MINISTRY OF WATER AND ENVIRONMENT
Farm Income Enhancement and Forest Conservation Project II (FIEFOC)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED MUBUKU IRRIGATION SCHEME IN KASESE DISTRICT UNDER FIEFOC II PROJECT

May, 2017

List of Acronyms

AfDB	African Development Bank
BOQ	Bill Of Quantities
DAO	District Agriculture Officer
DEO	District Environment Officer
DWRD	Directorate Of Water Resources Development
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
FAO	Food and Agriculture Organization
FIEFOC	Farm Income Enhancement and Forest Conservation Project
GoU	Government of Uganda
MAAIF	Ministry Agriculture Animal, Industry and Fisheries
MWE	Ministry of Water and Environment
MFPED	Ministry of Finance Planning and Economic Development
OHS	Occupational Health and Safety Officer
PIU	Project Implementing Unit
PSO	Project Support Officer
UBOS	Uganda Bureau Of Statistics
WUA	Water User Association

TABLE OF CONTENT

Executive summary

ES.1: Executive summary

Agriculture remains a key sector of Uganda's economy. It supports the livelihoods of 73% of the households, employs about 72% of the total labour force, 77% of whom are women, and 63% are youth, mostly residing in the rural areas (MoFPED, 2015). The proportional contribution of the agricultural sector to the Gross Domestic Product (GDP) of Uganda currently stands at about 20.9%. The sector is also very important in terms of food security, employment, and household income. In addition, the sector provides the basis for growth in other sectors of the economy. For example, it is the main source of raw materials to Uganda's local manufacturing industries and exports to regional and international markets (MAAIF, 2013)

ES.2: Agriculture production constraints

Agriculture still forms the back bone of Uganda's economy. However, growth in agriculture production is affected by a number of constraints. These include:-

1. Degradation of Land Resources;
2. Limited Agricultural Technology Development
3. Poor delivery and adoption of agricultural technologies
4. Pests and diseases

ES.3: Project Purpose

The FIEFOC-II aims at strengthening its commitment to providing necessary resources and inputs to enable farmers increase and manage valuable and profitable vegetation cover in local forest reserves, community forests, natural forests and degraded landscapes. The project will further support apiculture activities within selected watershed areas so that they contribute to conservation of forests and increase the quantity and quality of honey for immediate income generation.

The development goal of the project is to improve household incomes, food security, and availability of forestry products and services through sustainable natural resources management and agricultural enterprise development

The overall objective of the project is to improve farm incomes, rural livelihoods, and food security and contribute to poverty reduction through sustainable natural resources management and agricultural enterprise development.

ES.4: Purpose of the Assessment

The National Environment Act, 1995 lists projects for which EIA is mandatory in the third schedule. The proposed irrigation project is listed in category 8. Agriculture, including —

1) Large-scale agriculture;
2) Use of new pesticides; and
3) Use of fertilizers.

The basic purpose of the Environmental and Social Impact Assessment (ESIA) study is to identify, predict and analyse the magnitude of environmental and social impacts and propose enhancement and/or mitigation measures for significant environmental and social effects that are likely to arise from the various activities of the proposed irrigation scheme project during construction and operation phases.

In compliance with the above legislation, the developer has decided to undertake the EIA prior to establishment of the scheme. This Environmental Impact Statement (EIS) has been prepared to provide a detailed and comprehensive assessment of the environmental, social, cultural and economic impacts (beneficial and adverse) of the project. The EIS also identifies mitigation measures that may be applied to effectively manage any potentially adverse impacts arising from the project. This report therefore presents the findings of the EIA.

ES.5: Objectives of the study

Environmental Impact Assessment (EIA) is a planning tool that promotes the integration of environmental concerns into the project planning process at the earliest possible planning and design stages and helps provide management of the project with practical advice on the mitigation of any potentially adverse environmental impacts of the project. It is also expected to provide a means whereby the overall environmental performance and social benefits of the project can be enhanced. The specific objectives of the ESIA include the following:-

1. To ensure that the project is implemented within the policies and laws of Uganda;
2. Identification of sensitive environmental components likely to be affected by the proposed project;
3. Defining positive social and economic benefits local communities can derive from the proposed project implementation;
4. Identification, prediction and evaluation of the potential negative environmental impacts associated with the project implementation and;
5. Designing subsequent operation, and preparation of plans and recommendations regarding measures that will minimize adverse impacts and enhance beneficial impacts.

ES.6: Project description

The proposal involves the establishment of modern technology of crop production through construction of Intake (Main canal, protection dyke, drainage canal) workshop for agriculture machinery, a network of internal access roads and crop processing components aiming at value addition.

ES.7: Policy, Legal and Institutional Framework

The policy, legal and institutional framework within which the EIA was conducted, National regulations are discussed along with relevant international agreements and conventions to which, Uganda is a party. Key legislations governing the conduct of EIA in Uganda are the National Environmental Act (Cap 153) and the Environmental Impact Assessment Regulations (1998). The National Environmental Act established the National Environment

Management Authority (NEMA), and entrusts it with responsibility to ensure compliance with the EIA process in planning and execution of all projects that are or may cause adverse impacts on the environment.

BOX ES.1: Relevant policies and regulations reviewed

Policy Frame Work

- ✓ The National Environment Management Policy, 1994
- ✓ The Plan for Modernization of Agriculture
- ✓ The National Water Policy, 1999
- ✓ The National Environment (Riverbanks, Lakeshores and Wetlands) regulations, 2000

Legal framework

- ✓ The Constitution of the Republic of Uganda, 1995
- ✓ National Environment Act of 1995 Cap 153
- ✓ The Water Act, Cap 152
- ✓ The Land Act, Cap 227
- ✓ The Local Government Act, 1997
- ✓ The Occupational Safety and Health Act, 2006
- ✓ The National Wetland Conservation and Management Policy

African Development Bank's Environmental and Social Safeguard Policies

- ✓ Operational Safeguard 1: Environmental and Social Assessment.
- ✓ Operational Safeguard 2: Involuntary Resettlement: Land acquisition, population displacement and compensation.
- ✓ Operational Safeguard 3: Biodiversity and ecosystem services.
- ✓ Operational Safeguard 4: Pollution prevention and control, hazardous and control, hazardous materials and resource efficiency.
- ✓ Operational Safeguard 5: Labour conditions, health and safety.

Institutional framework

- ✓ National Environmental Management Authority (NEMA)
- ✓ Ministry of Water and Environment
- ✓ Ministry Agriculture, Animal, Industry and Fisheries
- ✓ Local Administration Structures

BOX ES.2: Stakeholders consultations and issues raised

Ministry of Agriculture, Animal Industry and Fisheries

1. Consider the terrain for the area to be irrigated;
2. High value crops should be considered in relation to the costs incurred during water pumping;
3. Crops grown should target market not for home consumption;
4. The irrigation costs shouldn't be higher than investment costs;
5. The scheme should focus on improving peoples livelihoods;
6. There should be proper soil analysis to determine the type of crops to be grown;

7. The proposed project should be strategized on large scale production;
8. The district should employ an agricultural engineer full time on site.

District Water Engineer

1. In terms of irrigation, the existing infrastructure has been causing loss of water, there is need to put in place mechanism to control water loss;
2. In terms operation and maintenance of the scheme, the money from the centre has significantly reduced leading to abandoning of some phases as earlier planned;
3. There should be effective water supply to crops to avoid wastage;
4. Effects of water logging should be handled with care since logging causes soil salinity;
5. Fertilizer application should be within the required range and under the guidance of a qualified agronomist. This is aimed at reducing effects of fertilizers on crop growth.

Officer in charge-Mubuku I.S.S

1. The scheme remains an important economic driver in the district, the scheme is the food basket for the district;
2. Challenge are there for instance, limited funds to maintain technical staff;
3. In order to address issues of land conflicts, farmers should be registered to strengthen collaboration;
4. Yet there is acute shortage of staff at the moment;
5. Regarding management, the farmers should be nurtured to manage their own issues;
6. The proposed design for the project should put into consideration proper drainage system to avoid pollution of the river;
7. There should be effective management of soil erosion which is commonly associated with irrigation scheme projects;
8. Income of the community will increase since new varieties of crops will be introduced.

ES.8: Analysis of alternatives

Integral to the Environmental impact assessment process is the consideration and evaluation of alternatives to the proposed development plan against the project need. Analysis of project alternatives considers other practicable strategies that can be taken to promote the elimination of negative environmental impacts identified. It is the basis for implementation of a development project with minimal environmental damage. The various alternatives were assessed in terms of both environmental acceptability and economic feasibility during the EIA phase of the project. The following alternatives were taken into consideration;

a) No Project Alternative

The EIA examined the impact of doing nothing (the "No Action" option) i.e. not establishing the proposed Phase IIB and Phase III Mubuku irrigation project. The do nothing option is retrogressive for an existing of such as a tremendous development whose vision is an integrated operation across the entire agricultural value chain that will introduce savings

from economies of scale. The project shall also provide a potential long-term opportunity for the community members from the profits received in their routine agriculture activities at the scheme. The proposed project is also geared towards creating several employment and business opportunities in addition to the several positive impacts in with food value chain. The No-Action alternative will imply that essentially, none of the identified impacts of proceeding with the project will be experienced. However, choosing this option would entail perpetual losses on the part of the developer resulting from unutilized land. This would further undermine the championing of agriculture as an engine for economic growth in the country. Furthermore no employment opportunities are envisaged under this option. Therefore, the No-Action alternative is not recommended.

b) Alternative site location

At present, the implementing authority does not have an alternative sites other than those already selected and various studies have been undertaken and they have been found palatable as far as crop production is concerned. The implementing body has already secured funds from African Development Bank (AfDB) for use at the scheme. Looking for the land to accommodate the scale and size of the project and completing official site studies may take up a lot of time which would delay project implementation. In addition to this, the intended land use (agriculture) blends well with the area land use since it is mainly cultivatable land gazzated by the government to improve the livelihoods of the community. The crops to be grown at the scheme are also indigenous crops common among the local community. Therefore the project does not conflict with the area land use. In consideration of the above concerns and assessment of the current proposed sites, relocation of the project is not a viable option.

c) Action option

This alternative would see the implementation of the project as proposed by the developer, and as outlined in this EIA report (Boosting of the Agricultural scheme).The consultancy team made comprehensive environmental impact study for the proposed project. Details of the study are the subject of this report. The Action option as proposed in this report appears to be the most attractive and long time investment whose returns can be considerable. This option would certainly be a solution to the projected food demand in the country. Mitigation measures for the identified negative impacts of this alternative have been thoroughly discussed in this report. If they are implemented as proposed, the project will not be damaging to the environment. The consultancy team therefore recommends that this alternative is the most appropriate.

ES.9: Potential environmental impacts evaluation

The study team evaluated the anticipated potential impacts of the project on the bio-physical and the socio-economic environment. The impacts were categorized as positive or negative and their level of effect on the environment were also gauged. In general the study findings indicated that the positive project impacts shall outweigh the negative impacts if the mitigation measures aimed at minimizing or eliminating the negative impacts are implemented. Below is an outline of the anticipated project impacts:-

Positive Impacts

1) Improved Water for Productive Uses;
2) Increased Agricultural Acreage and Productivity;
3) Increased Job Opportunities;
4) Environmental Protection;
5) Market Creation;
6) Opportunity for training and skills acquisition.

Negative impacts

The project will however come along with some negative impacts during its implementation and operation activities. The most common impacts are associated with pollution of the environment from agrochemical and other pollutants though to a less extent due to the production and use of organic fertilizers, impacts on workers from work area health hazard, impacts on water sources, and waste management, an elaborate analysis of these impacts is given in chapter 7 of this report. They include the following:-

1) Soil Compaction and Erosion;
2) Solid Wastes;
3) Impacts on Water Resources, Hydrology and Downstream Users
4) Air pollution;
5) Water pollution;
6) Increase on water usage;
7) Impacts of pesticide use on human health;
8) Occupational health and safety impacts.

ES.10: Proposed mitigation measures

Mitigation measures for the identified negative impacts are clearly discussed in section 7 of this report. An environmental management and monitoring plan upon which each impact will be mitigated is also provided in section 9. The key mitigation measures will include the following:-

- Prepare and implement the following stand-alone environmental planning tools
  - ✓ Environmental and Social Management and Monitoring Plan (ESMMP)
  - ✓ Waste Management and Monitoring Plan (WMMP)
  - ✓ Water Management Plan (WMP)
  - ✓ Occupational Safety and Health Management Plan (OHSMP)
- Provision of appropriate PPE to the workforce;
- Use of mechanically sound machinery;
- A first aid kit will be maintained onsite for emergency treatments;
- Reuse of organic waste material on the irrigation scheme as manure;
- Crop rotation practices will help reduce soil degradation.

In order to ensure that the proposed mitigation measures will be implemented, an environmental management and monitoring plan has been developed to guide all activities of the project during all its phases concerning the protection of the environment. This plan specifies the nature of the negative impact, the proposed mitigation measures, the

indicators in the execution of these mitigation measures, the time period, and the responsible party.

ES.11: Conclusion

The negative impacts of this project can be eliminated, reduced or compensated if the proposed environmental management plan is followed as proposed. Recommendations have been proposed so that the execution of the project becomes a success without harming or with the least negative effect to the environment in general.

On the basis of the above findings, it is recommended that the project be allowed for implementation provided the mitigation measures outlined in this report are adhered to and the Environmental Management and Monitoring Plan (EMMP) is implemented.

1 Agriculture sector in Uganda

1.1 Introduction

Agriculture remains a key sector of Uganda's economy. It supports the livelihoods of 73% of the households, employs about 72% of the total labour force, 77% of whom are women, and 63% are youth, mostly residing in the rural areas (MoFPED, 2015). The proportional contribution of the agricultural sector to the Gross Domestic Product (GDP) of Uganda currently stands at about 20.9%. The sector is also very important in terms of food security, employment, and household income. In addition, the sector provides the basis for growth in other sectors of the economy. For example, it is the main source of raw materials to Uganda's local manufacturing industries and exports to regional and international markets (MAAIF, 2013)

Despite the importance of agriculture in the economy, the sector's performance has not been impressive in recent years. The agricultural sector growth, in real terms, declined from 7.1% in 2000/01 to less than 1% in 2005/06 and 2006/07 before recovering to 2.6% in 2008/09 (BoU, 2009). This growth is much below the NDP annual growth target of 5.6%, and the 6% annual growth target of the African Union's Comprehensive Africa Agriculture Development Program (CAADP).

1.2 Agriculture production constraints

Agriculture still forms the back bone of Uganda's economy. However, growth in agriculture production is affected by a number of constraints. These include:-

Degradation of Land Resources – The causes of land degradation include soil fertility depletion, population pressure on land, capital-deficient unsustainable agriculture intensification, deforestation, overgrazing, poor farming practices, climate change and variability, land tenure, and policy issues, among others. These challenges are exacerbated by the low investment in the Agriculture Sector, which has led to stagnation or very slow growth of the sector (about 1.3%). These threats are further exacerbated by low and unreliable rainfall, frequent drought and precarious water supply, seasonal fires, and endemic poverty.

Limited Agricultural Technology Development - Uganda's agriculture is dominated by smallholder subsistence farmers and characterised by low productivity, use of rudimentary tools (hand hoe and panga), limited use of productivity enhancement inputs (e.g. improved seeds, fertilizers and herbicides), high post harvest losses (up to 30%) and limited mechanization.

Poor delivery and adoption of agricultural technologies – The agricultural advisory services delivery systems in Uganda are inappropriate thus limiting adoption of agricultural technologies. The number of technical staff is also inadequate with limited capacity to deliver extension services at district and sub-county levels. The situation is even worsened by delayed release of funds and the rigid procurement processes.

Pests and diseases – These significantly contribute to productivity losses and their control can tremendously improve agricultural production, and enable agricultural produce access international markets

Other constraints are; marketing gaps, limited mechanisation and limited irrigation technologies.

It is against this background that the Farm Income Enhancement and Forest Conservation project (FIEFOC) was framed to boost agricultural productivity and enhance food security through sustainable natural resources management and agricultural enterprises development.

1.3 Project Rationale and Justification

The National Development Plan II (NDP II) 2015/16-2019/20, which has been designated by Government of Uganda as the second of a series of six 5-year NDPs to translate the country's Vision 2040 into action, is the overall development strategy for Uganda. The NDP's core objectives are to increase household income; generate employment; develop the infrastructure; increase access to quality social services; promote science and technology; and develop human capital which FIEFOC is consistent with. The Project's activities, notably, construction of irrigation infrastructure and promotion of value addition to enhance household incomes, are also consistent with the Agricultural Sector Development Strategy and Investment Plan (DSIP) 2010, Gender Policy Brief for Uganda's Agriculture Sector (2012), the Rural Development Strategy (RDS) of the Ministry of Finance, Planning and Economic Development (MoFPED), the Local Government Sector Investment Plan (LGSIP Investment Strategy 6, Local Economic Development), the Uganda Forestry Policy, and the Uganda Climate Change Policy.

The Project is in line with the African Development Bank's Ten Year Strategy (TYS) as it relates to inclusive growth and food security through the involvement of youth and women in skills development and entrepreneurship. The Project is also consistent with the Bank's CSP (2011-2015) with its two pillars focusing on (a) the development and rehabilitation of critical economic infrastructure and increased agricultural productivity; and (b) improving capacity skills development for poverty reduction, both of which are well aligned to the NDPII. FIEFOC-II was identified by the CSP as one of the key investment projects to be supported by the Bank under its first pillar mentioned above. In addition, the Project is aligned with the Bank's draft Agriculture and Agribusiness Strategy 2015-2020, the Gender Strategy (2014-2018), the Bank's Climate Change Action Plan (CCAP, 2011-2015).

1.4 Project Purpose

The FIEFOC-II aims at strengthening its commitment to providing necessary resources and inputs to enable farmers increase and manage valuable and profitable vegetation cover in local forest reserves, community forests, natural forests and degraded landscapes. The project will further support apiculture activities within selected watershed areas so that they contribute to conservation of forests and increase the quantity and quality of honey for immediate income generation.

The development goal of the project is to improve household incomes, food security, and availability of forestry products and services through sustainable natural resources management and agricultural enterprise development

The overall objective of the project is to improve farm incomes, rural livelihoods, and food security and contribute to poverty reduction through sustainable natural resources management and agricultural enterprise development.

1.5 Purpose of the Assessment

The National Environment Act, 1995 lists projects for which EIA is mandatory in the third schedule. The proposed irrigation project is listed in category 8. Agriculture, including —

4) Large-scale agriculture;
5) Use of new pesticides; and
6) Use of fertilizers.

The basic purpose of the Environmental and Social Impact Assessment (ESIA) study is to identify, predict and analyse the magnitude of environmental and social impacts and propose enhancement and/or mitigation measures for significant environmental and social effects that are likely to arise from the various activities of the proposed irrigation scheme project during construction and operation phases.

In compliance with the above legislation, the developer has decided to undertake the EIA prior to establishment of the scheme. This Environmental Impact Statement (EIS) has been prepared to provide a detailed and comprehensive assessment of the environmental, social, cultural and economic impacts (beneficial and adverse) of the project. The EIS also identifies mitigation measures that may be applied to effectively manage any potentially adverse impacts arising from the project. This report therefore presents the findings of the EIA.

1.6 Objectives of the study

Environmental Impact Assessment (EIA) is a planning tool that promotes the integration of environmental concerns into the project planning process at the earliest possible planning and design stages and helps provide management of the project with practical advice on the mitigation of any potentially adverse environmental impacts of the project. It is also expected to provide a means whereby the overall environmental performance and social benefits of the project can be enhanced. The specific objectives of the ESIA include the following:-

1. To ensure that the project is implemented within the policies and laws of Uganda;
2. Identification of sensitive environmental components likely to be affected by the proposed project;
3. Defining positive social and economic benefits local communities can derive from the proposed project implementation;
4. Identification, prediction and evaluation of the potential negative environmental impacts associated with the project implementation and;
5. Designing subsequent operation, and preparation of plans and recommendations regarding measures that will minimize adverse impacts and enhance beneficial impacts.

1.7 ESIA Process for Uganda

The ESIA process followed the legal procedures as contained in Environmental Impact Assessment manual for Uganda, 2002. The flow chart in Figure 1.1 summarizes the process.

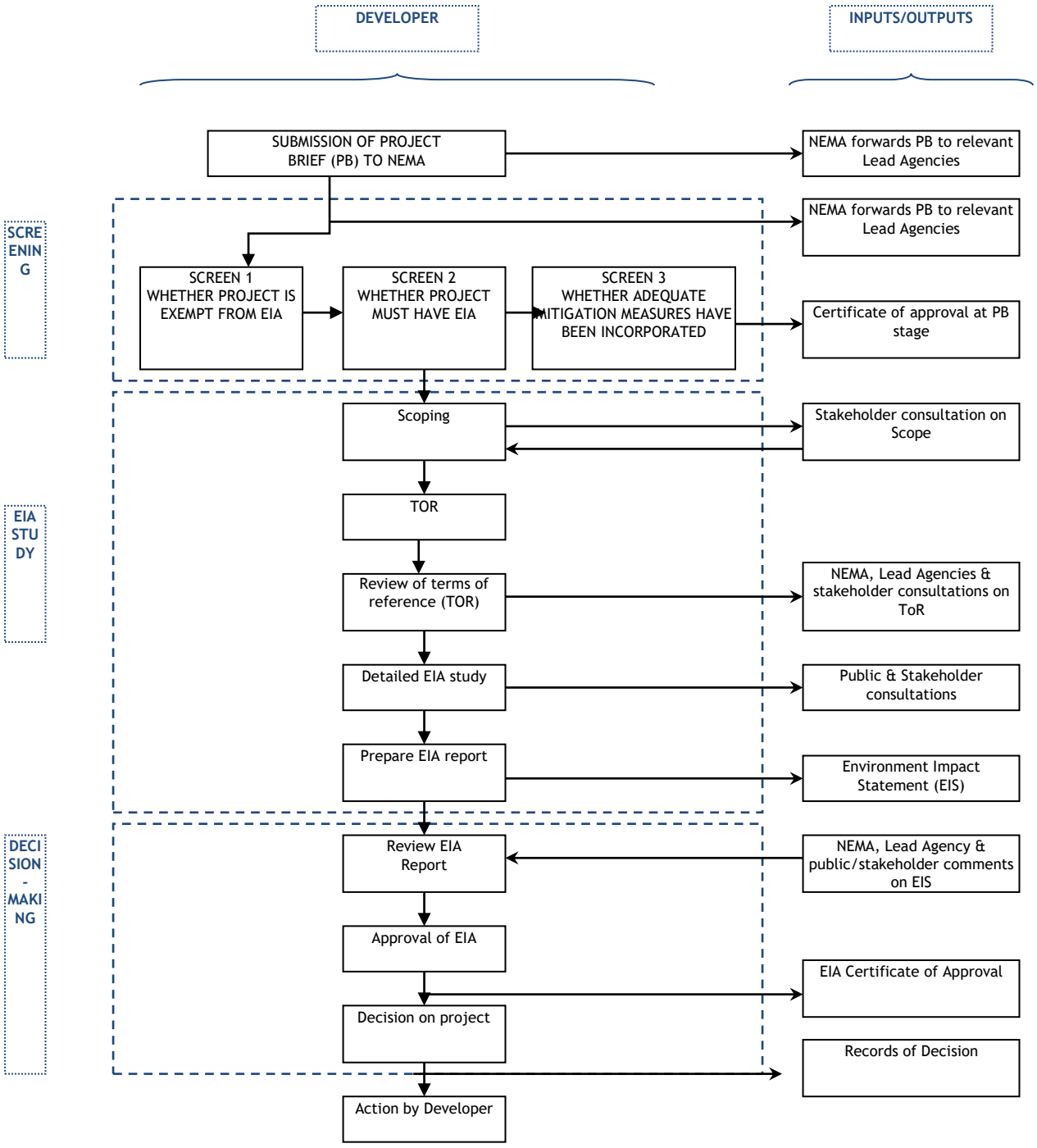


Figure 1.1: EIA Process in Uganda

2 Methodology and Approach

The general steps followed during the assessment were as follows:-

2.1 Environmental Screening

This step was applied to determine whether an environmental impact assessment was required and what level of assessment was necessary. This was done in reference to requirements of the National Environment Act, 1995, and specifically the third schedule. Issues considered included the physical location, sensitive receptors and nature of anticipated impacts.

2.2 Environmental Scoping

The scoping process helped narrow down onto the most critical issues requiring attention during the assessment. Environmental issues were categorized into physical, biological, social, and economic aspects. After identifying the project as one for which EIA is mandatory, the consultant, on behalf of the developer, carried out a scoping exercise and prepared a scoping report and terms of reference defining the scope of EIA required.

2.3 Collection and review of available Information

The consultant collected and reviewed published national policies, legislations, regulations and guidelines, census reports and performance standard on social and environmental sustainability documents. The existing environmental and socio-economic data was gathered from relevant sources at the district level (District state of environment reports). Primary data and information on the study area was collected using different tools and techniques including household interviews, local community representatives' consultations, checklists and matrices appropriate for this project.

2.4 Field Survey

Site visits were made to assess the baseline environmental and social conditions of the proposed project site; to define impacted areas and identify environmental and socio-economic components that are likely to be significantly affected by the proposed project. During field survey, basic data and information on the biophysical resources, socio-economic as well as historical and cultural sites were collected. Site investigations involved visual inspection of all project site area to identify environmental hotspots within and outside the site.

2.5 Public Consultations

Public Consultation was undertaken. During the impact assessment process, individuals and group community members were interviewed and consulted on the probable project social, economic and environmental impacts. The key stakeholders that were consulted include Ministry of Water and Environment, Kasese District Local Government technocrats (District water engineer, OC-Mubuku), the area local leaders, and the residents within the jurisdiction of the project site and their views were incorporated in the report.

2.5 Scope of the study

The EIA will consider the potential environmental effects of the project on components of the physical, biological, and socioeconomic environments that may be affected by the project. The EIA will also consider the environmental effects that could occur during all

phases of the project, including from credible accidents, malfunctions and unplanned events that could occur. It will also consider any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out. Finally, it will assess the significance of these potential environmental effects.

Spatial and temporal boundaries will be developed for each valued environmental component to identify and describe potential project-related environmental effects.

2.6 Spatial Boundaries

Spatial boundaries reflect the geographic range over which the project's environmental effects may occur. The spatial boundaries include the project development area, a local assessment area, and a regional assessment area. The project development area is the area of physical disturbance associated with the project (the "footprint" of the project) which is the 375ha and 78ha piece of land. The local assessment area is the area within which potential direct and indirect environmental effects of the project are predicted to occur. The regional assessment area considers the wider area within which cumulative environmental effects may occur.

2.7 Temporal Boundaries

Temporal boundaries reflect the timeframe over which the project's environmental effects may happen. The temporal boundaries for this environmental impact assessment will include the three phases of construction, operation and decommissioning.

2.8 Structure of the EIS

This report is divided into the following principal sections that follow in a chronological order:-

Chapter 1: Background
Chapter 2: Methodology and Approach
Chapter 3: Project Description
Chapter 4: Policy, Legal and Institutional Framework
Chapter 5: Environment and Socio-Economic Baseline
Chapter 6: Stakeholder Consultation and Disclosure
Chapter 7: Impact Analysis and Punitive measures
Chapter 8: Analysis of Alternatives
Chapter 9: Environmental, Social Management and Monitoring Plan
Chapter 10: Conclusions

3 Project Description

Mubuku Irrigation Scheme was set up with an intention of resettling farmers from different parts of Uganda. The scheme occupies a land area of 2,000 Ha of which 516 Ha is under irrigated crop farming. 480 hectares is not utilized for lack of water while another 1,000 Ha were reserved for livestock production. The scheme has 153 tenants sitting on an average land holding of 3.2 Ha. Farming at the scheme is the major source of income for 62.3% of the household heads while the remaining 37.7 % engage in the informal activities in addition to farming.

The originally envisaged area for the scheme was 2,000 ha. About 996 ha of area was to be irrigated to settle 262 farmers and the remainder 1,004 ha to be used for pasture and dairy production with proposed 730 milking cows. The scheme was envisaged to be a small holder farmers' cooperative and was provided with facilities like offices, staff housing, storage, various workshops etc. Besides cultivation of various crops other activities like dairy and piggery were practiced in the scheme. However, through time most of the facilities became non-functional or scaled down.

Plate 3-1: Current state of the proposed sites (Phase IIB and Phase III)

3.1 Phased Development of Mubuku Irrigation Scheme

The first phase (Phase I) of Mubuku Irrigation Project (400ha) was implemented in early 1970s. The scheme takes its water from a diversion weir located about 850m from the first block and is provided with pipeline conveyance system, irrigation canals, farm roads, and scheme head quarter with facilities like offices, stores, residential houses etc. There are 7 blocks with areas varying from 46-62 ha. This second phase (Phase II) was planned with 216 Ha but only a portion (Phase II A) with 116 Ha was implemented bringing the total area currently under irrigation to 516. Phase II lies adjacent to and on the western side of phase I. This area is supplied from separate diversion structure located very close to that of phase I (about 275m). It has a long idle canal length of about 3.3km. Due to steep slope the lower

part of the canal is concrete lined. Under the current initiative, the balance of land under phase II (Phase IIB) with 100 Ha and Phase III with 380 Ha all totalling 480 Ha is being planned for irrigation.

3.2 Conceptual design of water delivery system

3.2.1 Design Overview

The water availability analysis for R. Sebwe identified a reserve capacity of 8,800 m^3/d (or 0.2 m^3/s over 12 hours) which is not sufficient for the demand under Phase IIB and Phase III. There are two alternative water sources that were considered for this purpose; R. Nyamwamba and R. Mubuku. R. Mubuku would have been ideal as the alternative source since it flows close to R. Sebwe but its use for hydropower development has made it difficult to be considered for irrigation. This is because, the tail water from the last power station is at a lower elevation than most of the Mubuku irrigation command area. Knowing that the use of this option would result in pumping, the option was provisionally ruled out.

The R. Nyamwamba which flows west of the command area is currently not under use for water supply, and any future use would have to take into consideration irrigation requirements. The river can facilitate abstraction by gravity but has a problem of excessive floods which may have to be controlled under this project. A hydrological analysis shows that R. Nyamwamba has enough flow to sustain irrigation requirements under Phase IIB and Phase III without the need for night storage.

Therefore, this conceptual design is based on abstraction of water from R. Nyamwamba into a collection tank above the command area and then into main canals for distribution to the farms. A suitable site for an abstraction point was found just outside the town of Kasese. Here the river flows through a naturally narrow area created by a small hill. The elevation is 990m, with coordinates of UTM 175696.18ME, 21860.30MN such that water can be delivered under gravity to a tank which is located at elevation 978m.

3.2.2 Intake Works

Water will be diverted by means of a low weir into an intake works. The weir will be low enough to pass floods without interruption and will not hinder the bed load of the river. From the weir the water will be carried to a sedimentation tank before entering the transmission mains (canal) to storage tank.

3.2.3 Weir Intake

A rectangular free-overfall weir made of reinforced concrete with steel plate gate will be constructed so as toad just intake discharge and flow down floating particles or mud through gate. The raw water abstraction channel will have the capacity to abstract 0.746m^3/s, using a weir constructed of reinforced concrete across the river channel to keep the water at the required level. The weir will be constructed to withstand damage by floods and minimize problems caused by sediment by providing sluices to flush any sediment that might settle. The weir will have a width of 20m and height of 1m.The weir is designed to be constructed at right angle to the river flow so that the water's approach is vertical.

The dependable river flow at 80% probability of exceedance has been estimated as 1.033 m^3/s at the proposed intake. Allowing for environmental flow of 20% and an additional 10%

for other downstream users the balance is 0.775 m3/s which can be abstracted for irrigation using a weir constructed across the river channel. Irrigation water requirement calculations shows that 0.746 m^3/s is required for Mubuku irrigation scheme. Therefore, out of 0.75 m^3/s will be abstracted.

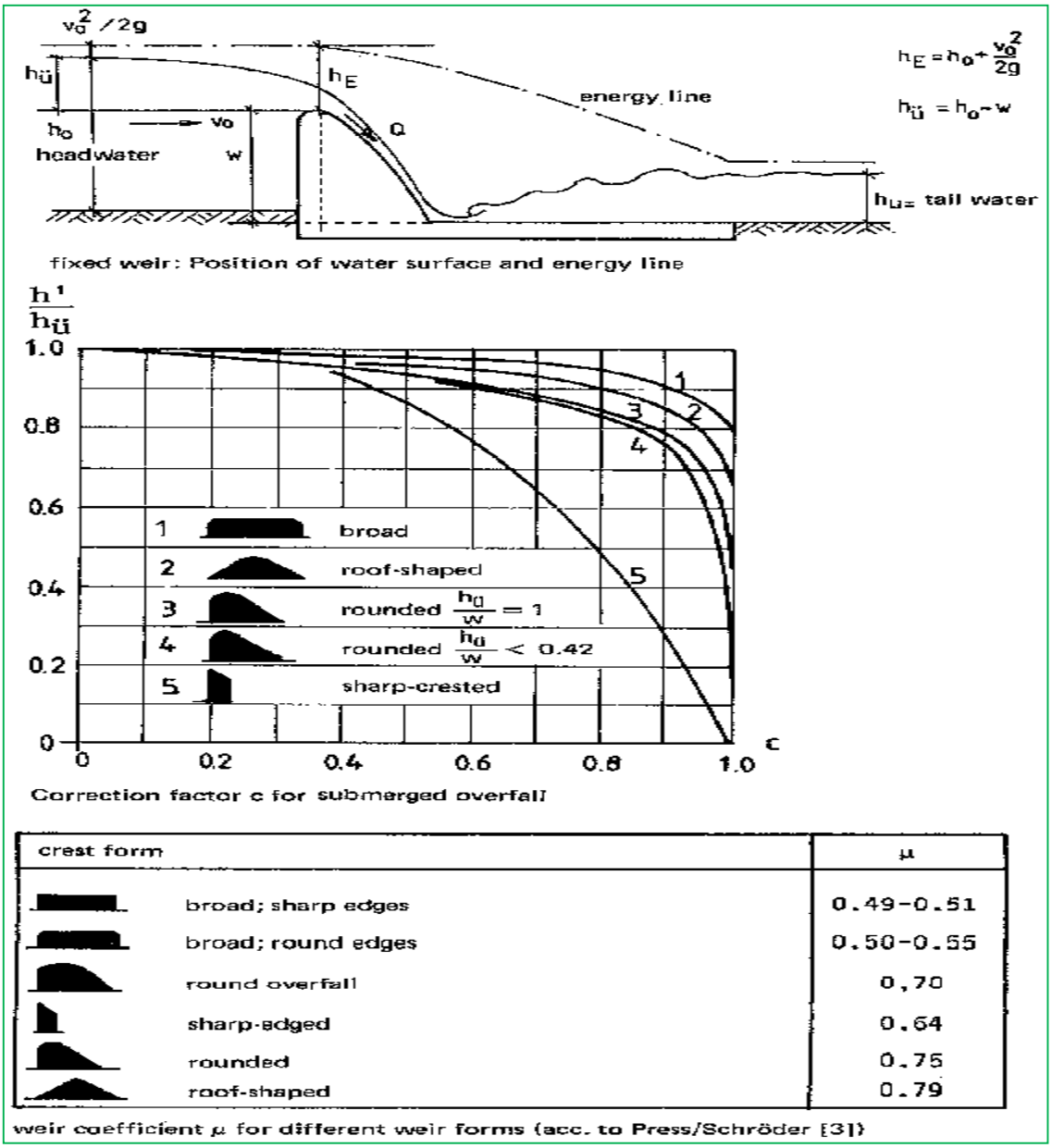


Figure 3-1: Intake Weir Design

The Intake structure has been designed to ensure the following:-

Maximum Flow: The alignment crosses the Fort Portal-Mpondwe road which will require an inverted siphon. The capacity of the inverted siphon will determine the maximum flow rate permissible in the canal. The intake structure has been designed to ensure that the canal does not become surcharged with more water than can be accommodated by the siphon. Any excess water will overflow back into the river channel.

Siltation: The shape of the overflow approach has been designed to maintain a flooded intake level for control purposes. The sloping upstream face will allow the passage of stones and gravel during the passage of floods. The angle of the approach will tend to ensure that suspended particles are carried past the channel off-take and over the weir. In the event of gravel being deposited upstream of the weir, this material will be flushed over the weir during floods.

High Flow Passage: Under high floods the entire structure and weir will be submerged. The embankments will be protected with 300mm deep stone packed gabion mattresses, anchored into the banks on both the upstream and downstream sides. A geo-textile layer under the cages will prevent scour from occurring under the cages.

Sedimentation Cleaning: The channels between the intake controls and the canal entrance have been designed to facilitate the deposition of some of the suspended solids that may be carried into the structure by the water movement. The low velocity of flow in these channels will allow some of the sediment to settle. Scour pipes and two channels facilitate maintenance.

Connection to Canal: The connection between the canal and the intake structure has been designed to limit the flow into the canal. This section will be sufficiently long to allow the passage of high floods to pass the canal without overtopping the canal banks.

3.2.4 Grit Removal/ Sand Trap Channel

This channel collects the irrigation water supply from the weir into the water system. Due to the high suspended matter content of the river water and the need to protect the mechanical components from abrasion by hard suspended matter such as quartz, sand traps are a necessity. The effective length and depth of the sand trap is estimated at 21m and 0.8m respectively based on the minimum target sand grain of 0.2mm, critical velocity of 0.3m/s. An assumed 35NTU was used for these calculations.

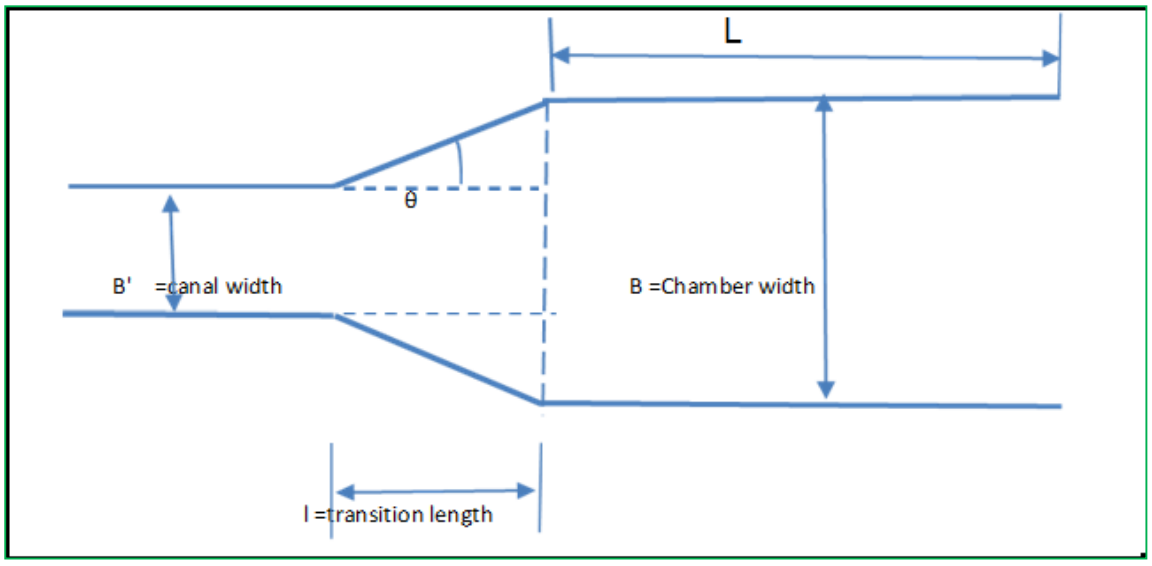


Figure 3-2: Sand Trap Hydraulic Calculation

Stability Analysis: The intake structure is a low level, reinforced concrete structure. The design is such that stability and earthquake analyses are not required for this structure. The embankment, being a flexible earth and clay structure, topped with gabions, will move with any earth movements and does not, therefore, require either a stability or earthquake analysis.

Connection to Canal: The connection between the canal and the intake structure has been designed to limit the flow into the canal. This section will be sufficiently long to allow the passage of high floods to pass the canal without overtopping the canal banks. The size of the connecting pipe has been determined to be a 900mm HDPE or concrete pipe. The exact length of this pipe will be determined by the detailed design of the intake works and detailed survey of the banks.

3.2.5 Contour Canal

The contour transmission canal will follow the contours on the alignment shown on Figure 3-2, above. In order to limit losses in the distribution system, the main, secondary and tertiary canals will all be constructed in concrete. The canal structure is concrete with panel sections placed on a plastic liner under the concrete. Joints will be sealed to ensure the canal losses are minimized and the structure retains water. The canal will be fitted with intermediate control structures for maintenance purposes or for the extraction of additional water (if desired).

3.2.6 Inverted Siphon

The canal will discharge into an inverted siphon before entering the housing development adjacent to the Fort Portal- Mpondwe road. The use of an inverted siphon to cross the housing and road is considered essential for safety reasons, as an open canal in close proximity to housing is not desirable. The siphon will consist of concrete inlet and outlet structures with a spigot and socket pipe length between structures. Grids on the entrance and outlet will ensure no person can enter the pipe. The siphon will be constructed out of either concrete or HDPE pipe with a diameter of 900mm, designed to accommodate 723 l/s.

3.2.7 Balancing Reservoir

The balancing reservoir will provide storage of 24 hours of run-of-river flow, amounting to 62 Ml. Ideally the reservoir should be a clay lined earth dam with a concrete topping to prevent erosion of the crest. If adequate clay or a quality suitable for lining the dam is not available in the region of the development (high clay content, low silt and organic content); then the reservoir will be provided with a HDPE liner. The details required for this reservoir structure are given in our design data and drawings. The concrete topping will be required to prevent solar damage to the liner and to protect the clay from damage during operations. The reservoir is designed to ensure that irrigation water can be drawn down over 12 hours at a higher flow rate. Recharge of the reservoir will occur during periods of no or low irrigation demand.

3.2.8 Transmission Main

It is proposed that the water conveyance system be by open canal before entering the housing development. For security reasons the water will be conveyed in a pipe through the

housing area. The main transmission canal has been designed to safely convey the design flow of 0.723m^3/s with a 300mm freeboard. Long weirs, combined with pedestrian and storm water overpasses are provided at regular intervals of 500m to ensure that the side-slope run-off does not surcharge the inverted siphon section. No discharge into fields or minor canals will occur from the main or secondary distribution canals.

3.2.9 Distribution System

Rotational type of water distribution is expected to be practiced in the scheme. The rotation will be within the blocks. In view of small holder nature of the scheme, the units were sized such that the flow is manageable with family labour. As given in the Agronomy part, the water scheduling shows irrigation interval of 5-6 days with varying depth of application. For hydraulic control purposes the system will consist of a main irrigation canal feeding into three secondary canals. The main canal will be a contour canal, distributing into the secondary canals which run more perpendicular to the contours. Control structures will be provided on the secondary canals so that flow from control point to control point is under hydraulic gradient. Water will be abstracted from the secondary canals into the tertiary lateral canals at the control points.

A main canal will supply water to the blocks through lateral canals which are contour canals in all cases. The main and secondary canals will have a combined normal capacity of 1450 l/s, as the full design flow will be applied over 12 hours. The balancing dam will store water during non-irrigation periods to ensure that irrigation can continue at all times. The canals should be concrete lined with a plastic under-lining, as per the main transport canal design from the intake structure.

Table 3-1: Transfer Contour Canal Design Criteria

Description	Value
Base Width (m)	0.5
Canal Depth (total) (m)	0.7
Normal Flow Depth (m)	0.4
Side Slope (1:x)	3
Longitudinal Slope (1:x)	300
Normal Capacity (l/s)	800
Maximum Capacity (l/s)	1 650
Velocity (Normal Flow) (m/s)	1.35
Critical Velocity (y=0.4) (m/s)	1.52
Velocity (Maximum Flow) (m/s)	1.65
Critical Velocity (y=0.5) (m/s)	1.67

Froude No. (Normal Flow)	0.78
Froude No. (Maximum Flow)	0.84

The laterals will supply to 40-60 ha and will have an average capacity of about 100 l/s. Lateral canals supply to sub laterals which run downhill supplying to field ditches at selected points along the sub lateral. Field canals/ditches will supply water to the furrows using individual siphons. Turnout and check drops will be provided to the head of each field ditch. Farm size per household in the scheme is set at 3.2 ha. A layout of the provisionally proposed canals is provided (See Fig 3-3), Irrigation Area, Layout and Section. Note that this layout is provisional only and the locations of the individual Tertiary Canals will be adjusted to ensure that farms are equally provided with water. Sub-lateral canals (or field ditches) will provide water to the individual farms. Thus one sub lateral supplies to two farms on both sides. The field canals/ditches are expected to be constructed by the beneficiaries. However, the control gates on the tertiary canals will be part of the main work.

Storm water flows will enter the main irrigation canal and the tertiary canals. The design of these canals is such that the excess flow will be conveyed to the lowest end of each canal, where it will be safely discharged by means of an overflow weir. The surplus water overflow will discharge into the storm water and contaminated water channels, which discharge into a number of unlined evaporation ponds. Water from these ponds can be used for growing of cattle feed etc. but direct discharge to rivers should be avoided because of the high fertilizer and pesticide concentrations expected. The lateral canal will be unlined, trapezoidal shaped canal. The base of these canals will be 0.3m wide, side slopes 1:3 and water depth a maximum of 0.3m. The longitudinal slope should not exceed 1:150, giving the canals a normal capacity of 0.440l/s. A maximum velocity of 1.11m/s is expected under normal operating conditions. The critical velocity of this system is 1.302m/s at a water depth of 0.3m and the Froude Number under normal operation is 0.854. A detailed survey of the area is required in order to accurately design the lateral and tertiary canals. These canals will typically operate under hydraulic gradient, with a maximum longitudinal slope of 1:150 provided. Storm flows will be discharged at the lowest ends of each canal. A detailed layout of the canal system is provided as Figure 3-3. Note that in the canal design a longitudinal slope of 1:250 has been specified. This is essential for control of the flow in the canals and to ensure that the flow remains sub-critical at all times. The canal layouts are indicated in appendix 2. The Secondary and Tertiary canals will, as far as possible, be located to suit existing field layouts. The need to have specific slopes will, however, dictate the locations of these canals to some degree

3.2.10 Transmission Main

It is proposed that the water conveyance system be by open canal before entering the housing development. For security reasons the water will be conveyed in a pipe through the housing area.

3.2.11 Distribution System

Rotational type of water distribution is expected to be practiced in the scheme. The rotation will be within the blocks. In view of small holder nature of the scheme, the units were sized such that the flow is manageable with family labour. As given in the Agronomy part, the water scheduling shows irrigation interval of 5-6 days with varying depth of application.

A main canal will supply water to the blocks through lateral canals which are contour canals in all cases. The laterals will supply to 40-60 ha with average capacity of about 100 l/s. Lateral canals supply to sub laterals which run downhill supplying to field ditches at selected points along the sub lateral. Turnout and check drops will be provided to the head of each field ditch.

Farm size per household in the scheme is set at 3.2 ha. Thus one sub lateral supplies to two farms on both sides. The field canals/ditches are expected to be constructed by the beneficiaries. However, the control gates will be part of the main work.

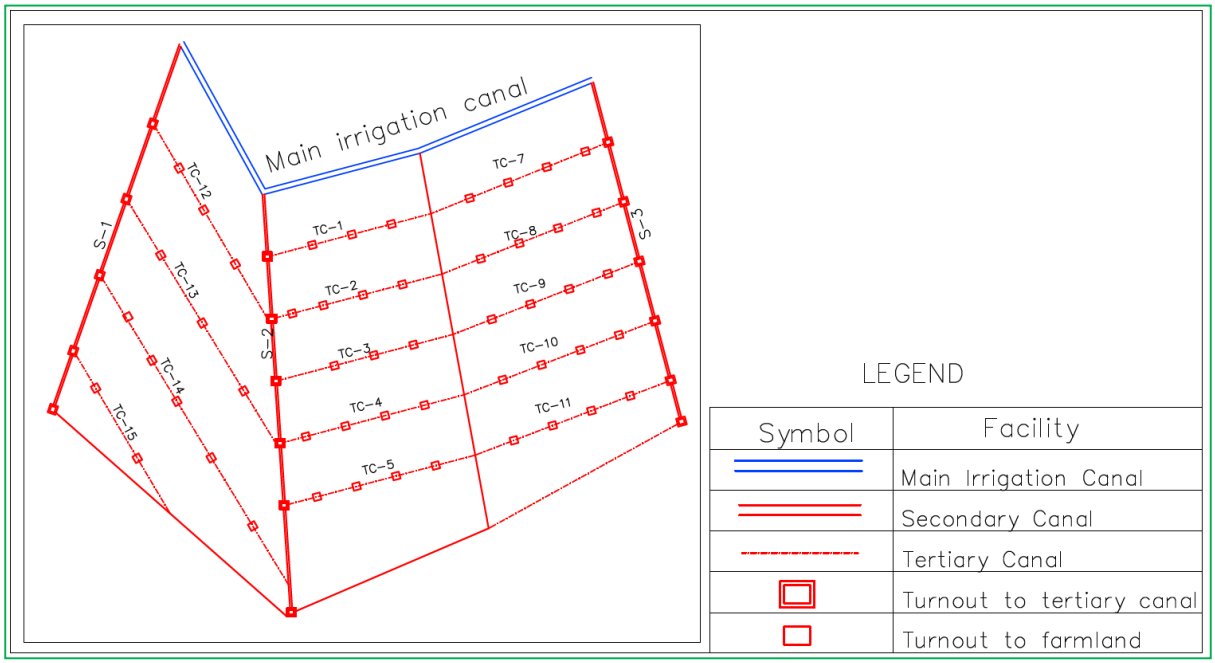


Figure 3-3: Layout of the main irrigation canal

Sub lateral canals will be provided for each area of about 6.4 ha in a block. Thus there will be about 59 sub laterals in each block. These will be provided with simple slide gate at the head reach. Flow to each block is about 100 l/s. The sub laterals are designed for capacity of 33 l/s which implies about three sub laterals operating at a time. As per the design, it was given that there are drop cum check turnouts along the sub laterals. The slope of the canal is 1:250. As these structures are not in place at the moment the velocity must be contained and controlled, as the existing 2% slope will result in excessive velocities and erosion.

3.2.12 Drainage System and Flood Protection

To avoid water logging, it is essential that a good drainage system be incorporated as part of the irrigation system. Each area supplied with water by an irrigation canal should be drained by a corresponding drain, which is located along the nearest drain canal, valleys or natural waterways. A drainage network of field canals, lateral and main will be provided to dispose of surplus irrigation water and storm water from the fields, blocks and the scheme respectively. Two main drains are provided to collect drainage from lateral drains. Field drains which are small in size and parallel to the sub lateral canals are expected to be constructed by the beneficiaries. The lateral drains are aligned along the contour in most cases parallel to the lateral canals. The storm water is estimated to be 48 l/s/km^2. The lateral drains carry drainage from one block which is about 30 l/s, clearly similar in size to the sub-laterals. For seven lateral drains this gives a total of about 200 l/s. The capacity of the main drain is taken as over 700 l/s. However, as this will result in erosion because of the topography, it is divided into four sections each of which dispose of the drainage into the adjacent grazing areas for better production of livestock feed. For low drainage values the depth of drainage canal is taken close to a meter for better subsurface drainage. The main drain is designed for 200 l/s. close monitoring of the main drainage canals is necessary as it might be eroded at some locations during high flows. To ensure that fertilizers and pesticides are not discharged directly into local streams, holding ponds have been provided. The storm water stored in these ponds can be used for feed irrigation or it can be held for evaporation purposes. The ponds will not be lined, but will be fenced for security reasons.

It is recommended that the irrigation channels be lined to prevent erosion, but it is accepted that costs may limit the expenditure in this regard.

4 Policy, Legislation and institution framework

The consultancy team reviewed and assessed the conformity of the proposed development to existing relevant Ugandan legislation, policies, and guidelines that have direct bearing on FIEFOC-II. The chapter also briefly describes some of the African Development Bank Safeguards polices applicable to the project, the following laws and regulations will be put under consideration and observed for the smooth implementation of the project.

Table 4.1: Policy, Legislation and institution framework

Policy	Relevance
The Constitution of the Republic of Uganda, 1995	The Constitution of the Republic of Uganda, 1995 is the main legislation body in the country. It offers, "every Ugandan the right to clean and healthy environment (clause 39) while at the same time expects citizens to play their part in creating a healthy environment. According to the Constitution, "It is the duty of every Ugandan to create and protect a clean and healthy environment" (clause 17j). The Constitution provides that the State shall "stimulate agricultural, industrial, technological and scientific development by adopting appropriate policies and enactment of enabling legislation." It also provides that the state shall "take appropriate steps" to encourage people to grow and store adequate food." It bestows responsibility for management of the agriculture sector with the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). One of MAAIF core functions is formulation, review and implementation of policies, laws, regulations, plans and strategies for the agriculture sector.

National Environment Act of 1995 Cap 153

The National Environment Act of 1995 Cap 153 is the main law relating to the protection of the environment in Uganda. The Act provides for various strategies and tools for environment management, which also include EIA (Section 19) for projects likely to have significant impacts on the environment. The Act imposes a mandatory duty on a project developer to have an Environmental Impacts Assessment conducted before embarking on a project. The Third Schedule of the Act made under section 18 of the Act lists the types of the projects to be subjected to EIA, including large-scale agriculture and flood protection. The NEMA was created under the NEA and is mandated with the responsibility to oversee, coordinate and supervise environmental management in Uganda, including the review of environmental impact assessments carried out for various projects.

The Water Act, Cap 152

The Water Act, Cap 152 of 1995 provides for the management of water in Uganda under the mandate of the Directorate of Water Resources Management in the Ministry of Water and Environment. Section 31, subsection (1) of the Water Act deals with prohibition of pollution to water and stipulates that a person commits an offence that, unless authorized under this Act, causes or allows:-

a) Waste to come into contact with any water;
b) Waste to be discharged directly or indirectly into water; and
c) Water to be polluted.

Under section 107, the Water (Waste Discharge) Regulations (1998); the Water Supply

Regulations (1999) and the Sewerage Regulations (1999) have been put in place in order to implement this Act and are aimed at minimizing pollution of public waters by developers and other users.

The Land Act, Cap 227

The Land Act, Cap 227 of 1998 provides that the Government or the local government shall hold land in trust for the people and protect natural lakes, ground water, natural streams, wetlands and any

other land reserved for ecological purposes for the common good of the citizens of Uganda. A local government may, upon request to the government, be allowed, to hold land in trust for the people and the common good of the citizens of Uganda.

Sections 43, 44 and 45(1) and (2) of the Land Act (1998), provides that national or local government may acquire land in accordance with the provisions of Article 26 and clause (2) of Article 237 of the Constitution of the Republic of Uganda.

A person who owns or occupies land shall manage and utilize the land in accordance with the National Environment Act, Cap 153 and any other laws binding. Part III sections 43, 44, and 45 specifically address the utilization of land in accordance with the various statutes and acts of environmental concern, which include the National Environment Act, The Water Act, and any other law. In addition section 45 addresses the control of environmentally sensitive areas.

The Local Government Act, 1997	The Local Government Act, 1997 provides for decentralization and devolution of Government functions, powers and services from the central to local governments and sets up the political and administrative functions of local governments. The local governments are responsible for the protection of the environment at the district level. This therefore, implies that local governments shall be consulted on projects to be located within their areas of jurisdiction and on matters that affect their environment. The Local Government Act, 1997 sets out the decentralization of functions, powers, responsibilities and services to Local Governments. Issues to do with WfAP are the responsibility of the Production sector in collaboration with the Department for Water.
The Occupational Safety and Health Act, 2006	The Occupational Safety and Health Act, 2006 consolidate, harmonize and update the law relating to occupational safety and health and repeal the Factories Act of 1964. It makes provisions for the health, safety, welfare and appropriate training of persons in work places. The application of this act will be critical during the re-establishment phases as well as during the operation and maintenance of the irrigation project.
Water Act, Cap 152	The objective of the Act is to enable equitable and sustainable management, use, and protection of water resources of Uganda through supervision and coordination of public and private activities that may impact water quantity and quality. Section 18 requires that before constructing or operation of any water works, a person should obtain a permit from Water Resources Management Directorate (WRMD). Irrigation scheme project is herein defined to include alteration, improvement, maintenance and repair of water systems. The Act also aims to control pollution of water resources (Sections 28 and 31). This Act is specifically applicable to one aspect of the proposed scheme project which will divert the river to access different sections of the gardens. Different canals will be constructed within the scheme.
Environmental Impact	The procedures for conducting EIAs and guidelines

Assessment Regulations, 1998	for EIA practitioners and regulatory bodies are stipulated in this document. The regulations require a detailed study to be conducted to determine the possible environmental impacts, and measures to mitigate such impacts. At the end of the study, the environmental assessment report is submitted to NEMA to take a decision as to whether to approve or reject the project. The Guidelines also stipulate that the EIA process should be participatory, that is the public should be consulted widely to inform them and get their views about the proposed investment. The developer has the legal obligation to seek the views of the public, persons that may be affected by the proposed project, as well as all other stakeholders. In this case, key stakeholders have been consulted in the course of the study and their views have been integrated into the study (See chapter 6).
Policy Framework	
The Plan for Modernization of Agriculture	The Plan for Modernization of Agriculture (PMA) is a multi-sectoral policy framework for agriculture and rural development, is responsible for shaping the policy environment for agriculture in Uganda over the past eight years or so. The PMA pillars include: - research and technology development; national agriculture advisory services; rural finance; agro processing and marketing; agricultural education, physical infrastructure and sustainable natural resource utilization and management. The PMA outlines the national agricultural goals and priorities (Uganda Government, 2010). Linkages with PMA interventions have been used in designing recommendations for this project.
The National Environment Management Policy, 1994	The National Environment Management Policy, 1994 is the cornerstone of Uganda's commitment to socio-economic development that is environmentally sustainable and brings the benefits of a better life to all. The National Environment Management Policy gives the overall policy framework, which calls for sustainable development that maintains and enhances environmental quality and resources productivity to meet human needs of the present generation without compromising ability

	of future generations to meet their own needs. The policy sets a guiding principle that Environmental Impact Assessment should be required for any activities which may cause significant impact on the environment.
The National Wetland Conservation and Management Policy	The National Wetland Conservation and Management Policy requires the preparation of Environmental Impact Assessment and Audit procedures for all activities to be carried out that will have an impact on a wetland (s). Furthermore, the policy aims at maintaining an optimum diversity of uses and users and consideration for other stakeholders when using a wetland.
The National Water Policy, 1999	The National Water Policy, 1999 aims at promoting an integrated approach to manage the water resources in ways that are sustainable and most beneficial to the people of Uganda. It stipulates that the quality of drainage water shall be such as not to pollute the receiving water or ground water and that all measures must be taken by the users to prevent increase in salinity levels in receiving waters, to prevent the accumulation of dangerous or toxic compounds in the subsoil, capable of contaminating underground waters.
The National Environment (Riverbanks, Lakeshores and Wetlands) regulations, 2000	The National Environment (Riverbanks, Lakeshores and Wetlands) regulations, 2000 provides a list of regulated activities whose implementation in wetlands is subject to issuance of a Permit granted by NEMA in consultation with the Lead Agencies. These include, among others, cultivation, drainage, commercial exploitation, sewerage filtration, fish farming and aquaculture. Environmental Impact Assessment is mandatory- under the statue-for all activities in the wetlands, riverbanks and lakeshores and special measures are essential for protection of these ecosystems.

Institutional Framework

Institution	Role and Responsibilities
The Ministry of Water and Environment	The Ministry of Water and Environment (MWE) is the principal Executing Agency for FIEFOC-II project and will be responsible for the overall monitoring and management of the project during both construction and operation, including ensuring the implementation of the mitigation and enhancement measures and adherence to Uganda's environmental regulations and the Bank's Operational Safeguards. Other institutions that will be directly and indirectly involved in the implementation process include the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), the Uganda National Environmental Management Authority (NEMA), the Ministry of Finance, Planning and Economic Development (MFPED), Ministry of Gender, Labour and Social Development, and the Ministry of Local Government (MLG).
The National Project Coordination Unit	The National Project Coordination Unit (PCU) established under FIEFOC-Phase 1 and housed in the MWE will coordinate the activities of all institutions. The PCU shall have 1 or 2 environmental and social safeguard specialist(s) (recruited or appointed by the MWE) who will monitor and manage the implementation of the ESMP. The functions of the specialists will include working with consultants and reviewing reports as well as ensuring that safeguard decisions are adequately mainstreamed. They will also participate in monitoring and evaluation exercises.MWE/PCU, in liaison with District Local Government, the Ministry of Works, Directorate of Water Resources Development, Department of Water Resources Management, Wetlands Management Department, the department of Occupational Health and Safety (MoGLSD), Civil Society and the Farmers' Organization will undertake regular environmental, social, safety and health inspections. A monitoring committee is proposed, comprising the above stakeholders to undertake quarterly environmental and social monitoring of project implementation.
The National Environmental Management Authority	The National Environmental Management Authority (NEMA) will be responsible for review, comment

	and overall approval of the ESIA/ESMPs reports for the proposed irrigation scheme. Once approved, NEMA will issue Conditional Approval Certificates for the ESIA for the proposed construction and operation of the irrigation scheme.
Kasese District Local Government (KDLG)	Since the proposed irrigation scheme is within the jurisdiction of Kasese district, the technical staff of this respective district will participate in the monitoring and enforcement of the environmental regulations, provision of extension services, and; mobilization of communities, sensitization and capacity building activities. The District will designate a Project Support Officer (PSO) among its staff, who will support the implementation and technical supervision of the Project, including sensitization of farmers, training, and monitoring and evaluation. More so, the district environment officer will be responsible for ensuring the compliance of all the project components in line with relevant regulations and conditions during construction and the operation of the irrigation schemes. The district environment officer will relay environmental and/or social concerns on the project to NEMA for technical guidance. These selected district officers will report periodically to the MWE/PCU on all issues related to the irrigation scheme activities including environmental and social safeguards.

4.1 African Development Bank's Environmental and Social Safeguard Policies

The African Development Bank's Strategy for 2013-2022 emphasizes the need to assist regional member countries in their efforts to achieve inclusive growth and transition to green growth. In addition, the Bank is committed to ensuring the social and environmental sustainability of the projects it supports.

The Integrated Safeguard System (ISS) is designed to promote the sustainability of project outcomes by protecting the environment and people from the potentially adverse impacts of projects. The safeguards aim to (a) avoid adverse impacts of projects on the environment and affected people, while maximizing potential development benefits to the extent possible; (b) minimize, mitigate, and/or compensate for adverse impacts on the environment and affected people when avoidance is not possible; and (c) assist borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks

The Bank requires that borrowers/clients comply with these safeguards requirements during project preparation and implementation. The Integrated Safeguards Policy Statement sets out the basic tenets that guide and underpin the Bank's approach to environmental safeguards. In addition, the Bank has adopted five Operational Safeguards (OSs), limiting their number to just what is required to achieve the goals and optimal functioning of the ISS:-

Table 4.2: African Development Bank's Environmental and Social Safeguard Policies

Operational safeguards	Relevance
Operational Safeguard 1: Environmental and Social Assessment	This overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social requirements. The FIEFOC-II project activities include the construction and use of irrigation infrastructures that may likely have significant environmental impacts such as loss of vegetation, soil erosion, pesticide use, wetland degradation and increase in waterborne diseases. These risks will be managed through implementation of mitigation measures elaborated in site specific Environmental and Impact Social Assessment (ESIA)/Environmental and Social Management Plans (ESMP).
Operational Safeguard 2: Involuntary Resettlement: Land acquisition, population displacement and compensation.	This safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement, and incorporate a number of refinements designed to improve the operational effectiveness of those requirements. The proposed irrigation scheme will not require land acquisition or resettlements. The scheme will be sited on government land, and as such there is no likelihood of a change in land status at this stage.
Operational Safeguard 3: Biodiversity and ecosystem services	This safeguard aims to conserve biological diversity and promote the sustainable use of natural resources. It also translates the commitments in the Bank's policy on integrated water resources management in operational requirements. FIEFOC-II project activities will be implemented on existing irrigated/farm land; hence degradation of natural habitats (wetlands and natural vegetation) is not anticipated from a

	modified habitat.
Operational Safeguard 4: Pollution prevention and control, hazardous and control, hazardous materials and resource efficiency	This safeguard covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry-specific and regional standards, including greenhouse gas accounting, that other multilateral development banks follow. The FIEFOC-II project interventions may likely intensify the use of agro-chemicals including pesticides needed to enhance productivity. Sustainable agronomic practices will be promoted to farmer groups including the preparation of Pest Management Plan to promote integrated pest management. Soil and water quality will be monitored during construction phase of the project as per requirements of country's regulations.
Operational Safeguard 5: Labour conditions, health and safety.	This safeguard establishes the Bank's requirements for its borrowers or clients concerning workers' conditions rights and protection from abuse or exploitation. It also ensures greater harmonization with most other multilateral development banks. The Contractor shall comply with the Labour laws and Best Practice Occupational Health and Safety requirements.

4.2 International Conventions

4.2.1 United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC or FCCC is an international environmental treaty produced at the UNCED, informally known as the Earth Summit, held in Rio de Janeiro from June 3 to 14, 1992. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Uganda having ratified this convention and putting into consideration the nature of the proposed project, there is an apparent need to ensure all the activities to be undertaken at the proposed irrigation scheme live within the carrying capacity of the environment and to avoid the emission of potentially atmospheric debilitating gases.

4.2.2 The Kyoto Protocol

The Kyoto Protocol is an international agreement linked to the UNFCCC. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the

European community for reducing greenhouse gas emissions, these amounts to an average of five per cent against 1990 levels over the five-year period 2008-2012. The major distinction between the Protocol and the Convention is that while the Convention encouraged industrialized countries to stabilize GHG emissions, the Protocol commits them to do so. Recognizing that developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity, the protocol places a heavier burden on developed nations under the principle of "common but differentiated responsibilities." Observance to this protocol will influence future potential funding. There should be adherence to minimal carbon emission levels during the all phases of project implementation.

5 Environment and socio-economic baseline

This section describes environmental and social baseline conditions of the project area in which the proposed roads are to be upgraded and in which the impacts of the implementation and operationalization of these roads may be experienced. The description is designed to enable identification of particularly sensitive receptors around the proposed project sites that may be vulnerable to impacts arising from the respective projects.

Data and information presented in this section was sourced from various documents which were used as references; and from primary data collected on the ground during the EIA study. The key documents of reference include; Kasese District Environment Profile report (2001, 2004) Kasese District Local Statistical Abstract 2009; Project structural designs developed by SABA Engineering; and various Environment study reports for Kasese District over the years, particularly the State of Environment Reports published by NEMA 2009/2010 in addition to other key government sources. In addition discussions held with lead agency representatives, key informants and consultation with the local community yielded considerable information that is also presented in this report.

5.1 The project area

The *Mubuku Irrigation Scheme* is located in the south western part of the country, in Kasese district, few kilometers north of Lake George. It is about 430Km from Kampala and about 5Km east of Kasese which is the nearest big town. It lies in western rift valley at an altitude of 900 - 1050 m.a.s. level and at latitude of less than 30 minutes north of the equator. The scheme is 10 km north east of Kasese town and about 430 km away from Kampala. It is bordered by river Sebwe from the east and river Nyamwamba (Rukooki) from the west. River Sebwe is the main source of irrigation water, while river Mubuku is about 2 km far from river Sebwe. The project area is located within the Lake Edward drainage basin. The basin, with an area of 18,450 km^2, includes both Lake George and Edward. Sebwe and Mubuku rivers ultimately drain in Lake George, which is interconnected with Lake Edward through the Kazinga channel. Main rivers draining in Lake Edward include Nyamugasani, Lubilia, Nyamweru, Nchwera, Chiruruma and Ishasha.

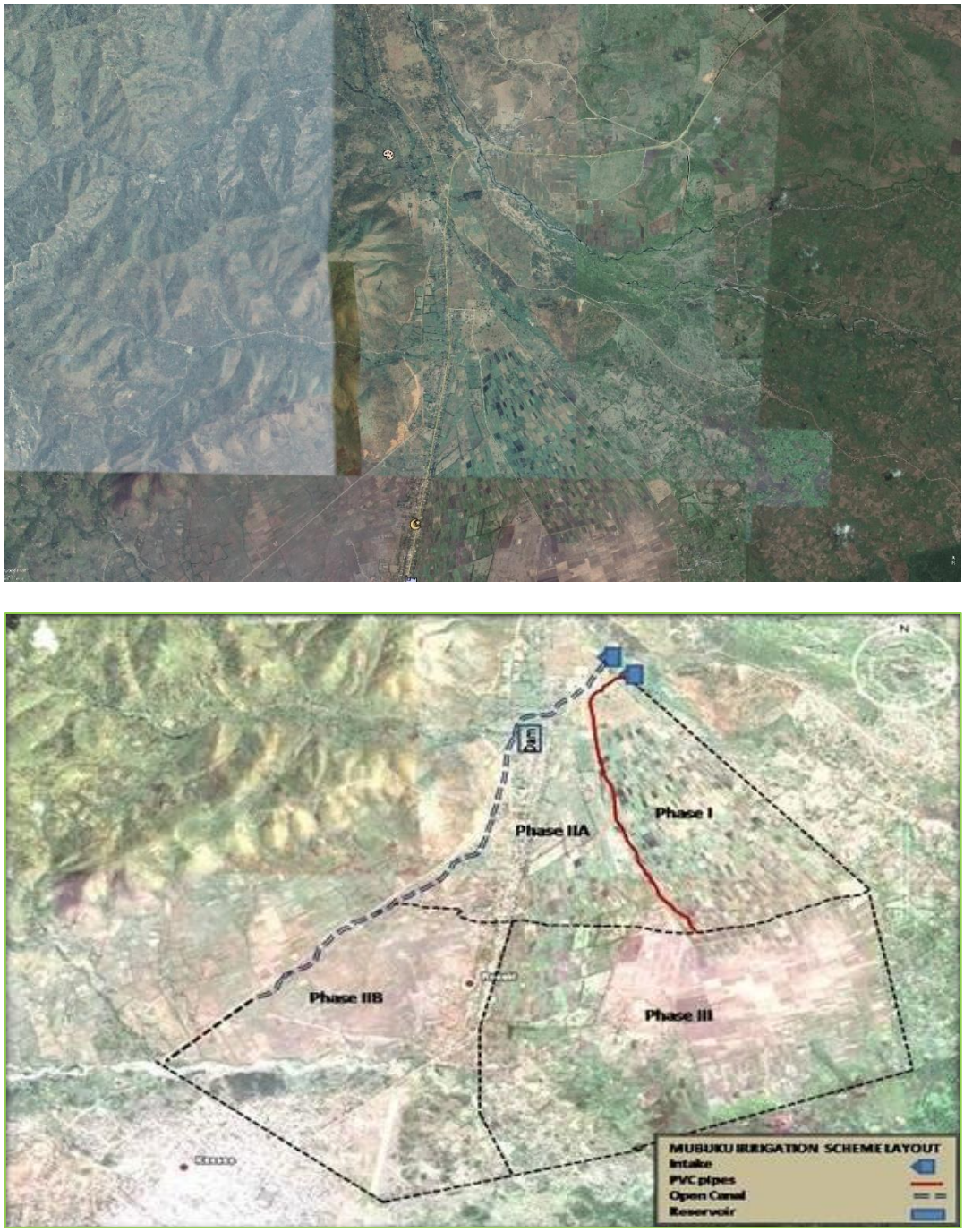


Figure 5-1: Google Map showing location of Mubuku Irrigation Scheme

The originally envisaged area for the scheme was 2,000 ha. About 996 ha of area was to be irrigated to settle 262 farmers and the remainder 1,004 ha to be used for pasture and dairy production with proposed 730 milking cows. Rehabilitation works were carried out about four years later to rectify problems observed during operation. Gross area of the scheme implemented in Phase I was 400 ha (1,000 acres). The land was not occupied at the time of implementation and it still belongs to the state. Direct beneficiaries involved in the irrigation scheme are 158 as per the information from the scheme management. The scheme was envisaged to be a small holder farmers' cooperative and was provided with facilities like offices, staff housing, storage, various workshops etc. Besides cultivation of various crops other activities like dairy and piggery were practiced in the scheme. However, through time

most of the facilities became non functional or scaled down. The scheme management was supported by many senior staff assigned from the government in the early stages of development. This has been scaled down to one officer in charge at the moment.

5.2 The Bio-physical Environment

5.2.1 Geology and Geomorphology

Kasese is underlain by undifferentiated metamorphic rocks, which include gneisses, schists and quartzites of the Toro - and basement complex systems. The Toro System comprises of inter-banded quartzite and Quartzo-felspathic gneiss and the Basement complex comprises of massive porphyroblastic biotite and quartzo felspathic gneiss, photo-geologically distinguished by a light tone, rough texture, and subdued topography and by showing a little structure.

The geology of the Mubuku irrigation area is dominated by *Pleistocene* to recent formations of sediment, alluvium, black soils and moraines from the *Cainozoic* era. The area is part of the *Western Rift Valley Sediments*. The *Western Rift Valley* runs the length of the country and constitutes the three main western lakes; Lake George, Lake Edward and Lake Albert. Further, it includes the Rwenzori mountain chains. Following the geology the geomorphology of the scheme area is influenced by sediments of *Western Rift Valley*.

The geology of the upper catchment of Sebwe and Mubuku rivers, i.e. the Rwenzori mountain blocks, however, is influenced by partly granitized and metamorphosed formations (particularly Buganda-Toro system) and wholly granitized or high to medium grade metamorphic formations (particularly undifferentiated gneisses) of the Precambrian era. The geomorphology of the Rwenzori mountain chain is dominated by remnants of upland surface, outwash fans and surface and scrap related to rift.

5.2.2 Topography

Kasese district is comprised of principally three topographical / geomorphologic features, namely the mountainous areas (Rwenzori mountains), the undulating region at the foothills, and the lowlands in the south and south-eastern part of the district. The rugged mountainous part constitutes the western part of the district stretching northwards up to the border with Kabarole District.

Mubuku Irrigation Settlement Scheme is located just at the foot hills of mountain of the moon ranges. It is in the western rift valley with predominant and continuous gentle slopes ranging between 0.87% and 2.0% in North South direction. The topography of Mubuku irrigation scheme area, the Rukooki plains, is generally flat ranging from 940m to 1,060m above sea level. Topography in this area generally falls while going from northwest to southeast. At the immediate east of the head works of the irrigation scheme is a small conical hill having 1,195m peak. Further downstream of the scheme, there exist vast plains where most of the streams of the area (including Sebwe, Mubuku, Rukooki, Kabaka, Chalanga, etc) drain to Lake George. In the immediate west and north of the scheme, however, the topography rises rapidly reaching its maximum (around 5,000m) at Mount Baker and Stanley and Speke. This part forms part of the Rwenzori mountain horse blocks, which is northwest of the irrigation scheme.

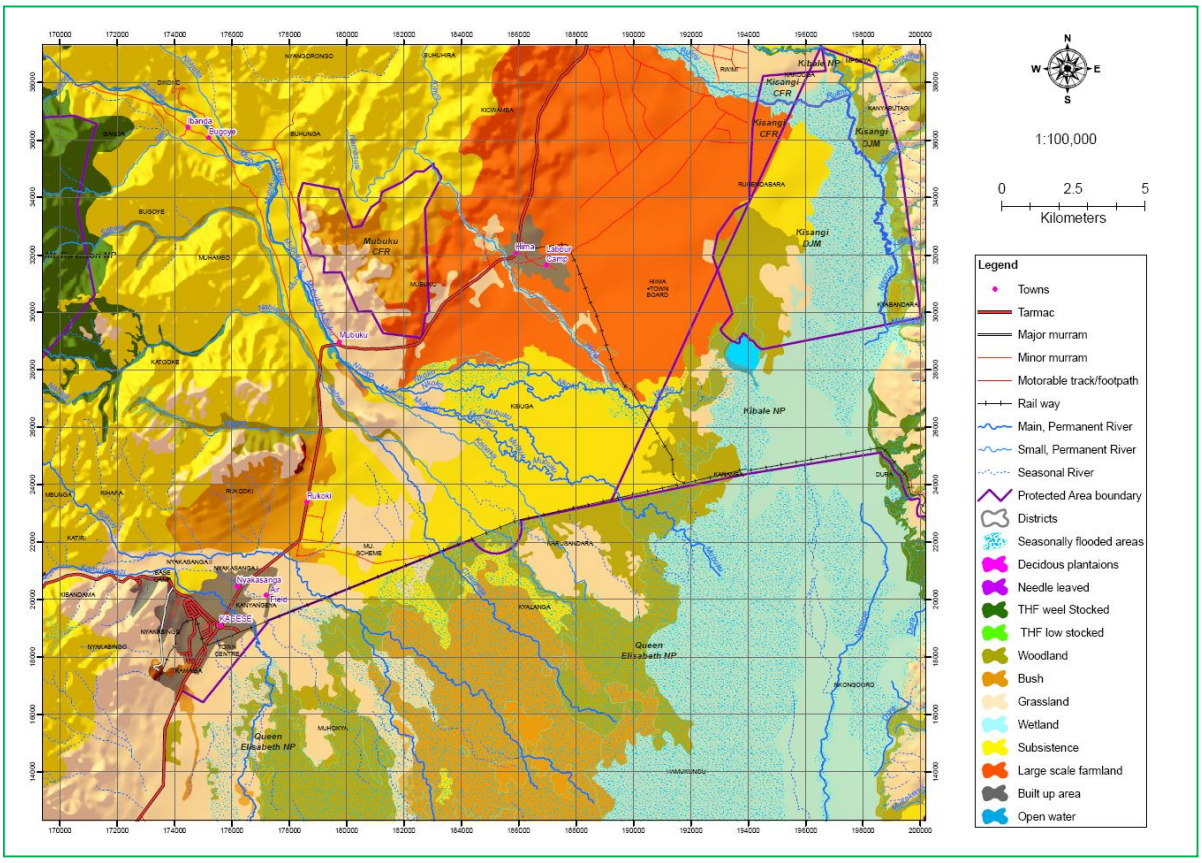


Figure 5-2: landscape, drainage and land-use in the Mubuku/Sebwe catchment area

5.2.3 Soils

Information obtained from earlier soils study, soils of the project area are sandy loam to clay loam and the wetland soils extended along the upper and middle reaches of the present valley systems. These soils have been developed with the hydromorphic gleysation weathering process under seasonally submerged and/or highly moistened conditions. These are mostly clayey to loamy in texture, relatively friable consistence when wet while very firm consistence when dry. These soils are all highly useful for cereal crop production, particularly for up land rice.

In general, Mubuku irrigation scheme lies in formation on slopes and valleys which are geologically, the Pleistocene beds, represented by sand, silts and clays of alluvial or lucustrine origin. During the site investigations trial pits were excavated to an average a depth of one and half meter to determine the soil profile and collect samples for testing. Samples were collected from different layers below the surface up to a depth not exceeding 2.0 m on average. This was to ensure that the material being tested were representative of the different blocks as the scheme is subdivided.

Detailed geotechnical investigations were carried out to determine the geophysical properties of the scheme for crop management. The investigation was carried using a hand auger and digging trial pits, disturbed and undisturbed samples were recovered for visual identification made, logging, and laboratory testing and findings identified that the soils of

the project area are generally moderately deep with about 30-90cm depths, thus in general there is no rooting depth limitation in the project area. They are of medium to fine in texture dominated by Eutrophic soils of tropical regions. The upper part of the Sebwe and Mubuku rivers is, however, dominated by either non-hydromorphic organic soils or humic ferrisols of high altitude.

Profile 1 (Kasese- Mubuku- Phase 3); Classification — Skeletic Fluvisols ‖ ; Location: 3km South from Mubuku Irrigation scheme main offices at (0.207220N, 30.131040E) ; middle pediment; Slope <1% and flat topography ; Well drained; straight slope form; orientation-North; Elevation 973 meters; Maize cultivation and ; Profile Description Status 2:1, Date 20150803.

Depth (cm)	Description of the profile layers
0-30	Brownish grey (10YR 5/1) ; Silt loam; slightly hard when dry, firm when moist, moderate Sub-angular blocky structure; many very fine and fine pores; common medium pores; many very fine and fine roots; very few medium roots.
30-90	Brown (7.5YR 4/3); Silt loam; hard when dry; firm when moist; strong sub-angular blocky structure; many very fine pores and common fine pores; few fine roots.
90+	Smooth round coarse gravel materials of fluvial deposit

Profile 2 (Kasese- Mubuku- Phase 3); Classification **"Skeletic Fluvisols "** ; Location: 4km South from Mubuku Irrigation scheme main offices at (0.204670N, 30.13460E);middle pediment; Slope <1% and flat topography ; Well drained; straight slope form; orientation-North; Elevation 969 meters; Maize cultivation and cotton; Profile Description Status 2:1, Date 20150803.

Depth (cm)	Description of the profile layers
0-30	Brownish grey (10YR 5/1) ; Silt loam; slightly hard when dry, firm when moist, moderate Sub-angular blocky structure; many very fine and fine pores; common medium pores; many very fine and fine roots; very few medium roots.
30-75	Brown (7.5YR 4/3); Silt loam; hard when dry; firm when moist; moderate sub-angular blocky structure; many very fine pores and common fine pores; few fine roots.
75+	Smooth round coarse gravel materials of fluvial deposit

Profile 3 (Kasese- Mubuku- Phase 3); Classification — Skeletic Fluvisols ‖ ; Location: 4km North from Mubuku Irrigation scheme main offices at (0.204670 N, 30.13460E);middle pediment; Slope <1% and flat topography ; Well drained; straight slope form; orientation-North; Elevation 969 meters; Maize cultivation; Profile Description Status 2:1, Date 20150803.

Depth (cm)	Description of the profile layers
0-45	Light grey (5YR 5/1); Silt loam; slightly hard when dry, firm when moist, moderate Sub-angular blocky structure; many very fine and fine pores; common medium pores; many very fine and fine roots; very few medium roots.
45-75	Dull yellow Orange (10YR 7/3); Silt loam; hard when dry; firm when moist; strong sub-angular blocky structure; many very fine pores and common fine pores; few fine roots.
75+	Smooth round coarse gravel materials of fluvial deposit

Profile 4 (Kasese- Mubuku- Phase 3); Classification —Skeletic Fluvisols ‖; Location: 4km South from Mubuku Irrigation scheme main offices at (0.197160N 30.137560E); middle pediment; Slope <1% and flat topography; Well drained; straight slope form; orientation-North; Elevation 960 meters; Maize cultivation; Profile Description Status 2:1, Date 20150804.

Depth (cm)	Description of the profile layers
0-30	Brownish grey (10YR 5/1) ; Silt loam; slightly hard when dry, firm when moist, moderate Sub-angular blocky structure; many very fine and fine pores; common medium pores; many very fine and fine roots; very few medium roots.
30-75	Brown (10YR 3/3); Silt loam; hard when dry; firm when moist; sticky and slightly plastic when wet; moderate sub-angular blocky structure; many very fine pores and common fine pores; few fine roots.
75+	Smooth round coarse gravel materials of fluvial deposit

Profile 5 (Kasese- Mubuku- Phase 3); Classification —Skeletic Fluvisols ‖; Location: 4km North from Mubuku Irrigation scheme main offices at (0.199590 N, 30.144720E);middle pediment; Slope <1% and flat topography ; Well drained; straight slope form; orientation-North; Elevation 959 meters; Maize cultivation; Profile Description Status 2:1, Date 20150804.

Depth (cm)	Description of the profile layers
0-30	Light grey (10YR 7/1) ; Silt loam; slightly hard when dry, firm when moist, moderate Sub-angular blocky structure; many very fine and fine pores; common medium pores; many very fine and fine roots; very few medium roots.
30-75	Brown (10YR 3/3); Silt loam; hard when dry; firm when moist; sticky and slightly plastic when wet; moderate sub-angular blocky structure; many very fine pores and

	common fine pores; few fine roots.
75+	Smooth round coarse gravel materials of fluvial deposit

Profile 6 (Kasese- Mubuku- Phase 3); Classification **"Skeletic Fluvisols"**; Location: 4km North from Mubuku Irrigation scheme main offices at (0.19996O N 30.1292OE); middle pediment; Slope <1% and flat topography; Well drained; straight slope form; orientation-North; Elevation 959 meters; Maize cultivation; Profile Description Status 2:1, Date 20150804.

Depth (cm)	Description of the profile layers
0-30	Light grey (10YR 7/1); Silt loam; slightly hard when dry, firm when moist, moderate Sub-angular blocky structure; many very fine and fine pores; common medium pores; many very fine and fine roots; very few medium roots.
30-75	Brown (10YR 3/3); Silt loam; hard when dry; firm when moist; sticky and slightly plastic when wet; moderate sub-angular blocky structure; many very fine pores and common fine pores; few fine roots.
75+	Smooth round coarse gravel materials of fluvial deposit

The soils samples collected from profile 1 from depth 0-20cm and 45-90 cm are sandy loam and Silt loam with sand 63.1%, 12.3 % clay and silt 24.6%. From profile 2 the soils samples collected from 0-30 is sandy clay loam with 47.1% sand, 2.3% clay and 50.6% % silt and from 30-60 cm sandy clay with 55.1% sand, 36.3% clay and 8.56% silt.

Soil pH (acidity/alkalinity) The results from Mubuku Irrigation Kasese show 100% out of samples have the pH value between 5.6 to 7.1 ,between the critical value range of pH values 5.2- 7.0 , and range suitable for most crops, therefore these soils are good as far as pH is concerned.

Soil organic matter content (% OM) A soil is considered to have high soil organic matter content when it has 6.0 % or more and a soil with organic matter content below 3.0%, is considered to be very low in organic matter and is likely to show response to additions of organic materials.

Total nitrogen content (% N) Nitrogen is the most important plant nutrient obtained from the soil. The critical level for nitrogen, i.e. the soil level below which crops are likely to suffer due to the shortage of the nutrient, is 0.20 %.Therefore total nitrogen content in these soils (at 0.07-0.42%) and varies considerable in some samples, i.e. Only 5 samples out of 32 are below critical value.

Extractable (available) phosphorus content (P): A good soil is supposed to have at least 20ppm extractable P while any soil with less than 5ppm of extractable P is considered to be poor and is likely to give good responses to P fertilizers. Therefore, extractable (available) phosphorous content in these soils is between 1.5 - 70.70 ppm there. Only 1 sample show abnormal values of P, BUT the rest are more than 5pmm. *For the new phase*

2B and Phase 3, P is the most limiting problems with all profiles showing values less than 5ppm. However addition of P fertilizers like TSP or organic materials rich in P, e.g. poultry manure can make it better.

Exchangeable (available) bases (K, Ca and Mg)

Table 5-1: shows how the bases are classified according to crops requirements

K	**Ca**	**Mg**	
----------cmol(+)/kg soil----------			
Very low	0 - 0.2	0 – 2	0 - 0.3
Low	0.2 - 0.3	2 – 5	0.3 -1.0
Medium	0.3 - 0.7	5 -10	1 - 3
High	0.7 - 2.0	10 - 20	3 - 8
Very high	> 2.0	> 20	> 8

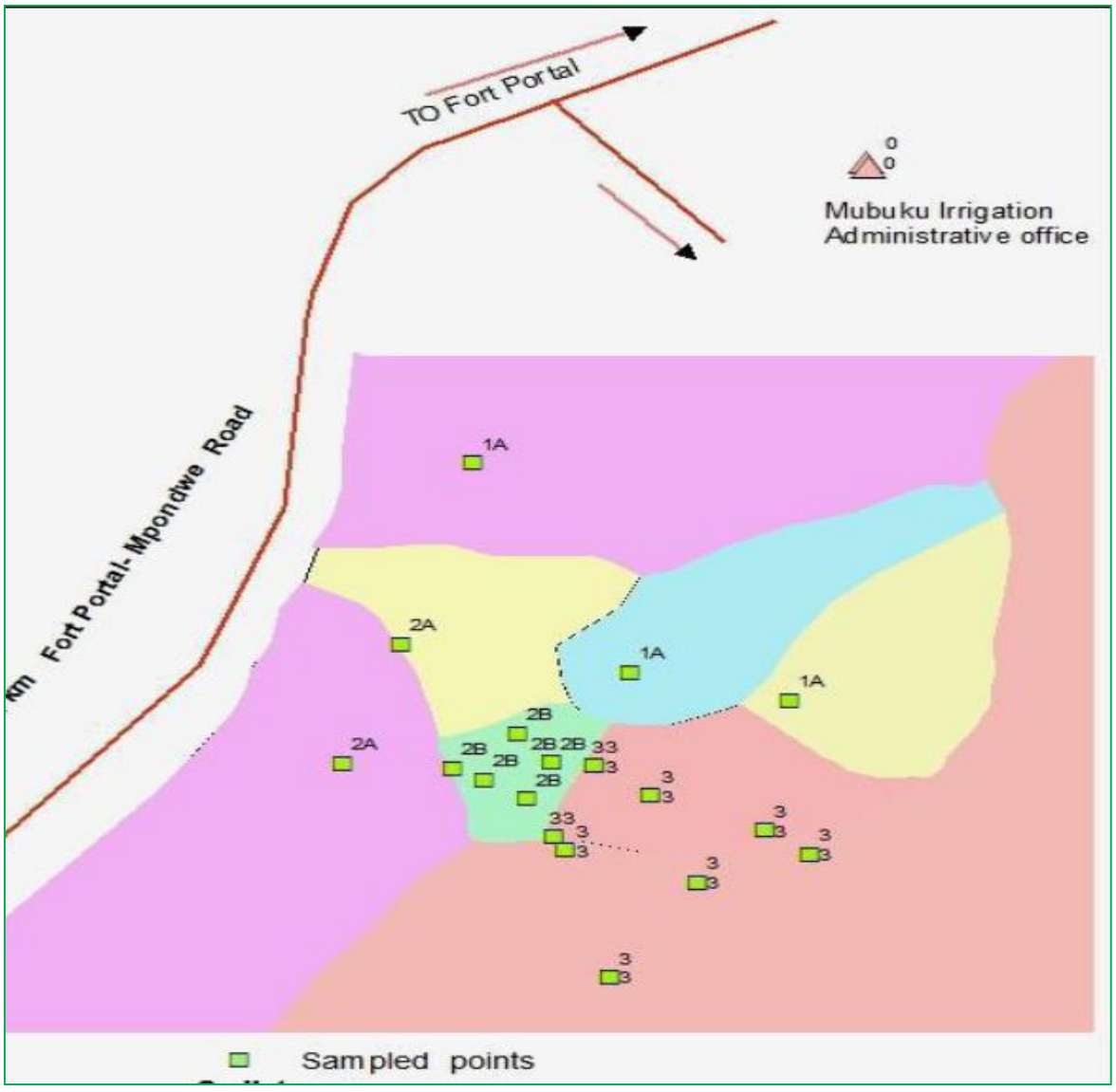


Figure 5-3: Show Sampled points and their Soil types

5.2.4 Climate

Mubuku irrigation scheme area falls within the Western Uganda climatic zone based on its rainfall pattern. Within the zone the project area falls in the Lake Albert – Lake George – N.E. Lake Edward sub-zone (the sub-division is mainly related to topographic features). The climate in this sub-zone is characterized as hot, with intense dry seasons having mean annual rainfall in the range of 875mm to 1000mm falling on average for 80 to 100 days per year. However, rainfall tends to rapidly rise with height, reaching as high as 2,500mm per annum at the peaks of Rwenzori. The bi-annual rainy season pattern comprises of two wet seasons, the first peaking in September-October while the second peaking in April-May.

The point rainfall values for Kasese station were directly used to represent real rainfall over the irrigation scheme, indicated in the table below (since mean annual values for Kasese and Mubuku scheme stations are more or less similar values for Kasese has been used. The Mubuku prison values looks underestimated and thus ignored).

Table 5-2: Project Area Mean Monthly Rainfall

Location	J	F	M	A	M	J	J	A	S	O	N	D	Year
Irrigation Scheme	29.1	38.3	84.1	125.6	99.2	46.3	35.9	67.0	86.3	107.4	101.6	60.2	881.0

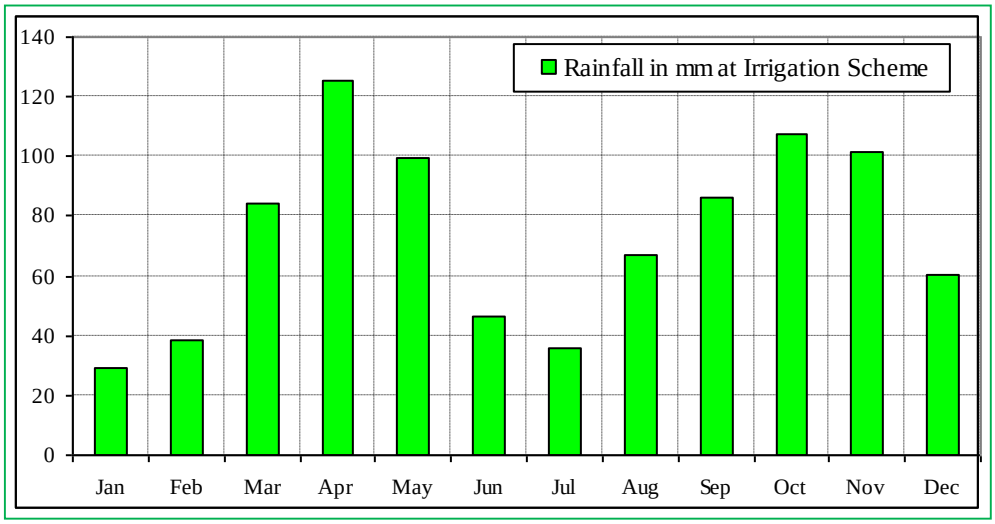


Figure 5-4: Area Rainfall of the Project

The rainfall indicated above is real rainfall at the irrigation scheme, i.e. the lower catchment of both Sebwe and Mubuku rivers. In general, rainfall in the area shows rapid increase with elevation. Both the Sebwe and Mubuku catchments receive more rainfall that the irrigation scheme area. The Sebwe catchment is better represented by mean annual rainfall of around 1,550mm measured at Kilembe. From around 1,100m at the outlet of the catchment, topography rises up to 3,400m at its furthest boundary. Mubuku catchment receives more rainfall compared to Sebwe, reaching as high as 2,500mm at the highest points along the Rwenzori mountain chain. In fact, River Mubuku is supplied by glacial meltdown from Mount Baker and Speke. The highest elevation of the catchment reaches as high as 5,000m.

5.2.5 Temperature

Temperature data is scarce and only monthly minimum and maximum temperature from Kasese meteorological station were obtained. The maximum, minimum and mean temperature at this station is indicated in table 5-3 below.

Table 5-3: Maximum, Minimum and Mean Temperature at Kasese

Temperature	J	F	M	A	M	J	J	A	S	O	N	D
Maximum Temperature, °C	30.8	31.7	31.1	30.3	30.1	30.2	30.2	30.2	30.6	29.8	29.4	29.9
Minimum Temperature, °C	16.7	17.3	17.8	18.2	17.9	17.2	17.0	17.6	17.2	17.3	17.3	16.6
Mean temperature, °C	23.8	24.5	24.4	24.3	24.0	23.7	23.6	23.9	23.9	23.6	23.4	23.2

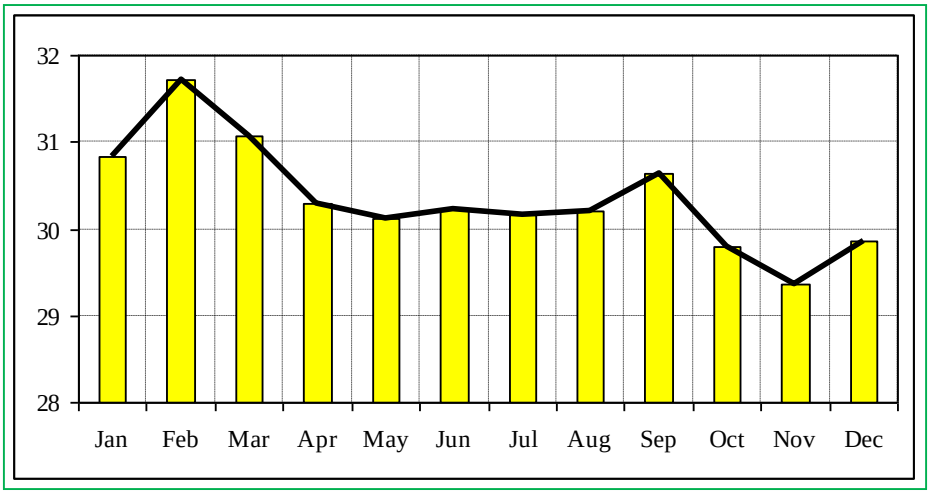


Figure 5-5: Monthly Average Maximum Temperature at Kasese

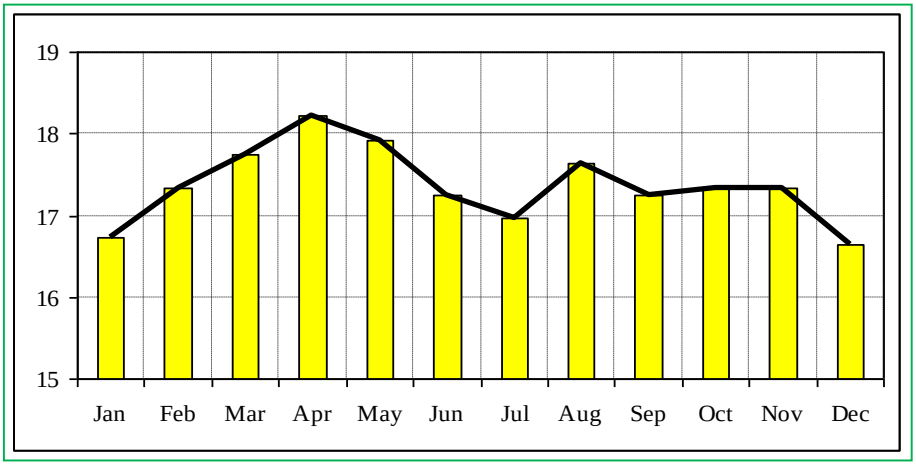


Figure 5-6: Monthly Average Minimum Temperature at Kasese

As indicated in table 5-2 the average maximum, minimum and mean temperature at Kasese is 30.4, 17.4 and 23.9°C, respectively. Due to its closeness and longer data record of Kasese meteorological station it has been adopted for the project area.

5.2.6 Drainage and Water Resources

The project area is located within the Lake Edward drainage basin. The basin, with an area of 18,450 km2, includes both Lake George and Edward. Sebwe and Mubuku rivers ultimately drain in Lake George, which is interconnected with Lake Edward through the Kazinga channel. Main rivers draining in Lake Edward include Nyamugasani, Lubilia, Nyamweru, Nchwera, Chiruruma and Ishasha. River Sebwe and Mubuku, the main rivers of the area, drain from the slopes of Rwenzori Mountain chains.

Although the name of the scheme is Mubuku, the main source of water for irrigation is River Sebwe which drains from the lower slopes of Rwenzori Mountain chains. However, there is a dense river network in the area which includes Sebwe, Mubuku, Kitajuka, Kabaka, Rukooki, Hima, Nkoko and Chalanga. The catchment areas of these rivers are close to one another and often share the same catchment.

Mubuku River originates from Bugoye and Maliba area and near to Mount Baker (the fifth highest peak of the continent), which is part of the Rwenzori mountain chains. The area has an average elevation of 4,000 to 4,500m above sea level. A number of small rivers contribute flow to Mubuku including Kuruguta from Bugoye area, Bujuku form Maliba area and Kitajuka which joints Mubuku further downstream. In the lower part of the catchment Mubuku River is divided to form Nkoko and Kabaka rivers in addition to its main course. While Kabaka flows alongside the main Mubuku River Nkoko flows eastward to joint River Hima which originates Kitoko area.

River Sebwe originates from Kianamo area which is located within the bounds of Rwenzori Forest Reserve. The area has an average elevation of 3,200 to 3,400m above sea level. The river generally drains in an easterly direction and changes to south easterly direction at the lower reaches of the river. Sebwe is branched to form Chalanga River just downstream of the existing headwork structures of Mubuku irrigation scheme.

The upper part of the Sebwe-Mubuku catchment is generally influenced by mountainous to escarpment terrain and dominated by dense vegetation which forms part of the Rwenzori Forest Reserve. The lower part of the Sebwe-Mubuku catchment is dominated by flat lands of Rukooki and Kurusandara area, north of Lake George and Rwenzori National Park. Most of the river networks of the project area end in the flat lands of Kurusandara area, which has an altitude ranging from 900 to 1,100m above sea level. The Mubuku irrigation scheme is located in the lower part of the Sebwe-Mubuku catchments, in Rukooki area.

Plate 5-1: Rivers Nyamwamba and Mubuku

5.3.7 Vegetation and Flora

The vegetation types and their main species composition have been studied based on observations made during the reconnaissance field survey, information obtained from local offices and informants as well as review of previous studies. In general, the Mubuku irrigation scheme area has limited vegetation cover as a resulted of years of human habitation and pressure.

The ecosystem of the irrigation scheme area is dry acacia savanna woodland. The main species for flora include *acacia spp.*, *albizia spp.*, *eucalyptus grandis*, *euphorbia tirucalli*, *ficus natalensis*, *grevillia robusta*, *mangifera indica*, *senna spectabili* and *vernonia amygdalina*. The vegetation cover has been depleted as the result of years of human habitation and land clearing for farming and other activities. This part extends from the immediate north and west of the irrigation scheme up to the shorelines of Lake George.

Although the Mubuku irrigation scheme area has a depleted vegetation cover there are numerous protected woodlands and forests close to the project area. These include the *Rwenzori National Park* located north of Lake George, the *Kibale Forest Corridor Game Reserve* located east of the irrigation scheme and the *Rwenzori Forest Reserve* located northwest of the scheme and cover the catchment areas of Mubuku and R. Sebwes. These reserves have a wide number of floral species and are dominated by alpine, montane and moorland ecosystems. Some of the main flora species include groundsels, lobelias, giant heathers and other ericas.

Plate 5-2: Vegetation covers at the proposed sites

5.2.8 Wildlife and fauna

The fauna of the Mubuku irrigation scheme area is highly depleted, if not non-existent, as a result of years of human habitation. However, the reserves available in close proximity to the project area has abundant species of fauna including hippos, leopard, elephant, buffaloes, bushbuck, waterbucks, rare giant forest hogs, porcupines, bush pigs, warthogs, lions, hyenas, civets and reptiles such as crocodiles, pythons and lizards.

5.2.9 Land Use and Land Cover

Kasese District has a total surface area of 3,389.8 square kilometres, of which 2911.3 square kilometres (86 per cent) is dry land, 409.7 square kilometres (12 per cent) is open water and 68.8 square kilometres (2 per cent) is permanent swamp/wetland. About 63 per cent of the land area (1834.6 square kilometres) is occupied by nature and wildlife conservation schemes; and also other government projects such as prison farms, mining institutions and irrigation farming. The population density in Kasese in 2002 was 183 persons per square kilometre, (450 persons per square kilometre in the area actually occupied by people) and the population growth rate is 3.6% per annum.

People in the district are predominantly agriculturalists involved in crop production, animal rearing and lake fishing. Agriculture employs the majority of the people (over 80%). Most farmers are small-holders. Other economic activities include; trade in commodities, manufacturing industries and mining. The district has been zoned into five agricultural zones.

The land use pattern of the catchment of Sebwe and Mubuku is, however, different from the irrigation scheme area. Most of the catchment area is covered with woodlands and dense forests, including the Rwenzori forest reserve. The upper most part of the Mubuku catchment is covered with glacial of Mount Stanley, Baker and Speke.

5.3 The socio-economic environment

5.3.1 Socio-demographic characteristic Demographics

The current population of the district is estimated to be 744,949 peoples; of this 52% are estimated to be females and 48% males. The district has a population density approximated by over 450 persons per square kilometer in the area actually occupied by people.

Kasese is a multi-ethnic district with many people of different backgrounds. The main languages and ethnic groups that dominate the area are the Lukonjo and Lutooro of the Bakonjo and Batooro people respectively. But there are also other groups in the district who include the Banyankole, Basongora and Bakiga.

Over 80% of the people in the district are predominantly agriculturalists involved in crop production, animal rearing and lake fishing. Other economic activities include; trade in commodities, manufacturing industries and mining. The district has been zoned into five agricultural zones. In the West, Kasese district boarders with Democratic Republic of Congo. This renders the district opportunities for cross boarder trading on a number of enterprises including agricultural produce, vegetables and other merchandise.

5.3.2 Sex of respondents

The socio-economic survey mainly targeted household heads or their spouses in case the heads were absent by the time of the interview.

According to Table 5-4 most of the households 110/154 (71.4%) were male headed. Female headed households formed (28.6%)). By Implication, this dominance of male headed household is an indication of a patriarchal society where a family as a key society structure is headed and controlled by males. Mobilization during project design and implementation should not only target male heads of households, but both men and women in their convenient time.

Table 5-4: Sex of Household Head

Sex	Frequency	Percentage
Male	110	71.4
Female	44	28.6
Total	**154**	**100.0**

5.3.3 Age of Household Head

The socio-economic survey inquired about the age of the household heads. Table 5-5 clearly indicates that majority of the household heads were aged between; 18-35 (42.0%), followed by those in the age category of 46-60 (23.0%). A relative proportion of the household heads were aged 61 years and above.

Table 5-5: Age of the household respondent

Age	Frequency	Percentage
18-35	29	18.9

36-45	30	19.4
46-60	62	40.3
61+	33	21.4
Total	**154**	**100.0**

Cumulatively, (38.3%) of the household heads reported to be aged below 45 years; by implication, this is a young population, with a potential for increased production especially in the agricultural sector. Irrigation scheme should be expedited to meet this anticipated water demand to enhance the agricultural production potential. On the other hand, a substantial proportion of the household heads were aged above 61 years which age bracket qualifies them to be categorized as a vulnerable group with urgent need for special and targeted assistance.

5.3.4 Religious Affiliation

Majority of the interviewed household heads were Christians (93.5%) while (3.9%) of the household heads reported to be Moslems as seen in Table 5-6 and Figure 5-7. By implication, the churches and mosques are strategic and suitable platforms for effective mobilization of the community to facilitate participatory design, planning and implementation of the irrigation scheme for purposes of facilitating local ownership and sustainability of the intervention.

Table 5-6: Religious Affiliation of Household Heads

Religion	Frequency	Percentage
Christian	144	93.5
Moslem	6	3.9
Tradition	1	0.6
Others	3	1.9
Total	**154**	**100.0**

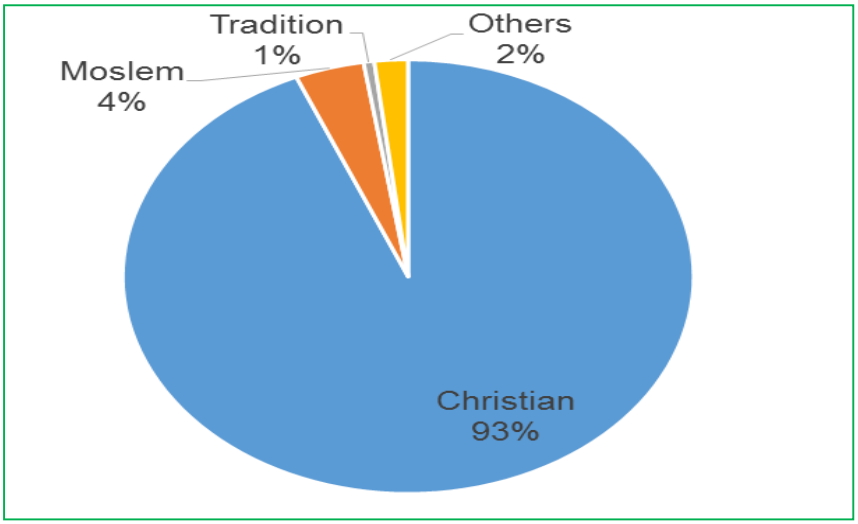


Figure 5-7: Religious Affiliation of Household Heads

5.3.5 Tribe of Respondent

The socio-economic survey set out to establish the ethnic backgrounds of the household heads in Sebwe parish, Nyamwamba Division. The majority of the respondents were from Bakonjo tribe comprising of (31.2%). This can help in understanding cultures and therefore behavioral change. In addition it can indicate the mode of communication during mobilization and sensitization activities. The findings reveal that the majority of respondents are of Bakonjo (31.2%), Banyankole 21.4%, Bakiga (7.11%), and other tribes contributing (32.5) as shown in Table 5-7 and Figure 5-3.

Table 5-7: Tribe of Respondent

Tribe	Frequency	Percentage
Bakonjo	48	31.2
Banyankole	33	21.4
Bakiga	11	7.1
Baganda	12	7.8
Others	50	32.5
Total	**154**	**100.0**

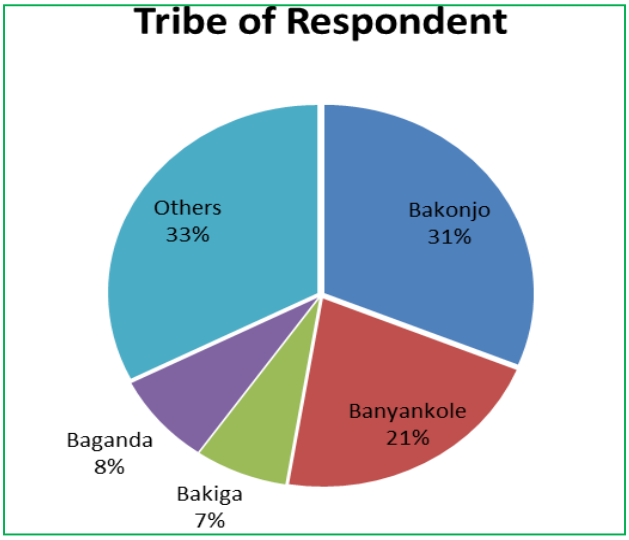


Figure 5-8: Tribe of Respondent

5.3.6 Education Levels

The study reveals that over (50%) of the respondents did not go beyond primary education, while less than a third (10%) had never gone to school. The details are shown on Table 5-8.

Table 5-8: Level of Education of Respondents

Education	Frequency	Percentage
Never went to school	16	10.4
Primary	78	50.6
Secondary	33	21.4
Tertiary/Vocational	19	12.3
University	8	5.2
Total	154	100.0

Overall, more than half of the household heads had attained at least primary education (50.6%) which is a good indicator for mobilization, participatory project design and implementation for local ownership and sustainability. Therefore, there is need to develop messages in local languages including visualizing them to cater for the 10.4% of the respondents who have never gone to school.

5.3.7 Marital status

The majority of respondents (74%) talked to were married or cohabiting while (14.3%) were widowed. Five percent (5.2%) had never married while 6.4% had separated with their partners as seen in Table 5-9 and Figure 5-9**.** Given that majority of the respondents were married is a clear indication for the demand for water for both production and domestic consumption. This therefore renders the irrigation scheme feasible. On the other hand, in a

patriarch society such in Mubuku, married women may be subjected to exclusion from decision making processes and actively participating in the project design and management including attending participatory planning meetings at community level and holding leadership positions in oversight committees such as the water user committees.

Table 5-9: Marital status

Marital status	Frequency	Percentage
Married	114	74.0
Never married	8	5.2
Widow/Widower	22	14.3
Separated	10	6.4
Total	**154**	**100.0**

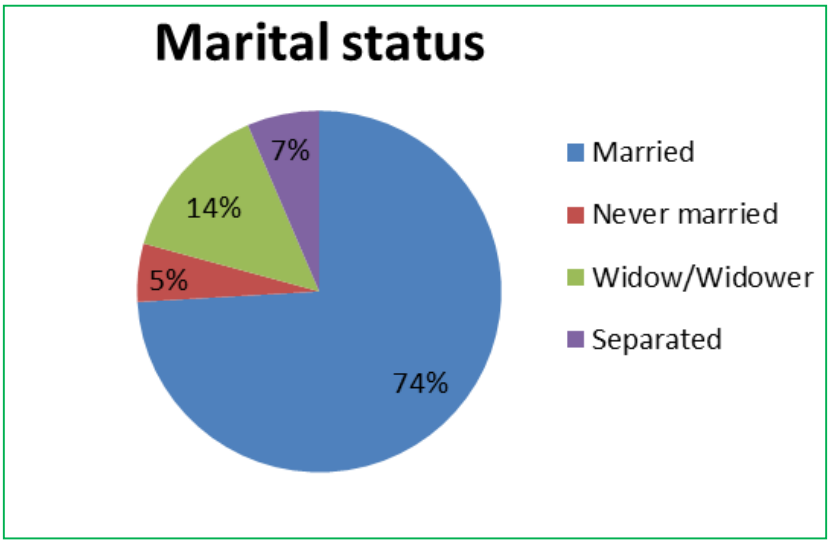


Figure 5-9: Marital status

5.3.8 Household composition

Most of the households (75.3%) reported to have between 1-4 adults (Table 5-10) in the house while 96.1% of the households reported to have between 1-4 children in the house. This large household size has a significant correlation to high demand for water for domestic consumption and agricultural production. It's also significant for family labour requirements for households. Rain-fed crop production utilizes family labour for about five months of the year. However, irrigated crop production is a year-round labour demanding enterprise. Farmers normally have on-farm and off-farm activities prior to irrigation development. Irrigation will therefore introduce extra demand on the people's labour.

Table 5-10: Number of people in the household (Adults)

Number of people	**Frequency**	**Percentage**

1-4	116	75.3
5-10	37	24
11+	1	0.6
Total	**154**	**100.0**

5.3.9 Acceptability, Adaptability and Affordability by Users

The project's objectives and expectations cannot be realized unless farmers'considerations on benefit and costs, feasibility and desirability and their priorities in life match that which the project requires of them. At times, smallholders' priorities differ from the project's priorities, Hence the need to assess the acceptability and desirability of the farmers to participate in the development of the irrigation scheme.

According to Table 5-11 and Figure 5-10 below, most of the respondents (94.2%) had knowledge about the Mubuku irrigation scheme. In fact (98.7%) were of the view that the proposed irrigation scheme was a good and well-intentioned intervention for their area. The socio-economic survey further inquired about the affordability of beneficiaries and their willingness to pay for water provided by proposed irrigation scheme. It was established that (96.6%) of the respondents exhibited willingness to pay for the services that will be provided by the scheme.

Table 5-11: Knowledge about the scheme and perception on the scheme

Number of people	**Frequency**	**Percentage**
Knowledge about the scheme	145	94.2
No knowledge about the scheme	9	5.8
Total	**154**	**100.0**

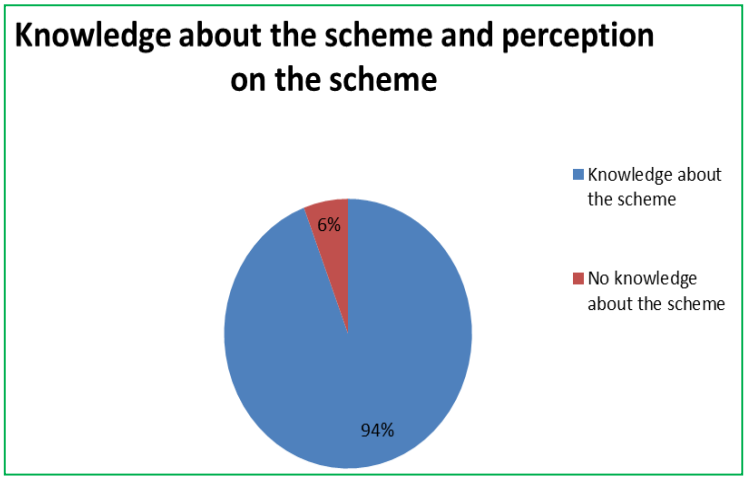


Figure 5-10: Knowledge about the scheme and perception on the scheme

Table 5-12: Perception towards the Irrigation scheme

Number of people	Frequency	Percentage
Good intervention	152	98.7
Not a good intervention	2	1.3
Total	**154**	**100.0**

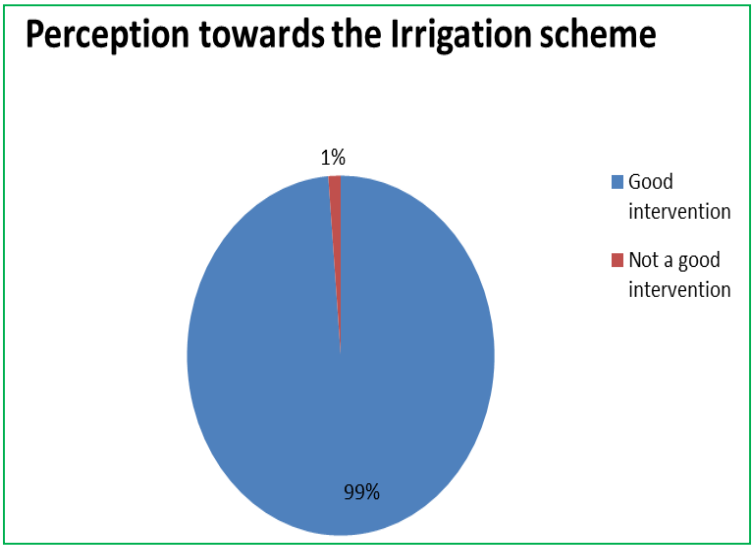


Figure 5-11: Perception towards the Irrigation scheme

However, through interactions both in FGDs and KIIs, adaptability of the community to the irrigation scheme project was assessed basing on peoples knowledge about it, benefits that come with it, risks involved and solutions and how to utilize the irrigation scheme. Overall, people showed eagerness, flexibility and compliancy to the new irrigation scheme as a result of gains realized from an earlier scheme.

5.3.10 Food Production Systems

People in the district are predominantly agriculturalists involved in crop production, animal rearing and lake fishing. Agriculture employs the majority of the people (over 80%). Most farmers are small-holders. Other economic activities include; trade in commodities, manufacturing industries and mining.

Regarding food production, respondents were asked where they obtained their food and 58% said they grew their own food on a piece of land close to their homesteads. Generally, this food grown contributed approximately to 80% of their household consumption, which means that the other 20% is either purchased from the market or is from other sources.

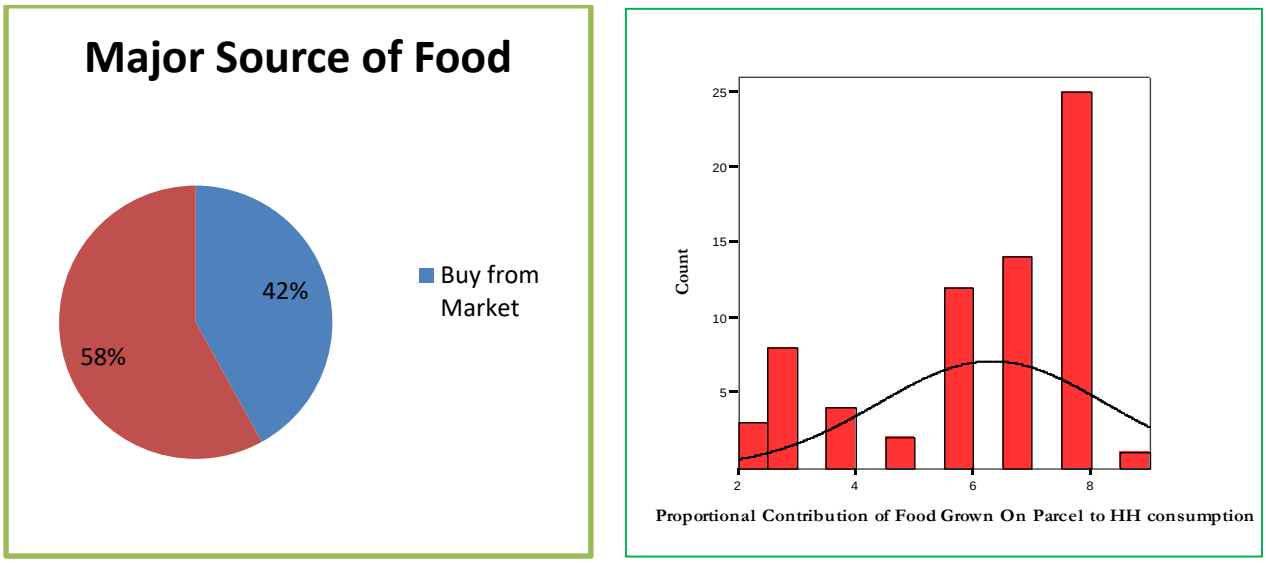


Figure 5-12: Major Sources of Food and Contribution to Household Consumption

The major crops grown for sale are shown in the table below and income earned largely depends on the land holding and agronomic practices. Maize and rice appear to be amongst the highest income earners followed by vegetable.

Table 5-13: Seasonal Income from Crops Grown

	Seasonal Income		
Crop	Average	Maximum	Minimum
Maize	1,134,833	4,000,000	70,000
Green Bananas	500,000	500,000	500,000
Banana	60,000	60,000	60,000
Rice	1,012,500	4,000,000	100,000
Beans	226,600	1,000,000	16,000
Water Melon	800,000	800,000	800,000
Onions	1,937,500	5,000,000	100,000
Cabbage	2,000,000	2,000,000	2,000,000
Carrots	280,000	360,000	200,000
Tomatoes	600,000	1,000,000	200,000
Cassava	500,000	500,000	500,000
Potatoes	420,000	600,000	160,000
Ground Nuts	268,750	800,000	50,000

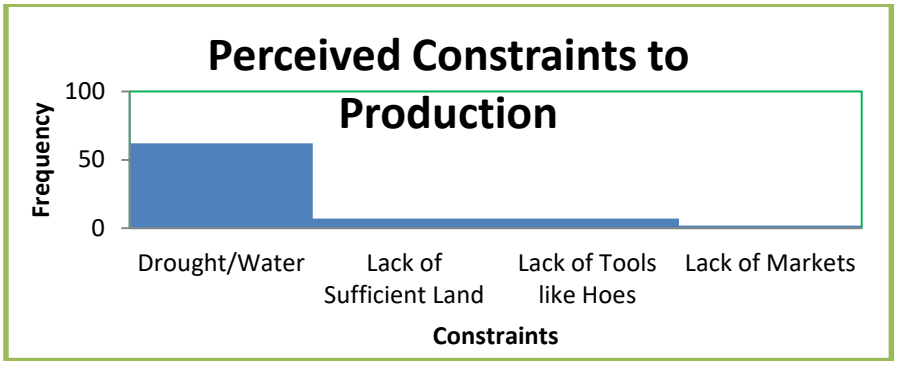
Mangoes	800,000	800,000	800,000
Egg Plants	1,625,000	3,200,000	50,000
Oranges	400,000	400,000	400,000
Hot Pepper	1,566,667	2,700,000	1,000,000
Sugarcane	60,000	60,000	60,000

Source: Field visits undertaken

Plate 5-1: Vegetables products grown at the scheme (Tomatoes and Cabbages)

A recent agronomic study revealed that constraints to production included the following:-

1) Inadequate water supply, lack of irrigation control, water logging;
2) Market related: contact with buyers, fluctuating prices, lack of on farm structures for storage and grading, lack of knowledge in quality standards, production techniques and market requirement standards, lack of on farm transport;
3) Credit and financing related: no access to banks, lack of sufficient funding in the Farmers Association, costly and inefficient contract machinery service, input procurement, cattle and oxen purchase;
4) Social and Health Services: impassable roads due to flooding through broken irrigation system, problem of establishing latrines due to high water table, potable water, no power supply to farm facilities, poor condition of school and inadequate health facilities.



Source: Field Visits March 2017

As shown in the figure above, water is the biggest constraint although all other factors raised make farmers vulnerable to climatic and economic shocks that limit them from operating to their full potential.

5.3.11 Income Status

Findings from the household socio-economic survey mostly revealed that (60%) of households were earning less than 500,000 monthly. See Table 5-14 and Figure 5-13 below. (7.3%) of the households earn between one to two millions (1-2 Million).

Table 5-14: Household income

Income Range	Frequency	Percent
10,001- 50,000	6	3.6
50,001 – 100,000	17	10.9
100,001 – 150,000	11	7.3
150,001 – 300,000	31	20
300,001 – 500,000	28	18.2
500,001 – 750,000	28	18.2
700,001 – 1,000,000	22	14.5
Over 1,000,000	11	7.3
Total	**154**	**100**

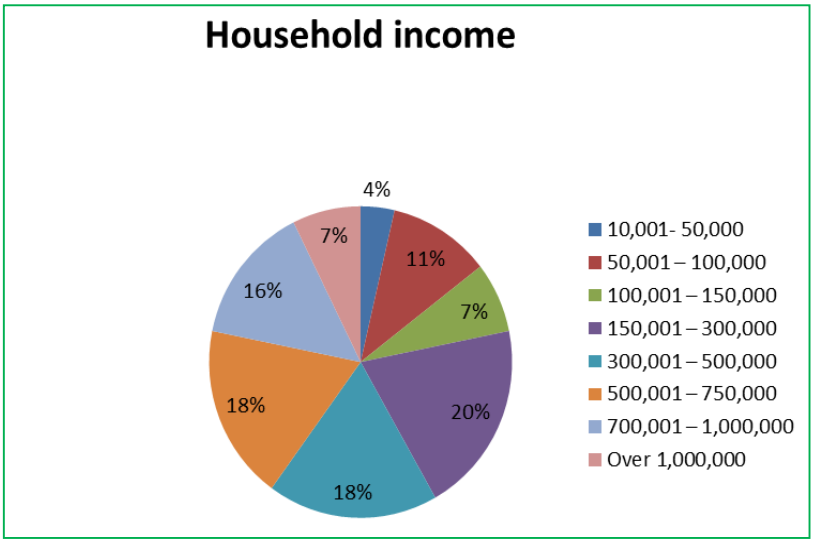


Figure 5-13: Household Income

Considering the typical under-reporting of incomes/expenditures by respondents in such surveys, it is only clear that on average population in the area are middle income earners.

5.3.12 Number of people engaged in income generating activities

The socio-economic survey sought to establish the number of economically active people or individuals involved in income generating activities at household level. Table 5-15 and Figure 5-14 clearly indicates that majority of the visited households (48.1%) had only one person primarily the head of the household engaged in some form of income generation activity. This is an indication of a relatively high dependence ratio in the project area.

Table 5-15: Number of people involved in income activities

Number of people	Frequency	Percent
1	74	48.1
2	66	42.9
3	5	3.2
4	9	5.8
Total	**154**	**100**

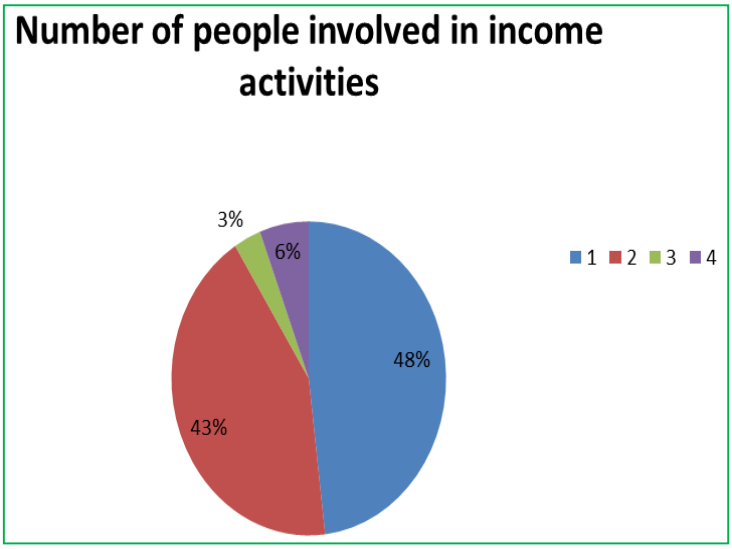


Figure 5-14: Number of people involved in income activities

5.3.13 Domestic Water Supply Facilities

In order to understand nature of access for water for domestic use, respondents were asked where they get their water. From the field surveys, 28.9% of the respondents reported using river while 26.1% of the respondents got their water from unprotected spring and only 25.6% from tap water.

Table 5-16: Water source for domestic use

Source	Frequency	Percent
Tap water	56	25.6
Borehole	27	12.4
Protected Spring	1	0.5
Unprotected Spring	57	26.1
Vendor	13	6.0
River	65	28.9
Others	1	0.5
Total	**154**	**100.0**

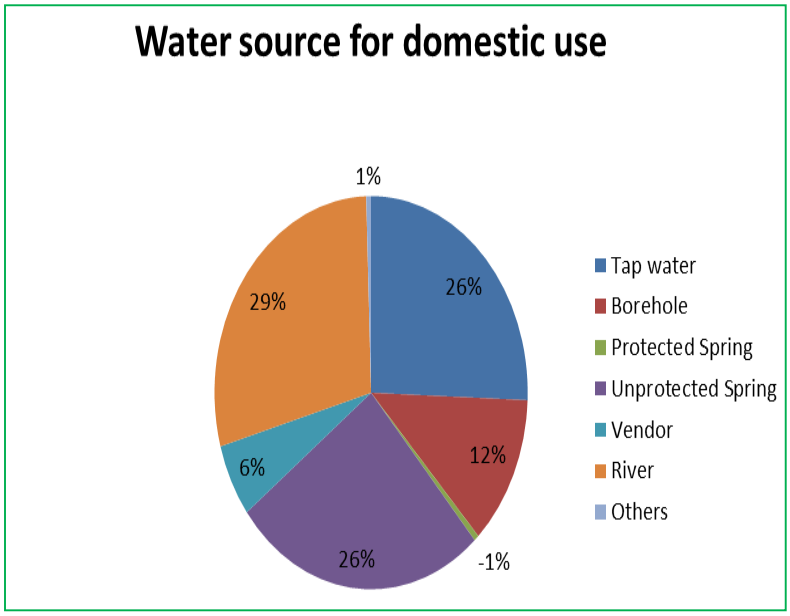


Figure 5-15: Water source for domestic use

In order to reduce on hours spent by especially women searching for water for domestic use, tap water should be placed for households so that they reduce hours spent searching for water and concentrate on farming.

5.3.14 Health and Vulnerability

According to Table 5-17 and Figure 5-16, most of the sampled households had members who had suffered from common illnesses in the last 2 weeks prior to the survey. (29.5%) reported to have suffered from malaria, (13%) suffered from diarrhea, (7.2%) reported Pneumonia, (27.1%) were attached by cough, (15.4%) experienced skin diseases while (7.7%) reported other illnesses including eye infections, headache, ulcers, and high blood pressure.

Table 5-17: Percentage of households with members who suffered common illnesses

Common illnesses	Frequency	Percent
Malaria	61	29.5
Diarrhea	27	13.0
Pneumonia	15	7.2
Cough	56	27.1
Skin disease	32	15.4
Other	16	7.7

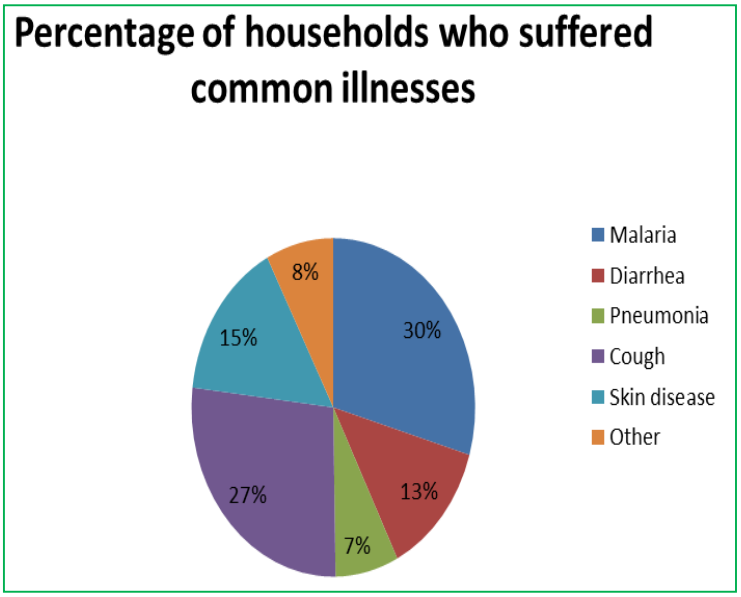


Figure 5-16: Percentage of households with members who suffered common illnesses

In addition, (33.8%) of the households confessed to have a disabled or chronically ill person. This is a big proportion that needs to be factored in during project design. Irrigation water may carry pathogens of communicable diseases for human beings. It can also provide the right environment for the breeding and propagation of their vectors. The creation of open water bodies and irrigation and drainage infrastructure can lead to the introduction of disease vectors in areas where they did not exist before, or encourage a rapid increase in their original densities.

Since rural women are the major users of irrigation infrastructure, the sensitivity of the different technologies to health aspects should be analyzed and taken into consideration during the decision-making process. As seen from the statistics, malaria is the major waterborne disease. It is therefore necessary to avoid or modify systems that promote these diseases. However, when going into the water themselves people are exposed to the disease. The trend of treated wastewater reuse for irrigation adds another dimension to the selection of an irrigation system in view of the additional hazards from the diseases such as parasitic worms, typhoid, cholera and salmonella.

5.3.15. Nearest and mostly used health facility

All the respondents of the households (100%) noted that Mubuku Irrigation HC III was the nearest health facility known in the project area. Other accessible and used health facilities included Nyakabingo HC II, Bughalitsa HC II, Kigoro HC, Buhaghura HC III, Rukoki HC III and Kigoro EMS. Although respondents observed that majority of health facilities (33.1%) were located within a distance of 1-2km, realistically almost all respondents (95.3%) reported accessing and utilizing these health facilities.

5.3.16 HIV/AIDS

1. **Knowledge about HIV/AIDS**

All the respondents had knowledge about HIV/AIDS including how it is spread and how it can be avoided, category of people more at risk and where to information about the scourge. Some of the respondents were aware of the people who were infected including family members who had died of HIV/AIDS.

2. Knowledge about HIV/AIDS transmission

Asked whether they knew how one catches the deadly HIV/AIDS. Unprotected sex intercourse without a condom registered (45.8%), followed by transfusion from unscreened blood (27.8%), and infected woman transfusion to her child during pregnancy (14.5%) and from an infected woman to her child during breastfeeding

3. Knowledge of anyone living with HIV/AIDS

Almost all respondents (73.4%) were not aware of someone who had acquired or were living positively with HIV/AIDS while only (26.6%) were aware. This could be attributed to the stigma of the disease still attached in some regions. In addition, a small percentage (3%) reported that some of the positive living persons were their close relatives.

6.0 Public consultations and disclosure

The National Environment Act, Cap 153, the EIA Regulations 1998, conduct of Environment Practitioners Regulations,2001 Guidelines for the EIA in Uganda all emphasize public participation in the EIA process. Several stakeholders and farmers found at the scheme premises were consulted. The consultations were aimed at getting views of stakeholders on health, safety, economic and others regarding the proposed project. The majority of the residents and other relevant stakeholders in the area acknowledged the fact that the irrigation project was necessary for the development of their area as far as food production is concerned.

6.1 Participation Objectives

The objectives of stakeholder consultations include the following:-

1) To disclose the proposed development and it very nature to the community surrounding it;
2) To provide sufficient information to all stakeholders and interested parties that will help them to participate in the whole process of the project;
3) To obtain views from stakeholders on anticipated benefits, fears, opportunities and any other concerns of the community as well suggestions on how best to mitigate their fears in regard to the proposed project.

Figure 6-1: Meetings with farmers and local leaders in Mubuku

6.2 Stakeholder classification

The stakeholders consulted were categorized into the national level technocrats from NEMA and relevant sectoral agencies; MAAIF, the district technocrats, Officer in Charge-Mubuku, Irrigation officer-Mubuku and members of the community both in the nearby commercial center and the community around the proposed irrigation scheme, as indicated in Table 6-1 below.

Stakeholders	Raised concerns

MAAIF-Directorate of crop resources Eng. Kato Andrew-0772182028	9. Consider the terrain for the area to be irrigated; 10. High value crops should be considered in relation to the costs incurred during water pumping; 11. Crops grown should target market not for home consumption; 12. The irrigation costs shouldn't be higher than investment costs; 13. The scheme should focus on improving peoples livelihoods; 14. There should be proper soil analysis to determine the type of crops to be grown; 15. The proposed project should be strategized on large scale production; 16. The district should employ an agricultural engineer full time on site.
District Water Engineer Kalende George K 0757559073	6. In terms of irrigation, the existing infrastructure has been causing loss of water, there is need to put in place mechanism to control water loss; 7. In terms operation and maintenance of the scheme, the money from the centre has significantly reduced leading to abandoning of some phases as earlier planned; 8. There should be effective water supply to crops to avoid wastage; 9. Effects of water logging should be handled with care since logging causes soil salinity; 10. Fertilizer application should be within the required range and under the guidance of a qualified agronomist. This is aimed at reducing effects of fertilizers on crop growth.
Officer in charge-Mubuku I.S.S Tibesigwa K. Lawrence 0702-160545	1. The scheme remains an important economic driver in the district, the scheme is the food basket for the district; 2. Challenge are there for instance, limited funds to maintain technical staff; 3. In order to address issues of land conflicts, farmers should be registered to strengthen collaboration; 4. Yet there is acute shortage of staff at the moment; 5. Regarding management, the farmers should

	be nurtured to manage their own issues; 6. The proposed design for the project should put into consideration proper drainage system to avoid pollution of the river; 7. There should be effective management of soil erosion which is commonly associated with irrigation scheme projects; 8. Income of the community will increase since new varieties of crops will be introduced.
Mwesigwa Patrick Irrigation Officer-Mubuku I.S.S 0779234970	1. There is only one option i.e. surface irrigation; 2. The schemes are not functional because of an array of reasons for instance there is no sufficient water in some of the schemes; 3. The other reason is that some of the schemes are water logged and this calls for proper drainage; 4. All the schemes need new structures because the existing ones are now obsolete. They were built in 1960's; 5. There is need to identify alternative sources of water to cater for the dry season; 6. There is need for capacity building especially in water scheduling and all aspects of running the irrigation scheme.
Community members	Community members acknowledged the following advantages of the project:- 1. The community members welcomed the project since they were facing a problem of poor yields during dry season and they acknowledged that the new irrigation technology will increased on their income since production of crops will be carried out throughout the year. More so new skills will be acquired during crop crowing hence improving their living standards; 2. Returns to the district will definitely increase as the project pays its local dues; 3. Crop production will contribute to the emergence of new employment initiatives as well as boosting food production in the area; 4. Agriculture demonstration school is expected to emerge due to the presence of the irrigation scheme;

5. Market for the yields will increase since good quality agriculture produce will be available.

Despite of the advantages of the project mentioned, the following disadvantages were also highlighted by the community members:-

1. There is fear that after improvement, the fees charges on water might increase;
2. The government might decide to take full control of the scheme thus eliminating local people from accessing land within the scheme;
3. Environmental pollution especially from agrochemicals to be used at the scheme;
4. Flooding especially due to excess water usage;
5. Lowering of water level of the river since much water will be abstracted for crop growing;
6. Conflict between community members themselves during sharing of crop benefits.

7 Impact Evaluation, Analysis and Mitigation

The project is expected to have environmental impacts on certain aspects of biophysical and socio-economic environment of the project area both during the construction and operation stages. The impacts of the project were assessed and are generally grouped into those affecting soil, water resources, air quality, flora and fauna, community and their economic activities, vegetation, land acquisition and aesthetics, landscape, noise and human health. Appropriate mitigation measures are also discussed. These impacts were considered for the various phases of the project as:-

1) During construction of the irrigation infrastructure;
2) During operation of the irrigation scheme;
3) Decommissioning of the facilities such as constructed offices, pipeline, canals, etc.

7.1 Positive Project Impacts

7.1.1 Improved Management of Natural Resources

The proposed sites are currently covered with bushes and shrubs. Converting this to an agricultural land will result to improved land management and optimal land use.

7.1.2 Improved Water for Productive Uses

The development of the proposed irrigation scheme will help smallholder farmers to access water for agricultural production so as to counter the problems of frequent dry periods, thus smoothening the cyclical impacts of droughts. In addition, the rehabilitation measures are expected to improve the efficiency of water diversion, conveyance and application and thus reduce water wasting. Apart from improving agricultural production this will avail additional water that would have been wasted to downstream users and thereby reduces water pressure and conflicts.

7.1.3 Increased Agricultural Acreage and Productivity

The construction of the irrigation infrastructure and proper management of the irrigation scheme (through efficient water application and sustainable irrigation practices) is expected to yield considerable increase in the agricultural output of rice which is the main source of income to the surrounding communities. The irrigation scheme will particularly encourage the rise of farmers groups that can support the supply of agricultural crops to the regional markets and will contribute to the overall economy of the regions and country as a whole.

7.1.4 Increased Job Opportunities

The project will create job opportunities for people living in the area, around the area and even from far places. Both skilled and unskilled labour will be required during project implementation and operation phases. Some of the personnel required include contractors, casual labourers, irrigation engineers, agronomists, food technologists, farm managers, accountants among others. This has the main benefit of increasing income to the locals and consequently improving their livelihoods. In addition, the amount of money earned through wages will directly enhance the operation of various economic activities and enterprise development in the areas neighbouring the project area.

7.1.5 Environmental Protection

The proposed project will be based on a catchment approach that will not only improve the livelihood of people living in the catchment area, but also promote sustainable development of the watershed to address environmental challenges (land degradation) in the project areas. Tree planting and other watershed management activities planned as part of the project will contribute to restoration of forest cover and ecosystems, thus reducing soil erosion, water pollution, combat desertification and deforestation as well as enhance water catchment functions. These activities will mitigate climate risks and contribute to reduced vulnerability to extreme weather events and provide a more secure social environment for targeted populations.

7.1.6 Improved Crop Varieties

There is projected to be an increased variety of crops grown thereby increasing the yields to the local farmers. Due to the availability of water, the rate of agricultural production is meant to increase thereby availing more food to the residents.

7.1.7 Opportunity for training and skills acquisition

Successful implementation of the project activities will require dynamic and multi-disciplinary professionals including agronomists, irrigation experts, among others. Regular short and tailor made training courses and seminars will be organized to reinforce the capacity of the farmers and project stakeholders. Some of the proposed training activities will be done for the operations and maintenance of the irrigation infrastructure and farm management. This will enhance the skills of community members.

Irrespective of the above stipulate positive impacts, FIEFOC-II project will contribute to long-term environmental positive impacts in the project areas including:-

a) Improved land conditions due to improved land management from sustainable land management activities promoted through the project to reduce land degradation and improve soil fertility; and
b) Enhanced soil and water conservation measures and activities as well as improved watershed management programme whose net impact will be improved soil and water conditions.

7.2 Negative Impacts and Mitigation Measures

7.1.2 During Construction Phase

Environmental and social impacts expected during construction phase of the proposed project include:-

7.1.2.1 Occupational Hazards

There are likely to be accidents during the construction of the irrigation scheme's infrastructure and both the skilled and unskilled workers at project site will be prone to the various accidents. The safety of workers can therefore be guaranteed through awareness creation on dangers, risks and safety and also training on first aid.

It is recommended that this be minimized and or controlled through adoption of effective measures to guarantee the health and safety of all workers. Application of health and safety

measures required by law and internationally accepted standards must be ensured and be complied with so as to minimize impacts on health and safety incidences. Health and safety regulations should be imposed on all the workers. Safety regulations including life and health insurance, first aid kits, protective clothing such as uniforms gloves and helmets will be adhered to.

The Contractor will put barriers where heavy machinery will be under use to avoid trespassing and as well as employing competent people to operate the machines used in order to minimize accident occurrence.

7.1.2.2 Air pollution

There will be air pollution from the equipment that will be used during the construction works from dust and exhaust fumes from vehicles and equipment used. This may endanger the health and safety of the workers and the surrounding communities if not mitigated appropriately.

7.1.2.3 Water and Soil Pollution

Oil wastes may become a source of pollution to the soils and water resources if carelessly handled, stored or drained from construction vehicles and equipment. There will also be increased sediment loads to the rivers and streams resulting from excavation works and construction debris.

Project related excavation could lead to surface and ground water quality degradation.

Contaminated soil or ground water in the project area could be disturbed by excavation resulting potential transfer of the contamination to surface waters. Spills of hazardous materials in excavated areas during construction could introduce contaminants to groundwater. The contractor will ensure proper disposal off of all construction debris in a sensible manner and not throw it into any of the rivers/stream.

7.1.2.4 Loss of Natural Vegetation Cover

The proposed irrigation scheme is expected to convert the current state of vegetation into agricultural land hence will require natural vegetation clearing. Clearing of vegetation during the rehabilitation works and excavation work for the scheme's infrastructure could also result in an increased runoff and thus encourage erosion. Incorporating soil conservation measures during construction would help to mitigate damage caused by erosion.

7.1.2.5 Disturbance of Soil Structure

Excavations and farming may result in to the disturbance of soil profile and structure. Soil management measures should be observed.

7.1.2.6 Public Health

Construction and rehabilitation works during operation will create dust, air and noise pollution, which can have an impact on public health. Oil wastes from vehicles can also impact on public health if they find their way into water sources. Sanitation and hygiene is also an issue of concern, and if not properly addressed can lead to outbreaks of illness such as typhoid, cholera etc. Construction works are associated with an increase in sexually transmitted diseases such as STDs and, HIV/AIDS due to the influx of workmen interacting

with the local people. Construction teams can also cause social upheaval among communities near the project area.

7.1.2.7 Labour Issues

The project is anticipated to stimulate many labour issues in the project area. The project activities are mainly labour-intensive. This call for locals in the project area to have them take up to 70% of the available jobs coupled with the changing labour patterns that make labour intensive irrigation unattractive will be a big challenge. There is need for continuous awareness campaigns to sensitize the local people on the various dimensions of the project to enable them embrace immigrants.

7.2 During Operation Phase

Environmental and social impacts expected during operation phase of the proposed project include:-

7.2.1 Soil Erosion

Destruction of natural vegetation will expose the soil to agents of erosion. This will be mitigated by planting cover crops and other soil management strategies such as:-

1) Use of soil erosion control techniques which disperse erosive energy and avoid concentrating it by providing good vegetative cover to disperse the energy of rain drops and contour drainage to slow down surface runoff;
2) Proper maintenance of canal and the irrigation infrastructures;
3) Adoption of conservation tillage systems to enhance infiltration and seepage.

7.2.2 Alteration of Soil Structure

Use of irrigated water might also alter the structure of the soil. This will be mitigated by sensitisation of scheme operators/workers on proper soil conservation and management measures.

7.2.3 Water-Logging and Salinization

Irrigation projects are largely associated with salinization and the rise in the local water-table (water-logging). Low irrigation efficiencies are one of the main causes of rise of water table. Poor water distribution systems, poor main system management and archaic in-field irrigation practices are the main reason. However, the proposed land to undergo irrigation is expected to use improved/modern irrigation technology that will lead to high field water application efficiency to mitigate water-logging and salinization occurrences.

7.2.4 Effects of the River Downstream Eco-System

The proposed land to undergo irrigation will be designed to optimize the available water resources. Operation of the scheme will result into reduced water flows for downstream users. To argument the available water source, a storage reservoir is proposed as an alternative source for the project to store water during high flows for use during low flows.

7.2.5 Pollution

Use of agro-chemicals including pesticides, fertilizers, herbicides, and insecticides may cause pollution to water, air and the soils. Improper use of these chemicals may become toxic. Some of these chemicals may also be dangerous in nature hence leading to health hazards.

A qualified agronomist should be hired to guide farmers on the effective use of these chemicals so as not to distort the environment.

7.2.6 Increased plant pests and Diseases

Elimination of dry season die-back and the creation of a more humid micro-climate may result in an increase of agricultural pests and plant diseases. This can be mitigated by proper planning and management of the project activities such as reduction of input to and release of nutrients (nitrogen and phosphorous) from cropped fields and use of organic instead of chemical fertilizers where possible.

7.2.7 Population Influx

Currently the project area is not a human settlement area. Establishment and operation of the project will lead to population influx within the area. People will migrate from the neighbouring areas and other areas to be part of the actors within the scheme's operations. This may lead to culture change and increased conflicts over resources and public and social services. This will be mitigated be enforcing by-laws, rules and regulations concerning movement in and out of the scheme which will be coordinated through the area administration office. Development of infrastructure for housing, electricity, domestic water supply, roads, sanitation, health facilities among others will be important within the farm so as to support the population increase.

7.2.8 Solid Waste Management

With the proposed scheme's enterprises and operations coupled with the rising population influx, enormous solid waste generation rate is expected. It is therefore proposed that proper waste management strategies be employed and adherence to solid waste management regulations. Minimization of waste generation will be first priority. However, unavoidable wastes will be separated at source, recycled or re-used.

7.2.9 Increased Communicable Diseases

If not well managed, an irrigation project may result to water-borne diseases such as malaria, bilharzia, diarrhoea among others. On the other hand, increased population growth with the associated social change may lead to communicable diseases such as HIV/AIDs. The proposed mitigation measure for these effects is to ensure stagnant waters and possible mosquitoes breeding areas are controlled and that HIV/AIDS campaigns and safeguard against prostitution are done to create awareness to the population within the area. Awareness creation on the expected social changes amongst the population will also be done.

7.3 During Decommissioning Phase

7.3.1 Air Pollution

There will be air pollution from the equipment that will be used during the demolition works. The exhaust fumes from vehicles and equipment used is also likely to pollute the soils, vegetation and the diverted water.

7.3.2 Solid Waste Generation

Demolition of the project infrastructure will result in large quantities of solid waste. The waste will contain materials used in construction including concrete, metal, drywall etc. It is

proposed that a licensed operator be engaged to collect demolition debris/wastes to avoid illegal final dumping at unauthorized sites. All debris/wastes should also be collected regularly to control air pollution and injuries.

8 Analysis of alternatives

Integral to the Environmental impact assessment process is the consideration and evaluation of alternatives to the proposed development plan against the project need. Analysis of project alternatives considers other practicable strategies that can be taken to promote the elimination of negative environmental impacts identified. It is the basis for implementation of a development project with minimal environmental damage. The various alternatives were assessed in terms of both environmental acceptability and economic feasibility during the EIA phase of the project. The following alternatives were taken into consideration;

8.1 No Project Alternative

The EIA examined the impact of doing nothing (the "No Action" option) i.e. not establishing the proposed Phase IIB and Phase III Mubuku irrigation project. The do nothing option is retrogressive for an existing of such as a tremendous development whose vision is an integrated operation across the entire agricultural value chain that will introduce savings from economies of scale. The project shall also provide a potential long-term opportunity for the community members from the profits received in their routine agriculture activities at the scheme. The proposed project is also geared towards creating several employment and business opportunities in addition to the several positive impacts in with food value chain. The No-Action alternative will imply that essentially, none of the identified impacts of proceeding with the project will be experienced. However, choosing this option would entail perpetual losses on the part of the developer resulting from unutilized land. This would further undermine the championing of agriculture as an engine for economic growth in the country. Furthermore no employment opportunities are envisaged under this option. Therefore, the No-Action alternative is not recommended.

8.2 Alternative site location

At present, the implementing authority does not have an alternative sites other than those already selected and various studies have been undertaken and they have been found palatable as far as crop production is concerned. The implementing body has already secured funds from African Development Bank (AfDB) for use at the scheme. Looking for the land to accommodate the scale and size of the project and completing official site studies may take up a lot of time which would delay project implementation. In addition to this, the intended land use (agriculture) blends well with the area land use since it is mainly cultivatable land gazzated by the government to improve the livelihoods of the community. The crops to be grown at the scheme are also indigenous crops common among the local community. Therefore the project does not conflict with the area land use. In consideration of the above concerns and assessment of the current proposed sites, relocation of the project is not a viable option.

8.3 Action option

This alternative would see the implementation of the project as proposed by the developer, and as outlined in this EIA report (Boosting of the Agricultural scheme).The consultancy team made comprehensive environmental impact study for the proposed project. Details of the study are the subject of this report. The Action option as proposed in this report appears to be the most attractive and long time investment whose returns can be considerable. This option would certainly be a solution to the projected food demand in the country. Mitigation

measures for the identified negative impacts of this alternative have been thoroughly discussed in this report. If they are implemented as proposed, the project will not be damaging to the environment. The consultancy team therefore recommends that this alternative is the most appropriate.

9 Environmental and Social Management Plan (ESMP)

This Environmental and Social Management Plan (ESMP) provides a logical framework within which the negative environmental and social impacts identified during the Environmental and Social Impact Assessment study can be mitigated and any beneficial environment effects can be enhanced. Monitoring and management practices are considered and cost estimates included. Responsibilities and time frames for the implementation of the various aspects of the Environmental and Social Management Plan have been identified. The Environmental and Social Management Plan should be implemented accordingly.

The mitigation measures for the anticipated negative impacts of the proposed project are presented in the Environmental and Social Management Plan (Tables 9-1, 9-2 and 9-3).

Table 9-1: Environmental and Social Management Plan during Project Construction

Possible Impacts	Proposed Mitigation Measures	Monitoring indicators	Frequency of Monitoring	Responsible Party	Cost
Workers accidents during construction process.	✓ All workers will be sensitized before construction begins, on how to control accidents related to construction; ✓ A comprehensive contingency plan will be prepared before construction begins, on accident response; ✓ Accordingly, adherence to safety procedures will be enforced; ✓ All workers to wear protective gear during construction, including helmets, gloves etc; ✓ Construction work should be limited to daytime only	✓ Number of workers sensitization meetings; ✓ List of attendants; ✓ Minutes of sensitization meetings; ✓ Number of workers accidents cases; ✓ Number of first aid kits purchased; ✓ A Safety Plan.	Periodic checks	Contractor; MWE; Site Environment personnel	Part of BOQ
Air pollution by dust and VOCs generated during construction process	✓ All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction; ✓ Careful screening of construction site to contain and arrest construction-related	✓ Number of workers trained prior to construction; ✓ Number of workers wearing protective gear; ✓ Less dust and vehicles gas vehicles emissions produced	Periodic checks	Contractor; MWE; Site Environment personnel	

	dust; ✓ Exposed stockpiles of e.g. dust and sand, will be enclosed, covered, and watered daily, or treated with non-toxic soil binders; ✓ All workers will be required to wear protective gear; ✓ Ensure construction machinery and equipment are well maintained to reduce exhaust gas emission; ✓ Stop all excavation work if wind threshold velocity has been exceeded.			
Inadequate human waste disposal by workers during construction process	✓ Temporary latrine should be provided on site to be used by construction workers	Number of established sanitation facilities within the project area	Periodic checks	MWE Contractor District Health Inspector
Pollution from hazardous waste	✓ Handling of the materials using the material safety data provided by the manufacturers; ✓ Appoint a safety officer to ensure that proper disposal guideline are observed;	✓ Number of OHS officers available; ✓ Presence of spillage and unmanaged hazardous waste	Periodic checks	PSO DEO; Health inspector;

	✓ Ensuring that maintenance and/or piece of work carried out on any piece of equipment or construction work is undertaken by qualified personnel; ✓ In case of spillage emergency spillage control measures to be instituted; ✓ Containerization of any wastes and disposal of by NEMA licensed waste handler.			OHS officer;	
Loss of natural vegetation cover	✓ Ensure proper demarcation and delineation of the project area to be affected by construction works; ✓ Design and implement an appropriate landscaping programme to help in re-vegetation of parts of the project area after construction.	✓ Re-vegetation and landscaping programme	Periodic and checks during construction	MWE; Contractor; Project Engineer;	Part of BOQ
Disturbance of soil structure	✓ Sensitization to the project workers on proper soil conservation and management measures; ✓ Excavations on unintended areas should be avoided.	✓ Number of workers sensitized; ✓ Part of the land affected.	Periodic checks	DAO; Contractor; Site agronomist.	
Increase in STI infections and	✓ Sensitization of local communities and staff working	✓ Number of sensitized workers;	Quarterly	Contractor;	Part of BOQ

other related diseases	on the project on dangers of free lifestyle; ✓ HIV/AIDS awareness training for all employees and subcontractors; ✓ Sensitization of the locals and the project staff on proper sanitation and hygiene.	✓ A health plan in place; ✓ Number of STI posters poster produced and displayed		Health Inspector.
Labour issues	✓ Project proponent should put in place a proper strategy to ensure fair recruitment of workers incorporating both locals and people from other areas ✓ Sensitization to the local communities on the expected population influx should be done.	Number of workers employed from the local community and other areas	Periodic checks	MWE; Contractor; Labour officer.

Table 9-2: Environmental and Social Management Plan during Project Operation

Possible Impacts	Proposed Mitigation Measures	Monitoring Indicators	Frequency of Monitoring	Responsible Party	Cost
Soil erosion	✓ Use erosion control techniques which disperse erosive energy and avoid concentrating it e.g. providing good vegetative cover will disperse the energy of rain drops and contour drainage will slow down surface runoff; ✓ Proper maintenance of canal and the irrigation infrastructures; ✓ Adopt conservation tillage systems to enhance infiltration and seepage.	Soil erosion control levels	Periodic checks	MWE; DAO; Site agronomist.	Part of BOQ
Alteration of soil structure	✓ Sensitization to the project workers on proper soil conservation and management measures.	Affected area	Periodic checks	DAO; Site agronomist	
Water-logging	✓ Use of proper irrigation management, closely matching irrigation demands and supply ✓ Installation and maintenance of adequate drainage system.	Levels of drainage within the cultivated land	Periodic checks	MWE; Project Engineer	

Increased soil salinization	✓ Careful management should be practiced to reduce the rate of salinity build up and minimize the effects on crops.	Levels of soil salinization	Periodic checks	DAO; Site agronomist	Part of BOQ
Effects of the river downstream ecosystem	✓ Ensure sustainable abstraction of water from Mubuku River; ✓ Establish a water storage reservoir	River abstraction levels	Periodic checks	MWE; DWRD; DEO	
Increased sedimentation	✓ Construction of sedimentation retention ponds (if necessary); ✓ Filters should be added to all storm water inlets, and silt fences established where erosion is predicted; ✓ Install sediment traps or screens to control runoff and sedimentation ✓ Design and management of canals to minimize sedimentation; ✓ Provision of access to canals for removal of weeds and sediments.	Presence of sedimentation ponds and traps; Levels of sedimentation.	Periodic checks	DAO; Site agronomist DEO	
Air pollution	✓ NEMA/ WHO environmental air emission standards should always prevail controlling suspended particles of matter,	Dust levels Pollution audit reports	Periodic checks	MWE; NEMA;	Part of BOQ

	Sulphur Dioxide, Nitrogen Dioxide and other pollutants; ✓ Tilled surface should not be left bare to minimise wind erosion and where possible embrace conservation agriculture; ✓ Use of pesticides and other chemicals should be done when the weather is relatively calm.			DAO.	
Proliferation of aquatic weeds	✓ Clearance of woody vegetation from inundation zone prior to irrigation (nutrient removal); ✓ Use Best Practices in weed control; ✓ Harvest of weeds for compost, fodder or biogas; ✓ Regulation of water discharge and manipulation of water levels to discourage weed growth.	Absence of aquatic weeds	Periodic checks	MWE; NEMA; DAO.	Part of BOQ
Pollution from Hazardous Chemicals (Waste)	✓ Appoint OHS officer to ensure proper disposal guidelines are observed. ✓ Ensuring that maintenance and/or piece of work carried out on any piece of equipment or construction work is undertaken by qualified	Pollution audit reports	Periodic checks	OHS Officer;	

	personnel. ✓ In case of spillage emergency spillage control measures to be instituted.			
Increased accidents	✓ All workers will be sensitized and trained on occupational safety and health issues and on how to control accidents related to field operations; ✓ A comprehensive contingency plan will be prepared on accident response;	Safety and training reports; Monthly accident reports; Number of safety posters produced and displayed.	Periodic checks and Accident audits	OC Mubuku; PSO
Increased communicable diseases	✓ Sensitization of local community and staff working on the project on dangers of free lifestyle; ✓ HIV/AIDS awareness training for all workers and community members;	No. of sensitization meetings held; A health plan; No. of STI posters poster produced and displayed	Quarterly	MWE DHI;

Table 9-3: Environmental and Social Management Plan during Project Decommissioning

Possible Impacts	Mitigation Measures	Responsible	Cost

		Party
Air pollution during demolition process.	✓ The demolition exercise will be limited to day time only; ✓ All personnel working in the project will be trained prior to commencing the demolition exercise on methods for minimizing negative impacts on air quality; ✓ All trucks hauling demolition debris/wastes shall be covered; ✓ Careful screening to contain and arrest demolition related dust will be adopted; ✓ Exposed demolition debris of e.g. dust and sand, will be enclosed, covered, and watered daily before transported to disposal site; ✓ All workers on the site will be required to wear protective gear while on duty	MWE NEMA inspectors Contractor
Demolition debris and related wastes	✓ Private contractor will be engaged to collect demolition debris/wastes; ✓ All debris/wastes will be collected regularly to control air pollution and injury; ✓ NEMA licensed company should be responsible for the final dumping demolition debris; ✓ All persons involved in refuse collection shall be in full protective attire.	NEMA inspectors Contractor DEO
Workers accidents during demolition process.	✓ All workers will be sensitized before the exercise begins, on how to control accidents related to the demolition exercise; ✓ A comprehensive contingency plan will be prepared before demolition begins, on accident response; ✓ Adherence to safety procedures will be enforced at all stages of the exercise; ✓ All workers, pursuant to labour laws, shall be accordingly insured against accidents; ✓ All workers will be provided and instructed to wear protective attire	Contractor Labour officer;

during demolition, including helmets, gloves, etc;

- ✓ Demolition work will be limited to daytime only to avoid workers accidents due to poor visibility;
- ✓ Provision of first Aids kits at the site.

9.1 Environmental and Social Monitoring Programme

9.1.1 Introduction

It is important that the Project Proponent sets up regular monitoring programmes to assess the ambient levels in principle parameters of the environment and social aspects as stipulated under the National Environment Act Cap 153.

Environmental and Social Monitoring will serve the following functions:-

1) To ensure that the environmental and social mitigation measures proposed in the ESIA report are effectively implemented by the various agencies in compliance to environmental provisions and standard specifications;
2) To evaluate the effectiveness of environmental and social remedial measures as well as various evaluation techniques and procedures;
3) To facilitate development of responses to new and developing issues of concern.

The environmental and social monitoring program will operate through the project construction and operation phases as presented in Tables 9-4 and 9-5.

Table 9-4: Environmental Monitoring Programme during Project Construction Phase

Effect	Parameter	Frequency	Location
Soil Erosion and siltation	✓ Soil erosion rates, stability of bank and canal embankments.	Monthly	River banks and canals
Public Health and Safety	✓ Frequency of incidents/accidents and fatalities; ✓ Number of vector breeding sites created by poor drainage; ✓ Availability of condoms, contraceptive supply, impregnated bed nets, mosquito repellents; ✓ Health and safety awareness among staff.	Weekly	Project area and environs
Surface and ground water quality	✓ Follow Sections 28 and 31 of the Water Act, Cap 152	Monthly	At river locations that were sampled during the feasibility study
Noise	✓ Noise limits	Monthly	At major construction site
Air pollution	✓ Particulates, especially dust as a result of earthworks and construction machinery	Monthly	In the project area and environs where major works will take place
Vegetation and habitats	✓ Vegetation structure and biodiversity	Quarterly	Project area and environs
Population changes	✓ Total population, in- and out-migration, structure of the population and vital statistics; informal settlements	Annual	In the project area and environs
Water	✓ Water usage by different operation areas	Monthly	Project area

Table 9-5: Environmental Monitoring Programme during Project Operation Phase

Effect	Parameter	Frequency	Location
Surface and ground water quality	Follow Sections 28 and 31 of the Water Act, Cap 152	Monthly	At river locations that were sampled during the feasibility study
Water related diseases	Identification of water related diseases, adequacy of local vector control and curative measure.	Monthly	Adjacent communities to the scheme
Soil erosion and siltation	Types and rate of erosion on irrigated land, banks of the river and canals	Seasonally	Project area
Solid waste generation	Types of solid wastes	Monthly	Project area
Air quality	NO2, SO_2, O_3, CO_2, CO,VOC, Benzene, and Hydrocarbons	Monthly	Project area
Accidents and hazards	Number, causes and actions taken	Quarterly	Project area
Public Health and Safety	HIV/AIDs, STDs and other diseases Accidents; Hazardous materials.	Quarterly	Project area and environs

10 Conclusion and Recommendation

10.1 Conclusions

The proposed construction of Mubuku II irrigation scheme has a number of positive impacts as already highlighted in the EIA. A number of negative impacts have also been identified, and actionable mitigation measures have been prescribed. Therefore, it is very possible that once the measures are implemented the impacts will either be eliminated or minimized.

10.2 Recommendation

The project is located in Kasese district and in order to enhance implementation of the proposed mitigation measures there is need for collaboration and involving of local government, the lead agencies like Ministry of Water and Environment, National Environmental Management Authority and other relevant district authorities for the smooth running of this new project.

The mitigation measures for the predicated negative impacts for the activities of Mubuku irrigation scheme have been clearly articulated and they are applicable. The Environmental Management and Monitoring Plan to be followed by Mubuku scheme have been developed to implement the proposed mitigation measures. Furthermore, to avoid disturbances from the authorized Government Agencies most especially NEMA and MWE project proponent should ensure that environmental audits for the irrigation are undertaken annually and reports submitted for review and advice by this authority.

11. References

1. African Development Bank, 2012: Small scale irrigation and agricultural value chain for food security project-Kenya;
2. Environmental impact assessment guidelines for water resources related projects in Uganda 2011;

3. Global Environmental Facility (GEF), 2003: Hai Integrated Water and Environment Management Project;
4. International Institute for Sustainable Development (IISD), 2013: Climate risk management for sustainable crop production in Uganda;
5. ILISO Consulting (Pty) Ltd. January, 2015. Final Inception Report: Consultancy services for Feasibility Study and Detailed Engineering Design of Katete, Kibimba and Mubuku II Irrigation Schemes (Lot 2) under Farm Income Enhancement and Forestry Conservation (FIEFOC) Project [Procurement Reference no: MWE/SRVCS/13-14-00156/2];
6. Kasese District State of environment report 2006;
7. MoFPED, 2015: Ministry of Finance, Planning and Economic Development; Second National Development Plan (NDP II), 2015/16 – 2019/20;
8. MoWE**,** 2011: Environmental Impact Assessment guidelines for water resources related projects in Uganda environmental impact assessment guidelines for water resources related projects in Uganda;
9. MAAIF, 2013: Ministry of Agriculture, Animal Industry and Fisheries. National Agriculture Policy;
10. MWE, 2010: A National Irrigation Master Plan for Uganda (2010-2035)
11. UBOS, 2015: Uganda Bureau of Statistics. 2015 Statistical Abstracts. Pp 330;
12. MAAIF, 2012: Performance of the Agriculture Sector in FY2011/12;
13. Ministry of Water and Environment (2015): Feasibility Study and Detailed engineering design of irrigation schemes under the Farm Income Enhancement and Forestry Conservation Project: Namaly, Labori, Ongom and Musamya Schemes, Draft Feasibility Study Report, Volume II: Socio-economic and EIA Study;
14. National Development Plan (2010/11-2014-15)-Uganda;
15. NEMA, 2010. National Environment Management Authority. State of Environment Report, 2009/2010. Kampala, Uganda;
16. NEMA, Transboundary and cross-border environmental issues in Uganda (year));
17. Uganda Population and housing census (2014) UBOS.

Appendices

Appendix 1: List of stakeholders consulted

Stakeholder sheet for the proposed construction of irrigation scheme infrastructures and facilities Lot 2: in Mubuku, Kasese district. Contract No: MWE/CONS/16-17/00040/2

Name	Contact	Designation	Signature
TIBESIGWA K. LAWRENCE	0702-160545	Officer-in-Charge Mubuku I.S.S.	[signature]
KALENDE GEORGE K	0757559073	District water officer Kasese DLG	[signature]
MWESIGE PATRICK	0779234970	Irrigation officer MISS	[signature]
Kobwonge Jenipher	0717168959	farmer	
Okello Noah	0781562038	"	
Nyakaisiki Teddy	0785884985	"	
Kushemererwa Juliet	0778782080	farmer	
James Mugisa	—	farmer	
Atuganyira Peter	0771637058	farmer	
Mbabazi Scola	0702845770	farmer	
Bifega Jimmy	0704768369	"	[signature]
Inday John K	0771890314	"	

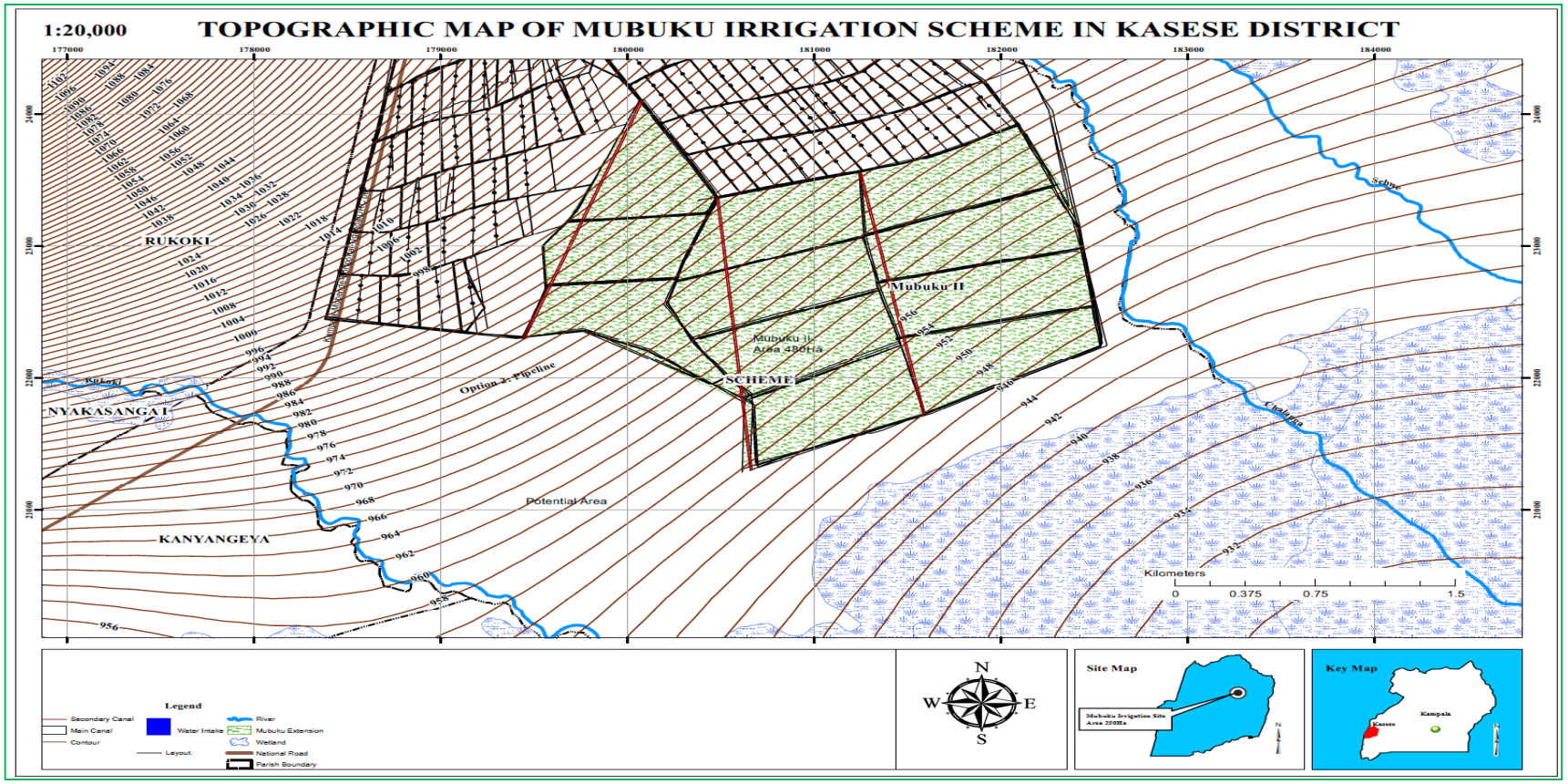
Ministry of Water and Environment

Stakeholder sheet for the proposed construction of irrigation scheme infrastructures and facilities Lot 2: in Mubuku, Kasese district. Contract No: MWE/CONS/16-17/00040/2

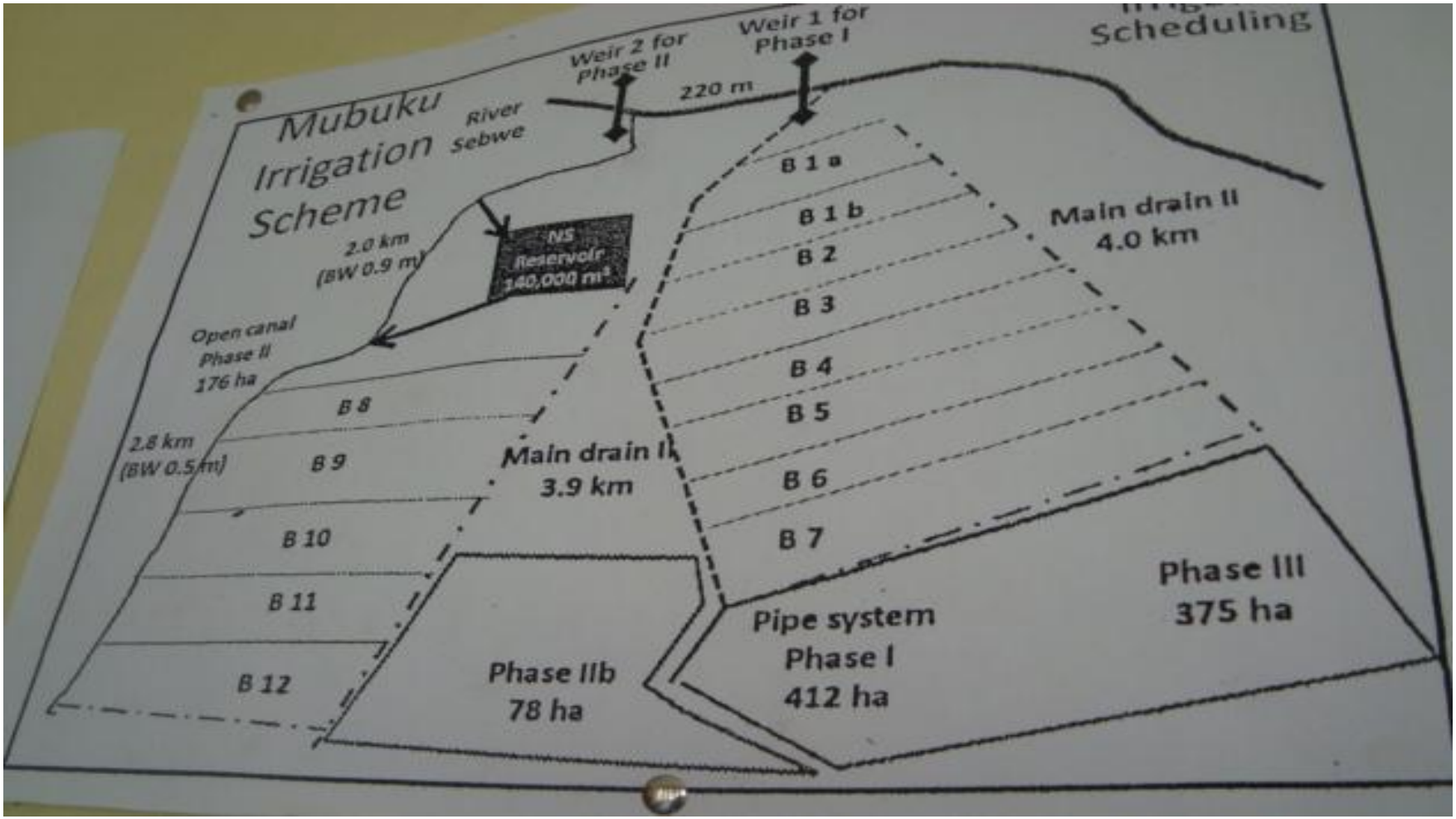
Name	Contact	Designation	Signature
Mbogo . S	0773505184	farmer	
Asaba Alfred	077122148	"	
Bridget Kanyigule	0786803962	farmer	
Anjelo Kabatabazi	0779-005725	farmer	K.J
Masika Jasmin	0787223732		
Ategeka Somat	0777926903	"	
Kajeru Rose	—		K.R
Ngonzi Georgena	0782771122	farmer	
Masereka Jackson	0704869725	—	—
Nyakahuma Mag.	—	—	—
Vienrondo Kobunyojo	—		—

Ministry of Water and Environment

Appendix 2: Topographic map of Mubuku irrigation scheme



Appendix 3: Layout plan for the proposed Phase IIB and Phase III



Appendix 4: Water Quality Assessment