoma-Cyuga			Ngoma-Cyuga	4.39	79	333,640	36,023,088	481.34	Next Phases
FR-RUL-23	Muyanza-Burega	1	2016/2017	Muyanza-Burega	6.70	80	509,200	36,532,288	488.04	Next Phases
FR-RUL-80	Mataba-Bugoboka				3.88	81	294,880	36,827,168	491.92	Next Phases
FR-RUL-66	Nkurura-Gitaba				4.03	82	306,280	37,133,448	495.95	Next Phases
FR-RUL-52	Cyamutara-Karera				7.02	83	533,520	37,666,968	502.97	Next Phases
FR-RUL-34	Karambi-Karambo				5.48	84	416,480	38,083,448	508.45	Next Phases
FR-RUL-69	Nyaruvumu-Kigina				4.51	85	342,760	38,426,208	512.96	Next Phases
FR-RUL-15	Mugambazi-Kinunga-Rusine	2		Mugambazi-Kinunga-Rusine	8.00	86	608,000	39,034,208	520.96	Next Phases
FR-RUL-27	Shyorongi - Rutonde yanze -Ngoma	1		Shyorongi-Rutonde-Yanze-Ngoma	8.41	87	639,160	39,673,368	529.37	Next Phases
FR-RUL-46	Amataba-Agasharu				5.71	88	347,168	40,020,536	535.08	Next Phases
FR-RUL-42	Kabuga-Kigomwa				0.95	89	72,200	40,092,736	536.03	Next Phases
FR-RUL-40	Kabuga-Kigomwa				1.19	90	90,440	40,183,176	537.22	Next Phases
FR-RUL-76	Nyakizu-Rubaya				2.99	91	227,240	40,410,416	540.21	Next Phases
					540.21					

7.0 COMPILED GIS DATA

The GIS data collected are organized and stored in geodatabase under feature datasets listed in Annex 10.

Annex 6 presents the data table for the Feeder Roads feature proposed by Consultant.

It is suggested that the GIS data and geodatabase developed during the course of this study is going to be in house and managed by RTDA for the reasons presented in Chapter 8.

The Consultant initiated an early draft template metadata for Feeder Road feature class (Annex 11). It is suggested that RTDA perform the following: - required and optional metadata entries (Section Name, Required/ Optional, Entry, and Description), - Data Administration (Data Owners & Stakeholders, Access & Security, Backups, Metadata, Procedures), - and Roles & Responsibilities (GIS Coordinator, Data Editor, Data User, Data Steward, Data Stakeholder).

8.0 INSTITUTIONALIZATION AND OWNERSHIP OF THE CURRENT STUDY

One of the recommendations of the draft inception report validation workshop is that Consultant should present in the final report, a recommendation on the ownership of the methodology of the prioritization study.

The feeder roads encompassed of classified roads network (Unpaved National Roads, District Class 1 and District Class 2) and unclassified roads. The recently developed Feeder Roads Development Policy & Strategy (FRDPS) listed the Ministries/Agencies (MINECOFIN, MININFRA/RTDA, MINAGRI, MINALOC/ LODA, RALGA, MINERENA/ REMA, ASSETIP, DISTRICTS, RMF, RURA, LCA, NGO/CBO, Private Sector) in the Feeder Roads Subsector and layout their Responsibility. The responsibility of three (3) of the key players is summarized below¹:

MINAGRI Responsibility:

- Coordinate all Feeder Roads stakeholders
- Prioritization of Feeder Roads
- Transfer to RTDA human resources related to Technical Support
- Financial management and Coordination
- Monitoring progress of activities
- Consolidation of financial progress reporting
- Monitoring of the impact of the Feeder Roads Program

District Responsibility:

- Establishment of DPMTs
- Responsibility for budget preparation, procurement and execution
- Ensuring the sustainability of investments
- Ensuring the alignment of project activities
- Timely approval & submission of invoices to MINAGRI
- Providing the MINAGRI & RTDA with periodic reporting & documentation about the status
- Preparation of business plans for FR rehabilitation & maintenance

MININFRA/ RTDA Responsibility:

- Harmonize the planning of upgrading the road network with the planning of FR rehabilitation in high potential agricultural areas
- Provision of target TA & Capacity building support

¹ *Feeder Roads Development Policy & Strategy (FRDPS)/Final Draft Policy, Annex 3, November 2015.*

- Certify all invoices presented by service provide
- Strengthening the Capacity of districts & Private Sector
- Provide a Technical report (technical engineering design, construction supervision, road condition assessment, traffic counts).

It is recommended that Feeder Road Engineers attached at RTDA have a harmonization and supervision role for the Feeder Roads Prioritization. It should be done in close consultation with Districts, which are the implementation institutions, considering the following:

- ✓ Feeder roads prioritization is a planning matter which involve multiple stakeholders and should be coordinated at the central level.
- ✓ One of the RTDA' s key responsibility is the harmonization of the planning of upgrading Rwanda road network;
- ✓ Target TA & Capacity building support to feeder roads sector by RTDA;
- ✓ Availability of human resources at RTDA (Feeder Roads Engineers attached at RTDA);
- ✓ Availability of hardware and software such Geographic Information Systems (GIS)/ ESRI, ArcGIS capabilities;
- ✓ Need to have a maintenance and the update of the road network database at a single, centralized location.

9 MULTI-CRITERIA ANALYSIS AND MAINTENANCE PLAN

The feeder roads maintenance policy, strategy, organization, program and arrangement have been extensively layout in multiple documents.

Even though, maintenance is beyond the scope of the study, Consultant would like to make, at some stakeholders' request, the following observations:

The Multi-Criteria Analysis Methodology tool can be a useful tool not only in the prioritization of feeder roads rehabilitation or upgrade but also in the preparation of work plans for maintenance of Feeder Roads.

10 LESSONS LEARNED

The following issues and lessons learned during the study:

- During the elaboration of the Terms of reference of the study, it is important to fully inform feeder roads Engineer about the object of the study and its outcomes;
- Due to the fact that consultation with stakeholders individually, at the central level, is time consuming, a join session at the beginning of the study would be very usefull;
- Field reconnaissance of the Feeder Roads under evalation is essential to evaluate the condition of the roads and also ases the conditions of roads that the proposed Feeder Roads under evaluation will connect to. The feasibility or pre-feasibly study and detailed technical engineering design necessarily for the implementation of the works will address these issues;
- The inventory of feeder Roads network, the mapping and the elaboration of a GIS database is a task which require more time;
- Data collection which involves other District Staff than the Feeder Roads Engineer can take a long time. A close consultation with District Authorities at the higher level (Mayor for example) can speed up the process.

11 CONCLUSIONS

Consultant developed a prioritization methodology of feeder roads rehabilitation or upgrade based on a Multi-Criteria Analysis, which evaluates each road segment on a set of indicators/criteria: - Road Network Technical Parameters (Connectivity, Road Condition Assessment, Forecast Traffic Assessment); - Economic Efficiency (Agricultural Benefit Indicator of road, Connection to markets and key infrastructures, and Connection to other Economic Infrastructures), - and Social Impact (Cost Effectiveness Indicator, Community Priority for road improvement, Access to facilities, and Impact on Vulnerable Sector).

The prioritization of Feeder Roads network of 3,250 km is based on the Multi-Criteria Analysis Methodology.

Consultant recommended the MCA as it integrates multiple criteria/indicators which take into consideration goal and objectives of the feeder roads program in Rwanda (Reference: paragraph 3.3 of the MCA Methodology document), which is more relevant than the CEI. The CEI is not a multi-criteria approach with scores and weighting, it is a single equation. Only the MCA ranking is considered on the final feeder roads prioritization lists and the illustrative maps included in the Final Report. Ultimately, it is up to the policy makers to decide which prioritization approach to use, both MCA ranking and CEI ranking are presented by Consultant as requested by the STORs.

The results of prioritization are a useful planning tool, which ensure collaboration among key stakeholders and transparency. As the Feeder Roads network expands and due to limitations of resources, the approach can be convenient for maintenance prioritization.

ANNEXES

(Provided under separate cover)



“The content of this publication is the sole responsibility of the Consultant and can in no way be taken to reflect the views of the European Union”