ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY TO SET- UP LARGE FEED-LOT (FORAGE AND FEED CROP PRODUCTION) AND GOAT AND CATTLE FATTENING PROJECT IN ENCHETE KEBELE, BENA TSEMAY WOREDA OF SOUTH OMO ZONE, SOUTHERN ETHIOPIA

(Final Report)

Consultant

Beles Engineering PLC

(Experts in Water, Land and Environment)

Client

Luna Export Slaughter House PLC

May 2022
Addis Ababa, Ethiopia

CERTIFICATION

I Prof. Tenalem Ayenew**,** submit this Environmental and Social Impact Assessment (ESIA) study report on behalf of Beles Engineering PLC (Consultant) for the proposed project *to set- up a large feed-lot (forage and feed crop production), goat and cattle fattening project of Luna Export* Slaughter House PLC (Client) project. The project is located in Bena Tsemay Woreda of Enchete Kebele, SNNPR (Southern Ethiopia). The ESIA report has been prepared in accordance with the Environmental Impact Assessment Regulations of Ethiopia and IFC Guidelines for ESIA.

Prof. Tenalem Ayenew Date

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General Manager, Beles Engineering PLC 13/05/2022

Signature_____

Project Client: Luna Export Slaughter House PLC

Mr. Tesfalidet Hagos Date

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General Manager, Luna Slaughter House PLC 27/05/2022

Signature_____

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LIST OF ACRONYMS AND SYMBOLS

ADLI	Agricultural Development Led Industrialization
CITES	Convention on International Trade in Endangered Species
EFCCC	Environment Forest and Climate Change Commission
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EPE	Environmental Policy of Ethiopia
ESIA	Environmental and Social Impact Assessment
EIA	Environmental Impact Assessment
ESMF	Environmental and Social Management Framework
FDRE	Federal Democratic Republic of Ethiopia
FGD	Focused Group Discussion
ha	Hectare
IFC	International Financial Corporation
IOM	Institute of Occupational Medicine
IUCN	International Union for the Conservation of Nature
km	kilometer
LDV	Light Duty Vehicle
m.a.s.l	meters above sea level
MoARD	Ministry of Agriculture and Rural Development
MoMPNG	Ministry of Mines, Petroleum and Natural Gas
MoWIE	Ministry of Water Irrigation and Electricity
MoWR	Ministry of Water Resources
NOx	NOX (Nitrogen compounds)
NRS	National Regional State
OHS	Operational Health and Safety
PAPs	Project-affected-persons
PIM	Project Implementation Manual
PM	Particulate Matter
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
REA	Regional Environmental Agency
RPF	Resettlement Policy Framework
SNNPR	South Nations, Nationalities and Peoples Region
WB	World Bank

EXECUTIVE SUMMARY

1. General

This study examines the Environmental and Social Impacts Assessment (ESIA) of Luna Export Slaughter House PLC's (client) new modern ranch located in the South Nations and Nationalities Regional State, Bena Tsemay Woreda of Enchete kebele, Southern Ethiopia. The project aims to build the ranch initially in 500 hectares of land which is already acquired from the local government following national regulations.

Ethiopia has a vast cattle population (the largest in Africa), which can significantly boost the economy. Unfortunately, this vast natural resource has been underutilized in terms of generating export revenue. The Government of Ethiopia has been exporting limited amounts of meat and live animals to the international market, primarily to Middle Eastern countries. However, there is still much work to be done in the sector. The planned project will undoubtedly play a critical role in strengthening the country's ability to establish modern ranches and export meat and live animals. The project is in line with the Growth and Transformation Plan (GTP2) and the ten-year Prosperity Development Plan of Ethiopia.

The project site is well-suited for the development of a modern ranch, with ample space and favorable agro-climatic conditions. Furthermore, it is close to a major highway that connects Hawassa, Wolayta, Arba Minch, and Jinka cities with Addis Ababa, as well as a number of towns along the regional southern highway that extends up to the Kenyan border.

The baseline information on the biophysical and social environment, the impact identification and assessment, the Environmental and Social Management Plan for the first phase of the project are included in this document. No Resettlement Action Plan is included as there are no inhabitants living within the project site.

2. The ESIA Study Process

Environmental and social impact assessment (ESIA) is a formal study process or procedure that examines the potential negative and positive effects of a proposed development project so that these factors can be taken into account in later stages of project planning and design, as well as during construction and operation until decommissioning. Standard procedures for ESIA study were followed: scoping, baseline survey and impact analysis, as well as the preparation of Environmental Management Plan. The ESIA document is prepared based on the FDRE's Environmental, Forest and Climate Change Agency's guideline, as well as the World Bank's Operative Directive (OD) 4.0 and rules set in the Ethiopia's Environmental Impact Assessment (EIA) Proclamation (No. 299/2002).

The Environmental Assessment guideline prepared by Environmental Protection Authority (EPA, 2003) requires development projects to conduct ESIA study to reduce adverse effects on the physical, biological and socio-economic environments. This project is considered as Schedule I which requires a full-fledged ESIA study which demands through analysis of the biophysical and the socioeconomics of the area and identification and mitigation of project impacts.

3. Objective

The main objective of this study to evaluate the environmental and social impact assessment (ESIA) study of the proposed commercial ranch and related out grower activities.

The specific objectives include (but not limited to):

- Conduct detailed baseline survey on the biophysical and socioeconomic environment;
- Identify major adverse and beneficial impacts of the project;
- Rate the environmental impacts and propose mitigation measures; and

- Prepare Environmental and Social Management Plan with indicative budgets for monitoring and evaluation.

4. Approach and Methodology

The study followed standard guidelines and approaches for ESIA study. Before, field investigation all relevant secondary data, legal and policy frameworks have been studied and open gaps identified. Base maps were prepared. Satellite images and thematic maps were used in the desk study.

The field investigation involved through study of the biophysical environment including in situ testing of some parameters. During the scoping the procedures, activities to be followed and the open gaps to be filled in the study were identified based on secondary data and initial field observations. At this stage the following activities have been followed. After preparing data collection instruments, detailed field investing. For the socioeconomics survey, data collection instruments (questionnaires, checklists) were prepared. Household Survey, Key Informant Interview and Focus Group Discussion were made. Field features and meetings were recorded and minuted. Starting with the woreda and kebele administrations and sectoral offices, all stakeholders were consulted.

The environmental and social impacts of the project were identified and evaluated. The impacts of the project activities on the biophysical and socio-economic receptors assessed using an environmental impact matrix. Impact evaluations were made using key impact evaluation elements: spatial scale, duration, probability, impact type and significance.

5. Relevant Polices, Legal and Administrative framework

Incorporating relevant national and international policies, regulations and guidelines is mandatory for a full-ledged ESIA study. The following relevant key policies, legal and administrative frameworks are identified and accounted in the study.

National Policy and Regulatory Framework **-** The Constitution of the Federal Democratic Republic of Ethiopia, adopted in August 1995, has a number of provisions, which have direct policy and legal relevance to environmental protection matters in connection with development projects. Articles 43 and 44 of the Ethiopian Constitution enshrine the notions of sustainable development and environmental rights in the people's rights. The citizens' right to development and to live in a clean and healthy environment, the duty to protect the environment and the people's right to full consultation and expression of views in the planning and implementation of policies and projects that directly affect them are all important principles stated in the Constitution.

The other important policy document is the Environmental Policy of Ethiopia (EPE), which has an overall policy goal to improve and enhance the health and quality of life of all Ethiopians, to promote sustainable social and economic development through sound management and use of natural, human-made and cultural resources and their environment as a whole. The EIA policies contained in the EPE emphasize the early recognition of environmental issues in project planning, public participation, mitigation and environmental management and capacity building at all levels of administration.

In addition, the Ethiopian Government has issued a number of legislations that are aimed at advancing environmental protection and sustainable use of the Country's natural as well as man-made resources. Among these laws, the most relevant ones include the Proclamation on Institutional Arrangement for Environmental Protection, Proclamation on EIA, Proclamation on Environmental

Pollution Control, Proclamation on Ethiopian Water Resources Management and many other proclamations that is related to environmental issues.

The Institutional Arrangement Proclamation is aimed at ensuring sustainable use of environmental resources, by assigning responsibilities to separate organizations for environmental development and management activities on one hand and environmental protection, regulations and monitoring on the other, thereby avoiding possible conflicts of interests and duplication of efforts.

The EIA Proclamation makes an EIA mandatory for specified categories of activities undertaken either by the public or private sectors and is the legal tool for environmental planning, management and monitoring. The planned commercial ranch project can be categorized as schedule 1 which requires a full-fledged ESIA.

The Pollution Control Proclamation - It is based on the right of each citizen to have a healthy environment, as well as on the obligation to protect the environment. Its primary objective is to provide the basis from which the relevant ambient environmental standards applicable to Ethiopia can be adhered and to make the violation of these standards a punishable act.

Water Resources Management - One of the most critical issues of the project is water use. Proclamation No. 197/2000 provides legal requirements for Ethiopian water resources management, protection and utilization. Its main objective is to ensure that water resources of the country are protected and utilized for the highest social and economic benefits, to follow up and supervise that they are duly conserved, ensure that harmful effects of water use is prevented and that the management of water resources is carried out properly.

The Ministry of Water and Energy prepared water resource management policy of Ethiopia. The overall goal of the policy is to enable and promote efficient, equitable and optimum utilization of the available water resource to bring about significant socio- economic development on sustainable basis. The policy ensures that water allocation is given highest priority to water supply and sanitation while apportioning the rest for users that result in highest socio-economic benefits through irrigation and hydroelectric generations. The policy ensures among others, the full integration of irrigation with the overall framework of the country's socio-economic development plans, such as Agricultural Development Led Industrialization strategy.

The other important policy is the Genetic Species and Ecosystem Biodiversity Policy. It is related to the conservation of genetic species and ecosystem biodiversity that includes the fauna and flora. It promotes in-situ system (i.e. Conservation in a nature reserve, farmer's fields), as a primary target for conserving both wild and domesticated biological diversity and also promote ex-situ system (i.e. conservation outside the original or natural habitat) in gene banks, farms, botanical gardens, reaches and zoos to supplement in situ conservation. It also promotes in-situ conservation of crop and domestic animal genetic diversity as well as other human managed ecosystem though the conscious conservation.

Any development project needs the support of the Federal Government and Regional Government its sectoral Bureaus and Offices at different administrative levels. The power and duties of the Federal, Regional and Local governments have been defined by Proclamations No 33/1992, 41/1993 and 4/1995. Regional states have duties and responsibilities of protecting natural resources, planning, directing and developing social and economic development programs.

World Bank's Safeguard Policies - The World Bank environmental assessment (EA) requirements are based on a three-part classification system such as Category A, Category B, and Category C. A project designated as Category A requires a full environmental assessment followed by Independent

Environmental Review. Category B projects require a lesser level of environmental investigations. Category C projects require no environmental analysis beyond that determination. And the planned project falls under Category A. Hence, a full-fledged ESIA study is required.

6. Main Features of the Project

The proposed project involves development of a modern ranch in Bena Tsemay woreda of Enchete kebele. The total acquired land for this phase of the project is 500 ha. It is likely to expand in the future. Out of the 500ha of land, 300 ha is going to be irrigated using center-pivot and drip irrigation systems using surface water and groundwater systems. The project is expected o construct pond to tap the large seasonal floods and drill a number of boreholes to satisfy the water demand. Center pivot irrigation system will be used to grow animal feed. The local communities living in the area are semi-pastoralists. There are no houses or residents within the project area. The area is woodland and with grazing grassland. At the moment there are no land preparation activities.

The project will have eight components: Irrigated Fodder Production Unit, Silos and Feed Processing Unit, Feedlot Unit, Laboratory and Veterinary Unit, Breed Improvement Unit, Out-Grower, Research and Development Unit and Meat Processing Plant. The project will use indigenous animal species instead of importing exotic animals. It will have effective backward linkage with farmers or out grower programs. Through its extension program, the project will try to improve the animal husbandry system of the smallholder farmers in the region by creating awareness among the farmers to produce animals for its/local market, by supporting them in animal feed production and proper feeding system training, veterinary services and better breeds plus basic infrastructural developments such as water supply systems.

The project will setup a nucleus farm within, for irrigated fodder production farm and produces crops like corn silage and Alfalfa. A modern feed lot will be established. Standard veterinary facility will also be installed with appropriate expertise. The farm will mainly focus in improving the available livestock resource of the pastoralists through better animal health and animal feed and eventually organize selected stocks. The project will start sourcing animal direct form the surrounding livestock markets until its operation on the out-grower husbandry program is strengthened to the level where all animals are sourced directly from the contracted farmers through the out-grower program. Therefore, on the 1st year of its operation, the project will buy 80,000 Sheep/Goat and 10,000 cattle the existing markets. This number will increase until the 5th year of the project cycle and reach to 320,000 Sheep/Goat and 50,000 cattle. After the 5th year, the sourcing trend will gradually shift to the out-grower program.

7. Baseline Conditions

The project area is located in the semi-arid region of southern Ethiopia within the middle reaches of the Weyto River that terminates in Lake Chew Bahir. It is one of the least developed regions in Ethiopia. The project is not far from the right bank of the Weyto River.

The geology is characterized by complex Precambrian basements of gneiss; grano-diorites and granites with sandy silt alluvial and residual sediments. These rocks are highly fractured with different sets of faults. The sediments form fertile soils that can be used for growing animal feeds. The only nearby surface water body is the Weyto river. The lowlands with relatively lower elevations are seasonally inundated by floods. People are using unprotected open Weyto River for different purposes. The hydrological and hydrogeological study made for the project revealed the presence of groundwater in the project area. Furthermore, Luna is going to construct its own reservoir to tap the

seasonal flood. Most of the features in the project area are under ambient conditions with no trace of major pollutions of the biophysical environment.

There are no archeologically and culturally important sites. These include churches and mosques or any other worshiping places within the project area. Except temporarily houses of pastoralists outside the project area, there is no settlement within the project area. The whole project area is government owned. Therefore, this project does not require resettlement action plan.

8. Potential Environmental Impacts of the Project

8.1. Anticipated Adverse Impacts

The project's operations throughout the different phases have limited negative consequences. The physical and biological environments as well as the society living in the surrounding area of the project are direct receptors. Mobilization (including construction), implementation or operation and decommissioning are all impacts in distinct phases. The potential adverse impacts identified are air, water and soil pollution, noise and vibration, impacts on the fauna and flora (deforestation and influence on wildlife) community health and safety, depletion of water resources, direct and indirect socioeconomic impacts.

Impact on Biophysical Environment **-** The obvious adverse impact is deforestation which leads the cutting of indigenous trees. The associated grassland will also be converted in to irrigated farm and infrastructures of the ranch. This will reduce the size of grazing land for the local community. There are a number of wild animals in the area. The project will also affect their habitat and mobility.

Impacts on air quality **-** The impact on air quality comes from dust and vehicular movements and construction activities which involve excavation, haulage, crushing and agricultural practices. The emissions of air pollutants include airborne particulates (dust), fugitive emissions, exhaust, combustion emissions and spray of agrochemicals.

The composition of dust is often inorganic and of non-toxic nature. The vehicular emissions constitute such gaseous pollutants as oxides of nitrogen, sulfur, carbon and some unburned hydrocarbons. The dust may accumulate on the ground and on vegetation nearby while the gasses may disperse and get diluted. If airborne agrochemicals are used it may spread in wide area. The chemicals are different types that include herbicides, insecticides and pesticides. As the farm is mainly for fodder different toxic agrochemicals may not be used. The level of the potential adverse impacts depends on the weather conditions (rainfall and wind direction), mobility of machinery, cars and livestock and irrigation activity.

*Impacts on water***-** The area is known by shallow unconfined aquifer with groundwater resources recharged from the surrounding hills through rainfall and absence of perennial water sources with few hand-dug wells. The water sources are likely to be polluted easily from agrochemicals unless care is taken. Hence, any large-scale soil or air pollution could affect the hydrochemistry. Chemical stores must be constructed properly and monitored to avoid any leakage in to the unconfined aquifers and surface waters.

As the main source of water for irrigation will be groundwater and rain water harvesting, groundwater resources depletion could be anticipated. Excessive pumping of groundwater could affect the static groundwater level and yield of wells. Therefore, water efficient technologies must be used for irrigation.

Impacts on land **-** In slightly undulating areas it is mandatory to level the ground which in turn affects the local topography. However, in the project area the land is largely very flat that may not affect the geomorphology significantly except increasing the particulate matter in the air during leveling and consequent farming.

There exist seasonal inundated areas from floods in the area and it is likely that the project may need to give due attention to it while trying its best to ensure sustainable supply of water to the community. It is mandatory to construct better all-weather access road to the project site. This might also have negative impact on air quality, erosion and cutting of trees.

Impacts on Community Food Source **-** As rural people derive a significant proportion of their food and energy requirements from various indigenous trees and shrubs (wild edible plants which are not cultivated) used by local communities to fill the gap of seasonal food shortages. When such project interventions that are not meant to rehabilitate or reproduce the existing flora and fauna is introduced, it is obvious that losses occur due to site clearing and excavation activities. Those important and useful trees as food source could be affected.

Community Health **-** Other likely adverse impact on the community could be spread of communicable disease as new employees are going to come from townships and probable communicable diseases when new workforce comes to the area.

Animal Feed **-** Loss of grazing land may pose negative impact on the local community as they may need to find alternative sites for grazing. However, the farm is likely to provide training on fodder production and growing better animal breeds.

Noise and Vibration **-** The noise pollution and vibration can come from operation of heavy machinery, crushing, excavation, due to loading-unloading operations, material handling, machine operation, equipment and vehicular movements. This is insignificant as the farms are a bit far from villages. The gravel road that passes through the project area may also be a concern if camps and feed lots are constructed close to the road.

Adverse Impacts and Mitigation Measures **-**The major anticipated potential adverse impacts and mitigation measures for the entire project cycle is smmerized in Table 7.1-7.4.

8.2. Beneficial Impacts

The most important positive impacts of the project include (but not limited to) the following.

- Economic impacts, mainly its positive role in foreign currency earning
- Employment opportunities for skilled and unskilled workers
- Paving the way for modern ranch development in Ethiopia which is almost non-existent.
- Technology and knowledge transfer to the local community and the region at large
- Proliferation of business around the project area
- Development of infrastructure (such as roads, veterinary and health services)
- Introduce better animal breeds and fodder production
- Create marketing facilities for farm products to local community

9. Environmental Management and Monitoring Plan

Environmental Management Plan (EMP) is the key to ensure that the environmental quality of the project area does not deteriorate due to the implementation of the proposed project. Environmental monitoring is an essential tool in relation to environmental management as it provides the basis for rational management, decisions regarding environmental impact mitigation. Monitoring should be performed during all stages of the project to ensure that the adverse impacts are not greater than predicted and to verify the impact predictions.

The EMP has been proposed to meet long-term objectives of the project activities. The EMP is designed to reduce or avert adverse environmental impacts and enhance the benefits of the project and keep alive the sustainability of the project and the benefits of the local community. The EMP provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate indicators for monitoring. Implementation timeframes and responsibilities are defined, and where practicable, the cost estimates for recommended measures are indicated

The day-to-day activities have to be monitored by a senior environmentalist to be employed by the client since the project mobilization stage together with all stakeholders at different administrative levels. It is also recommended to establish Environmental Management Unit (EMU) for the project.

For implementation of the EMP, for monitoring and evaluation indicative figures are proposed. Annually a total of **2,328,000.00 Birr** is required**.** The EMU needs to monitor all the proposed mitigation and monitoring measures.

10. Conclusion and Recommendation

The development of Ethiopia's commercial agriculture sector is at its infancy. Implementation of this modern commercial ranch by mitigating the identified limited adverse environmental impacts as per the proposed EMP and the rules and regulations of Ethiopia benefits the community and the nation at large. The project, being the first in its kind, will pave the way for other investors to engage in similar projects in different parts of the country. Ethiopia has huge potential to develop modern ranches.

On the contrary, one of the major concerns from the adverse environmental impact point of view is the loss of grazing land, deforestation. Other adverse impacts include the impact on the fauna and potential introduction of communicable diseases in the area as a result of migration of workers from towns. However, with proper training and by adhering to the mitigation measures indicated in this report, the adverse impacts could be minimized or avoided.

After careful review of the biophysical environmental and social baseline data and evaluating the importance of the project in economic development, and weighing the benefit against the adverse impacts the consultant has come to the conclusion that the project is highly impressive. This conclusion is supported unanimously by the local community, key informants and sectoral offices at different administrative levels. It is also in line with Ethiopia's development strategy. Therefore, it is strongly recommended to implement the project with strict observation of the environmental management and monitoring plan presented in this document.

1. INTRODUCTION

1.1. Background

Luna Export Slaughter House PLC is an Ethiopian company working on the development of modern ranches, irrigated agriculture and exporting meet and live animals. Furthermore, it has a chain of supermarkets in Addis Ababa selling mainly agricultural products. Luna has already acquired 500 ha of land for this project to develop modern ranch with feed lots and fattening facilities in Bena Tsemay woreda of South Omo Zone of SNNPR of Ethiopia. The project is expected to expand both in scope and spatially in the future. This project is the first phase.

Under the Ethiopian Environmental Impact Assessment (EIA) Proclamation (No.299/2002) large development projects need to conduct ESIA study to get approval from relevant Government body for implementation. The most important Government bodies in this regard are the Environmental Forest and Climate Change Commission and its regional branch offices. After competitive bidding, Luna (client) has appointed Beles Engineering PLC which is Ethiopian multi-disciplinary service provider with Grade I license having wide national and regional recognition to conduct any issues related to Environment.

The ESIA includes collection of baseline data on the biophysical and socioeconomic environment of the project area and its immediate environs and assess the potential environmental impacts associated with the planning, construction, operation and decommissioning phases of the project.

1.2. The ESIA Process

Commonly detailed ESIA study should be carried out in two phases i.e scoping and ESIA.

Scoping Study (Phase 1) - in line with the Ethiopian EIA regulations, the assessment process should start with scoping or preliminary assessment. Primarily this phase focused on identifying the impacts to be assessed, how these impacts will be assessed, which of these impacts are significant and most important as well as the geographical area of influence to be considered for each of the different environmental and social factors. In addition, the scoping study addresses: (i) the types of alternatives which ought to be considered, drawing and expanding on a number of analysis conducted to date; (ii) the available baseline data and which further baseline studies are required to characterize the existing environment, including salient social aspects; (iii) any special requirements for baseline studies regarding their geographical extent or timing and seasonal changes in fauna and flora; (iv) the level of detail of investigations required; (v) types of emissions and impact modeling, in line with international accepted standards, to be used to estimate the magnitude of environmental effects; (vi) the types of mitigation measures to be considered and monitoring to be required following relevant directives and lender's applicable standards; (vii) the stakeholder engagement and communication plan to inform the stakeholders and public through public consultations about the scope and preparation of the ESIA, the results of the scoping study, including identification of the main stakeholders and their concerns; (vii) agreement on the detailed scope and structure of the ESIA with the main stakeholders under the proposed project, including further consultations to be carried out during the environmental and social impact studies. As part of the scoping study exhaustive desk study has been carried out. The consultant has also good picture of the study area acquired during the previous field work in Buri kebele.

Environmental and Social Impact Assessment Study (Phase 2) – the ESIA study is tailored and concluded based on the findings in the scoping, but include in any case: (i) determine and further collect where needed the baseline data according to the scoping findings and guidance; (ii) for the proposed project and its alternative scenarios, discuss the technical, economic, social and environmental parameters and determine and assess the identified impacts; (iii) prepare the Environmental and Social Management Plan, identifying the required actions needed to avoid or mitigate environmental and social impacts of concern that will be integrated into the design (the proposed Mitigation Measures) the required Monitoring measures; (iv) identify the responsibilities for implementation as well as oversight for the identified mitigation and monitoring measures including an estimate of cost for implementing the EMP. The cost for investment and/or operating budget required is not the scope of this study (iv) prepare the final ESIA study by accounting relevant national legislation and directives as well as WB policies and Environmental Health and Safety Guidelines and IFC/MIGA performance standards.

Figure 1.1 summarizes the ESIA procedure according to the aforementioned guidelines. Host country laws of Ethiopia relevant to the successful implementation of all components of the proposed Project were also considered during the ESIA study process and all necessary licensing and permitting requirements have been identified based on current Project concepts and design. In addition to the applicable regulations and norms of the Government of Ethiopia, the proposed project has committed to comply with the requirements of the IFC, the World Bank Safeguard Policies and the African Development Bank (AfDB) Policies and Guidelines (Chapter 3).

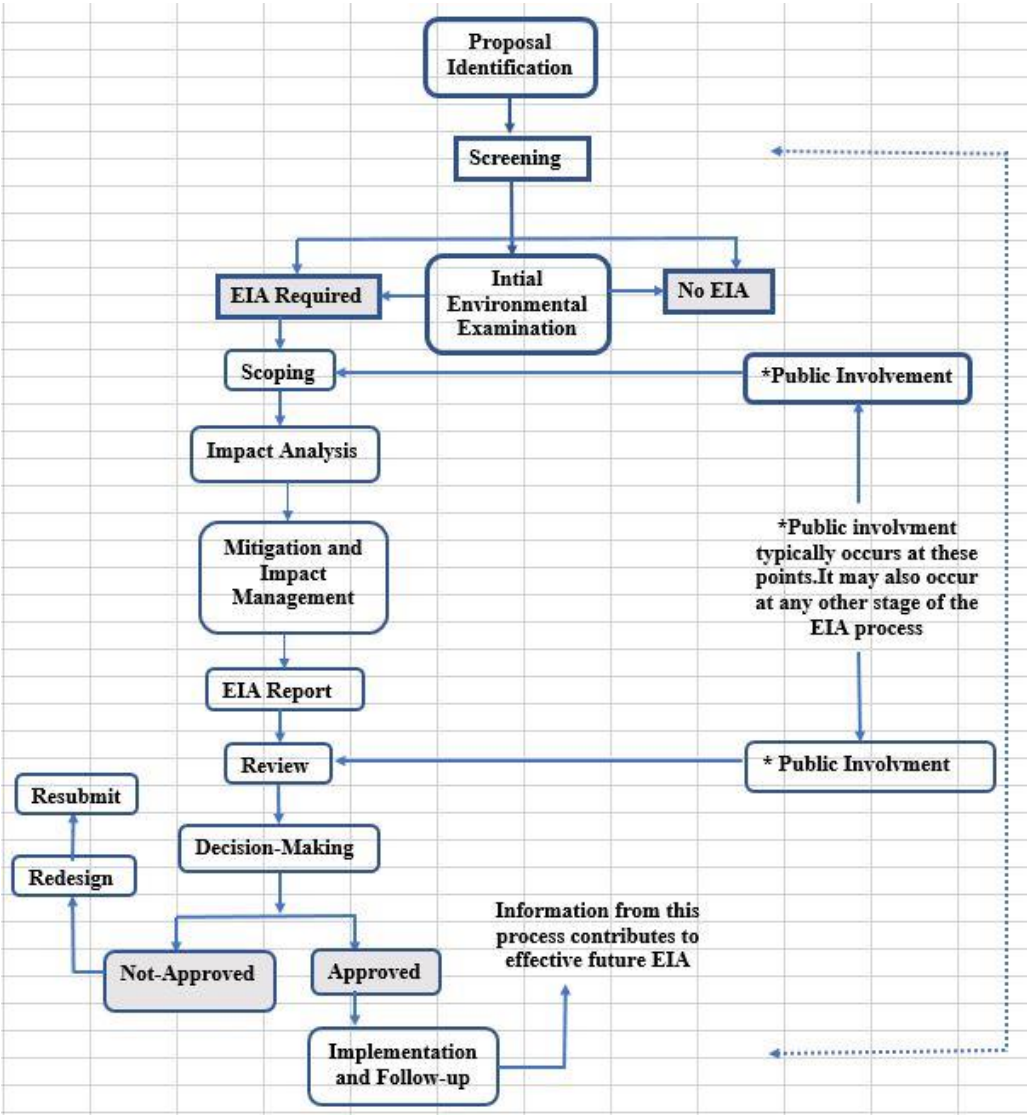


Figure 1. 1. The ESIA Process

1.3. The Purpose of the ESIA

The main objective of the ESIA include: (1) to help decide if the effects are acceptable or have to be reduced for continuation of the facility or proceeding with the proposed project, (2) to design/implement appropriate monitoring, mitigation, and management measures, (3) propose acceptable alternatives and (4) prepare an environmental impact assessment report.

As indicated above Luna Export Slaughterhouse PLC is in the process of establishing a modern commercial ranch for its export driven slaughterhouse in Bena Tsemay woreda (Enchete kebele) of SNNPR. The Client has already acquired the land from the SNNPR Investment Agency after presenting the economic feasibility of the project and preliminary scoping report. The proposed modern ranch is the first in its kind in the region. The ESIA document is mandatory for getting approval from the Environment Forest and Climate Change Commission from environmental sustainability point of view. The ESIA document is also vital for getting funding from international financial institutions.

In its Growth and Transformation Plan (GTP) and the ten-year Prosperity Development Plan, the Government of Ethiopia has given great emphasis to expand commercial farming in different parts

of the country. This project will open up opportunities for advanced farming technology and modern ranch expansion. The project is in line with the country's development plan.

According to the Environmental Policy of Ethiopia such a large project requires a full-fledged Environmental and Social Impact Assessment study before the implementation of the project. The client is well aware of the importance of addressing environmental issues for the sustainability of the project. In line with this, it has invited national consultants to carry out the work. After competitive bidding the Client has entered an agreement with Beles Engineering PLC which has extensive experience in conducting ESIA study, environmental auditing and environmental management plan preparation for various development projects. Following the contract agreement, the consultant has mobilized its team of experts to carry out the work. This document is prepared based on the national ESIA and IFC guidelines for similar projects.

1.5. Brief Description of the Client

Luna Export Slaughterhouse PLC is an Ethiopian Company established in 1995 E.C. which is involved in meat processing and export business and other agri-business. It is a major role player in the meat processing export business contributing significantly to the nation's foreign currency earnings.

Luna has commercial ranch in Koka area and export standard slaughterhouse at Mojo town of Oromia Regional State. The ranch has benefited the local community. It is the first major ranch developer in Ethiopia. The proposed project is part of Luna's vision to expand its business across Ethiopia and beyond.

Luna has its Head Office in Addis Ababa and it has branch office at Mojo and Koka towns and also established branch office in Jinka town that will oversee the proposed project.

The company will maintain high environmental standards in running its projects and will adhere to Ethiopian and International best practices for environmental safety in all phases of the project. The company will take positive action to protect the safety of the local community, conserve natural resources, and minimize the adverse impacts of its projects on the socioeconomic and biophysical environment through diligent application of appropriate technology and best practices of modern ranches

1.6. Brief Description of the Consultant

Beles Engineering P.L.C is a multi-disciplinary consulting firm which provides wide spectrum of professional services in land, water and environment. The company has strong national and international links with companies working in various development projects.

The Headquarter of Beles is located in Addis Ababa, Bole Kifle Ketema, Woreda 6, Kal Building (Tel +251911230110/913354916). It has liaison partners in major provincial large towns in Ethiopia and neighboring countries. The company is staffed with highly qualified professionals with international experience. In addition to its permanent staff, the company has qualified associate members working in different research and academic institutions and freelancers.

Environmental and Social Impact Assessment study, Environmental Auditing, Testing and Provision of training are the major engagements of Beles in the sector. The company has acquired Grade I license from the Environment, Forestry and Climate Change Commission (Previously Ministry of

Environment, Forest and Climate Change). It has state of the art instruments to test different biophysical parameters.

2. APPROACH AND METHODOLOGY

As stated above all the standard steps have been followed for the scoping and the ESIA document preparation. Aside from visual inspection, in situ testing has been made on some key environmental parameters as part of the baseline survey. Regarding the socioeconomic survey Household Survey, Key Informant Interview and Community Consultations have been carried out. In brief the approaches and methods used are outlined below.

2.1. Desk Study

The desk study involved in:

- Collection and review of the existing documents (socioeconomic and biophysical) relevant to the proposed project;
- Preparation of base maps, questionnaires for household survey, key informant interview and other stakeholder consultations before the detailed field investigation;
- Identify key stakeholders to be consulted; and
- Review of relevant legislative requirements, national and international environmental standards and guidelines.

2.2. Baseline Survey

The synthesis of the biophysical and socio-economic environmental data of the project area was undertaken after the development of proper data collection instruments. In the field relevant data from different institutions were collected and critically evaluated before the actual field data collection in the project area. Published regulations, guidelines, national policy documents as well as IFC/World Bank guidelines, feasibility and hydrological and hydrogeological investigation study documents.

Visual observations were made on biophysical and socio-economic environment. Photographs that depict key environmental features were taken and georeferenced. In situ water as well as soil samples were collected and analyzed. Dust and sound levels were evaluated. The fauna and flora of the area were recorded. Aside from field observations, red books of Ethiopia were consulted to describe the fauna and flora of the sub-region.

Discussions were held with local community, community leaders and key informants from different sectoral offices of the woreda (district) and Kebele. Consultation meetings were mounted (annexed).

2.3. Environmental Impact Assessment Approaches

Identification of key environmental impacts brings together the previous steps with the aim of ensuring that all potentially significant adverse and beneficial impacts are identified and taken into account.

To identify the environmental and social impacts of the project, all anticipated activities during the mobilization, construction, operation and decommissioning phases of the project have been considered.

Environmental and socio-economic receptors were identified for impact evaluation and rating (Tables 2.1- 2.3). The key inputs for the identification of receptors include the legislative review, the biophysical environmental baseline, and the socio-economic baseline and stakeholder and community consultation outcomes.

Table 2. 1. Physical environmental receptors

Receptors	Description
Air	Air quality in and around the proposed project development sites
Surface and groundwater	The surface and groundwater in which project activities are proposed to occur
Soil	The soils of areas in which project activities are proposed to occur
Land	Land use change

Table 2. 2. Biological environmental receptors

Receptors	Description
Flora	Plant species that exist in the project area and its immediate environs
Terrestrial fauna	Fauna that exists in the project area and its immediate environs

All key issues that were raised by members of the community and other stakeholders during the consultation meetings and key informant interview were recorded and included as environmental and socio-economic concerns regardless of the scientific, commercial or factual validity of the claim. In this way, it is assured that the ESIA process has addressed every community and/or stakeholder's concern. The consultant has carried out evaluation based on the existing condition of the project area and the sub-region at large by converging evidences collected from all sources.

Table 2.3. Socio-economic environmental receptors

Receptors	Description
Employment	Employment opportunities are the perceived benefits within the project site and the nearby areas.
Economic development	Promotion of various small and micro-businesses
Resettlement	There are no permanent houses or residents within the project area. Hence, no resettlement is required.
Vulnerable people	Aged, orphans and sick people are vulnerable groups
Diseases	Incidence of communicable diseases
Safety and hazard	In case of accidents

Through such steps, the activities involved in the development of the project and the possible interactions of each activity with the biophysical environmental and socio-economic receptors were assessed using an impact matrix.

In the prediction and evaluation stage, estimates of the magnitude of impact over each of the impact variables identified during the different phases of the projects' life were made. In assessing the level of environmental impact that an activity may cause, five key issues are considered.

- Spatial scale (site specific, local, nationwide)
- Duration (short term, medium term and long term)
- Reversibility (reversible, irreversible)
- Probability (the likelihood that an activity will occur)
- Direction (beneficial or adverse)
- Significance (low, medium, high)

Table 2. 4. Criteria used in the evaluation of impacts

Criteria	Significance			
Spatial scale	Site specific	Local	Nation wide	-
Duration	Short term	Medium term	Long term	Permanent
Probability of occurrence	Improbable	Possible	Highly Probable	Certain
Significance	None	Low	Medium	High

The criteria are defined as follows:

i. **Spatial Scale**: Site specific (restricted to the site) Local (the site and surrounds), National (affecting the nation).
ii. **Duration**: Short-term (up to 1 year), medium-term (1 year to 2 years), long-term (life cycle of the project) or permanent.
iii. **Probability of occurrence**: Improbable (unlikely), probable, highly probable or definite (certain).
iv. **Significance**: Based on a synthesis of the information contained in (i) to (iii) above, and taking mitigation measures into account, an evaluation of the significance of the impact is undertaken in terms of the following significance criteria:
    - ***No significance***-requires no further investigation and no mitigation or management;
    - ***Low Significance***-an impact which has little importance and is not sufficient to warrant further reduction if this involves unreasonable cost.
    - ***Medium Significance***-an impact which should be mitigated, if possible, to reduce it to acceptable levels;
    - ***High significance*** - an impact which requires extensive mitigation and management to reduce impacts to acceptable levels.

The environmental management and monitoring plan for the proposed project consists of a set of mitigation and monitoring measures to be taken during all phases to eliminate, offset, or reduce to acceptable levels of the identified and predicted adverse environmental and social impacts. The plan also includes the actions and resources needed to implement these measures.

Estimation of costs for various mitigation, monitoring, and institutional measures were made based on the current knowledge of the issues and local market prices.

3. ADMINISTRATIVE, POLICY AND LEGAL FRAMEWORKS

Relevant national policies, laws, guidelines as well as relevant IFC and World Bank guidelines for ESIA study is presented in brief. These are necessary for the successful implementation of the project and for consequent monitoring and evaluation.

3.1. Administrative and Institutional Framework

The FDRE has a parliamentary system of government, with two houses: the House of Peoples' Representatives and the House of the Federation Council. The Federal Democratic Republic of Ethiopia (FDRE) comprises ten member states: Tigray, Sidama (new), South West (new), Afar, Amhara, Oromia, Somali, Benshangul Gumuz, the Southern Nations, Nationalities and Peoples Region, Gambela and Harari and two City Administrative Councils: Addis Ababa and Dire Dawa with their own legislative, executive and judicial powers.

The FDRE Constitution (Article 50) states that all the ten regional states have legislative, executive, and judicial powers. The states are divided in zones, zones in to woredas and woreda in to kebeles. There are altogether around 800 woredas and about 15,000 kebeles in Ethiopia. Kebele is the smallest unit of local government.

For the day-to-day activities, the highest decision-making organ at the woreda level is the woreda executive committee, which comprises of the woreda Chief Administrator, vice administrator, chief secretary and others with varying responsibilities. The woreda executive committee is accountable to the woreda administration council. Kebele administrations are responsible for coordinating and organizing the community development activities.

The power and duties of the Federal, Regional and Local Governments have been defined by Proclamations No 33/1992, 41/1993 and 4/1995. Regional states have duties and responsibilities of protecting natural resources, planning, directing and developing social and economic development programs.

The Environmental Protection Authority which is now replaced by the Environment, Forest and Climate Change Commission (EFCCC), was first established in August 1995 under Proclamation no. 9/1995, and re-established in October 2002 under Proclamation No. 295/2002. The general role of the EFCCC is to provide services for the protection and conservation of the environment, through formulation of policies, strategies, laws and standards, which foster social and economic development in a manner that enhances the welfare of humans and the environmental safety which is key to sustainable development.

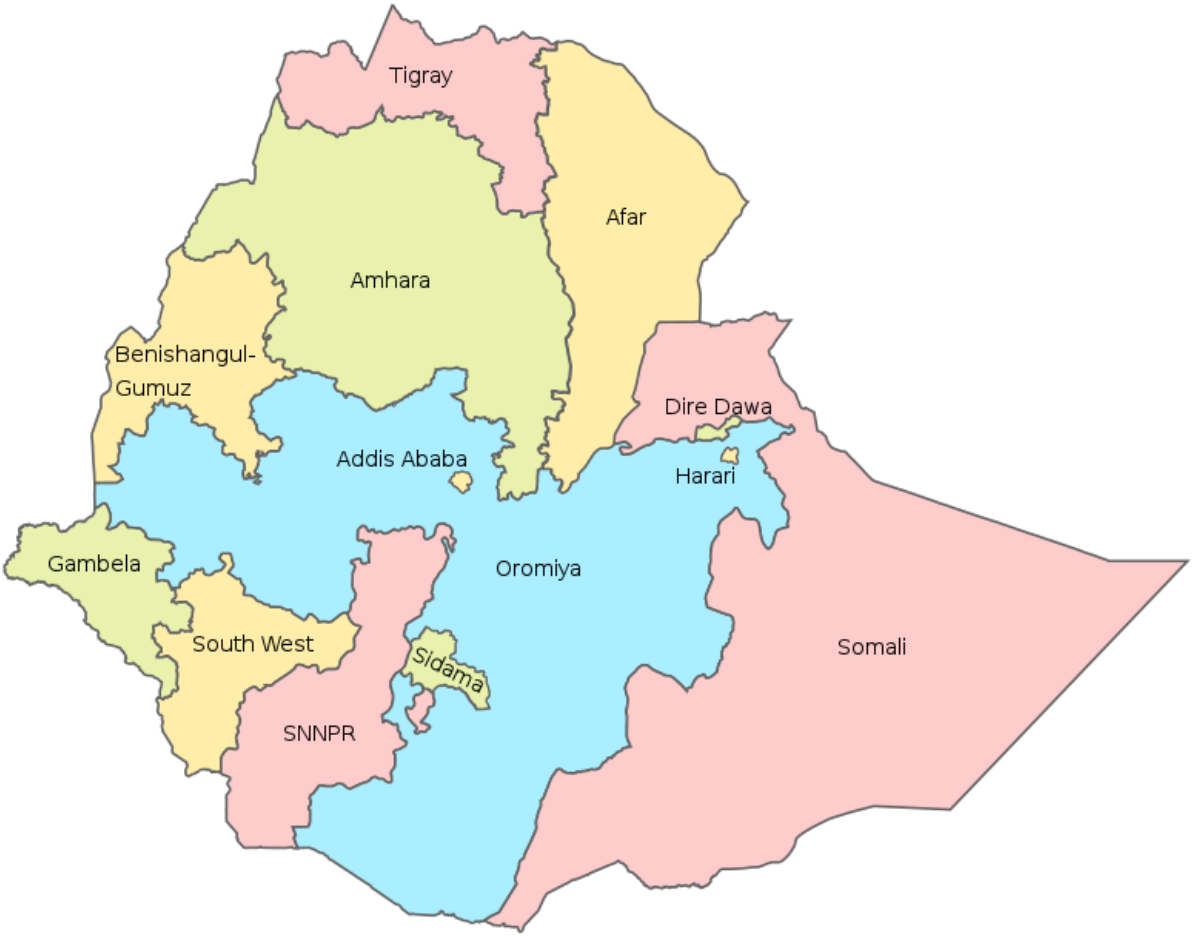


Figure 3.1. Major administrative structure of Ethiopia

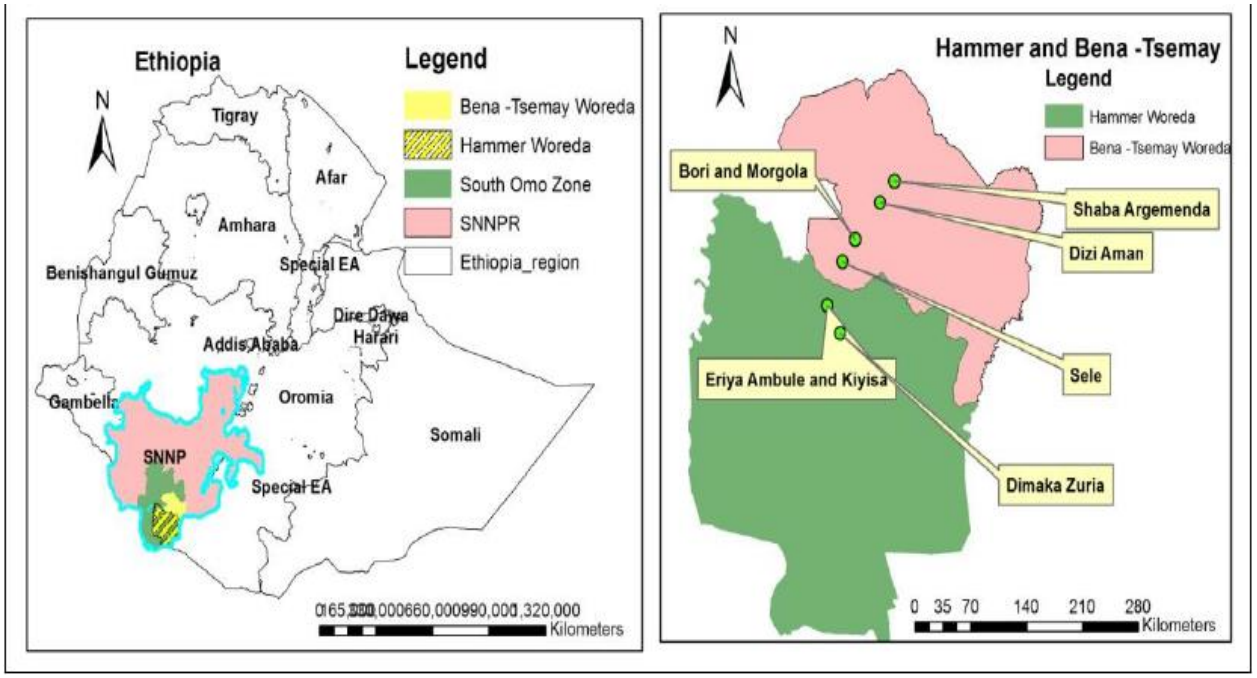


Figure 3.2. Administrative structure of Bena Tsemay woreda in SNNPR

Environment, Forest and Climate Change Commission (Formerly Environmental Protection Authority)

All Clients (project owners) and executive bodies (agencies and commissions) in the country should operate in close cooperation with the EFCCC and its branch offices to ensure that proper mitigating measures are designed and implemented especially for projects with significant adverse environmental impact. It is the responsibility of the EFCCC and its branch offices and other delegated executive bodies to handle ESIA process to:

- Ensure that the Client complies with requirements of the ESIA process;
- Maintain co-operation and consultation between the different sectorial agencies throughout the ESIA process;
- Maintain close relationship with the Client and provide guidance on the process; and
- Evaluate and take decisions on the documents that arise from the ESIA process.

Sectorial Environmental Units

According to the Proclamation No. 295/2002, every competent agency shall establish or designate an environmental unit that shall be responsible for coordination and follow up environmental issues so that the activities of the competent agency are in harmony with this Proclamation and with other environmental protection guidelines.

Regional Environmental Agencies

As per the Proclamation No.295/2002, each regional state shall establish an independent regional environmental agency or designate an existing agency that shall, based on the Ethiopian environmental policy and conservation strategy and ensuring public participation in the decision-making process, be responsible for coordinating the formulation, implementation, review and revision of regional conservation strategies, and environmental monitoring, protection and regulation

The proclamation also states that regional environmental agencies shall ensure the implementation of federal environmental standards or, as may be appropriate, issue and implement their own no less stringent standards. Finally, the proclamation states that regional environmental agencies shall prepare reports on the respective state of the environment and sustainable development of their respective states and submit them to the delegated executive government bodies such as environmental unite/offices in ministries and regional government offices handling environmental issues.

Ministry of Agriculture (Formerly Ministry of Agriculture and Natural Resources)

Proclamation No. 300/2004 (issued on 13th January 2004) amended the proclamation for the reorganization of the Executive Organs of the FDRE, Proclamation no. 256/2002. Thus, the then Ministry of Agriculture and Natural Resources (MoANR) replaced the former Ministry of Agriculture and Rural Development. Later the Ministry was renamed as the Ministry of Agriculture, Livestock and Fishery. The powers and duties vested in the new ministry includes, among others, conservation and utilization of forest and wildlife resources, food security programs, water harvesting and small scale irrigation, monitoring events affecting agricultural development and early warning systems, enhancing market led agricultural development, issuance of guidelines and procedures for agricultural input evaluation and release, ensuring the distribution of high quality agricultural inputs to users, and establishing and directing training centers of agriculture and rural technology.

The Ministry strives to solve chronic problems associated with: deforestation, land degradation, lack of land use planning, decline in crop and animal production, dependency on biomass fuels, and lack of alternatives livelihoods, etc. It is also responsible for the promotion and regulation of any agricultural activities. It generates basic agriculture and natural resources related data of the country promotes the agricultural potentials of the country, issues licenses to private investors and ensures that the concession agreements are respected. It is also delegated to review and approve Environmental and Social Impact Assessment studies related to agricultural development projects.

Ministry of Water and Energy (Formerly Water, Irrigation and Electricity Ministry)

The Ministry of Water Irrigation and Energy (MoWIE), now the Ministry of Water, Irrigation and Electricity (MoWIE) of Ethiopia is a federal institution established by Proclamation No. 4/1995 to manage the water resources of Ethiopia. This involves development, planning and management of water resources, water related development of polices, strategies and programs, setting water sector laws and regulations, conducting research and providing technical support to Regional Water Bureaus.

3.2. Constitution, Policies and Relevant Programs

3.2.1. Constitution of the Federal Democratic Republic of Ethiopia

The constitution of the Federal Democratic Republic of Ethiopia provides the overriding principles for all legislative frameworks in the country. The right of Ethiopian people to live in clean and healthy environment is enshrined in the constitution under Articles 43, 44 and 92 of the Constitution.

Article 43: The Right to Development identifies citizens' right:

- To improved living standards and sustainable development and
- Participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community; and
- The enhancement of their capacities for development and to meet their basic needs.

Article 44: Environmental Rights stipulate that all citizens have to:

- Live in a clean and healthy environment; and
- Be compensated for loss, including relocation with adequate state assistance.

Article 92: (Environmental objectives), it is declared that:

- Government shall ensure that all Ethiopians live in a clean and healthy environment;
- Programs and projects design shall not damage or destroy the environment;
- Peoples have the right to full consultation and expression of views; and
- Government and citizens have the duty to protect the environment.

The basis of social legislation for Ethiopia is derived from the Constitution of the FDRE. To support this, Expropriation of Landholdings for Public Purposes and Payment of Compensation (Proclamation No. 455/2005) and Payment of Compensation for Property Situated on Landholding Expropriated for Public Purposes Regulation (Regulation No. 135/2007) are intended to address the shortcomings of earlier implementation practices of resettlement programs as a result of displacement caused by development projects.

3.2.2. The Environmental Policy of Ethiopia

The Environmental Policy of the FDRE was approved by the Council of Ministers in April 1997. Its overall policy goal may be summarized in terms of the improvements and enhancement of health

and quality of life of all Ethiopians through the promotion of sustainable social and economic development and safeguarding the biophysical environment. It sets specific objectives and key guiding principles. It contains sectoral and cross-sectoral policies and provisions necessary for the appropriate implementation of the Environmental Policy.

The policy has been developed as a national instrument enhancing the objectives of the FDRE constitution and setting out clear directions with respect to environmental concerns particularly in terms of regulatory measures as well as in the process of design, implementation and operation of development projects. Its recognition of the significance of addressing cross-sectoral environmental issues in the context of a national approach to environmental assessment and management and integrates the efforts of a wide range of institutions across the country. It provides a sound and rational basis for addressing the countries environmental problems in a coordinated manner. The policy seeks to ensure the empowerment and participation of the people and their organizations at all levels and to raise public awareness and promote understanding of the essential linkage between environment and development. It also imparts handling environmental issues at community (popular), federal, Regional, Zonal and Woreda levels.

In addition to its guiding principles, the policy provides sectorial and cross-sectorial environmental policies. Environmental Impact Assessment (EIA) policies are included in the cross-sectorial environmental policies. Salient features of this policy that are of relevance to this project include the following:

Section 4.9: indicates ESIA needs to consider the physical, biological, social, socio-economic, political and cultural impacts and conditions of a development. It emphasizes that in private sector developments, the developer has the ultimate responsibility to ensure that a preliminary and a full ESIA are performed. The policy also requires that the ESIA process involves independent review and public comments.

3.2.3. Genetic Species and Ecosystem Biodiversity Policy

Policies related to genetic species and ecosystem biodiversity are drafted to:

- Promote in situ system (i.e. conservation in a nature reserve farmers' fields. etc.) as a primary target for conserving both wild and domesticated biological diversity and also promote ex situ system (i.e. conservation outside the original or natural habitat) in gene banks, farms, botanical gardens, reaches and zoos to supplement in situ conservation
- Promote in situ conservation of crop and domestic animal genetic diversity as well as other human managed ecosystem though the conscious conservation or samples of each ecosystem even each change as a whole is taking
- Ensure that factors such as the level of vulnerability, uniqueness, and economic and environmental important of the genome be taken into account in determining priorities in conservation.
- Ensure that the conservation of genetic resources in situ maintains a dynamic system of genetic variability in an environment of constant selection pressure that is normally present in nature or human made ecosystem as the case may be.
- Promote the involvement or local communities inside and outside protected areas in the planning and management of such areas.
- Ensure that the conservation of biological diversity outside that protected area is integrated with strategic land use plans, local level plans, and sustainable agricultural and pastoral

production strategies include that protected areas as wide a range of ecosystem and habitats as possible and where appropriate to link them by corridors of suitable habitats along which species can migrate;

- Ensure that pricing policies and instruments support conservation of biological diversity;
- Ensure the park, forest and wildlife conservation and management programs which conserve biological diversity on behalf of the country, and
- Recognize that certain animal and plant species are vermin or pests or may be reservoir of disease to humans, crops and livestock and the need control them.

3.2.4. The Ethiopian Water Sector Policy

The overall goal of the Water Sector Policy (2001) is to enhance and promote all national efforts towards the efficient, equitable utilization of water resources of Ethiopia. Furthermore, the policy aims for optimized utilization that allows for sustainable socioeconomic development.

Luna Export Slaughterhouse PLC needs to consult with the Ministry of Water, Irrigation and Electricity with regard to water use licensing requirements.

3.2.5. Environmental Impact Assessment Proclamation

Pursuant to the Environmental Impact Assessment Proclamation No 299/ 2002, project environmental impacts must be assessed based on the size, location, nature, cumulative effect with other concurrent impacts or phenomena, trans-regional effects, duration, reversibility or irreversibility or other related effects of the project. The resulting ESIA report should contain at least the description of the following:

- Nature of the project, including technology and processes to be used;
- Content and amount of pollutant that will be released;
- Source and amount of energy required for the operation;
- Information on potential trans-regional impacts;
- Characteristics and duration of all the estimated direct or indirect, positive or negative impacts;
- Measures proposed to eliminate, minimize or mitigate negative impacts;
- Contingency plan in case of accidents; and
- Procedures of self-auditing and monitoring during implementation and operation.

3.2.6. Prevention of Industrial Pollution

The Prevention of Industrial Pollution Council of Ministers Regulation (No. 159/2008) is directed to industry and in particular "factories". The regulation indicates the need for emergency response systems and the need for monitoring of environmental safety in factories.

3.2.7. Ethiopian Water Resources Management Proclamation No. 197/2000

The Proclamation regulates the use of water resources, by requiring a government permit in respect of most water uses, with the exception of minor and traditional uses. It also lays down basic criteria for the permit-granting authorities to use in deciding on applications for permits.

Applicability to Project

The project needs to utilize the water (surface water and groundwater) without significantly affecting the biophysical environment and the community living in the immediate environment. The need to

implement proper water management practice and follows the conditions set in the Ethiopian Water Resources Management Proclamation.

3.2.8. River Basin Councils and Authorities Proclamation

The objective of the River Basin Councils and Authorities Proclamation (No. 534/2007) is to provide a formal mandate to promote and monitor the process of integrated water resources management for river basins in Ethiopia.

Furthermore, the proclamation aims to use water resources associated with basins in a way that promotes socio-economic welfare for the people of Ethiopia and that allows for long-term sustainability of aquatic ecosystems. The proclamation allows for federal government to designate its powers to other entities such as Basin High Councils and Authorities (Basin Authorities).

For the purposes of water resource management, Ethiopia is subdivided into 12 river basins. Amongst other things, the few established Basin Authorities were provided with the power to issue permits applicable to the basins water use. The Authority was also empowered to initiate policy measures, to ensure that projects, activities and interventions related to water in the basin is in line with the integrated water management process, and to collect water use charges. All permits should be compiled and lodged in accordance with the Water Resource Management Proclamation and Regulations.

Applicability to Project

The project will be required by law to apply for and secure separate water use permits for land where water is intended to be used for agricultural and related activities.

3.2.9. Public Health Proclamation

The Public Health Proclamation (No 200/2000) prohibits the disposal of solid or liquid or any other waste in a manner which contaminates the environment or affect the health of civil society.

Furthermore, the proclamation details occupational health control and use of machinery by employees of any given company.

Applicability to Project:

As the project handles agrochemicals and farm wastes; they have to be disposed or contained properly so as not to not affect the biophysical environment and the community living around the project area.

3.2.10. Labor Proclamation

The Labor Proclamation (No 377/2003) obliges that an employer shall take the necessary measures to adequately safeguard the health and safety of the workers. In this proclamation the worker-employer relations are governed by the basic principles of rights and obligations with the goal to enable workers and employers to maintain industrial peace and work in the spirit of harmony and cooperation towards the all-round development of the country.

Applicability to the Project

The project will employ permanent and temporary staffs. Therefore, employment must follow the national and international labor laws and regulations.

3.2.11. Land holding Expropriated for Public Purposes

Payment of compensation for property is stated in regulation (No 135/2007) and expropriation of land holdings for public purposes and payment of compensation in Proclamation No. 455/2005. The purpose of the Regulation is to provide a formal approach for the payment of compensation to assets and properties to be affected by the project. For such a purpose proper Resettlement Action Plan (RAP) must done in case of resettlement. But, for any property directly affected by the project, compensation has been made based on the national rules and regulations. In fact, for this project RAP is not required as there are no people living in the project area.

Applicability to Project

The ESIA has to take into consideration the requirements and procedures stated in this regulation. Resettlement Action Plan (RAP) is not required as this hand been implemented already. Minor complaints rose in relation to compensation, also resolved by the woreda administration amicably.

3.2.12. Environmental Pollution Control Proclamation

The Proclamation (No.300/2002) is intended to ensure the right of citizens to live in a healthy environment and to impose obligations to protect the environment of the country. The proclamation addresses the management of hazardous waste; establishment of environmental quality standards for air, water and soil; and monitoring of pollution. The Proclamation provides a basis from which the relevant environmental standards applicable to Ethiopia can be developed, while sanctioning violation of these standards as criminally punishable offences. In order to ensure implementation of environmental standards and related requirements, inspectors belonging to the EPA or the relevant regional environmental agency are empowered by the Proclamation to enter, without prior notice or court order, any land or premises at any time, at their discretion.

3.2.13. Preservation of Cultural Heritage

The Conservation of Cultural Heritage Proclamation No. 209/2000 of Ethiopia defines cultural heritage broadly as "anything tangible or intangible heritage which is the product of creativity and labor of man in the pre-history and history times that describes and witnesses to the evolution of nature which has a major value in its scientific, historical, cultural, and artistic and handicraft content."

Prior approval of the Authority for Research and Conservation of Cultural Heritage is required to remove from its original site, an immovable cultural heritage (Art. 21/1). Whenever a registered movable cultural heritage is encountered during the execution of the project it is possible to remove such property by notifying the Authority in advance (Art. 21/2). Any person who destroys or damages cultural heritage intentionally shall be punished with gregarious imprisonment not less than 10 years and not exceeding 20 years (Art. 45/2/).

Applicability to Project

Any such projects release solid and liquid wastes and, in some cases, pollute the air. Therefore, proper environmental impact mitigation measures must be taken to avoid the adverse impact on the biophysical and social environment. Aside from the above mentioned key legal frameworks the summary of relevant legal and policy frameworks is listed in Table 3.1.

Table 3.1. Summary of main relevant national legal/policy instruments for the project

No.	Policy and Legal Framework	Brief Description
1	The 1995 Constitution of the Federal Democratic Republic of Ethiopia	Articles 43, 44 and 92 of the Constitution of the FDRE Right to development, right to development, all persons are entitled to: Live in a clean and healthy environment; and be compensated for loss, including relocation with adequate state assistance.
2	The 1997 Environmental Policy of Ethiopia	Summarizes the improvements and enhancement of health and quality of life of all Ethiopians through the promotion of sustainable social and economic development and safeguarding the biophysical environment.
3	Water Sector Policy of Ethiopia (2001)	The overall goal of the policy is to enhance and promote all national efforts towards the efficient, equitable utilization of water resources of Ethiopia. Furthermore, the policy aims for optimized utilization that allows for sustainable socioeconomic development.
4	Biodiversity policy of Ethiopia	Deals towards the effective conservation, rational development and sustainable utilization of genetic resources. It is formulated based on the rationale that the conservation of biodiversity is one of the conditions of the overall socio-economic development and sustainable environmental management goals. Hence, because of its vital importance in the socio-economic wellbeing of the Ethiopia people, the conservation, proper management and the use of biodiversity need to be supported by policy, legislation and national capacity building.
5	Environmental Impact Assessment Proclamation No 299/ 2002	Project environmental impacts must be assessed based on the size, location, nature, cumulative effect with other concurrent impacts or phenomena, trans-regional effects, duration, reversibility or irreversibility or other related effects of development projects.
6	Ethiopian Public Health Proclamation (No 200/2000)	It prohibits the disposal of solid or liquid or any other waste in a manner which contaminates the environment or affect the health of civil society. Furthermore, the proclamation details occupational health control and use of machinery by employees of any given company.
7	Ethiopian Labor Proclamation (No 377/2003)	It obliges that an employer shall take the necessary measures to adequately safeguard the health and safety of the workers. In this proclamation the worker-employer relations are governed by the basic principles of rights and obligations with the goal to enable workers and employers to maintain industrial peace and work in the spirit of harmony and cooperation towards the all-round development of the country.
8	Proclamation on Landholding Expropriated for Public Purposes (Proclamation No. 455/2005; No. 135/2007)	The purpose of the Regulations/proclamations is to provide a formal approach for the payment of compensation to assets and properties to be affected by the project. For such a purpose proper Resettlement Action Plan (RAP) must done in case of resettlement. But, for any property directly affected by the project, compensation has been made based on the national rules and regulations. In fact, for this project Rap is not required.
9	Environmental Pollution Control Proclamation (No.300/2002)	The Proclamation provides a basis from which the relevant environmental standards applicable to Ethiopia can be developed, while sanctioning violation of these standards as criminally

No.	Policy and Legal Framework	Brief Description
		punishable offences. In order to ensure implementation of environmental standards and related requirements, inspectors belonging to the EPA or the relevant regional environmental agency are empowered by the Proclamation to enter, without prior notice or court order, any land or premises at any time, at their discretion.
10	Conservation of Cultural Heritage (Proclamation No. 209/2000)	Cultural heritage is broadly considered as "anything tangible or intangible heritage which is the product of creativity and labor of man in the pre-history and history times that describes and witnesses to the evolution of nature which has a major value in its scientific, historical, cultural, artistic and handcraft content."
12	Establishment of SNNPR Environmental Protection, Land Administration and Utilization Agency, Southern Region EPLAUA (Proclamation No. 77/2004)	Any environmental studies must be approved by the agency. The agency is an autonomous body that is accountable to the president of the SNNPR. The main objective of the agency is to ensure that the region's social and economic development activities are carried out in a manner that the environment and natural resources are utilized, protected and developed on sustainable manner, to create conducive atmosphere by which the management, administration and use of rural land of the region could be appropriately decided.
13	The Southern Nations. Nationalities and Peoples Region Rural Land. Administration and Use Proclamation No.110/2007	The overall policy goal is to improve and enhance the health and quality of life of all the SNNPR people and to promote sustainable social and economic development through the sound management and use of natural, human and cultural resources and the environment as a whole so as to meet the needs of the present generation without compromising the ability of future generation to meet their own needs. The SNNPR Constitution has directly reiterated the environmental right and duties that are enshrined in the FDRE Constitution.

Table 3.2. Main national permit certificates required and certifying intuitions

No.	Permit Certificates Required	Organizations that give certification
1	Federal organ that permits and monitors any environmental issues	Environment Forest and Climate Change Agency
2	Any agricultural development and land acquisition needs to have approval from the Federal ministry	Ministry of Agriculture
3	Any ESIA issues and permit must be approved by this organ at regional level	SNNPR Environmental Protection, Land Administration and Utilization Agency
4	Any large-scale water resources utilization needs to be approved at the Federal level	Ministry of Water and Energy
5	Bena Tsemay Woreda Administration	The woreda will approve the land acquisition and follows all ESIA and monitoring issues closely
6	Enchete Kebele Administration	The lowest administrative structure which needs to be consulted in all aspects of security, land and community project relations. The Kebele needs to be in good phase with the project although official certification may not be required.

3.3. Relevant National Strategies and Development Plans

The principal long-term development strategy of the country's development is Agricultural Development-led Industrialization (ADLI). This strategy is dependent on the creation of a system of sustainable agricultural development, which in return dependent on the sustainable development use and management of the country's natural resources and environment. This implies long-term strategies that will protect and enhance the resource base do that it will be available for future generation.

This strategy is supported by various policies, which have been put in place by the Federal Government of Ethiopia; one of the major policy initiatives of the government has been the redirection of the economic system from centralized planning to a free economic market, which aims to encourage private investment and development. Based on the ADLI strategy and developed to promote equitable sharing of resource by controlling population growth, increasing woman participation and the improvement in social services. The proposed modern ranch establishment is in line with ADLI.

Since the early 1990s, the Federal Government of Ethiopia has undertaken a number of initiatives to develop regional, national and sector strategies for the environmental conservation and protection, Paramount amongst these was conservation strategy of Ethiopia (CSA, 1996).

It provided a strategic framework for integrating environmental planning in to new and existing policies, programs and projects from the outset, so that planners may take into account environmental protection as essential components of economic, social and cultural development. In particular, it recognizes the importance of incorporating environmental factors into development activities from the outset. So that planners may take into account environmental protection as essential components of economic social and cultural development.

Growth and Transformation Plan II (GTP II) - GTP II aims to spur economic structural transformation and sustain accelerated growth towards the realization of the national vision to become a low middle-income country by 2025. GTP II focuses on ensuring rapid, sustainable, and broad-based growth by enhancing the productivity of the agriculture and manufacturing sectors, improving the quality of production, and stimulating competition within the economy. "The major objective of GTP II is to serve as a spring board towards realizing the national vision of becoming a low middle-income country by 2025, through sustaining the rapid, broad based and inclusive economic growth, which accelerates economic transformation and the journey towards the country's Renascence. GTP II is primarily considered to be an important milestone towards realizing the national vision. In this context, during the GTPII implementation period, effective public participation in a coordinated and structured manner at all levels is critical to ensuring equitable development and to build developmental political economy.

The successful achievements of the first Growth and Transformation Plan (GTP I) will be taken as an additional input and developmental activities are expected to be implemented with greater commitment and diligence across the country by addressing implementation bottlenecks identified

during GTP I implementation period and through coordinated and integrated developmental mind set of development actors. The Luna project is in line with GTP II.

Prosperity Development Plan - Ethiopia's Parliament approved recently a new 10-years development plan that replaced the GTP II. The plan envisioned the country to become 'An African Beacon of Prosperity'. The plan is anchored 6 objectives, 10 strategic pillars, and 6 priority focus areas. The agriculture sector is one of the key priority areas.

Applicability to Project

As this project is categorized in the agriculture sector which focuses on modern ranch est5ablishemnt the project is well in line with Ethiopia's development priority areas which is well in line with GTP II and the ten-year Prosperity Development Plan.

3.4. National Environmental Assessment Guidelines

3.4.1. EPA's Environmental Impact Assessment Guidelines

The technical and procedural ESIA guidelines, which were issued in 2000 and 2003 respectively, are intended to guide developers, competent agencies and other stakeholders in carrying out ESIAs.

The procedural Guideline details the required procedures for conducting an ESIA, the permit requirements, the stages and procedures involved in ESIA process, and the roles and responsibilities of parties involved in the ESIA process. It also includes the categories of projects (schedule of activities) concerning the requirement of EIA, and list of project types under each category.

The guideline specifies standards that may be considered in the ESIA process. It provides the categories, the relevant requirements for an ESIA and project types under each category. Accordingly, projects are categorized into three schedules:

1. **Schedule1**: Projects which may have adverse and significant environmental impacts and therefore require a full Environmental and Social Impact Assessment.
2. **Schedule2**: Projects whose type, scale or other relevant characteristics have potential to cause some significant environmental impacts but are not likely to warrant a full ESIA study, and
3. **Schedule 3**: Projects which would have no impact and do not require ESIA.

3.4.2. Sectorial Guidelines

The Ethiopian Environmental Protection Authority has also issued other guidelines for environmental and social impact assessment of projects in different sectors. Some of these that are of relevance to the proposed project are:

- Guidelines for Dams and Reservoirs, 2004
- Guidelines on Irrigation, 2004
- Guidelines for Mineral and Petroleum Operation Projects, 2003
- Guidelines on Road and Railway, 2004
- Guideline on ambient water quality of domestic, agricultural and industrial wastes

3.5. Southern Nations Nationalities and People Regional State (SNNPR) Environment Related Proclamations

3.5.1 Southern Nations Nationalities and People Regional State Environmental Protection Agency

The Environmental Protection Organs Establishment Proclamation (Proclamation № 295/2002) requires regional states to establish or designate their own regional environmental agencies. The regional environmental agencies are responsible for coordinating the formulation, implementation, review and revision of regional conservation strategies; and for environmental monitoring, protection and regulation (Art. 15). Relating to EIA specifically, the Environmental Impact Assessment Proclamation (Proclamation No. 299/ 2002) gives regional environmental agencies the responsibility to evaluate the EIA study reports on projects that are licensed, executed or supervised by regional states and that are not likely to entail inter-regional impacts. Regional environmental agencies are also responsible for auditing and regulating the implementation of such projects.

The proposed project must abide the regional proclamations, policy and regulations which fits to the national proclamations and policies and regulations. Some of the most important regional relevant bodies and proclamations are outlined below.

3.5.2. Proclamation on Environmental Impact Assessment - SNNPR

The institutional standing of regional environmental agencies varies from region to region. In some regions, they are established as separate institutions, while in others they are constituted within other institutions. In the Southern Nations Nationalities and Peoples Regional State, the regional environmental organ is situated within the Bureau of Agriculture and Rural development as an Environmental Impact Assessment and Pollution Control Team.

The Agriculture and Rural Development Bureau (ARDB) is the key natural resource management institution at regional level. It is responsible for the management of land, forest, wildlife and biodiversity resources (Proclamation No. 110/2007). Relating to the wider land use domain, ARDB is expected to, inter alia, allocate/prepare rural land for agricultural investment; provide assistance to investors engaged in the sectors; and issue and implement directives that enable protect natural resources and the environment from pollution. Even though EIA is under ARDB, the new Executive Organs Establishment Proclamation of SNNPRS (Proclamation No. 106/2007) does not clearly mandate the ARDB to evaluate and decide on EIA study reports, and to monitor the implementation of its decisions.

As there is no autonomous environmental protection organ in this region, the revised *SNNPRS Determination of Executive Organs' Powers and Responsibilities Proclamation No 106/2007*, is the Proclamation (SNNPRS, 2007) that has determined the powers and responsibilities of the executive organs of the Regional State. Practically it can be observed that the environmental protection organ is organized as one part of the Bureau of Agriculture and Rural Development. The Proclamation has clearly given the power of environmental protection activities to this Bureau.

The following are the environmental protection powers of the Bureau, in addition to its mainline functions of agricultural development activities:

- Supervises protection and development of natural resources and parks; implements, causes the implementation of and controls wildlife protection and utilization laws (Article 23(1));
- Controls forest fires (Article 23(14)); Initiates biodiversity protection policy, issues directives and implements same (Article 23(18)); Issues and implements directives that would protect

the natural resources and the environment (Article 23(19)); It is anticipated that it is the environmental structure under the Bureau that is going to be entrusted with these functions.

- The Proclamation also indicates that the Agriculture and Rural Development Bureau shall prepare land for agricultural investment (Article 22(3)).

3.5.3. Proclamation on Environmental Pollution Control-SNNPR

Environmental Pollution Control Proclamation (No. 300/2002) is aimed at eliminating or, when not possible, to mitigate pollution as an undesirable consequence or social and economic development activities. It has also an objective of protecting the environment and safeguarding of human health, as well as the maintaining of the biota and the aesthetic value of nature are the duty and responsibility of all citizens. The Proclamation, among others has considered control of pollution; management of hazardous waste, chemical and radioactive substances; management of municipal wastes; the importance and need to respect environmental standards; and punitive and incentive measures.

3.5.4. Solid Waste Management Proclamation – SNNPR

Solid Waste Proclamation (Proclamation 513/2007) the national Solid Waste Management proclamation aims to promote community participation to prevent adverse impacts and enhance benefits resulting from solid waste management. It provides for preparation of solid waste management action plans by urban local governments.

3.6. International Treaties, Conventions and Protocols

Ethiopia is signatory to a number of international conventions and agreements relating to farming, environmental management and energy. In certain cases, these have influenced policy, guidelines and regulations and are incorporated in this report and need to be taken considered in the ESIA study.

The UN Convention for the Safeguarding of the Intangible Cultural Heritage (Ratified in 2006) - The Convention defines intangible cultural heritage as the practices, representations, expressions, knowledge and skills, as well as the associated instruments, objects, artifacts and cultural spaces that communities or groups recognize as part of their cultural heritage. The purpose of this Convention is to safeguard the intangible cultural heritage and ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned. It also aims to raise awareness at the local, national and international levels of the importance of the intangible cultural heritage and of ensuring mutual appreciation thereof and provide for international cooperation and assistance.

The UN Convention on the Protection and Promotion of the Diversity of Cultural Expressions (Ratified in 2008) - This Convention defines cultural expressions as those expressions that result from the creativity of individuals, groups and societies and that have cultural content. The Convention is underpinned by eight principles. These include the principle of respect for human rights and fundamental freedoms, equal dignity of and respect for all cultures, equitable access, and sustainability and complementarily of economic and cultural aspects of development.

The UN Convention Concerning the Protection of World Cultural and National Heritage (Ratified in 1977) - The Convention defines the kind of natural or cultural sites, which can be considered for inscription on the World Heritage List.

The Convention sets out the duties of States Parties in identifying potential sites and their role in protecting and preserving them. By signing the Convention, each country pledges to conserve not only the World Heritage sites situated on its territory, but also to protect its national heritage.

The UN Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora 1973 - CITES is an international treaty that provides protection for wild animal and plant species in international trade. To date there are 120 nations that have become "parties" to this convention.

By doing so, these countries have agreed to implement it in territories under their legal jurisdiction. To implement CITES all parties are required to develop wildlife protection laws in their countries and to establish a Management Authority to issue trade permits for wildlife products and a Scientific Authority to provide scientific expertise on the status of species considered for trade. Thus, CITES is designed to promote the conservation of endangered species whilst still allowing trade in wildlife species that can withstand the pressure of trade.

Basel Convention on the Control of Trans-boundary Movement of Hazardous Waste (Ratified in 2000) - The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics as well as the types of wastes defined as "other wastes" (household wastes, incinerator ash, etc.).

The provisions of the conventions center around the following principles: (i) The reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes wherever the place of disposal; (ii) the restriction of trans-boundary movements of hazardous wastes (iii) a regulatory system applying to cases where the trans-boundary movements are permissible.

United Nations Framework Convention on Climate Change, 1992 Ratified in 1994 (Ratified in 2005) - The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. Under the convention, national governments (i) gather and share information on greenhouse gas emissions, national policies and best practices, (ii) launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries and (iii) to cooperate in preparing for adaptation to the impacts of climate change.

Kyoto Protocol – The Kyoto Protocol is an international agreement linked to the United Nations Framework on Climate Change. 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 (GHG) emissions. These reductions amount to an average of five percent against 1990 levels over the five-year period 2008 to 2012.

UN Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification 1994 (Ratified in 1997) - The objective of this convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa. Achieving this objective will involve long term integrated strategies that focus simultaneously on improved productivity of land, and the rehabilitation, conservation and

sustainable management of land and water resources leading to improved living conditions, particularly on a community level.

3.7. ESIA Requirements of International Organizations

The World Bank and the regional development banks, such as the African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, and Inter-American Development Bank, now have well-established ESIA procedures, which apply to their lending activities and projects undertaken by borrowing countries. Although their operational policies and requirements vary in certain respects, the development banks follow a relatively standard procedure for the preparation and approval of an ESIA report. Borrowers are responsible for the preparation of the ESIA, and this requirement possibly more than any other has influenced the introduction and development of ESIA in many developing countries. Banks in developing countries have also made ESIA a requirement for lending.

3.7.1. IFC Performance Standards on Environmental and Social Sustainability

The International Finance Corporation of the World Bank Group has recently issued eight Performance Standards which establish standards that an investor must meet throughout the life of an investment (IFC, 2012) Performance Standard 1 establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the Client's management of environmental and social performance throughout the life of the project. Performance Standards 2 through 8 establish objectives and requirements to avoid, minimize, and where residual impacts remain, to compensate/offset for risks and impacts to workers, affected communities, and the environment. While all relevant environmental and social risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describes the potential environmental and social risks and impacts that require particular attention.

3.7.2. World Bank Group Operation Policies

The World Bank has 10 environmental and social "Safeguard Policies" that are used to examine the potential environmental and social risks and benefits associated with World Bank lending operations.

The World Banks' safeguard policies relevant to the Project include 1, 2, 5, and 6 and are:

Operational Policy 4.01 - Environmental Assessment (EA) evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation.

EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and trans-boundary and global environmental aspects.

Operational Policy 4.04 - Natural Habitats promotes the conservation of natural habitats. The World Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats. The Bank

encourages borrowers to incorporate into their development and environmental strategies analyses of any major natural habitat issues, including identification of important natural habitat sites, the ecological functions they perform, the degree of threat to the sites, and priorities for conservation.

The Bank expects the borrower to take into account the views, roles, and rights of groups, including local non-governmental organizations and local communities, affected by any project involving natural habitats, and to involve such people in planning, designing, implementing, monitoring, and evaluating such projects. Involvement may include identifying appropriate conservation measures, managing protected areas and other natural habitats, and monitoring and evaluating specific projects.

Operational Policy 4.11 – Cultural Property addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community. Any project involving significant excavations, demolition, movement of earth, flooding, or other environmental changes are to take cognizance of this policy in the EA.

Operational Policy 4.12 - Involuntary Resettlement is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. It promotes participation of displaced people in resettlement planning and implementation, and its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects.

3.8. ESMF and RPF Requirements

The Government of the Federal Democratic Republic of Ethiopia has prepared two safeguard policy documents that were agreed and disclosed as part of the borrower's legal commitment to the project. These policy documents are an Environmental and Social Management Framework (ESMF) dated April 13, 2007, and a Resettlement Policy Framework (RPF) dated May 4, 2007. These documents, in conjunction with the guidance provided in the Project Implementation Manual (PIM), dated August 2007, need to be consulted directly during project implementation. The ESMF and RPF are briefly described below and the ESIA study for the Luna Slaughterhouse modern ranch project is carried out in accordance with the ESMF and RPF requirements and the guidance provided in the PIM.

3.8.1. ESMF Requirements

The ESMF outlines an environmental and social screening process, which should be carried out in parallel with other sub-project preparation activities such as technical, economic, and financial analyses. The ESMF has been prepared because the Ethiopian guidelines do not make provisions for the screening of small-scale sub-projects, which could have negative localized environmental and social impacts that would require mitigation. Therefore, the provisions of OP 4.01 Environmental Assessment for screening, assignment of environmental category, application of appropriate

environmental mitigation measures and/or preparation of separate Environmental Impact Assessment (EIA) reports, review and clearance of screening results and/or separate EIA reports, consultations, and monitoring are applied to the sub-projects.

3.8.2. RPF Requirements

According to the World Bank's OP 4.12, the development of a RPF is a requirement for projects that may entail involuntary resettlement, impacts on assets, or loss of livelihoods. Any impact of this modern ranch project on land and/or people (land acquisition, impact on assets, resettlement, and livelihood restoration of affected people) will be addressed in compliance with the Constitution of Ethiopia, with other Ethiopian regulations, and with the World Bank/IFC safeguard policy in involuntary resettlement (OP 4.12).

Where gaps exist between Ethiopian laws and the Bank's OP 4.12, the Luna Slaughterhouse modern ranch project will follow the requirements of the Bank's policy. There is a gap between the existing Ethiopian laws and the Bank's OP 4.12 related to eligibility for compensation. According to the Bank's OP 4.12, project affected people are considered legitimate for resettlement assistance regardless of the legality of land tenure. Whereas according to the Article 22 of the Ethiopian Regulations on Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes (Regulations No. 135/2007), any person who claims for payment of compensation in accordance with the Proclamation No. 455/2005 and the Regulations No. 135/2007 is required to produce proof of legitimate possession of the expropriated landholding and ownership of the property entitling compensation. Therefore, in relation to this project, the RPF will follow the requirements of OP 4.12.

It would be appropriate and possible for the modern ranch project to follow the agreed Resettlement Policy Framework as it is expected to be in conformity with the Bank's Operational Policy on Involuntary Resettlement. The policies or principles provided in the RPF including design procedures to minimize displacement, compensation principles and eligibility for compensation will be applied for the project. It is considered that the project will fully implement the resettlement and compensation procedures recommended in relevant sections of the final ESIA report. There is no resettlement need for the project as there are no houses inside the project area at present. In case of any future expansion of the project in the area or any other place in the vicinity and any effect on settlement needs to account this policy and preparation Resettlement Action Plan (RAP).

4. PROJECT DESCRIPTION

4.1. Description of the Area and the Project

The project area is located in Bena Tsemay Woreda (South Omo Zone of SNNPR), specifically in Enchete Kebele. The woreda capital is Key Afer. The woreda is dominantly located close to the watershed divides of the Turkana (Omo) and the Chew Bahir basins. The woreda is bordered by Mali, Alie, Hammer and Baka Dawla woredas to the north, east, south and west respectively.

In terms of topography, 30, 40 and 30 percent of the woreda is mountainous, flat and undulating terrain respectively. The total area of the woreda is 301,198 ha out of which 113,880.5 ha is covered with farmland and 54,059 ha is forested virgin land and 51914.2 ha grazing land.

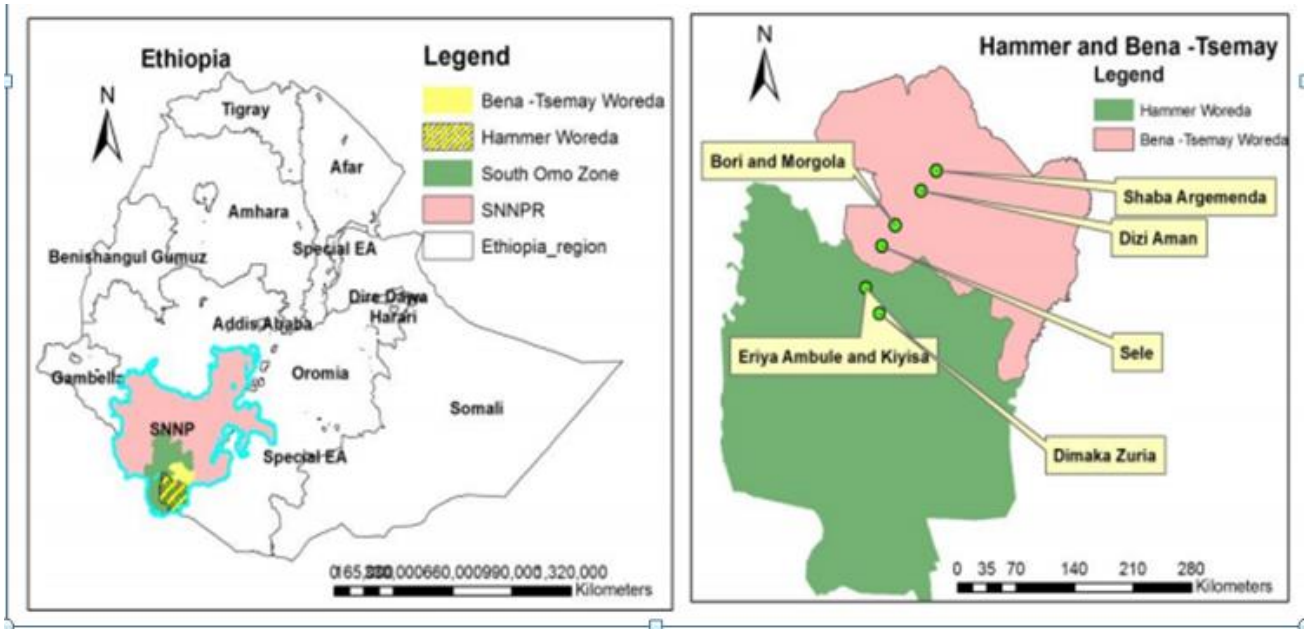


Figure 4.1. Location map of Bena Tsemay woreda

Key Afer and other four small towns in the woreda get basic services such as electricity, mobile network, school and health service centers. One of the major problems in the woreda is lack of safe drinking water. Most small towns get water from shallow wells and few low discharges springs. The rural community relay mainly on ponds and hand-dug wells along stream banks and river beds. Details of the baseline conditions of the project area are presented in Chapter 6.

The project site can be accessed through 7 km all weather gravel road that goes from Weyto (Berhale) town to the project site. The road is not part of the licensed project area. The project site is around 42 km north east of the zonal capital Jinka town.

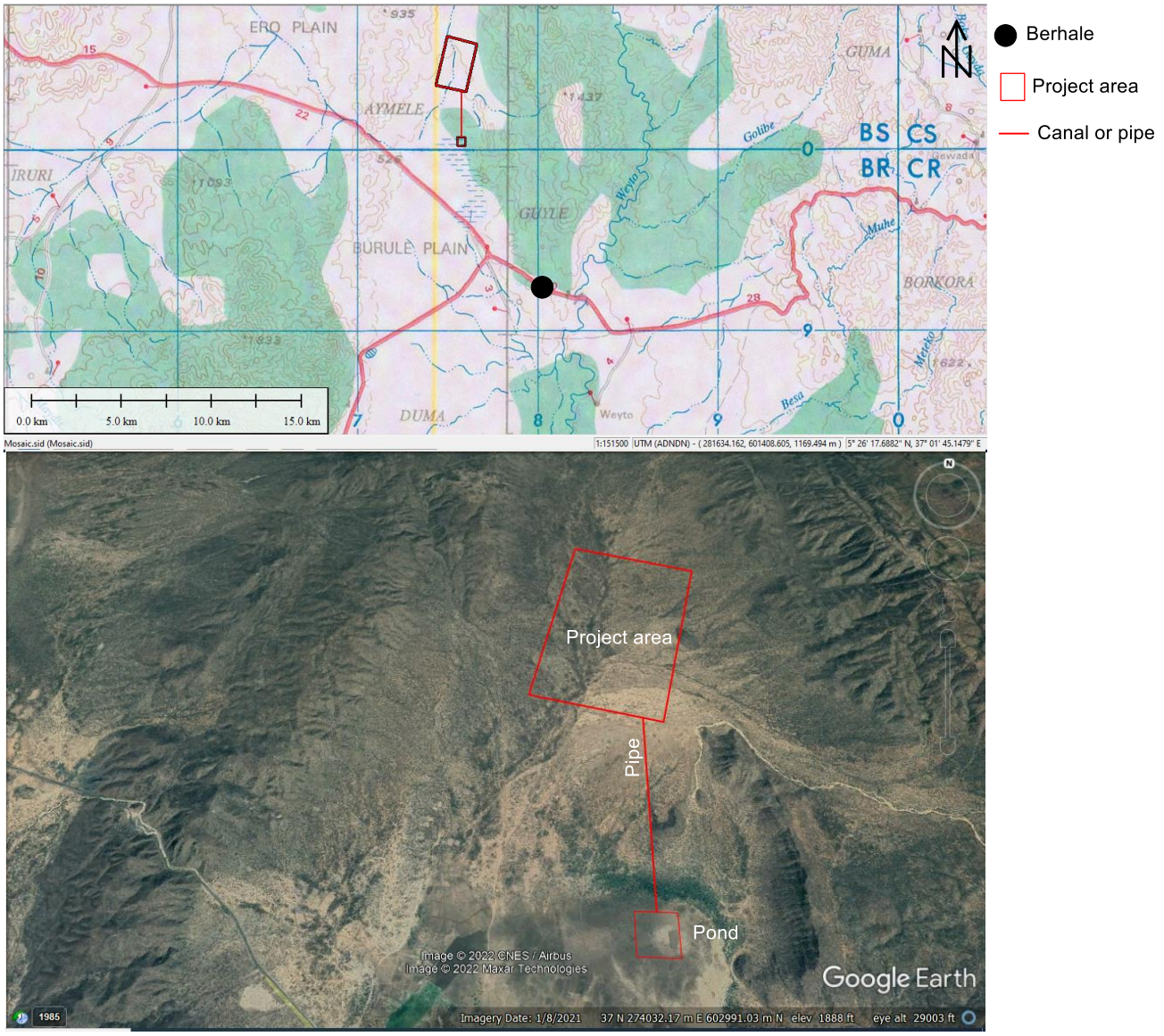


Figure 4.2. Google view of the specific project area

Generally, the woreda has great potential for agriculture and modern ranch development Area adjacent to the project site is already identified for expansion in full consensus with the regional government to approve once the project start implementation in alignment with the plan. The existing license areas are nucleus farm which is already enough to start the implementation.

Figure 4.3. Google Earth image of the project area and its immediate environs

The boundary of the control points along the outside boundary of the farm is summarized below (UTM, Adindan).

Table 4.1. Border coordinates of the project sites for first phase

Coordinated for the main project area	
Easting	Northing
276565	605789
274935	606225
274319	603493
275977	603119
Coordinated for the pond area	
Easting	Northing
275492	600623
275950	600623
275950	600121
275492	600121
Coordinates for Irrigation canal/pipe	
Easting	Northing
275715.3	600623.4
275745.8	600623.01
275781.5	603166.2
275744.4	603164.3

***Remark**: Datum = Adindan; Projection = UTM*

4.2. Description of the Project

4.2.1. Scope and Objective the Project

As per the feasibility document, the project intends to establish commercial Livestock Farm with the objective of achieving efficient utilization of the animal resource in the sub-region through effective backward linkage with pastoralists and farmers, to ensure regular supply of properly raised animals. The project involves Proper animal feeding and Fodder production, Efficient Animal Health system, Effective Breeding stock management and organized market structure. It will also work to improve the animal husbandry system of the pastoralists by intervening on the above areas and creating mind set on business-oriented husbandry to make the animals ready for target market. In line with this, the project will support the producers in animal feed production, proper feeding system; veterinary applications and breed improvement.

The project will start sourcing animal direct form the surrounding livestock markets until its operation on the out-grower husbandry program is strengthened to the level where all animals are sourced directly from the contracted farmers through the out-grower program. Therefore, on the 1st year of its operation, the project will buy 80,000 Sheep/Goat and 10,000 cattle the existing markets. This number will increase until the 5th year of the project cycle and reach to 320,000 Sheep/Goat and 50,000 cattle. After the 5th year, the sourcing trend will gradually shift to the out-grower program.
Via the out-grower scheme, the project is planning to work with 2000 smallholder households; 1000 of them on sheep/Goat and the rest on cattle husbandry contract on the 1st year. The number of smallholder households who will participate in the program will grow to 40000 households at the 10th year of the project life. The company is planning to work on more than 15,000 sheep/Goat and 2500 cattle on the 1st year of its operation while this will dramatically increase to more than 1 million Sheep/Goat and 150,000 cattle on the 10th year.

To execute its plan the project will setup a nucleus farm with irrigated animal fodder production, Feed processing unit, Modern feedlot with Quarantine Unit, Standard Veterinary Facility including laboratory setup and Breed Improvement Section. Initially, the project total area will be 1000 Hectares with planned allocation of Irrigated Fodder production area /800 Ha/, Feedlot /100 Ha/, Feed Silos and feed processing plant /25Ha/, Quarantine area & Laboratory /25 Ha/, Research and Development /25 Ha/ and Breed Improvement Unit /25Ha/. Once the first operation plan is implemented, an additional 1000 Hectare will be required on the second phase expansion.

The farm is planning to use center pivot irrigation and will grow legume plants like Alfalfa as sources of protein and crops like corn silage for energy sources. The feedlot facility is planned to accommodate annually more than 90,000 sheep/Goat and 15,000 bulls at the 1st year expanding to 1Mln shoats and more than 150,000 cattle by the 10th year of the project.

The total investment capital in the course of 10 years will be more than Br1.375 billion. The project will employ 105 skilled professional and semi-skilled employees at the beginning and increase its staff at the farm to 485 employees. This does not include the casual workers expected to be employed for the farming, feedlot operation, breed improvement and additional support activities. Extension workers will be assigned to each community to support the smallholders in modern husbandry techniques: How to produce appropriate animal feed, how to store the feed, how to feed the animals

and, in general, how to raise their animals efficiently.

The project will organize effective vaccination programs in coordination with relevant Governmental and Non-Governmental organizations. It will also carry internal and external deworming programs and case by case treatments. All the animals in the program will be ear tagged with a linked standard data base record about their life history. These interventions will help to decrease morbidity and mortality as well as weight loss of the animals. It will also improve to shorten the maturation period of the animals, increase the quality of the meat and skin/hides by protecting the external part of the animal from parasites like tick. The feed program will focus in teaching and supporting the community to produce proper animal feed especially in the rainy season and store them through the dry season. Inputs like seed, fertilizer and chemical which will help to produce the feed will be provided by the company on credit basis that will be deducted step by step when the animals are sold.

The stronghold of the project is its approach to engage smallholder farmers as the major stakeholders in its plan to achieve its objective. This will create a mutual benefit both to the company and the smallholder farmers. The main advantage of the company will be the benefit from economies of scale that will be created by engaging with many smallholder farmers which would, otherwise, be unimaginable to achieve the planned target. The company will definitely be taken positively by the community amid its vision to link the operations and share the benefits of the project to the smallholder farmers via its out-grower scheme.

Pastoralists and Smallholder farmers around the project area will improve their livelihood by practicing modern husbandry system, breed improvement and efficient utilization of their animal resources. The company will also strategically plan to minimize the calamities on animals' lives at the times of droughts. The company will be smallholder farmers' best partner in preventing animal diseases.

After the company ensures regular and quality supply of animals, it will invest on an export standard meat processing plant which will make the operation much more convenient and efficient. It will also be possible to ensure better sanitary and physico-sanitary protocols by creating disease free corridors in the region. This will create opportunities to enter new high end market destinations.

Enabling smallholder farmers to develop modern animal husbandry skill, will help to off-take animals at younger age, proper weight range, and guarantee secured market. This will enhance the farmers' livelihood by increasing their income significantly. Off-taking animals in a planned way, will ensure regular supply of healthy, young and quality animals that will convey proper export operation by the meat processing plant, hence secure appropriate export sales contract.

4.2.2. Project Components

The project will have standard components of a modern ranch and without grower facilities that beneift the local community. The project will have the following components which will be implemented once the overall design is completed. Some of the components will be implemented in dffrent phases.

1) **Irrigated Fodder Production Unit -** For animals to perform well and deliver the results desired; proper feeding is very crucial. Animals are expected to be raised by the virtue of natural vegetation which is challenging when natural vegetation depletes either due to overgrazing, poor management or drought occurrence. In order for the project to be successful in its livestock operation and produce globally competitive meat the first important element to consider is producing animal feed. The fodder production unit will produce animal feed for the animals to be fattened in the farm. It will also serve as a demonstration field to farmers to encourage them produce feed for their animals. The animal feed stock will also serve as a backup life saver for animals of the farmers by the time of drought.

   To use the land more effectively and avoid the risk attached with rain irregularity, the fodder production has to be equipped with irrigation facility. The two main crops preliminarily identified for fodder production are Corn Silage and Alfalfa. The project will organize and convince farmers to produce fodder apportioning certain part of their land. From the experience of the promoter, producing corn silage for animal feed has 60% more value than producing dry corn and saves one third of the production cycle. The farm will also arrange on credit basis leasing its farm equipment to help farmers prepare their land and chop/ensile their fodder. The company will require 3000 Hectares of irrigation farm by the 10th year of the project life. Since the operation is done step by step, the area required on the first years of the project is not more than 1000 Hectare. The animal feed production is planned to be done by using center pivot irrigation, a system very popular in other countries for the production of animal feed.

2) **Silos and feed processing plant - The** farm will stock all the animal feed, including semi-liquid feed like Molasses, enough to feed the animals for the at least three months period. The feed processing plant will include grinding, mixing and palletizing operations. In order minimize the waste while transporting the concentrated feed and make it more palatable, the farm is planning to install Feed palletizing plant. All the ingredients based on the ration, will be mixed and produced like pellet; with different pellet sizes for cattle and shoats. In this case high value ingredients are taken by each animal as per the recommended portion without much waste and variation which will have a great impact on the weight gain of the animal.

3) **Feedlot Unit - Once** the animals are received from the smallholders, they will be fed intensively in the feedlot. The feedlot will be used as a buffer between the slaughterhouse day to day demand and the smallholder animals' supply through the capacity to receive and recondition the animals regardless of the slaughtering demand. On top of that it will help to ensure the uniformity of the animals in terms of size, weight, and body conformation to guarantee standard supply of meat to the international market. The unit will have quarantine section where the animals will be examined for 15 days before they are mixed with the rest of the stock. The facility will have a standard biosecurity measure to avoid disease contamination. The feedlot will hold more than 40, 000 animals at a time.

4) **Meat Processing Plant - The** company will establish an export standard abattoir with appropriate plant layout, design and construction for efficient and hygienic production of meat. Maximum number of animals and kind of animals to be slaughtered per day is taken into account for layout of plant. The designing of the abattoir will be for full processing of the animals including byproduct processing. An integrated modem abattoir for export of meat would large area of land for lairage, slaughter halls for cattle, sheep and goat, chilling, deboning, freezing and cold storage. The capacity of daily production may be around 200 cattle and 2000 sheep/goat. The abattoir shall have facilities

like resting places for animals before slaughter, ante-mortem inspection lierage, slaughtering hall with proper machinery and equipment, by-products handling and processing facility, quality control section with fully equipped Laboratory, deboning and packing section, large cold and freezer rooms with adequate and continuous water and electric power supply throughout the compound.

5) **Laboratory and Veterinary Unit - The** main objective of this unit is to get the maximum efficiency of the operation at the smallholder and the farm level by providing standard animal health services. It is known that vaccination, preferably at the earliest age of the animals, plays a decisive role, in order to have the best result on the animal operation in terms of decreasing morbidity, better body conformity, and increasing appetite and feed intake. Proper deworming activities both for internal and external parasites are also required to get optimum result of the operation. Case by case treatments are planned to be diagnosed whenever disease incidents occur. The unit will employ qualified professionals with proper veterinary drugs and equipment. A standard laboratory with necessary lab equipment will help to identify and diagnose diseases.

6) **Breed Improvement Unit - This** unit will do selection and mapping of Bucks, Rams and Bulls focusing initially on local breeds and extending to imported breeds later. It will conduct adoption trials and performance review on mother-Kidding ratio, Kid birth weight, disease immunity, growth rate and the parameters on the meat quality of the animals before extending the breeds to the smallholder farmers. Once the operation to a level where mating will be done with selected breeds, the herd quality will improve and bring efficiency in terms of kidding ratio, birth weight, disease resistance, feed conversion ratio, and overall performance of the animal which will ultimately benefit the smallholders by selling quality, young but heavy weighed animals in short period of time.

7) **Extension Services ("Out grower" Unit) -** One of the most important components of the project is its extension services through the out-grower unit. The extension services will likely enhance the livelihood of the local community. Aside from the knowledge transfer in modern animal husbandry and animal feed production, Luna will provide better veterinary services and supply better livestock breeds. There is a general consensus that modern ranches improve cattle productivity while enhancing carbon sequestration which contributes also to the multiple goals of improving ranchers' livelihoods and mitigating climate change.

   The Out-grower unit enrolls smallholder farmers who are willing to be part of the program and close the contract with the farmers. It will register the animals in the program and provide the support until the time the animals are inducted to the farm. The support includes training, veterinary services, breeding improvement activities, fodder production operations both for their own stock and to be sold to the farm. Extension workers will be assigned in each community to support the smallholders in modern husbandry techniques: How to produce appropriate animal feed, how to store the feed, how to feed the animals and, in general, how to raise their animals efficiently. The project will organize effective vaccination programs in coordination with relevant Governmental and Non-Governmental organizations. It will also carry internal and external deworming programs and case by case treatments. All the animals in the program will be ear tagged with a linked standard data base record about their life history.

These interventions will help to decrease morbidity and mortality as well as weight loss of the animals. It will also improve to shorten the maturation period of the animals, increase the quality of the meat and skin/hides by protecting the external part of the animal from parasites like tick.

The feed program will focus in teaching and supporting the community to produce proper animal feed especially in the rainy season and store them through the dry season. Inputs like seed, fertilizer and chemical which will help to produce the feed will be provided by the company on credit basis that will be deducted step by step when the animals are sold. This will help to make sure that the animals get balanced diet and guarantee their weight gain in addition to significantly reducing major mortality losses whenever drought occurrences happen.

8) **Research and Development -** It is eminent that best performance of the farm is proved with its efficiency in the animals' performance. The performance of the animals will be better if a clear strategy is designed to conduct research in the various operations of the farm and extend the best results to the farm and the smallholder farmers. This unit is intended to have a strong linkage with universities and research institutes.

One of the areas the farm is planning to conduct research is breed adaptation. Identifying breeds which perform well in the locality, do have a better disease resistance and have better acceptance in the market will help to make the livestock operation economically more viable both to the farmers and the farm. The fodder production research unit will plant various fodder plants and trees and review their performance in the locality. This will help to decide on the types of crops the farm and the smallholder farmers will plant to get better efficiency in their fodder production and feeding operations.

The farm has to set up its own feed rations for the different types of animals based on their breeds, age and induction time. This operation also requires the findings from the on the control and experimental groups to be observed and recorded clearly. In addition performance trials of veterinary medicines and vaccines will also be done in this unit.

4.2.3. Manpower Requirement

As stated above the project will employ 105 skilled professional and semi-skilled employees (excluding the personnel for Environmental Management Unit) at the beginning and increase its staff at the farm to 485 employees. This does not include the casual workers expected to be employed for the farming, feedlot operation, breed improvement and additional support activities. The summary of skilled and semi-skilled manpower is shown in Table 4.2.

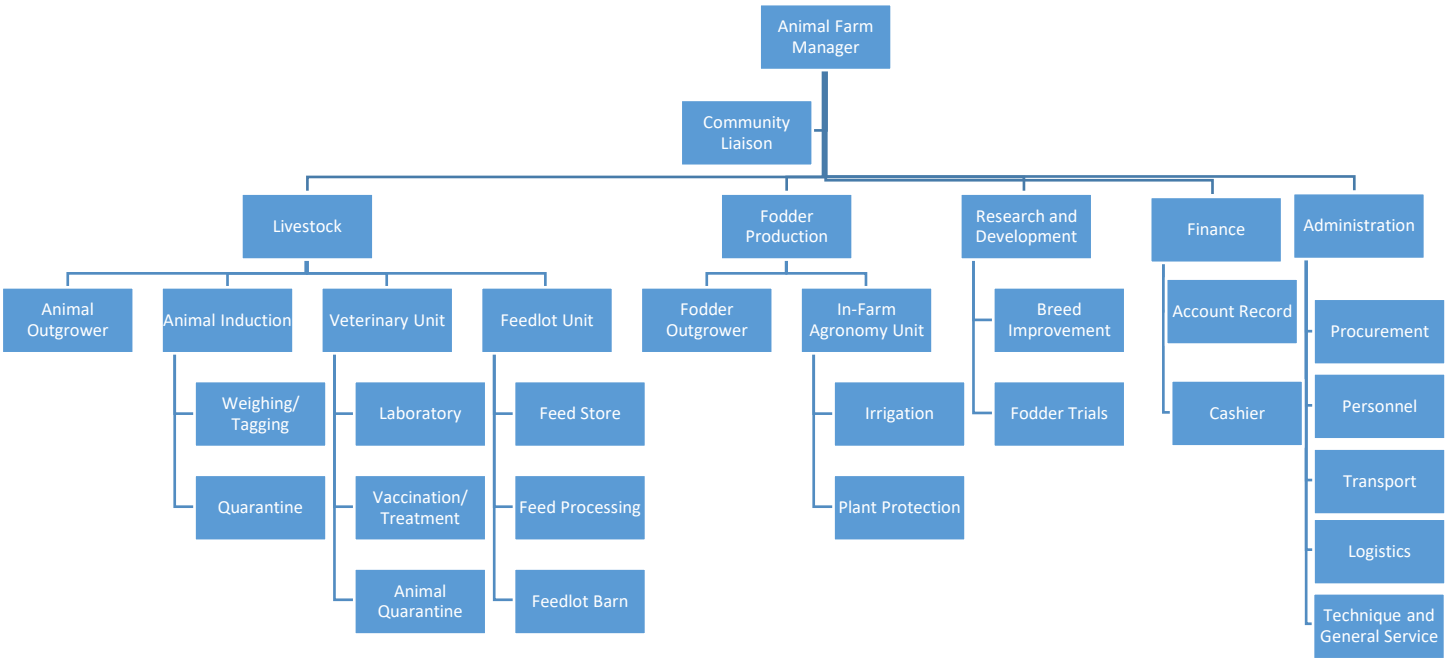
The project organogram on the first phase of its implementation is presented in Figure 4.4. The project will have a farm manager with a wide and long experience and professionalism to manage the overall operation with five departments under him: Livestock, Fodder, Research and Development, Finance and Administration. Each department will have a qualified person to manage and execute the tasks efficiently.

On the first phase of the project implementation, the farm will hire 213 employees on permanent basis at the 1st year of its operation and 478 employees on the 10th year of the project life. In addition, the project will also employ ranging from 1000 to 10000 casual laborers based on the seasonality of the fodder production.

Table 4.2. Manpower requirement for the project

Position	Rate		Year										
	Monthly	Qty	0	1	2	3	4	5	6	7	8	9	10
Managerial Posts			4	6	6	6	6	6	6	6	6	6	6
Project Manager	30000	1	1	1	1	1	1	1	1	1	1	1	1
Fodder Production Unit Head	15000	1	1	1	1	1	1	1	1	1	1	1	1
Animal Handling Unit Head	15000	1		1	1	1	1	1	1	1	1	1	1
Veterinary Unit Head	15000	1		1	1	1	1	1	1	1	1	1	1
Administration and Finance Unit Head	15000	1	1	1	1	1	1	1	1	1	1	1	1
Out-growers Scheme Unit Head	15000	1	1	1	1	1	1	1	1	1	1	1	1
Department Heads			7	11	11	11	11	11	11	11	11	11	11
Animal Handling Department				2	2	2	2	2	2	2	2	2	2
Animal Purchasing Section Head	10000	1		1	1	1	1	1	1	1	1	1	1
Feedlot operation Section Head	10000	1		1	1	1	1	1	1	1	1	1	1
Fodder Production Department			1	1	1	1	1	1	1	1	1	1	1
Veterinary Department				2	2	2	2	2	2	2	2	2	2
Vaccination and Treatment Section Head	10000	1		1	1	1	1	1	1	1	1	1	1
Laboratory Section Head	10000	1		1	1	1	1	1	1	1	1	1	1
Out grower Scheme Department			2	2	2	2	2	2	2	2	2	2	2
Promotion and Recruitment Section	10000	1	1	1	1	1	1	1	1	1	1	1	1
Extension service Section	10000	1	1	1	1	1	1	1	1	1	1	1	1
Administration and Finance Department			4	4	4	4	4	4	4	4	4	4	4
Finance Section Head	10000	1	1	1	1	1	1	1	1	1	1	1	1
Personnel and Logistics Section Head	10000	1	1	1	1	1	1	1	1	1	1	1	1
Technique Section Head	10000	1	1	1	1	1	1	1	1	1	1	1	1
Security and Safety Head	10000	1	1	1	1	1	1	1	1	1	1	1	1
Animal Handling Unit			**10**	**38**	**49**	**61**	**78**	**92**	**105**	**108**	**111**	**114**	**116**
Animal Purchasing Section				**4**	**6**	**7**	**9**	**11**	**13**	**13**	**13**	**14**	**14**
Animal Purchasers @ 1 per 20000 animals	20000	1		1	2	2	3	4	4	4	4	5	5
Animal Receivers @ 1 per 10000 animals	10000	1		3	4	5	6	7	9	9	9	9	9
Feedlot Operation Section			**0**	**14**	**19**	**24**	**30**	**36**	**43**	**44**	**45**	**45**	**47**
Feedlot team leaders @ 1 per 10000 animals	10000	1	0	3	4	5	6	7	9	9	9	9	9
Animals handlers @ 1 per 2500 animals	2500	1		11	15	19	24	29	34	35	36	36	38
Fodder Production Section			**10**	**20**	**24**	**30**	**39**	**45**	**49**	**51**	**53**	**55**	**55**
Unit Managers @ 1 per 100 Ha.	100	1	2	4	5	6	8	9	10	10	11	11	11
No of Field Foremen @ 1 per 25 Hectare	25	1	8	16	19	24	31	36	39	41	42	44	44
Veterinary Unit			**0**	**8**	**11**	**14**	**17**	**20**	**23**	**23**	**24**	**25**	**26**

Position	Rate		Year										
	Monthly	**Qty**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Veterinarians @ 1 Per 20000 Animals	20000	1		1	2	2	3	4	4	4	4	5	5
Number of Vaccinators @ 1 Per 5000 Animals	5000	1		5	7	10	12	14	17	17	18	18	19
Lab Technicians	5000	2		2	2	2	2	2	2	2	2	2	2
Out Growers Scheme Unit			**0**	**6**	**10**	**14**	**17**	**20**	**24**	**25**	**26**	**27**	**29**
Extension Workers required @1 per 500 HH	500	1	0	6	10	14	17	20	24	25	26	27	29
Administration and Finance Unit			**73**	**81**	**87**	**93**	**101**	**103**	**105**	**105**	**105**	**105**	**105**
Secretary	3000	1	1	1	1	1	1	1	1	1	1	1	1
Store Section		**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
Store Section head	3500	1	1	1	1	1	1	1	1	1	1	1	1
Store Keepers	2000	3	3	3	3	3	3	3	3	3	3	3	3
Finance Section		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Accounts Clerk	3500	2	2	2	2	2	2	2	2	2	2	2	2
Cashier	3000	1	1	1	1	1	1	1	1	1	1	1	1
Technique Section		**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**
Auto Mechanics	7500	2	2	2	2	2	2	2	2	2	2	2	2
Plumber	7500	1	1	1	1	1	1	1	1	1	1	1	1
Electricians	7500	2	2	2	2	2	2	2	2	2	2	2	2
General Mechanics	7500	2	2	2	2	2	2	2	2	2	2	2	2
Personnel and Logistics			**58**	**66**	**72**	**78**	**86**	**88**	**90**	**90**	**90**	**90**	**90**
Truck Drivers			2	4	6	8	10	10	10	10	10	10	10
Pickup Drivers			2	4	6	8	10	10	10	10	10	10	10
Tractor operators	Per Tractor	1	2	4	5	6	8	9	10	10	10	10	10
Tractor operators' assistants	Per Tractor	1	2	4	5	6	8	9	10	10	10	10	10
Security and Safety Section			50	50	50	50	50	50	50	50	50	50	50
Total No of Permanent Employees			**94**	**150**	**174**	**199**	**230**	**252**	**274**	**278**	**283**	**288**	**293**



4.4. Integrated Animal Farm Organizational Structure

4.3. Pasture Management

At the moment there is no paster management guideline developed. However, the project is expected to prepare pasture management plan and implement it as per the project development plan in a phased approach. If proper management plan is set, ppastures are kept in good condition by controlling weeds, fertilizing and most importantly, managing livestock. Implementing pasture management and grazing principles will increase forage yield and quality, provide a healthier place for livestock and improve farm aesthetics and overall productivity. It will also play important role in the overall environmental safety.

The paster management plan to be prepared will address in detail the following issues (components).

1) ***Management Plan -*** First is the management plan itself, which is the compilation and integration of the other six components listed below.

2) ***Pasture Management*** - Second is the pasture management plan, which includes the soils, forages and water resources. The management plan is grounded by the pasture management plan, which forms the foundation upon which the other components rest. The pasture management plan is the first component to address in intentional management.

3) ***Stocking Rate Management -*** Third is the stocking rate management plan, which entails the matching of grazing livestock numbers to forage production as well as managing and adapting livestock numbers as forage production changes within and throughout years.

4) ***Cattle Management -*** Fourth is the cattle management plan. The cattle management plan includes the breeding, nutrition, health and husbandry aspects of a cattle program, which ideally complements the land resources of the operation.

5) **5.** ***Marketing Plan -*** Fifth is the marketing plan, which leverages the attributes of the cattle and management for optimum economic results. Typically, this means managing the ranch resources so there is an element of flexibility within the stocking rate for retained ownership of calves or other stocker cattle enterprises as well as timing sales with favorable cattle markets and market cycles.

6. Record-Keeping System - The sixth component is a good record-keeping system for ranch operations. This is a record-keeping system that allows easy tracking and monitoring of critical production and economic information. It also provides managers the ability to conduct enterprise analyses, prepare financial statements, and develop monthly and annual operational reports.

7. Personnel Management Plan - The plan allows a manager to intentionally develop the skills and knowledge of ranch staff to build competencies and enhance their value to the operation. A personnel management plan addresses the needs of the operation, from onboarding a new employee to rewarding valued and tenured employees. It also includes performance evaluations, goal-setting sessions, training and professional improvement.

4.4. The Irrigation System

The water source for the farm will be from ponds and groundwater using boreholes fitted with submersible pumps which are going to be drilled. Detailed water resources assessment has been carried out by another consultant which revealed the availability of enough water source for the project. Beles has received the document. There is also additional adjacent basin to the west with likely large groundwater reserve that can be used in future whenever expansion is recommended.

The irrigation system will mainly be **center pivot type** with also potentially drip system. The farm will crop two or more times per year rotationally between corn and legume. Detailed irrigation system design has been carried out by another consultant. The schematic plan view of the design of the center pivot system is shown in Annex 5.

Drip (or micro) irrigation, also known as trickle irrigation, functions as its name suggests. In this system water falls drop by drop just at the position of roots. Water is delivered at or near the root

zone of plants, drop by drop. This method can be the most water-efficient method of irrigation, if managed properly, evaporation and runoff are minimized. The field water efficiency of drip irrigation is typically in the range of 80 to 90 percent when managed correctly. In modern agriculture, drip irrigation is often combined with plastic mulch, further reducing evaporation, and is also the means of delivery of fertilizer. The process is known as fertigation.

Deep percolation, where water moves below the root zone, can occur if a drip system is operated for too long or if the delivery rate is too high. Drip irrigation methods range from very high-tech and computerized to low-tech and labor-intensive. Lower water pressures are usually needed than for most other types of systems, with the exception of low energy center pivot systems and surface irrigation systems, and the system can be designed for uniformity throughout a field or for precise water delivery to individual plants in a landscape containing a mix of plant species. Although it is difficult to regulate pressure on steep slopes, pressure compensating emitters are available, so the field does not have to be level. High-tech solutions involve precisely calibrated emitters located along lines of tubing that extend from a computerized set of valves.

Center-pivot irrigation (sometimes called central pivot irrigation), also called water-wheel and circle irrigation, is a method of crop irrigation in which equipment rotates around a pivot and crops are watered with sprinklers. Center pivots are typically less than 1600 feet (500 meters) in length (circle radius) with the most common size being the standard 1/4-mile (400 m) machine. A typical 1/4-mile radius crop circle covers about 125 acres of land.

In this modern CV system, a circular area centered on the pivot is irrigated, often creating a circular pattern in crops when viewed from above (sometimes referred to as crop circles). Most center pivots were initially water-powered, and today most are propelled by electric motors. Center pivot irrigation is a form of overhead sprinkler irrigation consisting of several segments of pipe (usually galvanized steel or aluminum) with sprinklers positioned along their length, joined together and supported by trusses, and mounted on wheeled towers. The machine moves in a circular pattern and is fed with water from the pivot point at the center of the circle. It is by far more water efficient than the traditional furrow or flood irrigation system or old pressurized irrigation systems.

For a center pivot to be used the terrain needs to be reasonably flat; but one major advantage of center pivots over alternative systems that use gravity flow is the ability to function in undulating country. This advantage has resulted in increased irrigated acreage and water use in some areas.

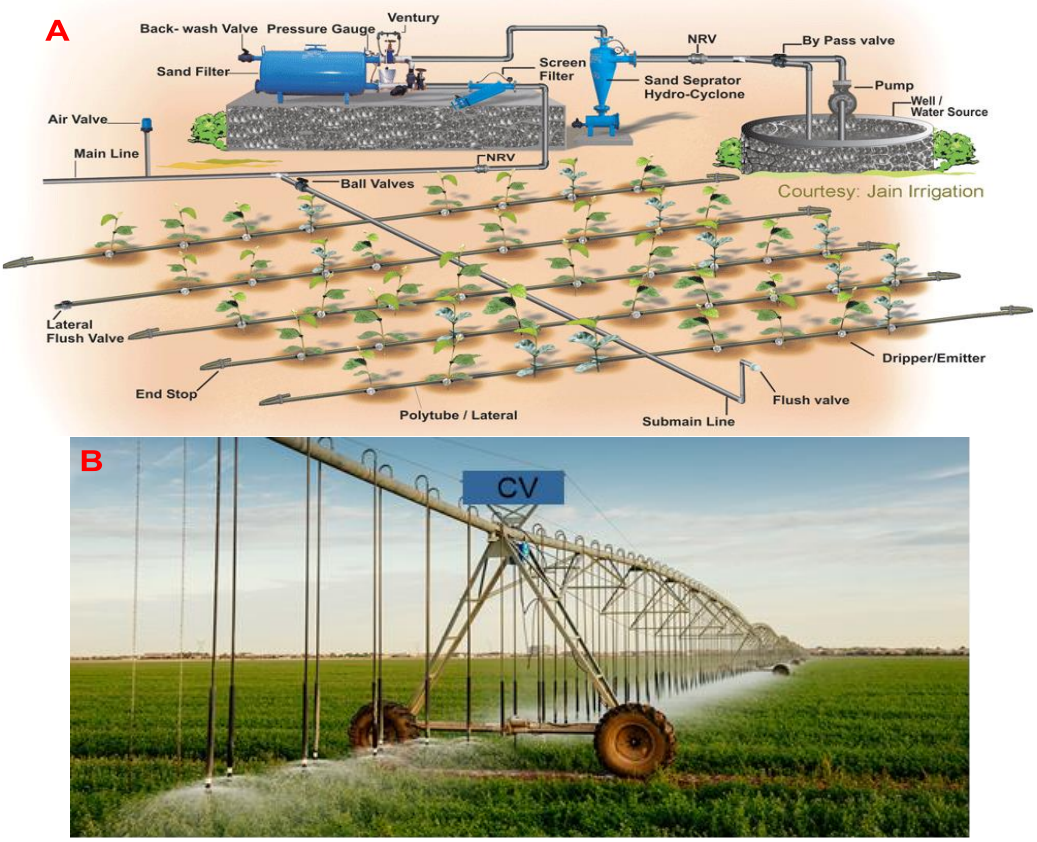


Figure 4.5. Illustrative plate showing drip (A) and center pivot (B) irrigation systems

4.5. Machinery and Equipment

The main equipment and machinery list for the project is shown in Table 4.2. In fact, no accurate information on the age and type of machineries and vehicles to be used has been obtained from the Client. The following figures are just indicative i.e. it is likely to change as the project progresses. At this stage, it is difficult to specifically give accurate numbers and types of machines and equipment to be used. With accurate figures and their mobility, the Green House Gas (GHG) emission rates could have been calculated correctly. In general, from the nature of the project and its size it can be anticipated that significant impacts on the air quality may not result.

Table 4.3. Indicative major machinery list for the project

No.	Major Machines/vehicles	Number
1	Feedlot mixer wagon	1
2	Feedlot tractors, to pull mixer	1
3	Front end loader	1
4	Tub grinder for hays	1
5	Heavy duty slasher	1
6	Root peeler	1
7	Root slicer for cassava & sweet potatoes	1
8	Forage chopper for all forages	1
9	Farm ute, for pen cleaning & feed distribution	1
10	Farm trailer for distributing forages	1
11	Tractor	1

***Remark**: In addition to the indicated major machines few vehicles and tracks could be used for transportation as full implementation stage of the project. The list is applied for slow-by-slow startup.*

In fact, GHG can be also generated from such facilities as animal feed preparation plants. At the moment the design of the plant and the technology to be used is not known. Furthermore, diesel generators for pumping groundwater could be source of GHG. But, it is expected that all boreholes will pump water using solar power /electricity. From the above list of machinery and scale of the project the GHG is insignificant and can be considered as not significant.

4.6. Project Phases and Development Schedule

As stated in the previous section the project represents Luna Slaughterhouse PLC's backward integration into feed crop farming and animal fattening by establishing a modern livestock farm and securing quality livestock (goat and cattle) on a long-term and sustainable basis. The Company's investment plan over the next two to three years includes investment in an out-grower program, irrigation systems, utilities and potable water supplies, animal housing construction, equipment, breeding animals and working capital.

The project is expected to start within a year and will eventually achieve a livestock holding capacity of over five a million in ten years as shown below.

Table 4.4. Planned number of Goats and cattle to be handled annually for ten years

Item	1	2	3	4	5	6	7	8	9	10
Goat	85000	162618	228035	299062	331083	369511	404787	442381	487796	526571
Cattle	12000	19713	29763	40688	47027	54275	58456	64841	70825	79142

The capacity to slaughter will be enhanced to about 360,000 animal per annum or over 1000 animals per day. With a quarantine period of 10 days and a fattening period of 45 - 60 days, the feedlot can run approximately 6.6 cycles per year (365 days / 55 days). Provided that the challenges related to the mindset of the pastoralists to start producing animals for market, based on the detailed work instructions on animal husbandry and side sales of the animals breaching the contract entered are solved stepwise.

To source livestock for its slaughterhouse, Luna works with selected traders who in turn source from smaller traders (animals ultimately sources from pastoralists.) Through the Project, AS advisory will work with 5,000 smallholders (including at least 1,500 women) to establish an out-grower scheme linked to Luna. These farmers and herders will benefit from improved breeding, feeding, fattening, and animal health and welfare support for their animals. They will also be introduced to better seed planting and growing techniques for feeding their herds, reducing their reliance on imported seed. This is important because the yield on goats (kilograms (kg) of meat per goat in Ethiopia is low (8.5kg) when compared to the yields in India (10kg), Kenya (10.6kg), Tanzania (12kg), Somalia (13kg), Australia (15.9kg), and Pakistan (20.7kg). IFC expects Luna will buy 50% of the animal fodder it needs from out growers and 38% of the animals it needs for slaughter (some of those it would buy as young animals for the feedlot and others as direct kill from farmers that follow Luna husbandry protocols). Luna's close integration with supplying farmers will enable it to increase supply and quality, better serve the seasonality of demand, and ensure and the animals its sells have uniform weight, be traceable to birth origins, and disease free.

4.7. Waste Management

The wastes to be generated could be solid and liquid. At the moment there is no any infrastructure such as landfills sites in the project area. There is no also visible large disposed waste within the

project area at the moment. The sources of the major wastes come from the ranch and related structures such as animal feed processing plant, animal dung, animal feed wasted, wastes from office and residential areas, stores, machinery leaks, etc. The nature of the wastes is also highly viable. The effect of the waste on the biophysical environment is addressed in detail in later chapters.

The project will try to use waste produced by the ranch beneficially. The waste site will be designed in such a way that it will not pollute mainly the productive aquifer system. The organic wastes could be used as compost for the farm. This requires separating the solid wastes in to different categories. Special emphasis has to be given to separate hazardous wastes and organic wastes for proper disposal and reuse in the latter case.

The project is expected to adhere to best environmental protection and management practices. Particular care has to be given to handle properly potentially hazardous wastes and other agrochemicals. As such dedicated facility would be constructed for management of hazardous wastes. A dedicated pad has to be constructed for hazardous waste, which will be used to store waste that has potential adverse impacts. The potential sources will include reagents packaging, old oil containers, general hazardous substances from offices and the feed lot site and veterinary facilities. In addition, dedicated area will be allocated for storage of general waste like kitchen and office waste, feed lots, building rubble, and recyclable wastes, etc.

4.8. Roads

The farm can be accessed through gravel road in a very bad condition that goes from Berhale town to the farm. This road is not in good condition. The main asphalted road that goes from Jinka to Addis Ababa passes close to the farm. Roads within the farm must be constructed properly to reduce the negative impact of the dust.

Figure 4.6. Partial view of the access road that goes to the farm

4.9. Water Supply System

The entire water source for the project is expected to be drawn from drilled boreholes, rainfall and ponds that will collect water from overland flow (surface runoff). Unfortunately, the rocks in the

area (basement complex metamorphic and intrusive) are not good to store large and deep groundwater system. However, the thick sediments overlying the basement could form shallow and intermediate depth aquifers. The groundwater is likely to be shallow and unconfined aquifer system.

To maximize the sub-surface water utilization, drilling more wells in a distributed manner is a good strategy. The aquifers are only present in the southern part along the dry stream course. It is important to use water efficient irrigation system.

4.10. Power Supply

Power for the project will be sourced from the Ethiopian national power grid. The project would request from the relevant section of the Ministry of Water and Energy for a connection point from the nearby Berhale town which is around 7 km south of the farm. The area has also good potential for using solar energy.

5. PROJECT ALTERNATIVES

The aim of this chapter is to analyze reasonable alternatives (including the no project option) for the proposed project, site, technology, design and the processing in terms of potential impacts on the environment and their relevance to local conditions.

5.1. Alternative Location

The physical boundaries of the project are defined by the location of economically and environmentally sound reasons. In fact, there are many regions in Ethiopia that can be used for modern ranch. The selected range land is ideal for ranch with its own fodder farm as compared with many regions. The population living in the area is well experienced in rearing different animals. There is also very wide area that can be developed further for similar purposes. The out-grower service will also benefit the local community. It is not also far from the big local markets following the route from Jinka town all the way to Addis Ababa. Although there are still a number of places to be used for ranch development in SNNPR of Ethiopia in the future the chosen site is ideal in all terms and to begin with.

Area is already identified adjacent to the project site for expansion in full consensus with the regional government to approve once the project start implementation in alignment with the plan. There are no people to be displaced as a result of the project implementation. All community members are in support of the project.

5.2. Alternative Livestock Acquisition

The project is expected to grow its own better breads of cattle and goat. It has also out grower plan to provide better breeds to the local community. The community in return sells livestock to Luna. The majority of the community in the sub-region have well established experience in livestock rearing as they are mostly semi-pastoralists. acquire livestock from the local community. Certainly, this approach is the most feasible and more economical option that benefits both Luna and the local community. Therefore, it can be concluded that there is no better alternative at this stage of the project (phase I).

5.3. Alternative Technologies

The technology options for the farming and associated infrastructure is assessed. The fodder farm is expected to use state of the area water efficient pressurized drip and center pivot irrigation systems. This is the best option against flood or furrow irrigation systems that often used in areas with more water and surface water systems. The later irrigation system is not convenient for groundwater-based irrigation systems. Hence, the technology chosen is the best option.

Pressurized irrigation and groundwater pumping demand energy source. For this there is power supply system from the national grid. Although, the cost for energy is higher it is available. There is no other option rather than using groundwater and ponds for irrigation and animal drinking. The quality of the water is also likely to good as observed from the in-situ tests and the local geology observations.

The size of the center pivot and drip irrigation systems is not yet defined. Drip irrigation requires high level management and more investment cost. Furthermore, it requires highly skilled professionals. As the farm is basically for fodder production the center pivot irrigation system is by

far better than drip, although it requires more water. Drip irrigation is extremely recommendable in areas where there is no enough water. The proportion of drip and center pivot system will be defined based on the amount of the groundwater which will be known after drilling and pumping test.

5.4. Alternative Water Supply

The possible sources of water supply in the area are rain and underground water. The area has relatively better groundwater shallow groundwater as studied by another consultant for this project.

Underground water at the required scale demands higher investment and operating costs. It is not also advisable to pump groundwater from environment point of view unless the recharge rate is higher than the consumption. The hydrological study in the region revealed that the groundwater recharge for the valley from the surrounding highlands is very high.

Water harvesting from rain is an alternative considered for additional animal drinking and farming. But, the hydrogeological condition of the valley floor is not conducive to store surface water. Any water that drains to the floor of the plains in the lowlands finds its way to the groundwater. But, local ponds with impermeable liner or ground treatment could be developed as supplementary water use.

5.5. Design Alternatives

The consultant has acquired the preliminary design of the project. The sites chosen for infrastructural development (e.g. Irrigation system, pond, reservoir site, building sites and stores etc.) upper to be well designed in relation to the local geology, geomorphology, hydrology and land use. However, borehole drilling sites must be chosen at relatively lower elevations far from local hills as much as possible close to streams and galleys. In case of water stress in the future there are alternative sources outside the project areas to the west and south. Furthermore, as the project expands there is a chance to even use the Woyeto river, although the distance is a bit far.

5.6. Design of Livestock Acquisition

The project will have its own livestock development facility. Furthermore, through the out-grower unit, livestock is expected to be acquired from the local community. The out-grower unit will enroll smallholder farmers who are willing to be part of the program and enter the contract with the farmers. It will register the animals in the program and provide the support until the time the animals are inducted to the farm. The support includes training, veterinary services, breeding improvement activities, fodder production operations both for their own stock and to be sold to the farm. Extension workers will be assigned in each community to support the smallholders in modern husbandry techniques: How to produce appropriate animal feed, how to store the feed, how to feed the animals and, in general, how to raise their animals efficiently. Finally, better animal breeds will be sold to the project back. This will benefit both project and the local community.

The acquisition of livestock from the local community living in the area through the out-grower unit is very interesting program. However, as an alternative better breeds could be sought from abroad or breeding centers in Ethiopia in the future when the project expands. As an alternative, still there is ample chance to acquire livestock far from the immediate environment including the Borena and Guji zones of Oromia and far to the Kenyan border area in South Omo zone.

5.7. Other Infrastructures

The consultant has reviewed the preliminary report of the farm and associated infrastructures. Generally, the design scheme is acceptable. The assessment of the farm and its environs in relation to the local surrounding geomorphology, topography and the technology to be used including accessibility of the sites it is acceptable. The client is also willing to use it as it stands now for the first phase of the project. Therefore, no better alternative is suggested in terms of design and location. However, in the future where modern slaughter house is going to be erected within the farm, the design could be revisited.

5.6. The "no project" option

The assessment of this option requires a comparison between the alternative of proceeding with the proposed project with that of not proceeding with the proposed project. The proposed modern ranch will result in a loss of current grazing land uses within the proposed areas, which may include in the future for subsistence agriculture. Upon closure, the ranch site will be rehabilitated to as close to pre-project capability as practically possible. Therefore, the majority of the rehabilitated areas could be used for pre-project or modern farming uses after closure.

The project has the potential to uplift the local communities by providing employment opportunities, out grower services, technology transfer and providing veterinary services.

The proposed project also represents a relatively large private sector investment and its success will have a positive impact on the national and local economy in the short term. Potential negative impacts on the environment can be managed to acceptable levels if the recommendations in the EMP are successfully implemented.

Thus, the "no project" option would result in a lack of:

- Employment opportunities for local communities;
- Training and development of skills
- Out grower services
- Marketing for local community veterinary services
- Financial benefits for the Ethiopian Government at the local, regional and national levels.

6. BASELINE CONDITIONS OF THE PROJECT AREA

6.1. The Physical Environment

6.1.1. Settlement and Existing Infrastructures

As compared with many areas in southern Ethiopia, the sub-region is not densely populated. Relatively, the area around the town of Jinka is more populated. The towns are located along main all weather and asphalted roads. The most important towns in the region are Jinka (zonal capital), Key Afer (Woreda capital), Kako. Berhale and Alduba. The nearest town for the farm is Berhale where the local community sells their products and gets basic services (Figure 6.1).

Figure 6.1. Google Earth Image of landmark sites in the area

The settlement in the project area is sparse. The communities living in the areas are semi-pastoralists. Seasonally they take their livestock to the Weyto river basin to the south along the river course and hills with grass.

The project site is located in virgin land with no settlement inside the area. With regard to associated facilities with the project there is nothing visible in the area. Existing foot path is being used as road to reach the farm. This will be upgraded to a new all-weather gravel road that can play important role for the mobility of the local community. Otherwise, there is no any facility that can be directly associated with the project area.

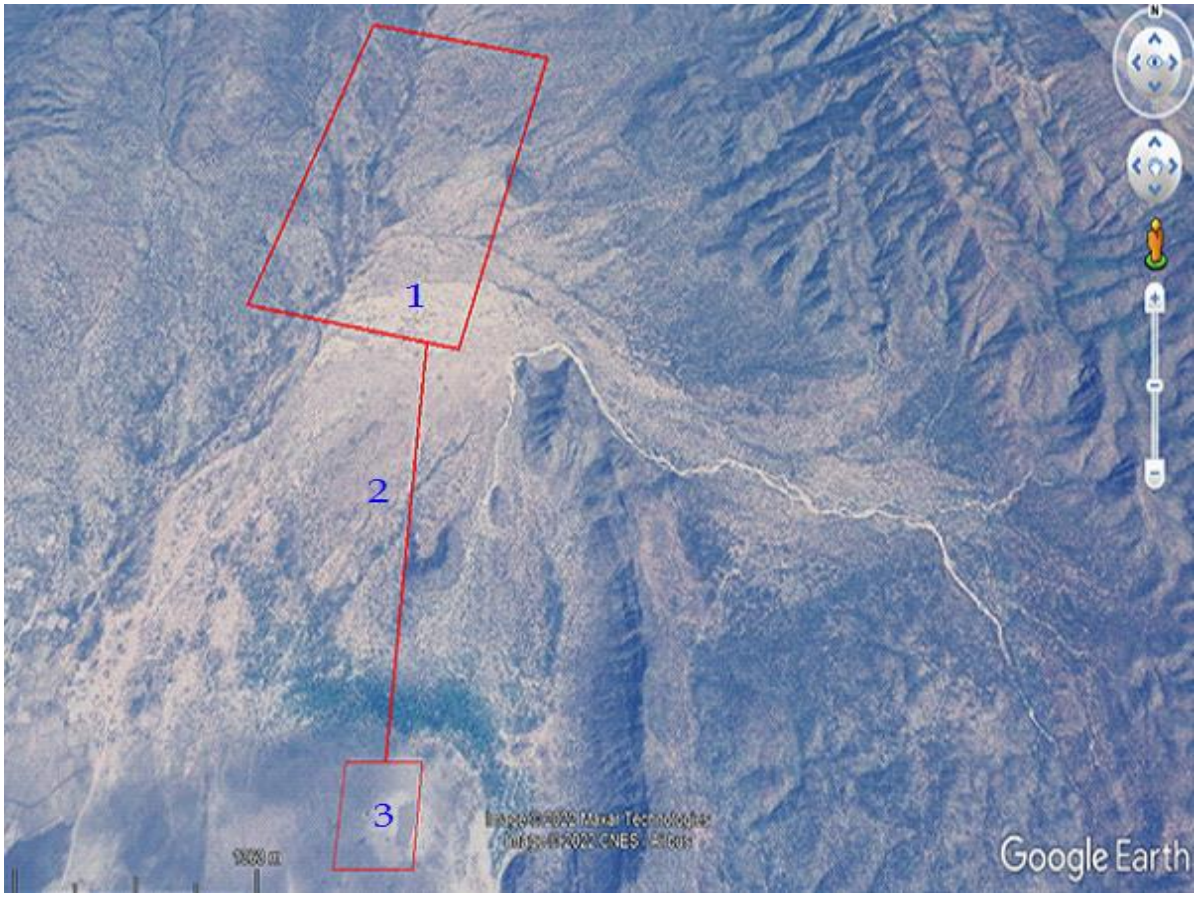


Figure 6.2. Google earth partial view of the project area and its environs

Remark: 1= Farm Land, 2=Water Canal, 3=Water Pond

There are scattered houses outside the project area. Most of these are temporary that serves the pastoralists during the grazing season. Within the project area there are also permanent houses with farm plots a bit far from the project area along the access road. Most of these houses are simple huts constructed out of wood and grass.

Figure 6.3. Typical settlement (housing) in the area

6.1.2. Basic Services

The mobile network and internet are functional in the majority of the woreda. There is also electricity in the nearby towns. There are health posts and secondary and primary schools within the Kebele at Berhale town.

The road network in the region is not good. The project area can be accessed from Addis Ababa by plane through Jinka (Zonal Capital) then to Bena Tsemay worda by car through asphalted and gravel road. From Key Afer the project site is some 30 km to the east. Most of the project area is vegetated with many indigenous trees, bush and grass land. Proper road construction is required to access the farm throughout the year. The exiting road may not be good enough to be used during heavy rainfall.

6.1.3. Hydroclimate

The project area can be classified as 'Kola' (sub-tropical) climate). The nearest meteorological station is located in Jinka town. According to the National Meteorological Service Agency, Southern Zone, Jinka station, the mean annual rainfall of the area is 1249 mm, and mean monthly average temperature of the same is 22 ^{o}C. The project area is likely to have slightly lower rainfall and high temperature.

The climate of Bena-Tsemay Woredas is hot to warm semi-arid with altitudinal variation of 500m to 1800m. The average daily temperatures range between 15.6°C to 26.5°C in Bena-Tsemay and altitude varies from 450 m to 1765 m.a.s.l. with average annual rainfall of 400 mm. The rainfall is bimodal, with the long rain season from April to June and the small rains in September and October. The wet season is between June and September and the dry season lasts from December to March. In general, the study area has an erratic, variable rainfall and high ambient temperature ranging from 26 to35^{o}C.

Table 6.1 shows the summary of the climatic classification [long-term monthly rainfall (Pm) and rainfall Coefficient (Rc)] of the sub-region (Daniel Gemechu, 1977). The long-term average monthly climatic data at Jinka which is assumed to be more or less the same as the project area is summarized in Table 6.1. Figure 6.4 and Table 6.2 shows the temporal variations of minimum, maximum and average monthly temperature.

Table 6.1. Long-term mean rainfall and rainfall coefficient at Jinka

Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pm(mm)	49	61	115	182	166	104	108	96	112	145	111	51
Rc	0.45	0.56	1.06	1.68	1.53	0.96	1.00	0.89	1.03	1.34	1.02	0.47

On the basis of the rainfall coefficient values, months in the year are classified in to three.

i) Dry months: December, January and February
ii) Small rainy months: June and August
iii) Big rainy months: March, April, May, June, July, September, October and November

Like in most parts of Ethiopia, the diurnal variation of temperature in the study area is more visible than its seasonal variation. Attempt was made to calculate the long-term monthly average climatic

data of the project site based on Localism software developed by FAO. The result is summarized in Table 6.2.

Table 6.2. Climatic data at the project site

Monthly ETo Penman-Monteith - D:\book\Location_3.pen

Country: LocClim_Single_Point Station: Location_3

Altitude: 940 m. Latitude: 5.37 °N Longitude: 36.90 °E

Month	Min Temp	Max Temp	Humidity	Wind	Sun	Rad	ETo
	°C	°C	%	km/day	hours	MJ/m²/day	mm/day
January	14.1	29.7	74	95	7.9	20.0	3.95
February	15.3	30.0	77	104	8.4	21.7	4.32
March	16.6	29.7	81	173	6.2	19.1	4.12
April	16.6	26.7	83	130	7.5	21.0	4.03
May	16.2	25.5	87	104	5.7	17.5	3.32
June	15.6	24.7	86	104	5.8	17.2	3.19
July	15.3	24.2	71	95	4.7	15.8	3.19
August	15.3	24.7	67	104	3.8	14.9	3.23
September	15.3	25.3	72	86	5.5	17.8	3.50
October	15.8	26.0	90	95	6.7	19.2	3.50
November	14.1	26.8	68	69	7.9	20.1	3.73
December	13.6	29.0	83	69	8.4	20.3	3.73
Average	**15.3**	**26.9**	**78**	**102**	**6.5**	**18.7**	**3.65**

Source: Weyto Data source (LocClime, 2022)

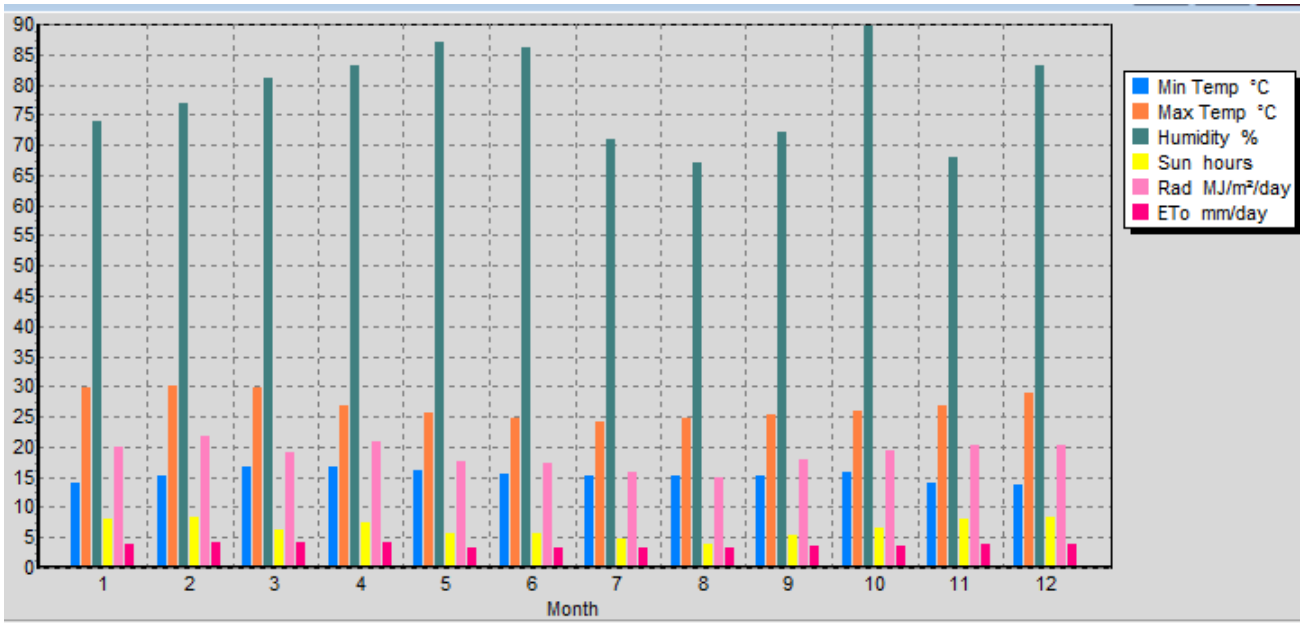


Figure 6.4. Long-term mean monthly climatic data

Rainfall distribution, evapotranspiration, geology, slope and vegetation cover affects the amount of runoff in any area. High rainfall, non-weathered, higher drainage density and higher slope increase overland flow, while low rainfall, high evapo-transpiration, gentle slope results in low runoff.

The study area is bounded by ridges. Most of the farm area is flat with small galleys. To the east the project site is boarded by seasonal stream. Otherwise, there is no perennial river in the project area. As most of the land is flat and highly vegetated surface runoff is very low. Stream channels experience flooding soon after rainfall. Most streams are ephemeral. As a result, there is serious water shortage for the local community.

The farm area is found at the watershed divide of the bigger Chew Bahir and Turkana basins. The total catchment area for the streams in the project area is very small. This also has influence on groundwater recharge.

6.1.4. Topography and Drainage

The sub-region is typically of Precambrian basement and metamorphic geomorphology. The region is undulating with low drainage density. The low drainage density is related to the geology of the area. The rocks are not easily erodible. Geomorphologic features are usually created by erosion and intrusion in the area. The farm is surrounded by hilly areas to the west, north and east. The Weyto River elevation is 515m to the east. Within the project area the elevation difference is not dramatic.

Within the lower elevation areas there are seasonal streams. These rivers drain both to the Weyto River to the east and the Lake Turkana basin to the west. The most important rivers modifying the geomorphology of the sub-region are Sheba, Kaske, Gilesha, Dukule, Kako Shewshew and Segen. Figure 6.5 shows the Digital Elevation Model (DEM) of the project area with E-W cross-section extracted from SRTM DEM.

The elevation ranges from a little above 600 up to 1300 m.a.s.l. The lowest position is the stream adjacent to the eastern boundary of the farm. Much of the farm area is within the range of 600 to 700 m.a.s.l.

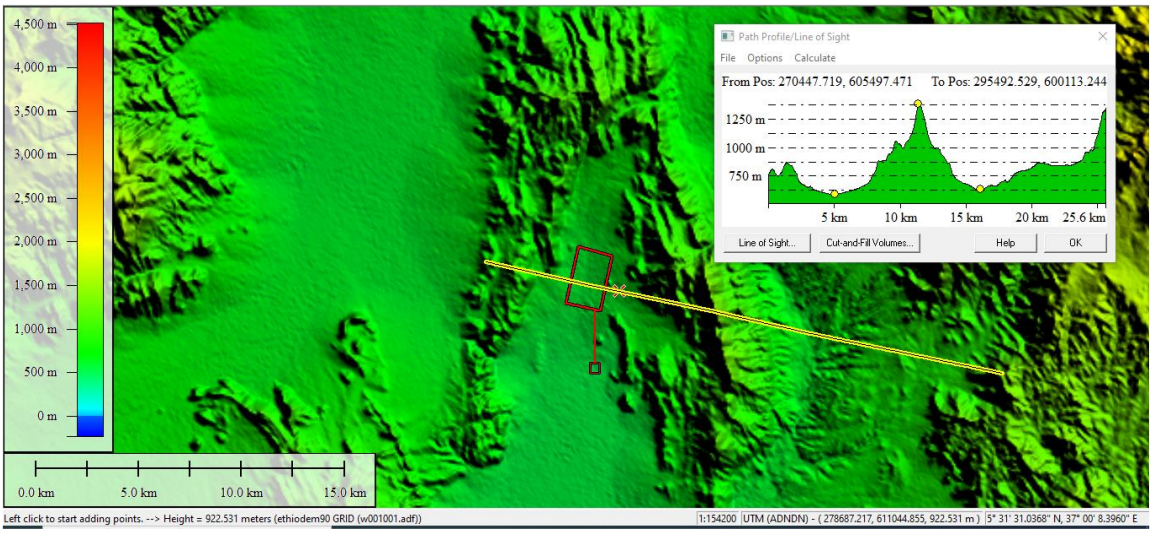


Figure 6.5. SRTM DEM of the farm area and its environs

The area is almost the water divide of the Omo (Turkana) basin to the west and the Weyto (Chew Bahir) basin to the east. In the farm area the drainage density is very low. No large galleys and stream channels exist. The drainage density in the surrounding hilly areas is low. The drainage pattern is dominantly dendritic. There are no perennial rivers in the area. The streams in the valley floor are seasonal and ephemeral. The only perennial river in the region is the Weyto river located some 10

km east of the project area. During the peak wet season part of the valley experiences flood and soon after the wet season the water infiltrates into the aquifer. As most rocks are less permeable the recharge is low in the underlying hard rocks. The rainfall goes as surface runoff. The catchment area is also not much as it is close to two major river basins i.e Chew Bahir and Omo (Turkana).

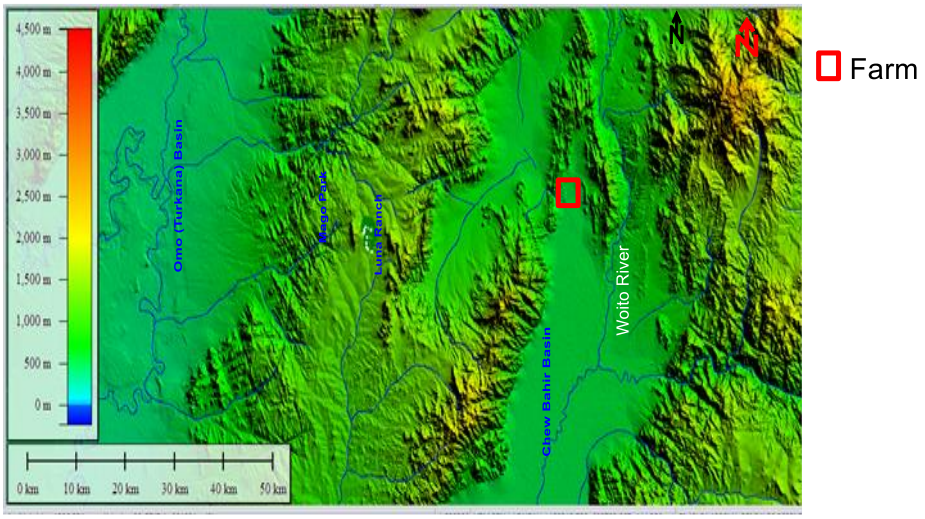


Figure 6.6. Drainage of the area superimposed on SRTM DEM

6.1.4. Land Use/Land Cover

The natural vegetation that exists in the elevated areas provide various ecosystem services including fuel wood, charcoal and hosts limited wild animals in the region. The vegetation cover is characterized by scattered woodland and some densely vegetated shrubs and trees.

The surrounding hills are dominantly covered with virgin forest and bush land. But, within the farm area there are different land use / land cover units. Much of the farm is characterized by scattered trees and grass land; followed by farm plots. There is also forested area. Houses are mainly constructed out of wood with grass cover and few with iron sheets (Figure 6.7).

Figure 6.7. Major land use / land cover units in the area

(Remark: 1 = houses (settlement); 2= farm land; 3= vegetated area with tree; 4 = grass land with scattered trees, and 5= road)

6.1.5. Soil and Farming

Soils are formed either by chemical or physical weathering processes which involves the erosion of parent material in to fragmented mineral particles and dissolve mineral in the solution then transported by different agents such as water, wind and ice. This resulted in deposition of weathered minerals which facilitates the formation of soil. Parent rocks could also be changed in to soil through physicochemical processes in situ. Biological processes could also play a role in soil formation.

The degree of weathering and the hydro-climatic conditions affect the thickness of soils. In areas with more rainfall the soil development or thickness is high. In the project area the soil formation is good. Most soils are alluvial with limited residual soils with little thickness. The typical soils are sandy and silty sand type. Black cotton soils are non-extent. The sand dominates over the silt size particles.

Figure 6.8. Typical soil type of the project area

The vegetation cover of the study area is a mixture of *Acacia, Boswellia* and *Commiphora* woody species and short grasses type with varying density of woody vegetation. The major cropping season in mid land areas of Bena Tsemay woreda are;'Belg' and 'Mehere' mixed cropping (sorghum with common bean) is common. In the specific project area farming is limited. The farm area is entirely vegetated with mixed grass and bushes. There is no trace of farmland inside the project area. Land preparation is mainly done by oxen and the frequency of tillage is determined by crop type, soil type and oxen availability.

6.1.6. Geology

The region has very complex geomorphology and geology. The rocks range in age from recent undifferentiated sediments to the oldest Precambrian basement complex rocks. The Precambrian rocks of granite, gneisses, pegmatite vein and quartzite rocks, which are exposed in mountainous areas. In plain lowland areas the basement is covered with Quaternary sediments. The rocks are extremely fractured and faulted.

Three groups of rocks could be identified in the sub-region. In the order of their age (from the youngest to the oldest) they are Quaternary sediments, volcanic rocks and basement Precambrian rocks. The volcanic rocks are confined around the hills of Jinka area. The other two types of rocks are present in the project area.

6.1.6.1. Lithology in the Project Area

1. Quaternary Sediments

These rocks cover the basement in almost all the farm area. The farm area is mapped as Quaternary sediments. However, it was observed that in few places the basement rocks are exposed along road cuts and stream banks. The soil gradually tends to be weathered rock. The alluvial sediments are confined in the eastern part of the project area.

2. Basement Complex Rocks

The typical rocks in the study area are granites and granodiorites with different associated metamorphic rocks. Crystalline basement is exposed in elevated areas and Weyto horst (which is found west of Weyto town). These are outcrops of rocks belonging to the crystalline basement complex, which are composed of granites, gneisses, schist, feldsphatic gneiss and quartzites. The rocks of the basement complex are gradually overlain by a series of unconsolidated material of sands, and silt which are commonly termed alluvial or lacustrine sediments of Quaternary age.

The metamorphic basement rocks are highly deformed and metamorphosed and reach granulite faces (Davidson 1983). The metamorphic basement rocks are belonging to the high-grade belt. This belt is mainly composed of various coarse grained and foliated rocks. The rocks of this complex are metamorphosed to the highest degree ranging from amphibolites to granulite facies which refers to the Hamar Domain. Structurally broad and gently dipping synforms and antiforms, overturned and recumbent isoclinal folds are characteristic styles. Foliation is generally sub-parallel to the layering sometimes making slight angles to it.

There are also different types of schists in the mountainous areas. These include muscovite-quartzite, mica schist, biotite schist and the hornblende schist. Biotite-schist in some areas forms an outer rim to the zoned bodies.

6.1.6.2. Structural setting

The geological structures such as faults, folds, joints, foliations play important role as water storage, and the former two particularly by juxtaposing rocks of different ages and character side by side play great role by acting as barriers and conduits there by influencing the groundwater flow.

The study area is part of the Ethiopian southern rift. These include, the southern continuation of the main Ethiopian rift system, the Chew Bahir rift, both having symmetrical grabens and border the study area from the east; and the Turkana depression bounding the study area from the west. The Chew Bahir rift breaks northward in to several smaller rifts north of Weyto and terminates towards Bala and Maze rifts, west of the main rift shoulder. The Turkana depression includes the southern component of Turkana rift, which continues northward to southern Ethiopia where it is manifested by several rifts; Omo rift, Usno rift, Kibish rift which themselves end against the southern Ethiopia plateau along their strike. The rift structures play important role in the localization of groundwater.

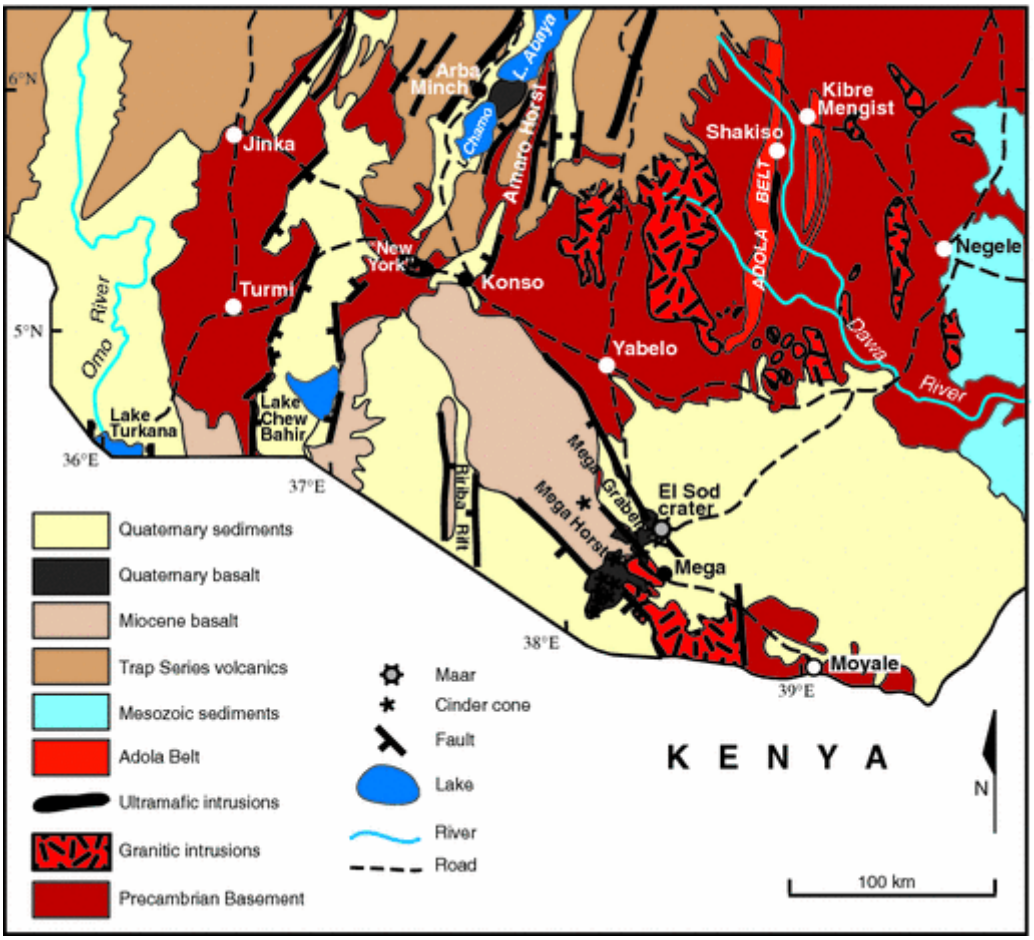


Figure 6.9. Simplified geological map of the sub-region

Figure 6.10. Typical basement rocks of the project area (gneiss and weathered schist)

6.1.7. Hydrological and Hydrogeological setting

6.1.7.1. Hydrology

The hydrology of the region is strongly dependent on the geology, topography, land use and climate. The study area is confined within a small catchment bounded to the east and west by mountain ranges. The farm is exactly located in the middle of the two ridges. To the north also the area is bounded with hilly area. All surface runoff from these elevated areas converges towards the center

where the farm is located. The area designated as pond construction site is seasonally inundated by surface runoff. There are small seasonal streams draining to the south.

As the farm area is more vegetated surface runoff is low. But, in less vegetated farmland overland flow could be relatively higher. This is evident from a number of flat areas with no vegetation as a result of seasonal inundation.

The only perennial large river in the area is the Weito River. There is no gauged stream in the area, as all of them are seasonal. But, to understand the general sub-regional picture of runoff processes the record from the Neri River near Jinka is shown in Table 6.3. The stream flows (discharge) in the study area generally increases from April through October and decreases from November to March. Minimum flows occur in February and the highest flow period occurs in October.

Table 6.3. Average runoff at Neri River gauge near Jinka (as mm runoff over catchment)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mean	14.2	12.8	15.2	**53.0**	**67**	**44**	**60**	**73**	**52**	**92**	**37**	**24.2**	544
% CV	77	89	137	**100**	**61**	**58**	**74**	**114**	**69**	**145**	**74**	**67**	54

6.1.7.1. Hydrogeology

As compared with the geology the hydrogeological setup of the region is simple. Groundwater is localized in thick Quaternary sediments (mainly along stream/river courses and depressions) and in weathered and fractured basement complex rocks. The volcanic rocks in the region are not widespread. Otherwise, if they present in depressions, they form important aquifers. Generally, this part of the country does not have very high groundwater potential.

Recharge is also low. Important factors that control groundwater recharge, circulation and storage depends on: 1) geomorphological situation, 2) vegetation cover, 3) climate and hydrometeorological situation, 4) permeability of rocks, i.e. degree of weathering, jointing and fracturing effect of rocks; grain size, shape and sorting, type and degree of cementation of alluvial and colluvial deposits, 5) geological structures/fractures which increase the accumulation of groundwater, 6) the nature and frequency of aquifer and aquiclude layers etc. These factors have been accounted in the study of the water resources of the area by different consultant. In this study focal area for drilling has been identified. So far, no drilling has been started.

Generally, three hydrostratigraphic units could be identified.

1. **Porous Media Aquifers –** These are localized in undifferentiated Quaternary sediments. These aquifers are located along the bank of streams in low-lying areas. The yield of these aquifers is very limited. It is this type of aquifer that dominates in the farm area.

2. **Fractured Basement Aquitards –** The basement rocks are highly fractured and weathered. Below the soil zone there are different types of rocks forming these types of aquifers. They are the most dependable type of aquifers in the area. However, these aquifers are not laterally extended. They are hydraulically connected with the porous media aquifers. Hence, the two hydrostratigraphic units are the source of most wells in the region. Many hand dug wells fitted with hand pumps and in few cases with submersible pumps form the major aquifers in the region. Groundwater is structurally controlled in many places.

3. **Aquitards** – Non-fractured and hard rocks form regional aquitards. These are found mainly below the above two units. In general, productive aquifers are found in less than 100 m depth in the region. There is no deep aquifer unless the sediments are very thick like the lower Omo valley.

Pumping test data of 2 shallow wells and one deep well have been checked in previous hydrogeological investigation in the sub-region. The aquifer hydraulic parameters from these wells could provide good picture of the hydrogeology of the area.

1. Kako shallow well

This shallow well was drilled at position of UTM Adindan 37N at 239667E, 626547N and 1355 m.a.s.l with a total depth of 55m. Main water strike was occurred at 9-15m and the main aquifer found was sand. Constant pumping test rate of 2.2l/s was registered for 15 hours where progressive changes in water level reached 12.10m. The transmissivity was estimated at 2.49 x 10^{-2} M^2/min and a hydraulic conductivity of 4.98 x 10^{-3} M/min. The specific capacity is 31.36l/min/m with a safe yield of 17 l/sec.

2. Alduba deep well

This well was drilled at position of UTM Adindan 37N 235157E, 599984 N and 1307masl with depth of 145m. Main water strike was occurred at 9-15m and the main aquifer found was fractured granitic gneiss. Constant pumping test rate of 5.7 l/s was registered for 24 hours where progressive changes in water level reached 50.62m from static water level of 10.12m. The specific capacity and safe yield was found to be 8.44 l/min/m and 9.30 l/sec respectively.

3. Birale deep well

The well is drilled to a depth of 83m, is found at geographic location of 37E 0278277E, 0592788N and 575 m.a.s.l. Constant pumping rate 4 L/sec was registered for 24 hours where the water level reached at 35.14 meter with total draw down of 4.44 meter. The static water level is 30.7 meter. The specific capacity and safe yield is 54.05 l/min/m and 30.45 l/sec respectively. This well is exceptionally good. Probably, at this point major structure might have been encountered.

As part of the baseline data well yield information has been collected in the sub-region. Table summarizes the data.

Table 6.4. The discharge of existing well in the sub-region

ID.No.	Easting	Northing	Elevation	Keble	Estimated Discharge	Type of scheme	Remark
1	238325	598714	1320	Alduba	0.5	Shallow well	Functional
2	235980	600122	1316	Alduba	0.5	Shallow well	Functional
3	235282	600015	1312	Alduba	0.5	Shallow well	Functional
4	235157	599984	1307	Alduba	5.7	Borehole	Functional
5	248653	610130	1575	Keyafer	2.5	Borehole	Functional
6	247272	609222	1536	Olkakibo	0.5	Shallow well	Functional
7	240524	622355	1289	Bonker	9.7	Borehole	Functional
8	240711	622412	1285	Bonker	0.5	Shallow well	Functional
9	239584	626348	1333	Bonker	0.5	Shallow well	Functional
10	243067	621616	1345	Mukecha	0.5	Shallow well	Non-Functional
11	241943	608639	1383	Sheba	0.5	Shallow well	Functional
12	238602	609024	1314	Gurmamero	0.5	Shallow well	Functional
13	237758	608275	1289	Gurmamero	0.5	Shallow well	Functional
14	233759	608312	1286	Gurmamero	0.5	Shallow well	Functional

ID.No.	Easting	Northing	Elevation	Keble	Estimated Discharge	Type of scheme	Remark
15	236172	606553	1244	Dizzy Ama	0.5	Hand dug well	Non-Functional
16	235127	603889	1302	Dizzy Ama	0.5	Shallow well	Functional
17	243597	609315	1417	Shaba	0.5	Shallow well	Functional
18	249413	629362	1331	Chale	0.5	Shallow well	Functional
19	247810	627898	1334	Chale	0.5	Shallow well	Functional
20	247572	626883	1311	Chale	0.5	Shallow well	Functional
21	247918	626594	1299	Chale	0.5	Shallow well	Functional
22	236280	628287	1375	Goldiya	2.5	Borehole	Functional
23	236338	628227	1371	Goldiya	0.5	Shallow well	Functional
24	235823	628917	1399	Goldiya	0.5	Shallow well	Functional
25	236603	627946	1374	Goldiya	0.5	Shallow well	Functional
26	236202	626396	1327	Goldiya	0.5	Shallow well	Functional
27	243659	618456	1369	Mekocha	0.5	Shallow well	Functional
28	244574	618438	1389	Mekocha	0.5	Shallow well	Non-Functional
29	231285	584718	1222	Sile	0.5	Hand dug well	Functional
30	231481	584590	1218	Sile	0.5	Hand dug well	Functional
31	231358	583253	1202	Sile	1	Hand dug well	Functional
32	231481	583283	1199	Sile	1	Hand dug well	Functional
33	230850	586152	1221	Sile	1	Hand dug well	Functional
34	228532	585348	1214	Sile	1	Hand dug well	Functional
35	232530	587060	1241	Morgala	1	Hand dug well	Functional
36	233303	588932	1262	Morgala	1	Hand dug well	Non-Functional
37	233149	590551	1273	Morgala	1	Hand dug well	Non-Functional
38	242977	621394	1345	Mukecha	0.5	Shallow well	Non-Functional
39	242578	617043	1409	Mukecha	0.5	Shallow well	Functional
40	246828	614812	1584	Argo	3	Shallow well	Functional
41	248616	611439	1588	Olkakibo	0.5	Shallow well	Functional
42	248737	611347	1578	Olkakibo	0.5	Shallow well	Functional
43	233348	592119	1287	Bori	1	Hand dug well	Functional
44	233385	592238	1286	Bori	1	Hand dug well	Functional
45	233410	593447	1301	Bori	1	Hand dug well	Functional
46	233637	593614	1309	Bori	1	Hand dug well	Functional
47	232450	595421	1333	Bori	1	Hand dug well	Functional
48	239432	595540	1409	Gurdo	0.5	Shallow well	Non-Functional
49	239502	595520	1417	Gurdo	0.5	Shallow well	Functional
50	239570	594927	1436	Gurdo	0.5	Shallow well	Functional
52	281127	589487	587	Birale	6	Borehole	Non-functional
53	274070	597977	540	Encheate	0.5	Shallow well	Non-functional
54	274231	597727	541	Encheate	0.5	Shallow well	Functional
55	261940	604004	621	Luka	0.5	Shallow well	Functional
56	261215	603735	629	Luka	15	Borehole	Functional
57	260219	604739	630	Luka	0.5	Shallow well	Functional
58	250657	605834	1127	Shaba	0.5	Spring	Functional
59	262040	615779	627	Sitimba	0.5	Shallow well	Functional
60	262276	614403	624	Sitimba	0.5	Shallow well	Functional
61	261730	612650	616	Sitimba	0.5	Shallow well	Functional

ID.No.	Easting	Northing	Elevation	Keble	Estimated Discharge	Type of scheme	Remark
62	261382	609691	598	Sitimba	0.5	Shallow well	Functional
63	261380	610933	608	Sitimba	0.5	Shallow well	Functional
64	262939	560342	521	Bura	0.5	Shallow well	Functional
65	264302	575941	544	Bola	0.5	Shallow well	Functional
66	265726	574812	537	Bola	0.5	Shallow well	Functional
67	268066	579973	538	Gisma	18	Borehole	Functional
68	576157	264396	530	Gisma	0.5	Shallow well	Abandoned
68	269582	582913	545	Duma	0.5	Shallow well	Functional
69	270549	587080	550	Duma	0.5	Shallow well	Functional
70	273610	590383	549	Duma	0.5	Shallow well	Functional
71	273554	590444	549	Duma	9.46	Borehole	Non-functional
72	274534	590325	551	Duma	0.5	Shallow well	Functional
73	254773	584779	1169	Ollo	2.5	Spring	Functional
74	252856	587928	966	Shalla	0.5	Shallow well	Abandoned
75	258302	601296	669	Luka	0.5	Shallow well	Non-functional
76	259046	602730	649	Luka	0.5	Shallow well	Non-functional
77	247031	586799	940	Ansonda	0.5	Shallow well	Non-functional

6.2. The Biological Environment

6.2.1. Flora

From biodiversity point of view Ethiopia is one of the richest countries in the world. Ethiopia's natural vegetation is composed of four biomes. The first is savanna, which is in wetter portions of the western highlands, consists of montane tropical vegetation with dense, luxuriant forests and rich undergrowth. The second biome is mountain vegetation; it comprises montane and temperate grasslands and covers the higher altitudes of the western and eastern highlands. The third biome, tropical thickets and wooded steppe, is found in the Rift Valley and Eastern Lowlands. The fourth biome is desert steppe vegetation, which covers portions of the Denakil depression. The project area is grouped in the third biome.

It is estimated to have nearly 7,000 species of higher plants, of which about 12% are endemic. The vegetation types with the highest portion of endemics are the woodlands, followed by the Afroalpine and Sub-afro-alpine. Ethiopia is the Centre of origin for various crop species including Arabica coffee, teff, enset (Ensete Ventricosum) and sorghum in part (State of the Environment Report for Ethiopia – August 2003).

The region is majorly characterized by thick vegetation (wood land species in the highlands) dominated by Acacia spp. and with considerable densely vegetated land with shrubs dominated by *Dodonaea Angustifolia*. In the district it is also rarely found woody and herbaceous climbers. As per the secondary data obtained from the woreda and previous studies in the region the project location the vegetation cover is high. There are a variety of trees and bushes with grass land.

Generally, in Bena Tsemay woreda there are a variety species of natural vegetation. The species of grasses, legumes, sedges, other herbaceous plants and woody plants that include the common and/or dominant grass species *Cenchrus ciliaris* and Cynodon *dactylon* and *Tetrapogon tennulis*.

The common and/or dominant woody species in the communal grazing areas were highly palatable species of Acacia tortilis and Grewia bicolor and less palatable Solanum species. In riverside grazing areas, the common and/or dominant woody plants were species of Acacia tortilis, Grewia bicolor, and Solanum species while further away from the project location; species such as Acacia brevispica and Acacia tortilis were found. Generally, vegetation cover in the study area varies from place to place.

The vegetation of the districts is dominated by varying densities of *Acacia, Grewia and Solanum* woody species and 35 herbaceous species of grasses and legumes can be found (Admasu et al., 2010). The dominant land use in Bena-Tsemay is predominantly agro-pastoral land use. More than 48% of the total land area of the woreda is used for grazing and/or browsing by cattle, sheep and goats (Admasu et al., 2010). The following tables show major herbecious species and their ranks in Bena Tsemay woreda.

Table 6.5. Major Herbecious species in Bena Tsemay woreda (with their vernacular names in Bena language), their abundance ranked

Benagna Language	Scientific Name	Ranking
Turna	*Indigofera spicata spira*	**1**
Kontsala	*Cyperus bulbosus*	**2**
Garant	*Vernonia natalensis*	**3**
Mugr	*Crotalaria incana*	**4**
Zaki	*Vigna unguiculate*	**5**
Zersi	*Cynodon dactylon*	**6**
Erbo	*Ormocarpum mimosoides*	**7**
Mara	*Tetrapogon teneullus*	**8**
Enku	*Lablab purpureus*	**9**
Gojo	*Euphorbia tirucalli*	**10**
Gaya Ukuma	*Tribulus terrestris*	**11**
Sepety	*Rhoicissus tridentata*	**12**
Mesta	*Achyranthes aspara*	**13**
Malo	*Capparis tomentosa*	**14**
Ganaya	*Tribulus terrestris*	**15**
Pelik	*Digitaria abyssinica*	**16**
Melkela	*Dovyalis abyssinica*	**17**
Gali	*Tephrosia species*	**18**
Tire	*Lawsonia inermis*	**19**
Menzo	*Lantana camara*	**20**

Table 6.6. List of major browse species for goats in Bena-Tsemay Woreda (with them Vernacular names in Bena language), their abundance ranked

Benagna Name	Scientific Names	Ranking
Tulungo	*Sclerocarya birrea*	1
Pulanti	*Acacia seyal*	2
Zurguma	*Avicennia manna*	3
Zergo	*Acacia brevispica*	4
Ara	*Terminalia brownie fresen*	5
Mega	*Annona senegalensis*	6
Banaki	*Cenearia diacrostadilia*	7
Kelansa	*Acacia polyacantha*	8
Arike	*Acacia sieberiana*	8
Menzo	*Brachimia discolor*	9
Goleli	*Acacia toritilis*	10
Dile	*Dichro stachys cinerea*	11
Jamo	*Entada abyssinica*	12
Domoko	*Belanites aegyptila*	12
Galansa	*Acacia albida*	13
Moshiko	*Indigofera spicata spira*	14
Lelo	*Acacia nilotica*	15
Kenya	*Ekebergia capensis*	16
Anshali	*Crotolaria spinosa*	17
Briza	*Bridelia micrantha*	18
Bitsobitso	*Mytenus ovatus*	18
Gedake	*Dalbemergia melanoxylon*	19
Sefiti	*Bridelia micrantha*	20
Gelife	*Combretum molle*	21
Gergeta	*Vitellaria paradoxa*	22
Mekela	*Grewia tenax*	23
Kufre	*Albizia lophantha*	24
Chakanti	*Grewia tenax*	25

***Source**: Hidosa, D. and Hailu, Shagnachew enbela: Feed Resource Inventory and Feed Balance in Bena-Tsemay Woreda of South Omo Zone, South Western Ethiopia*

The local people derive a significant proportion of their food and energy requirements from various indigenous trees and shrubs (wild edible plants which are not cultivated) and these are used by local communities to fill the gap of seasonal food shortages. When interventions that are not meant to rehabilitate or reproduce the existing flora and fauna are introduced, it is obvious that losses occur as these plants are destroyed during site clearing and excavation activities. Basic information pertaining to wild fruit species is available from the local people who are the custodians of these resources and knowledge about them.

Some wild edible plants were well known in the study area more than others. As a result, local informants cited the most commonly used plants repeatedly as supplementary foods to the staple food. And those important and useful trees and bushes identified by the communities and which are likely to be stamped out from the project location due to the intervention had been identified with the locals (list not exhaustive of course); photo also captured by their vernacular names (Bena Tsemay language) these categorized, taxonomically- However, they strive well in other location out of the target area and as such they are not going to be totally destroyed.

Hence, it is important that the promotion of wild edible plants as valuable resources is supported to improve household food security, nutrition and income, especially for households living in the project location. Besides it is recommended that selective clearing is carried to enable In-situ conservation of the edible trees and shrubs through the participation of the local communities.

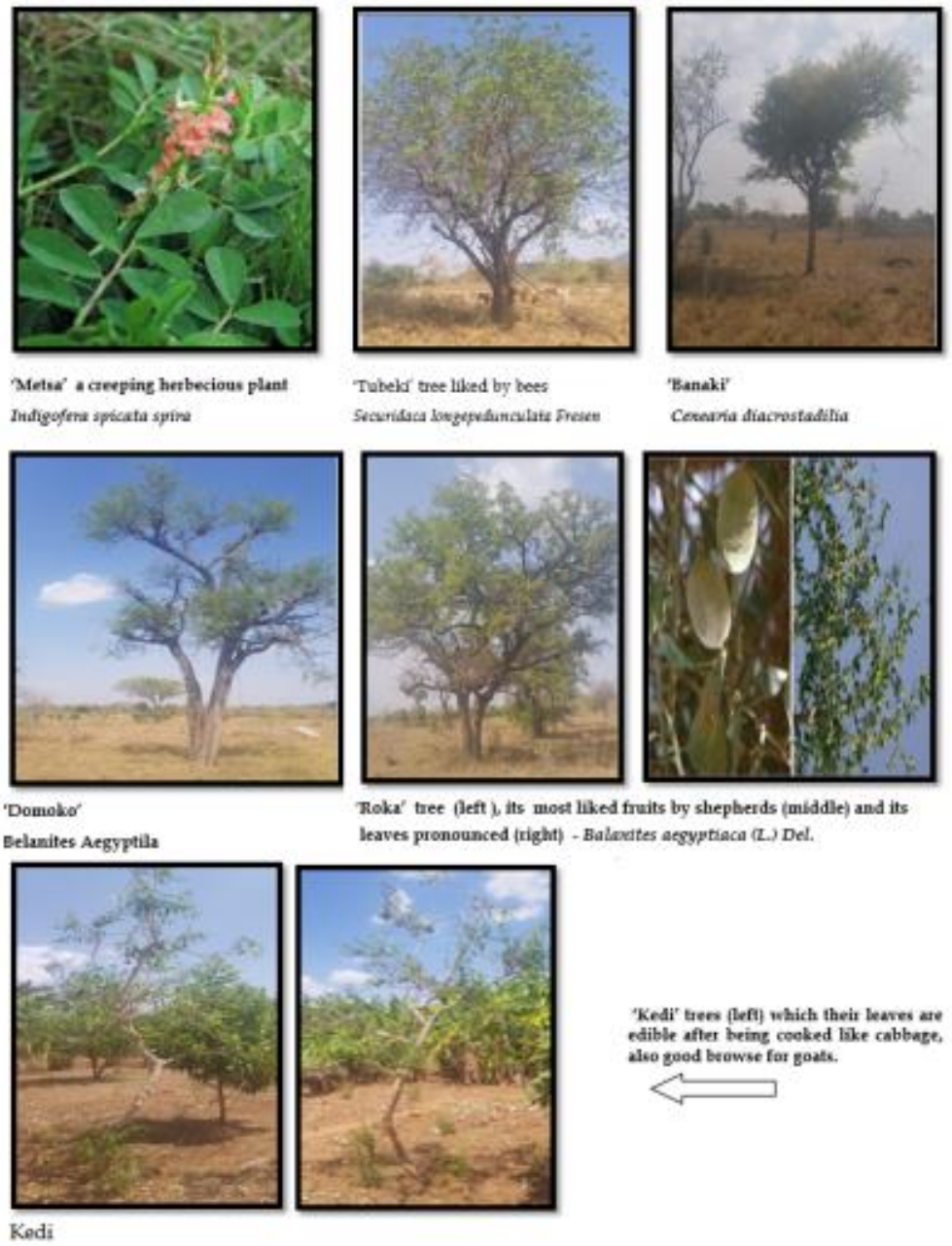


Figure 6.11. Typical common tree is the sub-region

1. 'Metsa' a creeping herbaceous plant which its leaves are consumed, cooked as cabbage also mixed with flour of different grains
2. 'Tubeki' a tree liked by honey bees mostly used for hanging traditional bee hives.
3. 'Banaki' is another tree most liked by Honey bees and the tree is unique in that it is drought tolerant and is known to flower all-round the year. Due to its upright stature and hardiness, it is known to be termite tolerant and is preferably used for construction of mud and grass houses.
4. 'Domoko' is a horny tree which its leaf is most liked by all sorts animals. Goat, sheep, cow and camel. It is mostly used during the time of grass scarcity. Shepherds usually climb the tree to remove leafy branches and feed the leaves to their animals.
5. Tree 'Rokoa' it is a fruit bearing tree and the fruits are enjoyed by shepherds who are taking care of their animals during field grazing.

6. 'Kedi' tree which its leaves are edible cooked like cabbage during food shortage (at times of drought) also the leaves are liked by goat so much.

Besides deforestation dust deposition on the remaining vegetation will also affect the survival of the rest of the flora at initial construction stages of project. But as the problem is short lived and the problem occurs during initial stages of construction the effect is not significant.

On the other hand, in the project location, there is a well-established fiber plant botanically named as Agave Sisalana (sisal) widely grown as natural living fence on farm border and beyond it. The sisal plant, if wisely used, can also positively impact the project. Sisal is flowering plant species native to southern Mexico, but widely cultivated in Ethiopia and elsewhere. Its family is Asparagaceae; Genus Agave, Kingdom Plantae. It is one of the most important fiber crops and its fiber is traditionally used for rope and twine, and has many other uses, including paper, cloth, footwear, hats, bags, carpets, geo-textiles, and making dartboards. It is also used as fiber reinforcements for composite fiber-glass, rubber and cement products. So, the study team here suggests that the project to consider the use of this particular plant as natural live fence to the ranch, furthering its production across the farm border. Instead of constructing artificial cemented walls or barbed wire made of iron, which are also expensive. As planting two or more rows of sisal on farm border can also serve the same purpose.

Generally, the sub-region has great potential for a modern ranch development. The existing license areas are nucleus farm which is already enough to start project.

6.2.2. Fauna

Wildlife can be considered as one of the most important Ethiopian natural resources. Out of 277 mammals 31, out of 862 birds 16, out of 201 reptiles 10, and out of 63 amphibians 34 are endemic to Ethiopia. Out of the bird's species, 31 are globally threatened. There are 5 mammals and 3 birds found endangered in Ethiopia (State of the Environment Report for Ethiopia – August 2003).

Generally, human intervention in the area, consisting of expansion for agriculture and grazing practices and encroachment for fuel wood and construction has significantly affected the vegetation cover in the area. Hence, it could not provide a good habitat to support diverse wildlife species. However, according to the Woreda office and local people, species that are common in many parts of the country like spotted hyenas, hare, fox, duiker, warthog, jackal, dikes etc. are present in the area. There are no rare or endemic animal species in the project Area.

The wildlife information in the project area and its immediate environs were obtained through:

1) **Formal and informal discussions** with the local communities, elders and experts living in the project area based on their daily experience and historic observation had enabled to identify the animals that frequent the project area; and
2) **Visual Observations**: Visual observations were made by traversing the study area and very common vertebrates and invertebrate's wildlife were observed and their images captured.

Moreover, evidence of their presence was studied in the form of tracks, nests, burrows, feathers etc. Based on the assessment, the number of wildlife species in the project area and its environs is listed in Table 6.7. The assessments also indicate that there are no endangered, endemic or rare species in the project area. Some of the species are listed as Least Concern and Vulnerable on the IUCN

(International Union for Conservation of Nature and Natural Resources) Red List data. The following wild animals are expected to exist in the area; mainly in the mountainous woody areas.

Table 6.7. Lists of wildlife species identified in the project area

S.No.	English or common name	Scientific name
1.	Hyena	-
2.	Gazelle	-
3.	Jackal, golden	Canis aureus
4.	Hog	Hylochoerus meinertzhageni
5.	Frog	-
6.	Lizard	-
7.	Python	-
8.	Snake	-
9.	Guinea fowl/Quail	-
10.	Porcupine	Hystrix cristata
11.	Goose/Egyptian Goose/	Alopochen aegyptiacus
12.	Ant	-
13.	Black beetles	-
14.	Grasshopper, Green	-
15.	Butterfly	-
16.	Termite	-

6.3. The Socio-economic Environment

The project's long-term viability is highly dependent on how well it integrates with the local population. The initiative must benefit the community and provide the people a sense of ownership. The project's negative effects on the community must be limited, if not non-existent. The consultant's expert team held extensive discussions with the local community and other stakeholders at all administrative levels. In a nutshell, this section deals with the socioeconomic baseline conditions. The views of the community are captured and minuted (see annex).

The data was gathered through a combination of desk research and field investigations. In Chapter 7, the project's impact is discussed in depth. Only baseline socioeconomic data and information on basic services are presented in this section.

6.3.1. Survey Approach and Methodology

Prior to the field work, questionnaires and checklists were prepared, and key informants and community members and experts were selected. Community consultation, key informant interview, and household survey were conducted. Representatives from the woreda and kebele administration were present throughout the engagements. In the Enchete kebele, a total of 22 families have been identified for a household survey.

The list of persons consulted and stakeholders and the questionnaire used are annexed. Purposefully selected community members were invited for community consultation meetings. Unanimously the participants supported the implementation of the project

Key informants from kebeles, woreda and zone, were consulted. The goal of these meetings is to learn about stakeholder reactions and perspectives on the project, develop strategies to reduce potential negative environmental impacts while enhancing positive impacts, and ensure community and government participation in the development of impact mitigation measures of the project. The

outcome suggests that the project's implementation has a lot of support at all levels. All stakeholders insisted to commence the project as urgently as possible. They also recommended that the client must give emphasis to the local community in the course of recruiting the work force.

Figure 6.12. Consultation with stakeholders

6.3.2. Brief Description of the Woreda

The project area is located in the arid Weyto valley with sparse population destruction. Most of the area is vegetated with limited settlement. The only town in the area is Weyto (Berhale). There are 34 woredas in the zone. Out of these only 4 are urban woredas.

Generally, the project area and its environs are inhabited by semi-pastoralist community. The inhabitants belong to the Berayle tribe. Agricultural practice is very limited. They are mainly cattle and goat growers. Camel is almost nonexistent. Sheep are not also common in the project area. During adverse dry season the community temporarily leaves to southern Turkana and Chew Bahir basins.

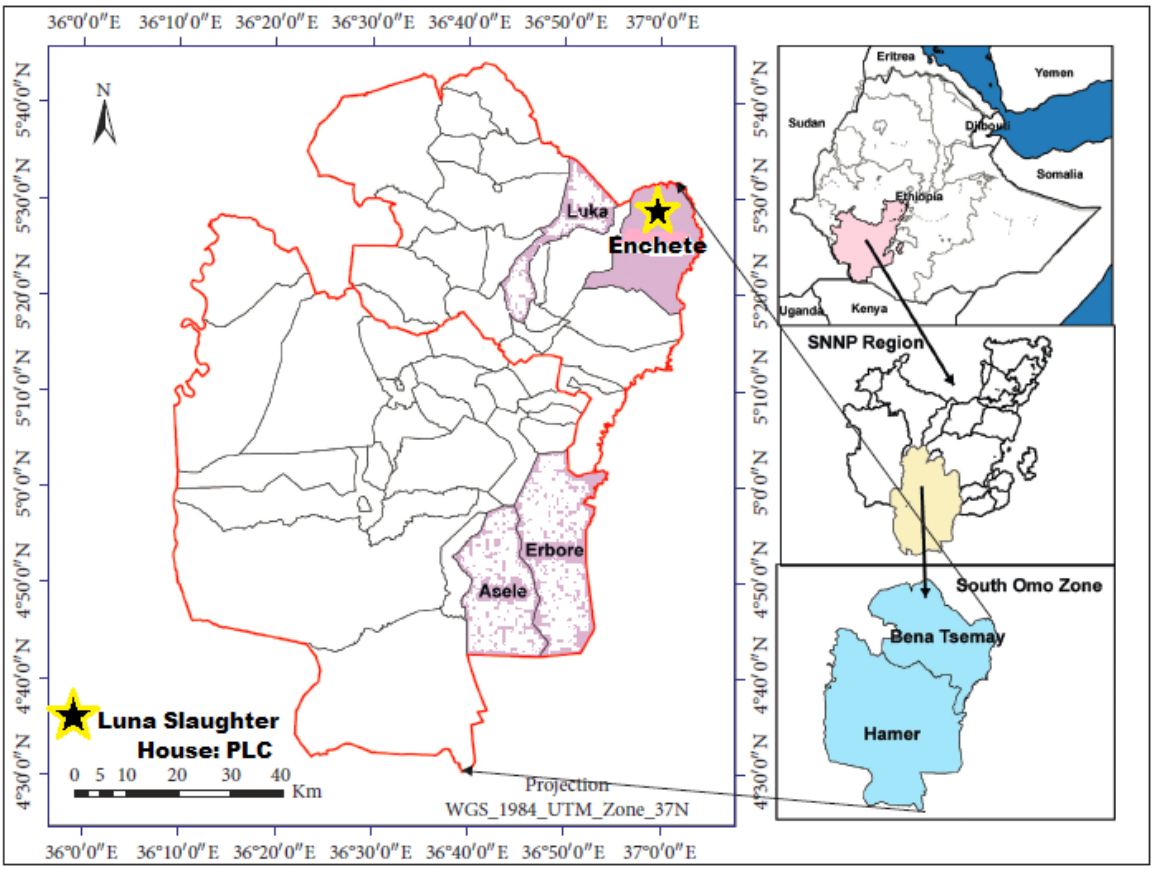


Figure 6.13. Bena Tsemay woreda and location of the proposed project

6.3.3. Population

According to the Bena Tsemay woreda's socio-economic profile data, the Woreda's total population in 2022 is expected to be 78,946, with a male population of 39,947 and a female population of 38,999. The rural population accounts for 88.2 percent of the total population, while the urban population accounts for 11.8 percent. The population density per square kilometer is 25 people.

6.3.4. Ethnicity, Language and Religion

The South Omo Zone is home to 16 ethnic groups, three of whom live in Bena Tsemay woreda, namely Bena-Tsemay, and Berayle. The graph below depicts their demographic statistics. In terms of their religious beliefs, the majority of them are traditional religious followers.

6.3.5. Livelihood and Economic Activities

This region is categorized under southern Agro-pastoral Livelihood Zone (USID, 2005). The average household's considerable livestock holdings and the presence of good grazing land makes the region appropriate for modern ranch development. Agricultural productivity is minimal in comparison to other livelihood zones in the SNNPR, despite the abundance of cattle and livestock products. This is primarily due to the fact that sedentary farming is a relatively new practice in the area. Though there is good agricultural potential if water access is expanded, the area's biggest long-term promise appears to best for livestock production. The community relay on animal rearing and farming. They also depend on forest products (edible fruits, trees, gum and honey).

The crops they cultivate include maize, sorghum, tomato (locale) and other limited perennial crops. There is no much fruit trees in the area. Although livestock and agriculture are important contributors to the local economy, the vast majority of people living in rural areas (88.2%) practice

agriculture as their additional source of income. They entirely depend on rain-fed agriculture. They use hand tools.

South Omo Zone is known by the rich livestock resources. The majority of tribes rely on animal husbandry. The livestock population of the woreda is summarized below.

Table 6.8. Livestock population

No.	Livestock Type	Number
1	Cattle	533,830
2	Sheep	218,808
3	Got	953,944
Total		1,725,869

Source: Woreda Socio-Economic Profile, March, 2022

6.3.6. Household Survey Result

Household survey has been carried out based on well framed data collection instruments (questionaries). The outcome of the survey result is briefly summarized below.

6.3.6.1. Profile of the Household Survey Respondents

A total of 27 households were chosen based on statistically accepted population based on purposive random sampling technique. Out of the 27 respondents 8 are women.

Due to cultural barriers, men typically take the lead in daily decision-making and participation in outdoor activities such as off-farm and on-farm activities. In the current study, the gender of the household head revealed a substantial difference between female and male-headed families.

The age distribution of the respondents is shown below. The respondents age range between 18 to 60 years.

Table 6.9. Age distribution of respondents

			Age			Total
			18-30	30-50	50-60	
Gender	Male	Count	8	11	0	19
		% Within Gender	42.1%	57.9%	0.0%	100.0%
	Female	Count	2	2	4	8
		% Within Gender	25.0%	25.0%	50.0%	100.0%
Total		Count	10	13	4	27
		% Within Gender	37.0%	48.1%	14.8%	100.0%

The family size in the project area ranges from 1 to 10. Most of the household have family size more than 6 which accounts 63 %. The remaining 37% have less than 6. The average household size is 5.2.

6.3.6.2. Views towards the Implementation of the Project

The outcome of the household survey and the community consultation meeting is more or less the same. All respondents do not have objection in the implementation of the project.

The reasons of support are mostly related to the high chance of income generation from better livestock breed rearing and better job opportunity. Generally, from the KII, FGD and HHs it is evident that the project has overwhelming support.

Whereas the respondents' have some concerns. One of the key issues is related to selective job opportunity. The repeatedly insisted that priority has to be given to the local community in the course employing personnel (both skilled and unskilled). They also insisted that the area should not be extensively deforested because, most people relay on forest resources for their livelihood.

Droughts are becoming more common in the area, possibly as a result of long-term climate change, contributing to rangeland resource reduction which resulted in the increasing rivalry among pastoralists for communal grazing land. During times of drought, when grazing is difficult, mobility is an important pastoral risk management approach. Therefore, during droughts not only the community living in the vicinity but also many of the region's pastoralists mobilize their livestock to the area where water and grass is easily available. In this connection, the community expects more positive role from the consultant in knowledge transfer on ways of getting sustainable animal feed.

6.3.6.2. Water Supply System

The woreda is water scares. The rural community is mainly using traditional unprotected ponds, low discharge springs and hand-dug wells. In few kebeles there are protected hand dug wells fitted with hand pumps. In urban centers there are boreholes with submersible pumps. The Weyto River remains the main source of water across the sub-region.

In the project area the main water source comes from streams (seasonal), ponds and hand dug wells. In many places they dig river bed sand and get water. The majority of the people use the ponds during the wet season. These ponds are also used for washing and animal watering.

The summary of water supply sources at the woreda level is shown in Figure 6.13. There are 87 hand-dug wells in the woreda, seven developed springs, and 45 shallow wells with hand pumps. In rural Kebele, the coverage of potable water supply is roughly 63.05 percent, based on a daily usage of 25 liters per person. 41% of the total constructed water supply schemes are not operational.

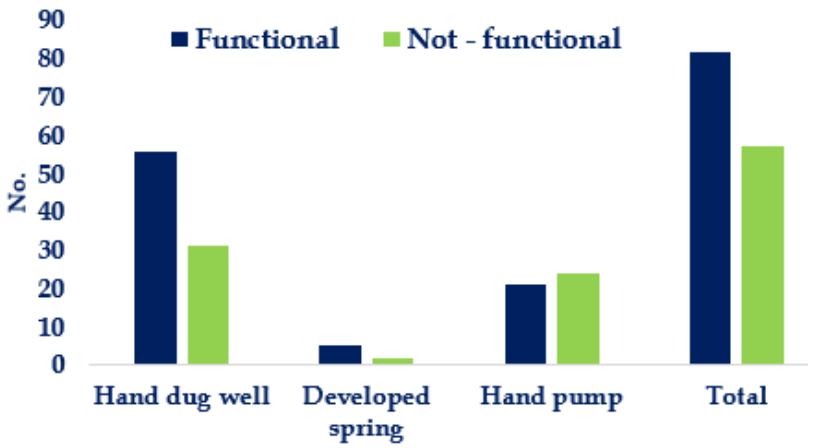


Figure 6.14. Domestic water supply sources

Ponds and hand dug wells provide drinking water to 85 percent and 15% of the surveyed households respectively. This demonstrates that the vast majority of people use pond water for a variety of purposes. Sustainable water supply looks to be the community's most pressing issue.

Figure 6.15. Common water sources in the project area (Weyto river and shallow well)

6.3.6.3. Housing

The most common type of residential houses in the study area is made up of wood with mud. Corrugated iron sheets are being used mainly for the roofing in urban and peri urban areas. There are also typical tukuls with grass and wood roofing. The fences are commonly sisal. The houses are scattered. Most of them are constructed along road sides.

6.3.6.4. Health and Sanitation Condition

As per the data obtained from the woredas Finance and Economic Development, in the entire woreda there are 6 Health Centers, and 33 Health Posts. The most common diseases are eye infections, intestinal diseases and malaria In connection with these diseases 71% of respondents reflected that eye disease is most common health problem in the area.

According to the household survey, 82 percent of respondents went to a health post located inside their kebele for health services. The remaining 18% of respondents travel outside their area to other health-care facilities. They are referred to the only Government Hospital in Jinka when they are very ill. There is only one health post in the project kebele.

Solid wastes are disposed in the open field. Due to lack of water hand washing is not a common practice. The sanitation condition is bad. Open deification is a common practice. Sanitation infrastructures are not present in rural villages.

Livestock diseases (such as trypanosomiasis, pasteurolosis, blackleg, and anthrax) constitute a common threat. A lot of livestock dies of these diseases. There are no well-organized veterinary facilities.

6.3.6.5. Education

At the woreda level there are a total of 41 schools. Of all these schools there are 9 primary schools (1-4 grade) and 30 second cycle primary schools (5-8 grade) and 1 high school (9-11) at Key Afer. There is primary school in the studied kebele. Most of the surveyed household members are illiterate. The education coverage is so small.

Table 6. 10. Education status of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Illiterate	24	88.9	88.9	88.9
	Read and write	1	3.7	3.7	92.6
	Junior	1	3.7	3.7	96.3
	Primary	1	3.7	3.7	100.0
	Total	27	100.0	100.0	

6.3.7. Historical, Cultural and Archaeological Sites

In relation to historical, cultural and archeological sites, there is no concern at all. As per the information gathered from the local people and the woreda relevant offices (Agriculture and Environment Office), there are no churches and mosques within the project area. There is no archeologically or socially sensitive sites within the project area. No cemetery or graveyards have been traced within the project area.

6.3.8. Energy Sources

The community in the project area depends on traditional biomass for cooking (fire wood-through deforestation) and charcoal, kerosine for lighting. There is no electric line in the vicinity of the project area. The nearest place with electricity source is Berhale town.

Charcoal production is not extensively practiced in the area. Fire wood is sold only in towns. With regard to electricity, the area has access to the national electric grid at Berhale town. But, the rural community does not have access to electricity.

Figure 6.16. The most common source of energy for cooking (wood)

7. ENVIRONMENTAL IMPACT IDENTIFICATION, ANALYSIS AND MITIGATION MEASURES

When addressing the potential adverse and beneficial environmental impacts of any project on the biophysical and social environment in the project area and its immediate environs, it is mandatory to make detail analysis (identifying, rating, proposing mitigation measures) after collecting data on the baseline conditions. Thorough evaluation of the baseline condition is important to check the impact of the project in the future. Any future monitoring and evaluation should be made against the current baseline conditions. In environmental impact analysis the nature of the project has to be well understood including the materials to be used, infrastructures to be established and the technology to be used.

In this section, the general environmental impacts that are expected to occur at different phases of the project are identified, analyzed and rated based on the identified impact indicators. The most important phases of the project are mobilization construction, operation or implementation and decommissioning (closure).

Table 7.1 summarizes the qualitative description and rating of the anticipated key impacts of the project on the biophysical and social environment. The details of the parameters tested and methods used in future monitoring and evaluation are addressed in Chapter 8. Standard color codes are used in rating the impacts. The rating is made after a thorough evaluation of the nature of the project and studying the baseline environment in and around the project area.

Table 7. 1. Summary of Mobilization Phase Impacts

Receiving environment		Criteria						
		Spatial Extent	*Duration*	*Significance*	*Probability of occurrence*	*Reversibility*	*Adverse/beneficial*	*Objective /Subjective*
Mobilization Phase								
Physical	Air quality degradation	Site specific	Medium	Low	Certain	Reversible	Adverse	Subjective
	Soil erosion	Site specific	Short	Low	Probable	Reversible	Adverse	Subjective
	Soil contamination	Site specific	Short	Low	Probable	Reversible	Adverse	Subjective
	Land use change	Site specific	Long	High	Certain	Irreversible	Adverse	Objective
	Water quality	Local	Medium	Low	Probable	Reversible	Adverse	Subjective
Biological	Flora	Site specific	Medium	High	Certain	Irreversible	Adverse	Objective
	Fauna (terrestrial)	Site specific	Medium	Medium	Certain	Reversible	Adverse	Objective
Socio-economic	Employment	Local, national	Medium	Medium	Certain	-	Beneficial	Objective
Others	Health (Diseases)	Local	Medium	High	Possible	Reversible	Adverse	Objective
	Noise and vibration	Site specific	Medium	Low	Certain	Reversible	Adverse	Objective
	Occupational Health and Safety	Local	Short	Medium	Probable	Reversible	Adverse	Subjective

Table 7.1. Summary of Construction Phase Impacts

Impact issue on receiving environment		Criteria						
		Spatial Extent	Duration	Significance	Probability of occurrence	Reversibility	Adverse/beneficial	Objective /Subjective
Construction Phase								
Physical	Air quality	Site specific	Medium	Medium	Certain	Reversible	Adverse	Subjective
	Soil erosion	Site specific	Short	Low	Probable	Reversible	Adverse	Subjective
	Soil contamination	Site specific	Short	Low	Probable	Reversible	Adverse	Subjective
	Land use change	Site specific	Short	High	Certain	Irreversible	Adverse	Objective
	Water quality	Local	Medium	Low	Probable	Reversible	Adverse	Subjective
Biological	Flora	Site specific	Long	Medium	Certain	Irreversible	Adverse	Objective
	Fauna (terrestrial)	Site specific	Medium	Medium	Certain	Reversible	Adverse	Subjective
Socio-economic	Employment	Local, national	Medium	Medium	Certain	Reversible	Beneficial	Objective
Others	Health (Diseases)	Local	Medium	Medium	Possible	Reversible	Adverse	Objective
	Noise	Site specific	Medium	Low	Certain	Reversible	Adverse	Objective
	Occupational Health and Safety	Local	-	Medium	Probable	Reversible	Adverse	Subjective

Table 7.2. Summary of Operation/Implementation Phase Impacts

Impact issue on receiving environment		Criteria						
		Spatial Extent	*Duration*	*Significance*	*Probability of occurrence*	*Reversibility*	*Adverse/beneficial*	*Objective /Subjective*
Operational/Implementation Phase								
Physical	Air quality	Site specific	Medium	Medium	Certain	Reversible	Adverse	Subjective
	Soil erosion	Site specific	Medium	Medium	Probable	Reversible	Adverse	Subjective
	Soil contamination	Site specific	Medium	Medium	Probable	Reversible	Adverse	Subjective
	Land use change	Site specific	Long	High	Certain	Irreversible	Adverse	Objective
	Water quality	Local	Medium	High	Probable	Reversible	Adverse	Subjective
Biological	Flora	Local	Long	Medium	Certain	Irreversible	Adverse	Objective
	Fauna (terrestrial)	Local	Long	Medium	Certain	Reversible	Adverse	Subjective
Socio-economic	Employment	Local, national	Medium	Medium	Certain	-	Beneficial	Objective
	Increase income through better breeding and marketing	Local	Long	edium	Certain	-	Beneficial	Objective
Others	Health (Diseases)	Local	Medium	High	Probable	Reversible	Adverse	Objective
	Noise	Site specific	Medium	Medium	Certain	Reversible	Adverse	Objective
	Safety (accidents)	Local	Medium	Medium	Probable	Reversible	Adverse	Subjective

Table 7.3. Summary of Decommissioning Phase Impacts

Impact issue on receiving environment		Criteria						
		Spatial Extent	*Duration*	*Significance*	*Probability of occurrence*	*Reversibility*	*Adverse/beneficial*	*Objective /Subjective*
Decommissioning Phase								
Physical	Air quality	Site specific	Medium	Medium	Certain	Reversible	Adverse	Subjective
	Soil erosion	Site specific	Short	Low	Probable	Reversible	Adverse	Subjective
	Soil contamination	Site specific	Short	Low	Probable	Reversible	Adverse	Subjective
	Land use change	Site specific	Short	High	Certain	Irreversible	Adverse	Objective
	Water quality	Local	Medium	Low	Probable	Reversible	Adverse	Subjective
Biological	Flora	Site specific	Long	Medium	Certain	Irreversible	Adverse	Objective
	Fauna (terrestrial)	Site specific	Medium	Medium	Certain	Reversible	Adverse	Subjective
Socio-economic	Loss of Employment	Local, national	Long	Medium	Certain	-	Adverse	Objective
Others	Health (Diseases)	Local	Medium	Low	Possible	Reversible	Adverse	Objective
	Noise	Site specific	Medium	Low	Certain	Reversible	Adverse	Objective
	Safety (accidents)	Local	Medium	Medium	Probable	Reversible	Adverse	Subjective

7.1. Mobilization Phase Impacts

The mobilization phase includes mainly activities like transportation of construction materials, equipment, machineries, mobilization of new work force and farming materials to the project site, construction of temporary stores etc. Most of the environmental impacts during this phase is more or less similar to the demobilization phase impacts. Major impacts on the receiving environment are briefly described.

7.1.1. Ambient Air Quality

The causes of pollution of the ambient air can be largely due to emission from vehicles which transport machineries, equipment, construction materials and workers to the site. The vehicular emission depends, among others, on the age of vehicles, the retrofit exhaust technologies and their maintenance. Particulate matter (dust) levels will increase. This depends on the type of road to be used. The effect is dominantly reversible, and of short duration as compared to the duration of the project operation/implementation phase and therefore the impact may generally be considered as low significance, local and subjective.

7.1.2. Soil Erosion and Contamination

Soil is a fundamental element or receiving environment, which supports a host of communities of living organisms, and is the main medium for agricultural production and other essential biochemical processes. Thus, soil is an indispensable resource that human, animals and plants exclusively dependent on for their existence. Any construction activities usually aggravate soil erosion through destruction of its structure, removing vegetation cover from quarry and borrow areas, access road constructions. Upon removal of the protective cover and destruction of its structure, the soils are prone to erosion. The degree of soil erosion depends on several factors like inherent characteristics of the soils, slope and intensity and duration of rainfall.

There may be some soil contamination due to oil leaks from vehicles and machineries as well as due to some unhygienic practices in the farm infrastructures and camps. This impact can be mitigated with proper maintenance procedures and availing toilet facilities to workers and training on hygiene practices and instructing personnel who transport machineries and goods to the site. The impact will be local and of very low significance. Moreover, soil loss due to dust emission is probable. This impact is however of short duration and intermittent.

7.1.3. Groundwater contamination

The aquifers of the Bena-Tsemay (Enchete kebele) are unconfined in nature. Any pollution of air and soil and effluents and leaks are likely to affect the groundwater system and seasonal streams. Fuel leakages from storage tanks or vehicles and inappropriate disposal of wastes can cause pollution incidents. The impact is rated as medium, short term, adverse and reversible. Regular maintenance of vehicles at workshops, placing liners and bunds in sensitive sites respectively below and around storage tanks is suggested for mitigation measures.

7.1.4. Impacts on flora

In fact, the project area is mainly a disturbed grazing and farm land. Vegetation clearance for temporary camps, improper management and placement of equipment and machineries and deposition of dust generated by the movement of vehicles on nearby areas may bring some impact on vegetation. This impact is low, reversible and permanent. Using dust suppression techniques, limiting clearance of vegetation to the minimum, observing good waste management practices can help mitigate the adverse impacts.

7.1.5. Impacts on fauna

The potential impacts to wild life and livestock include disturbance such as noise and vehicle traffic that may affect the movement and behavior of wild life including vehicle fatalities and dust deposition on forage/vegetation. As the mountainous areas with woodland hosting wild animals

are not far from this area wild life mobility problem could be affected. Furthermore, the surrounding places which are likely to be used for future expansion could be deforested. Hence, the impact of the project on wild life is certain and long term. This impact is of low significance. Limiting vehicular movement to day time and adopting proper measures will reduce the impacts.

7.1.6. Noise and Vibration

There will be noise associated with the vehicular movement. The impact is short-term, reversible, and insignificant. Limiting the movement of vehicles to day time can limit the nuisance impact. The vibration is insignificant as there are no large construction activities and blasting of quarry sites.

7.1.7. Socio-economic

Some unskilled workers will get temporary employment at this phase. There will be loss of property and livelihood as a result of road construction during this time. The impact is permanent and medium significance which should be addressed through proper compensation and livelihood enhancement programs or community development plans. In fact, the farms were dominantly communal grazing land. Through availing and training of better fodder production, farmers can replace the adverse impact of the project. By supplying better animal breeds to farmers throughout grower program the livelihood of the community could be improved. Furthermore, the technology transfer and employment opportunity will be beneficial to the local community. During the mobilization phase the impact is short term and insignificant.

There is no settlement area within the farm. The same is true in the surrounding areas. The equipment and vehicles could affect the day-to-day activity of the farmers surrounding the Special care must be taken in the movement of machinery and vehicles to avoid accidents and reduce the air pollution by dust. Better roads in the area and training of the personnel who operate machineries and vehicles could reduce or avoid accidents.

7.1.8. Cultural Heritage

There are no cultural heritage sites such as churches, cemetery, mosque etc. within the project area. It is also very unlikely to get archaeologically or historically sensitive sites in the areas. As revealed from community consultation and visual observations there are no graveyard present inside the project area. In case encountered, the community is willing to relocate them in socially acceptable manner in consultation with the community and religious and community leaders.

7.1.9. Occupational Health and Safety

There may be safety concerns like accidents during loading and unloading of equipment and construction materials and during construction of temporary camps. To avoid potential safety problems proper instruction must be given to the work force. Proper Personal Protection Equipment has to be given for staffs. The impacts are probable, adverse, and of low significance which can be mitigated by strictly observing proper Operational Health and Safety (OHS) procedures and training.

7.2. Construction Phase

Most of the impacts during the mobilization, construction and demobilization phases are similar although the impact rating for some parameters may differ as shown in Table 7.1. The main activities during the construction phase of the project are limited to the sites of the camp and processing plants, offices and associated structures and irrigation facilities including the land leveling processes. The

impacts include vegetation or grass removal, topsoil stripping, stockpiling, compaction of construction areas, earthworks during the creation of terraces, cuts and fills, pipeline installation, construction of buildings and roads, haulage, storage of waste material including oils, fuels, land leveling for farming, etc. The impacts are probable and short duration with low to medium significance.

7.2.1. Ambient Air Quality

The air quality could be affected through emissions and blowing dust. The emission sources in the construction phase include:

- Site clearing and leveling;
- Topsoil stripping of the infrastructure footprints, pit areas, canals;
- Topsoil stockpiling;
- Earthworks during the creation of terraces, cuts and fills;
- The movement, maintenance and refueling of vehicles and machinery;
- Concrete batching and placement;
- Construction of buildings and roads;
- Installation of feed processing plant, pipes and electricity
- Storage of oils, fuels, solvents, agrochemicals etc.;
- Transportation of materials/waste to and from site; and
- Operation and maintenance of construction camp and vehicles and construction machinery

The main impacts on air quality result from increased ambient dust from site clearing and leveling, haulage of material and general construction as well as due to wind-blown dust from stockpiles and from vehicular emissions like NOx and PM10.The impact is of adverse, reversible, medium term, medium significance. Employees on site during the construction phase are likely to be affected by the generation of dust. To minimize the impact, they need to follow proper operational safety procedures and by providing PPE to the workers.

The mitigation measures include regularly spraying roads and stockpiled material (especially under windy conditions) with uncontaminated water and checking all machineries and storage facilities to avoid or minimize any non-environmentally friendly chemicals and wastes.

7.2.2. Impact on Soil

The adverse impact on soil comes as a result of clearing and affecting the soil horizon and potential leaks. The main impacts include:

- Clearance and stripping of vegetation and leveling;
- Topsoil stripping and establishment of infrastructure footprints and pits;
- Topsoil stockpiling;
- Earthworks during the creation of terraces, roads, cuts and fills;
- The movement, maintenance and refueling of vehicles and machinery;
- Construction of buildings and roads;

Installation of pipes and electrical systems and irrigation infrastructures

- Storage of hazardous material including oils, fuels, and solvents;
- Transportation of materials/waste to and from site;
- Operation and maintenance of construction camp machinery, vehicles and employee facilities

The impacts on soil are mainly loss of soil structure and biota due to striping and in stockpiles, increased vulnerability to erosion and loss of soil productivity as a result of disturbance of the soil horizon, potential contamination of soil from hazardous materials and spillage of fuels, lubricants and reagents. Currently, there is active erosion along stream courses and even on the sides of existing roads (Figure 7.1).

Figure 7.1. Gulley formation along exiting track inside the project area

The proposed mitigation measures include:

- Limiting clearing of vegetation to the minimum possible;
- Ensuring that stock piles are placed on a freed raining location so as to limit erosion and limit the slope of the pile to the recommended level;
- Placing berms around stock piled soil to prevent soil loss due to erosion (unlikely to have big stockpile); and
- Undertaking site remediation on a concurrent basis during the construction phase to ensure that vegetation is restored to disturbed areas, which will restore some of the site's flood attenuation capabilities and reduce vulnerability to erosion.

7.2.3. Land use change

The project will to some extent modify the local landscape due to removal of soil and vegetation cover clearance. There will be temporary and permanent loss of grazing land and natural vegetation. As the area is flat to gently sloping there will not be large change in the landscape morphology except the conversion of grazing land in to irrigation field. In fact, some ditches may slightly modify the local landscape morphology. The impact is adverse, long-term, site specific and of low significance. At the moment the area is flat to undulating with dense trees and bushes (Figure 7.2).

Figure 7.2. Typical land cover in the project site

7.2.4. Impact on Water bodies

The major water source of the area is groundwater, ponds and seasonal rivers. The most important water source is in the Woreda is the Weyto River which is being used for different purposes by local communities. It plays pivotal role in animal watering the zone (Figure 7.3). It is being used by the Berhale Commercial farm located south of the project area. The river has still large potential for irrigation across the sub-region.

With regard to groundwater and ponds to be constructed in the area, fuel leakages from storage tanks or vehicles and inappropriate disposal of wastes can cause pollution incidents. The impact is adverse and medium significance. However, large accidents of chemical leaks could significantly pollute the groundwater. This demands special care and the impact is expected to be of medium significance, medium term and can be mitigated through proper training and taking care of the environment as per the Environmental Management Plan of this project.

Figure7.3. **The Weyto River being used for animal watering at the diversion site for irrigation**

The in-situ water quality test (Figure 7.4) displays that the water is good for irrigation. The test from the shallow well fitted with hand pump the water is good for drinking. With extensive use of

agrochemicals and other pollution sources may affect it unless proper mitigation measure is taken.

Figure 7.4. In situ water quality testing

7.2.5. Flora

The activities of the project will pose some minor threats to the diversity of plant species. Farming removes a lot of the vegetation within and around the project area and therefore decreases the water absorption and increases the surface run-off and hence leads to more soil erosion that may affect ecosystem functions and processes. The clearance of vegetation leads to several ecological losses. The soil structure will also be affected. Other vegetation related benefits that will be affected include social values, and environmental values, moisture retention and, protecting fauna. Forest resources being used for food and honey production could also be affected. This impact is of high significance, medium term, irreversible and local.

Dust generated by the movement of vehicles will deposit on vegetation. This impact is low as the dry weather road is not long. But, roads to be constructed within the farm must be good to avoid dust emission and protect soil erosion.

Mitigation measures include limiting vegetation clearance to the minimum possible, immediate rehabilitation of temporarily disturbed area, limiting/prohibiting access of workers to the remaining undisturbed vegetated area, regularly spraying haul and communication roads to suppress blowing dust. Accurately collect and preserve the biodiversity for future rehabilitation of the area. Introduce plantation program around and in the project area to suppress wind effects. This intervention will also reduce impacts on the microclimate and reduce erosion.

7.2.6. Fauna

Loss of limited biodiversity will occur primarily in the construction phase as a result of clearing of the vegetation. The clearing of vegetation will result in the permanent reduction of natural habitat of reptiles, birds, insects and few mammals present within the project areas. They will also be disturbed during construction activities because of the noise created by heavy machinery and vehicle. Loss of grazing area is the other obvious impact. The impact is expected to be local and of medium significance. Protection of the remaining vegetated area in the vicinity from human intervention is important to conserve the biodiversity of the area. Proper training has to be given

to the PAPs on how to protect their environment in the vicinity of the resettlement area.

7.2.7. Socio-economic Impacts

Road accidents during construction and movement of machinery and manpower are potential adverse impacts of low significance at a local scale. In terms of beneficial impact local employment of skilled and unskilled manpower may enhance the livelihood of the local community at this stage of the project. The community has high hopes to get employment and better animal breeds and veterinary services. They are also very much hopeful to get safe drinking water from the construction of the new boreholes by the client. This is well reflected during the community consultation meetings. Other positive contribution is the potential employment opportunity.

7.2.8. Occupational Health and safety

Construction works mostly have the potential for the spread of HIV/AIDS and other STDs such as Covid-19. The risk is high, probable and in most cases reversible through proper training. Dust and other emissions may affect the respiratory tract. Borrow pits and other construction related activities may create stagnant water that can become breeding place for diseases causing insects. The impacts are probable, adverse, and of medium significance. The mitigation measures are introducing safety and operational health procedures for all activities, speed limits, water spraying for dust suppression and demarcating potentially dangerous areas and giving proper training.

7.2.9. Noise and Vibration

Noise will be generated due to activities of loading-unloading, material handling, excavation, machine operation, equipment and vehicular movement. Small but temporary degree of vibration may be felt during compaction and movement of heavy vehicles. Noise will lead to increased irritation especially in the areas close to the construction site. Impact of noise and vibration may be categorized as direct, short-term, adverse, reversible and of low magnitude. The mitigation measures include:

- Switching off equipment when not in use;
- Limiting clearing of trees as much as possible to reduce the noise reduction
- Enclosing fixed noise producing sources in enclosures or putting noise suppression around the noise source
- Supplying PPE for workers

7.2.10. Traffic

There will be increased traffic in the project area as well as in the vicinities due to the presence of construction vehicles that may shuttle within the area as well as from surrounding towns. It is important to provide operational safety training to avoid traffic and associated road accidents. The impact is considered temporary and short term if the construction is not extended.

7.2.11. Wastes

Waste production is inevitable in any construction site. Even a modest site can produce huge volumes of waste. At the construction stage different types of wastes could be generated. This demands proper waste management plan. At this stage temporary protected solid waste disposal site can be dedicated. Most of the solid wastes could be burnt at the end of the construction period. The way how this can be addressed is presented in Chapter 8.

A few different construction processes produce waste as a byproduct The most common wastes expected at this stage of the project include (but not limited to): (1) Materials Budgeting and Procurement: This means that once construction is over, the excess materials become waste. Often, they are suitable for reuse. If companies cannot reuse the materials, they may try to sell or recycle them. 2) Building Processes: Excess, damaged or scrap building materials often end up as waste after construction is over. These materials, such as wood, glass, metal and concrete, may come from construction, restoration or remodeling projects. If the materials are relatively intact, the construction company may be able to reuse, sell or recycle them instead of sending them to the landfill. (3) Demolition: Many construction projects involve demolishing an existing structure. In this case, the pile of rubble the project creates will require some form of disposal. Demolition projects generally produce many of the same waste materials as new construction projects — after all, the demolished structure was a new construction once. Construction companies have a few different waste disposal methods to employ for their materials, including: Reuse, Recycling, Land Disposal and Treatment and Disposal.

As detailed machinery to be deployed and the type of construction materials are not well defined currently the volume of wastes may not be accurately determined. Considering the size of the project area and the structures to be erected and the activities during the construction phase roughly the total solid waste generation rate may not exceed more than one ton per day. This includes both recyclable and non-recyclable wastes. If proper waste disposal site is developed and the ESMP properly implemented, the waste may not significantly affect the environment.

The type of wastes and mitigation measures during the decommissioning is more or less the same as the construction phase. However, during decommissioning the land has to be rehabilitated and demands also cleanup operation. Toxic substances must be disposed in protected areas with maximum care.

7.3. Operational or Implementation Phase Impacts

The major activities in this phase include all impacts related to transportation of animals, goods, chemicals and any farm products, impacts related to machinery operations in the farmer and feed processing, irrigation and spraying of agrochemicals, the movement, maintenance and refueling of vehicles and machines, the transport and storage of hazardous materials including oils, fuels, solvents and curing compounds, earthmoving activities.

Unless proper training is given communicable diseases and HIV could be adverse impact for the community living in the area as a result of the new community working in the farm and the local residents and small towns in the area. As to the beneficial impacts; employment, enhancement of livelihood throughout grower services, veterinary services, technology transfer, etc.

Unlike other phases of the project the impacts are medium to long duration with most medium significance. Most of the impacts could be reversed if proper OHS is followed and the project adheres the EMP shown in Chapter 8 is implemented.

7.3.1. Ambient Air Quality

The largest potential impact of the project on air quality would be dust release from the farm during farming in dry seasons and perhaps spraying of agrochemicals. Fugitive dust emissions will occur also from transportation process using gravel roads. These activities, fugitive dust emissions and

some agrochemicals will occur throughout the life of the project. These impacts could be minimized through proper operation processes and are of medium to high significance.

Vehicle exhaust emissions are predominantly NOx and PM10 and studies have shown that the concentrations of these decrease rapidly and that beyond 200 m the contribution of vehicle emissions to local pollution levels is not significant.

Although manure is a valuable natural fertilizer, it is also a source of extreme greenhouse gas emissions, mainly methane. Methane, right after carbon dioxide, is considered to be the greenhouse gas that is the most harmful to the microclimate. The reduction of methane emissions slows down negative climate changes and improves air quality.

Hazardous materials and waste management impacts are related to the types and amount of equipment and machinery used for the operation phase and the waste they produce. They include evaporation of diesel fuel and heavy fuel from temporary tanks on site that are used for re-fueling of heavy machinery and trucks, tractors and combines, as well as possible spills during loading of fuel from tankers to tanks.

These impacts are of high significance and are likely to be present during the whole life of the project.

The mitigation measures include:

- Water spraying of roads can reduce up to 75% of dust emissions;
- Implement a vehicle speed limiting mechanism and monitoring system on site,
- Ensure that stockpiles exist for the shortest possible time, minimize surface areas of stockpiles exposed to wind erosion and vegetate topsoil and overburden storage piles;
- Convert t waste to energy technology solutions such as integrated biogas systems
- Introduce a regular maintenance procedure and inspection of site vehicles and machinery emission;
- Introduce soil stabilization at areas that are prone to erosion in farms
- Securely cover all waste skips;
- If possible, try to locate machinery, fuel and chemical storage and dust generating activities away from site boundaries and sensitive receptors etc.

7.3.2. Soil

In the farm, soils are in continuous disturbance if ploughed regularly. In addition, there is the potential that the movement of large vehicles and machinery will result in the compaction of soils which can have impact during rehabilitation as it will limit rooting depth for plants and water infiltration into the soil which will in turn will increase run off. In addition, spills and leaks of hazardous materials and the deposition of contaminated wind-blown dust and agrochemicals can lead to soil contamination and ultimately finds its way to water bodies. These impacts are probable and can be present during and even after the life of the project. They are localized and of high significance.

The impacts can be mitigated, although they may not be totally eliminated, to a low level through the following measures:

- Limiting vehicles movement to the dedicated access routes;
- Implementing storm water management plan
- Regularly monitoring leakage and spillage of especially hazardous chemicals
- Implementing soil erosion prevention mechanisms
- Limiting storage and use of fuels and lubricants to lined areas
- Restricting all maintenance activities to appropriately designed workshops; with proper oil separators and implementing leak minimizing mechanisms.

7.3.3. Water Quality

Decrease in water quality through sedimentation will happen as a result of runoff from farming areas and associated structures and stores. Erosion of soil stockpiles may also occur during the operational phase. Rain water infiltrating through the soil in to the groundwater environment may have the potential to pollute the aquifers. The well-known impact of ranches on water bodies is increase nitrogen compounds in to water bodies. High nitrate levels are often reported in shallow aquifers in ranch areas. Different types of agrochemicals may also affect the surface water and ground waters.

The IFC/World Bank Group recommends the following measures for the prevention of water pollution:

- "Implementation of water management techniques such as diverting clean run off away from potentially polluting areas, and segregating "dirty" runoff from natural runoff;
- "Controlled placement of polluting materials (including wastes) to provide permanent conditions that avoid contact with water; and
- Isolating potential agrochemicals from any form of water and isolate them from the water table with an impermeable cover to limit infiltration and also to exposure to air.

If leaks and agrochemicals are left unattended these impacts can extend beyond the life of the project and have adverse impact with high significance which can be mitigated by adopting the following measures to a low level of significance.

The mitigation includes:

- Ensuring erosion prevention measures are put in place at all waste dumps and stockpile areas;
- Monitoring of groundwater and surface water qualities in and around the project area to detect the pollution and make timely mitigations;
- Implementation of Agrochemicals Management Plan;
- Storage of fuel and lubricants within purpose-designed area;
- Monitoring access to chemical stores; and
- Availing appropriate spill kits at all hydrocarbon, chemical storage and handling areas and in workshops

Table 7.4. Air and water quality data of the project area

Place	Coordinate			Description	Value
	Zone	Easting	Northing		
Seasonally Inundated area	37	275844	599956	Sound Level (DBL)	54.1
				Radiation (bql)	0
				Brightness	34.1
				Humidity	47%
				Temperature	84^0F
				PM2.5	23.2
				PM10	30.3
				Total Particle count	29,801
Southern border (painted tree) (3:35)	37	276090	600053	Sound Level (DBL)	51.2
				Radiation (bql)	0
				Brightness	65.4
				Humidity	39%
				Temperature	990F
				PM2.5	16.5
				PM10	23.1
				Total Particle count	22,698
Center part of farm land (3:52)	37	274858	602073	Sound Level (DBL)	56.3
				Radiation (bql)	0
				Brightness	31.7
				Humidity	31%
				Temperature	36.8 ^{0}C
				PM2.5	16.2
				PM10	21.8
				Total Particle count	23,021
Galo Ade Water point	37	274230	597661	pH	6.72
				EC (µS/cm)	1526
				eH (mvolt)	16.1
				Water Temperature	32.4 ^{0}C
				Sound Level	60.5
				Radiation	0
				Brightness	34.1
				Humidity	33%
				Temperature	37.4 ^{0}C
				PM 2.5	8.2
				PM10	11.5
				Total Particle count	11,680
				EC (µS/cm)	356µs
				eH (mvolt)	42.8mv
				Water Temperature	32.1^{0}C

7.3.4. Water Consumption/Utilization

The project requires a lot of water for irrigation, animal watering and camp and feed processing plant site. As compared with the groundwater potential of the area the water demand is not large.

Furthermore, there are no large water users in the area. The water is expected to be obtained entirely from the groundwater after drilling a number of boreholes. The drilling result is highly encouraging in the area.

The project requires a lot of water for irrigation, animal watering and camp and feed processing plant site. As compared with the groundwater potential of the area the water demand is not large. Furthermore, there are no large water users in the area. The water is expected to be obtained entirely from the groundwater after drilling a number of boreholes. The drilling result is highly encouraging in the area.

The hydrological and hydrogeological study of the Enchete-Kebele revealed that there is large groundwater reserve in the basin. However, the estimate for make-up water requirements is based on the dry season and a dry year. In general, the study by an independent consultant revealed the availability of groundwater in the area. The pond being constructed could be better option. Although, the distance is a bit far, Weyto River can also be considered as the third alternative in the course of expansion of the ranch.

With continuous pumping of groundwater, the water level may slightly decline. The mitigation measures are minimization of evaporative losses, recycling water as much as possible and using water efficient technology for irrigation. The site selected for pond construction is the natural lower ground for accumulation of surface runoff from the surrounding hills (Figure 7.5).

Figure 7.5. Partial view of the proposed site for pond construction

7.3.5. Flora and Fauna

Dust created during farming and transportation activities may have a negative effect on vegetation (both natural and subsistent) due to dust deposition on exposed parts, which affects transpiration and photosynthesis. Owing to the increase in farming related activities and vehicular movement in gravel roads, it is likely that this will impact on local fauna communities. The increased noise levels, air pollution and on-going disturbances may unsettle local fauna.

Vibration and noise will have a significant effect mainly on fauna species in the immediate vicinity of the project, haul roads, processing plants and waste dump areas, due to the heavy machinery utilized for the farming and transport. Vibration can affect a number of sub terranean fauna taxa,

such as burrowing mammals and reptiles. Vibration affects these animals by causing the collapsing of burrows, and causing these animals to leave the area.

Agrochemical can have a negative effect on the flora and fauna in the area in which it is spilled and/or sprayed, direct contact with plant and animal species can cause injury or death of the species. Larger spills may leach into the soil causing changes in the soil chemistry in the area which may be detrimental to the plant species in the area. Small spills are likely to pose low risks to the fauna and flora of the area where the spills occur, these risks increase with an increase in the volume of the spill.

The interruption of animal movement due to conveyors, fences and roads is also an impact of the operational phase, along with the impact of vehicles and associated road accidents when animals cross the roads. These impacts will be present for a long time and their adverse impact is of medium to high significance depending on the nature of the impact.

The mitigation measures proposed for the mitigation include:

- Keeping as much vegetation as possible to aid in the noise reduction and maintain convenient microclimate;
- Putting fixed noise producing sources housed in enclosures or barriers;
- Limiting transport activities to daylight hours, where possible;
- Implementing dust suppression measures;
- Storing fuel, lubricants and agrochemicals within lined and bounded areas;
- Monitoring of groundwater and surface water qualities in and around the project area;
- Introducing emergency clean-up procedures;
- Relocating plants of special importance to a safe area such as a nursery or area that will not be disturbed. A nursery could be set up for this purpose as well as to propagate appropriate species for future land rehabilitation. This nursery could be outsourced to stimulate new business opportunities to the local communities;
- Controlling access to the sensitive sites;
- Educating the employees about the importance of protecting the biodiversity;
- A speed limit should be stipulated and adhered to at all times to prevent road related accidents;
- Vehicles should be restricted to the demarcated roads and areas around the operation; and
- Fencing off dangerous areas (chemicals and inflammable substances) to prevent access to animals.

7.3.6. Socio-economics Impacts

The only negative impact on the local community is loose of grazing land. This may pause on animal productivity. This can be mitigated through providing better varieties of animal feeds that can be grown in small plots and provide vet services and better varieties of animals to farmers. As the farm develops and becomes operational there will be an opportunity for the local community to be hired to work on the farm. Both skilled and unskilled workers will get temporary and permanent employment in the project even from outside the local community. Small businesses may also emerge around the project area. Especially skilled labor may come from outside the

community. The technology transfer, the untapped animal resource utilization, the foreign currency earnings are among the benefits of the project.

Positive impact enhancement measures include giving preference to local employment, where applicable and implementation of skills development programs to ensure support local population in obtaining employment opportunities. The out-grower service will certainly benefit the community a lot.

In addition to the above-mentioned advantage, there is a potential to use the sisal for various purposes (Figure 7.6.). Nothing has been done so far in production and marketing of this resource. There is also growing trend of growing sesame. According to the community interview, they look this resource as wild plant grown by itself with no market value. It yields a stiff fiber used in making rope and various other products. If trained the local community could generate income from this important resource.

Figure 7.6. Sesame farm in the vicinity of the project area

7.3.7. Noise and vibration

During the operational phase the main source of noise will be the farming operations, animal feed processing plant and vehicles transporting farm products and animals. Noise levels during operations will last for the duration of the project and will prevail mainly during the day. The impact is adverse, localized and of low significance.

The noise impact can be mitigated by implementing the following mitigation measures:

- Switching off equipment and vehicles when not in use;
- Keeping as much vegetation as possible to aid in the noise reduction of the operation activities;
- Housing in enclosures or putting barriers around fixed noise sources; and
- Limiting as much as possible transport and haulage activities on site during the day

7.3.8. Solid Waste Types and Generation Rate

The major wastes to be generated during the operation phase of the project are of typically agricultural wastes of animal rearing and associated farms that grow animal feed. There are also

limited wastes of agrochemicals and household wastes. In a typical commercial ranch, the major wastes are generated under different processes:

1. ***Overproduction*** - In farming, overproduction in the form of unsold crops or animals is among the most odious kinds of waste, because unsold goods have a lot of investment wrapped up in them and often cost money to get rid of. Overproduction can happen because of poor planning (erroneous forecasting), a bumper harvest (unpredictable weather), or market volatility.
2. ***Waiting*** - On the production line, waiting waste takes the form of workers standing idle until parts arrive or equipment is fixed. Waiting waste also occurs when a product sits, as when crops or animals that are ready for market await customers.
3. ***Transportation*** - Moving goods from one place to another happens every day on farms; so does transportation waste—the inefficient or unnecessary transport of products. Examples might be inefficient equipment use—using a tractor to carry a single bunch of carrots or making four hay-loading trips with a small wagon rather than one trip with a big wagon—or delivering products that customers would be willing to pick up at the farm. Many direct market farms get bogged down with poorly planned delivery routes, where farm products are delivered in small batches to far-flung accounts rather than consolidated to minimize road time.
4. ***Over processing*** - This type of waste encompasses any activity that creates or does more for your customers than they are willing to pay for. Examples include bagging items that could be sold without packaging, washing food more than is necessary, delivering to more locations than necessary, or spending too much money on websites.
5. ***Inventory*** - Inventory waste means keeping more materials or goods on hand than is absolutely necessary. On farms, inventory management can be challenging because production output is impossible to control completely, since nature always finds a way to alter a farmer's plans. Even the best production forecasting will never allow a farm to determine exact yield, compared to a factory that can make exactly the number of units it needs. Even so, farms can do much to keep inventories—of both supplies and finished goods—to a minimum.
6. ***Motion*** - Too much moving is a form of enormous waste on farms. Motion waste includes handling items too many times, inefficient harvest practices, and poor planning at planting or seeding time (running back to the greenhouse for more trays of seedlings). A common problem on many farms is spreading out too far—propagation greenhouses too far away from fields, fields too far away from processing areas, processing areas too far away from storage rooms, storage rooms too far away from loading docks, loading docks too far away from the road. Awkward farm layout also contributes incredible motion waste, for instance when you have to go around three buildings and cross a road to bring home a harvest rather than make a straight path.
7. ***Making Defective Products*** - Defect waste includes unsellable food and food that must be discounted because of poor quality. Defects result for many reasons. For animal products, poor management increases animal sickness and mortality. For fruits and vegetables, poor handling, improper storage, and poor field management are among the many reasons crops don't turn out the way farmers intend. Again, because farmers live and work in the messy world of nature, some causes of defects, such as harsh weather or insect migration, are outside of a farmer's control. Defects are a major source of waste because, as with overproduction

waste, defective products often contain a lot of lost investment. It's best to spot defect early. We would much rather a crop fail within a few days of planting time than after we've spent time and money growing and tending or even harvesting a crop. The lean principle of poka-yoke, or "mistake-proofing," targets this waste through systems for early defect detection.

8. ***Overburdening (Muri)*** - In the Japanese language, muri is often used to mean "impossible," "unsustainable," or "unreasonable." On the farm, muri waste occurs when workers and equipment are overstretched. With people, muri lead to burnout, injury, and poor work. With equipment, it leads to engine failure, broken handles, and worn-out parts. Equipment and bodily overburden can be a problem on farms especially around harvest time, when there is more to do than time allows. And there is often a lot of muri when farms grow too rapidly. Workers are overstretched trying to build new greenhouses or animal barns in addition to getting regular production tasks accomplished.
9. ***Uneven Production and Sales (Mura)*** - Mura translated from Japanese means "unevenness," "irregularity," or "lack of uniformity." In a production environment it refers to sales and production spikes and dips. Standardized and predictable work is easy to perform efficiently. A worker can readily find a rhythm, which simplifies spotting waste and making improvements. But uneven work is often inefficient because it involves less rhythm, more mistakes, and higher costs. On vegetable and fruit farms, some amount of mura is unavoidable, as fresh products on such farms will ripen according to their natural season. But expanding production seasons and spreading out sales of food products—whether from animal or produce farms—has a leveling effect on framework and increases efficiency.
10. ***Unused Talent*** - Many farms need lots of help during harvest or extra hands at butchering time and can get by with less labor the rest of the year. It's tempting to divide a farm workforce into two camps—one for workers who grind away, heads down, completing simple, mindless tasks and another for workers who think, process data, design systems, and complete complex and more interesting assignments. But to do so disrespects workers and the farm loses out on talent as well. Lean places emphasis on the shop floor (or gemba) as the best place for new ideas to generate. Responsibilities are pushed down the organizational ladder so that problems are looked at from many angles. Farm laborers working with production details day in and day out will often have better insights than the farmer on more efficient ways to get a job done. But systems need to be set up to receive and incorporate their views.

In the first phase of the project, all the above listed wastes may not be significantly generated. However, during the expansion the wastes become huge. The major wastes come from the animals and irrigated farming for animal feed and feedlots. In all cases, the waste is likely to be dominantly organic which could be converted as usable resources .

If properly managed organic farm wastes can be converted in to useful resources. the majority of the farm wastes could be reused. Among others more, the waste can be used as compost and/or biogas. Compost can be prepared from browns and greens. Browns include materials such as dead leaves, branches, and twigs. Greens include materials such as grass clippings, vegetable waste, fruit scraps, and coffee grounds. Water is required for preparing the compost. The right amount of water, greens, and browns is important for compost development.

The waste from the animals is the major ingredient for biogas. To obtain biogas from agricultural wastes, pre-treatment methods like size reduction, electron irradiation, heat treatment, enzymatic action etc. are necessary. For optimizing the C/N ratio of agricultural residues, co-digestion with sewage sludge, animal manure or poultry litter is recommended. Care must be taken in handling agrochemicals. Agrochemicals may include fertilizers, herbicides, insecticide and medicine for animals. If properly handled the generation of waste could be safely managed. This makes the biophysical environment safer.

Waste generation rate strongly depends on a number of factors Among others, the most important ones are the type of animals, the transportation system, the waste management system and the machinery to be used. In case of animal execrate, it depends on the type of animals and the way how they are being fed. In this connection there is no universally accepted standard waste generation rate. There is no information on the waste generation rate from modern ranches in Ethiopia.

Attempt was made to estimate the major agricultural waste generation rate by accounting best practices from other countries from published literature. The agricultural waste generation rate (manure and animal dung) and crop residue from 12 countries is summarized in Table 7.4. By consulting the feasibility document (number and type of animals) Considering the size of the project area and crops to be grown at different phases of the project, waste to be generated could be estimated. For this the average annual value from the 12 countries could eb considered as optimum estimate.

Table 7.5. Researched annual agricultural waste generation rate from selected countries.

No.	Country	Annual production, million tones		
		Agricultural waste (Manure/animal dung)	Crop residues	Total
1	Bangladesh	15	30	45
2	PR China	255	587	842
3	India	240	320	560
4	Indonesia	32	90	122
5	Malaysia	12	30	42
6	Myanmar	28	4	32
7	Nepal	4	12	16
8	Pakistan	16	68	84
9	Philippines	20	12	32
10	Rep. of Korea	15	10	25
11	Sri Lanka	6	3	9
12	Thailand	25	47	72
Total Annual		***668***	***1213***	***1881***
Average		***334***	***606.5***	***940.5***

Source: ESCAP 1997

The great majority of the waste to be generated is reusable. If more detailed document on the machinery and irrigation activities including number and type of animals is obtained a more

classified wastes with the corresponding generation rates could be established. At this stage it can be concluded that if the proposed ESMP is properly implemented the waste to be generated may not affect the environment significantly.

Luna has a plan to manage wastes within the farm. There will not be any large solid waste disposal site (open dump). Most of the wastes will be reused. It has also a plan to produce compost and biogas. Luna is expected prepare detailed waste management plan in the future.

7.3.9. Health and Safety

Adverse health effects may arise from polluted air and water if these are not properly protected. The main issue is however on mitigating potential hazards. The concerns associated with farming operations and processing is related to animal excreta and agrochemical. Occupational health hazard could be the basic health concern of the farming due to the constant exposure to the suspended particulate matter and toxic substances which lead to various respiratory and skin diseases of workers. Communicable and other diseases such as HIV need to be given special emphasis. In this connection proper training has to be given to the project and local community.

The impact could be adverse, long-term, possible and of high significance but can be minimized by strictly observing the proposed environmental management plan or mitigation measures. Use of protective gears, limiting access to potentially dangerous areas, installing efficient and durable liners for the areas where there is potential leakage of chemicals implementing dust suppression mechanisms, regularly monitoring leakage, seepage, liner failure, surface and underground water quality, observing OHS, putting in place emergency and disaster prevention plans, putting in place a specialized clinic and supplying PPE are the mitigation/prevention measures.

7.4. Decommissioning Phase Impacts

The main activities in this phase are decommissioning of operations, reclaiming and chemical store and leak containment facilities and waste soil dumps, demolition of concrete structure and other infrastructure, dismantling of equipment and metallic structures and pipes, disposing all hazardous and non-hazardous waste as per international practices, encapsulation of potential reactive waste, transportation of recyclable and reusable materials, rehabilitation of the project site using stockpiled overburden material and topsoil, construction of bund around the pit for safety and also to minimize clean runoff into the pit earth, and vegetating of disturbed areas.

7.4.1. Ambient Air Quality

During decommissioning and closure, the main source of air pollution (increased ambient dust) would have decreased due to the cessation of the farming and associated activities. There will, however, be a period where areas are not yet re-vegetated, and this could lead to erosion and associated dust releases, especially under dry conditions. Haul road traffic is often a major dust source during decommissioning.

The decommissioning of the farm equipment has the potential to create windblown dust if it is dismantled as some dust will still be present in the system and any associated stacks.

This impact is short term, reversible, and of low significance. The impact can be mitigated by continuing the onsite dust suppression and disposing all wastes in proper places.

7.4.2. Soil and Water Bodies

Decommissioning and closure activities may result in soil disturbance and the activities associated with the decommissioning phase will be similar to those during the construction and in part operational phase.

Decommissioning and closure activities could also result in increased erosion and sedimentation of local streams, as well as pollution of water bodies if no provision for waste removal is created. These impacts are negative, long term and of high significance. Mitigation measures are:

- Encapsulating potentially reactive waste;
- Containing and returning water into the catchment;
- Keeping vehicles on dedicated roads to avoid compaction;
- Re-vegetating areas where infrastructure was removed using site specific species;
- Minimizing footprint area during decommissioning;
- Putting into place erosion control measures at all disturbed areas;
- Monitoring erosion and compaction in areas of rehabilitation;
- Maintaining Storm water management measures during closure; and
- Managing accidental hydrocarbon spillages as per norms and rehabilitating the affected soil.

7.4.3. Flora and Fauna

During the decommissioning and farm closure phase, there will be initial continued environmental impacts as heavy machinery will be utilized to remove infrastructure and earth moving equipment that will be used to level and rehabilitate all disturbed areas. This may cause increased dust levels due to exposure and mobilization of soils which will impact on plants.

There will also likely be an increase in noise levels which will discourage animals from returning to the site. The initial impacts and the mitigation methods will be similar in nature to those of the construction phase.

After this phase, however, the area will be re-vegetated with indigenous species to stabilize soils in the rehabilitated areas and to reduce soil erosion and improve storm water run-off drainage. This will be a positive impact. If surrounding areas are kept in their natural state, populations of vegetation and animals will be available to move (or be moved) into newly rehabilitated areas. The introduction of vegetation will attract different animals into the area. Depending on how well the surrounding areas are maintained will determine how fast this process happens.

7.4.4. Socio-economy

A temporary increase in employment opportunities followed by a decrease/reduction in employment opportunities and associated decline in economic activities is expected. Farm closure would result in the loss of direct jobs, as well as associated indirect employment and local small business enterprises.

Most of the impact on the local community is negative. However, the farmland could be again used for grazing or farming. If there is such a plan the infrastructures of the farm could be used by the local community for different community services such as clinics, schools, stores etc.

The mitigation measures proposed to attenuate/prevent adverse impacts will be to develop ahead of time Community Development Plan that includes skills training and development to ensure transferrable skills and options for alternative livelihood strategies.

There will be loss of job for the majority of the staff and an increased number of unskilled and semi-skilled workers. For short period temporary employment exists during farm closure.

7.4.5. Noise and Vibration

Noise levels are expected to increase in areas where infrastructure will be removed and material is transported. The main component of the noise emissions will be caused by diesel-powered equipment, and the demolition of buildings, as well as the movement of vehicles. Once closure is completed, noise levels will decrease (as noise levels return to baseline conditions).

7.4.6. Health and safety

Noise levels are expected to increase in areas where infrastructure will be removed and material is transported. The main component of the noise generation will be caused by diesel-powered equipment, and the demolition of buildings, as well as the movement of vehicles. Once closure is completed, noise levels will decrease (as noise levels return to baseline conditions).

7.5. Issues of Cumulative and Trans-boundary Impacts

7.5.1. Cumulative Impacts

Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. It is the combination of these effects, and any resulting environmental degradation, that should be the focus of cumulative impact analysis. Some activities known to have significant impacts on the environment and contribute highly to cumulative effects are marine resource development, energy production and consumption, and land use changes. The cumulative environmental effects of human activities ultimately intensify global warming and climate change.

Cumulative impacts could be anticipated in over pumping of groundwater, river diversion, land degradation and agrochemical utilization.

The intensification and expansion of dairy farms have contributed many environmental problems such as the contamination of groundwater and surface water, insufficient water for irrigation during droughts, excess nutrients losses from farms, larger emissions of greenhouse gases particularly methane and nitrous oxide ... The cumulative impacts could be reduced or avoided by implementing the proposed ESMP.

7.5.2. Trans-boundary Impacts

Attempt was made assess the geographical influence on the biophysical and social environment of the project. In terms of the impact on the biophysical environment, the impact is only limited within the farm and its immediate environment. The maximum influence may not exceed more than 15 km radius from the farm area. The only concern is if liquid wastes are released to the nearby stream. This may lead pollution of surface water and groundwater systems that may extend beyond the woreda

boundary. However, if the ESMP is properly implemented the impact could be considered as insignificant.

In relation to the socioeconomic impacts the project has far reaching positive implications. The project may play important role in enhancing the local economy at different administrative levels in the sub-region. It will create job opportunity, technology transfer and in supplying better animal breeds for the pastoralist and farming community.

A trans-boundary environmental impact means any impact on the environment within the area under the jurisdiction of Ethiopia and neighboring countries caused by a proposed project the physical origin of which is situated wholly or in part within the area under the jurisdiction of one of them. The project site is not far from the Kenyan border. In terms of trans-boundary impacts, it is very unlikely that any of the identified negative impacts affect neighboring countries or wider area beyond the immediate environment surrounding the project site. Few positive trans-boundary impacts could be identified. These include availability of better breeds of animals, export of live animals and animal products to the local and international market.

8. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

8.1. Environmental Management Plan

The potential adverse environmental and social impacts of the planned modern large feed-lot (forage and feed crop production) and goat and cattle fattening project of Luna Export Slaughter House PLC project have been identified, where possible quantified and their significance evaluated in Chapter 7. In addition, the corresponding mitigation measures that should be implemented to avoid, minimize or offset the negative impacts are recommended.

This section presents an Environmental Management Plan (EMP) that links the impacts identified and mitigation measures proposed in the ESIA report and the responsibilities of potential stakeholders for implementation and monitoring. Also, it indicates the time horizon over which the mitigation measures to be executed, and where necessary, cost estimates (only indicative) of the mitigation measures.

Prior to the commencement of the construction works and during construction, the Contractor, the Supervisor Consultant and other responsible bodies should be aware of the environmental and social mitigation and management requirements and organize themselves to take the responsibilities vested upon them. During construction, the Contractor would execute most of the mitigation measures recommended to control the possible impacts related to construction activities. The Supervisor Consultant would monitor impacts and implement the proposed mitigation measures along with the proponents' environmental monitoring unit representative. In particular, the Supervisor Consultant would control the activities at the construction sites such as operation of equipment and vehicular traffic, operation of quarry and borrow sites, operation of materials processing sites like stone crushing & concrete batching plants, handling of hazardous substances like oils and fuel, disposal of spoil materials, etc. In addition, the Consultant has to approve the Contractor's Site Restoration Plan for the construction sites, construction material sources (quarries and borrow pits), materials processing and storage sites, and campsite, and make sure its proper implementation. When construction is completed, it is expected that those sites would be reinstated to their original state as closely as possible or to the state where the sites can be used for some productive uses like growing trees, crops, livestock pasture, or living areas, etc.

During the project operation phase, the woreda environmental and land administration office would be responsible for implementing most of the mitigation and monitoring measures recommended in this ESIA document. Details of the proposed EMP are presented in Table 8.1 below. In order to ensure that the Contractor complies with the recommended environmental protection requirements, the provisions of the EMP and Environmental Guidelines for the Contractor should be part of the contract terms or agreements with the Contractor.

Table 8.1: Environmental Management Plan during the Different Phases of the Project

Issue/Environmental Component	Mitigation measures	Mitigation schedule / Technical Details on Monitoring	Responsibility	
			Implementation	**Supervision**
Mobilization and Construction Phase				
Land Expropriation	The temporary and permanent acquisition or obtaining of land for onsite works shall be carried out in accordance with the entitled framework for the project which should follow the regional and national regulations and laws. All grievances of the PAPs need to be reasonably addressed, in accordance to the land acquisition implementation mechanism. The land to be acquired could be for the farm or road construction. In fact at the moment the land has already been acquired. In case there is expansion or infrastructural development outside the farm.	*Before construction* Implement as of the project as per Proclamation No. 455/2005	Luna Contractors	Grievance Handling Body/Committee to be established by the Woreda (compensation given already to PAPs) Environmentalist (or Site Manager to be assigned by Luna)
Farming and construction	Currently there is no land preparation, except the commencement of water well drilling. The drilling and farming must follow proper OHS procedures. Implement dust suppression methods and follow all procedures stated in the in Chapter 7 to minimize adverse environmental impacts. Any construction activity needs to follow proper OHS procedure and avoid spills from machinery and stores	*Whole phase* Check on the impact of the farming on the nearby farm plots possessed by farmers	Luna Contractors	Site Manager and eexperts involved in the agricultural services Woreda Agriculture and Environment offices
Ambient air	• Dust suppression by water sprinkling • Setting speed limits to vehicles and moveable farm machineries • Proper maintenance of vehicles and construction machinery • Use smoke suppression methods	• *Whole phase*	Luna Contractors	Environmentalist Woreda Environment Office Contractor
Soil and water contamination	• Providing sanitation facilities to workers • Use most measures mentioned above for farming activities • Implement appropriate erosion prevention measures so as to also minimize siltation of streams • Avoid any chemical spill from machineries and vehicles	• *Whole phase*		Environmentalist Woreda Environment Office
Flora and flora	• Restrict vegetation clearance to the minimum possible during mobility • Water spraying on gravel roads • Select proper location to avoid damage of very important flora species • Although no significant fauna exists instruct workers not to kill or harm animals and other different species of flora even inhabiting in soils and rocks	*Whole phase* Record the flora and fauna of the project area and its immediate environs and take care or reserve the genetic resource together with stakeholders	Luna	Environmentalist Woreda Environment Office

Issue/Environmental Component	Mitigation measures	Mitigation schedule / Technical Details on Monitoring	Responsibility	
			Implementation	**Supervision**
Operational Health and Safety	• Giving orientation to workers about safety procedures • Awareness Creation on HIV-AIDS and communicable diseases • Erecting traffic signs • Providing protective wear to workers • Availing first aid kits and services • Appropriate warning signs should be placed in areas where accidents are expected to occur • Strict prohibition of operation of equipment by unauthorized personnel	*Whole phase* Ethiopia has ratified about 20 ILO conventions, including core conventions such as - Occupational Safety and Health Convention, 1981 (No. 155) (3). .Follow the national level policy on Occupational Safety and Health (OSH) which has recently been developed and approved (July 2014) by the Central government.	Luna	Environmentalist Woreda Environment Office
Operational Phase				
Farming and associated activities	• The farming and associated animal breeding (production) must follow standard best practices of a modern ranch so as to avoid or minimize the adverse impacts on the biophysical environment and the community living around the project area. Any adverse environmental impacts on the biophysical environment must be avoided or minimized. • • The out grower program should also be accompanied with knowledge transfer in animal husbandry and better animal feed production. It requires a lot of professional advisory services and good public relation with the community. From community consultation meetings it was evident that the community living in the area is expected a lot from the project in terms of livelihood enhancement and job opportunity.	*Whole phase* Measure particulate matter, NOx and $CO_{2,}$ CO and $SO_{2,}$ $SO_{3,}$ Pb	Luna	Site Manager and experts involved in the agricultural services Woreda Agriculture and Environment offices
Air quality	• Dust suppression by water sprinkling • Setting speed limits to vehicles and moveable farm machineries • Proper maintenance of vehicles and construction machinery • Use smoke suppression methods in machinery and animal feed processing plant • Minimize plant clearing • Backfill exposed construction site as soon as possible	*Whole phase* Measure particulate matter, NOx and $CO_{2,}$ CO and $SO_{2,}$ $SO_{3,}$ Pb	Luna	Environmentalist Woreda Environment Office

Issue/Environmental Component	Mitigation measures	Mitigation schedule / Technical Details on Monitoring	Responsibility	
			Implementation	**Supervision**
	• Limit stockpile height of topsoil (if there is any) • Construction materials should be covered during transportation by trucks • Preventive maintenance of vehicles and construction equipment at designated areas • If airborne agrochemicals are sprayed it has to be done in a manner that should not cover wide areas out of the farm with acceptable concentrations in calm climatic conditions			
Soil erosion	• Prepare stockpiles appropriately to ensure vegetation/grass establishes itself and erosion is minimized • Ensure stockpiles are placed on a free draining location so as to limit erosion loss • Ensure erosion protection measures are put in place at all waste rock dumps and stockpile areas and ditches and road sides • Topsoil stockpiles should be maintained for effective rehabilitation following the closure of the farming system. • Shaping and contouring farm plots and stock piles as in a manner the prevents erosion as well as facilitating grass cover to prevent erosion in stockpiles • Planting trees	*Whole phase* *Monitor gully formation* *Observe sheet erosion* *Measure sediment load in seasonal streams during wet season*	Luna	Environmentalist Woreda Environment and Agriculture Offices
Soil contamination	• Water spraying of roads and stock piles can reduce up to 75% of dust emissions; • Area with potential dust emission could be enclosed with the addition of water sprayers to reduce the amount of fugitive dust emissions controlling dust from crushing and screening operations • Implement a vehicle and machinery speed limiting mechanism and monitoring system on site, • Ensure that stockpiles exist for the shortest possible time, minimize surface areas of stockpiles exposed to wind erosion and vegetated topsoil and overburden storage piles • Introduce a regular maintenance procedure and inspection of site vehicles emission • Introduce soil stabilization at areas that are prone to erosion • Securely cover all waste skips • If possible, try to locate machinery, fuel and chemical storage and dust generating activities away from site boundaries and sensitive receptors etc. • Clean animal feedlots and housing of animals properly and avoid animal excreta seeping in to the groundwater system • All heavy machinery operators and truck drivers should stay on designated areas and access roads/tracks • Storage and use of fuels and lubricants should be confined to lined and bunded areas and comply with Waste Management Plan guidelines	*Whole phase* Measure soil pH, salinity, sodium hazard level, petroleum hydrocarbons, solvents, pesticides, agrochemical, heavy metals	Luna	Environmentalist Woreda Environment Office

Issue/Environmental Component	Mitigation measures	Mitigation schedule / Technical Details on Monitoring	Responsibility	
			Implementation	Supervision
	• Accidental chemical spills should be reported and cleaned up immediately, and the affected soil should be removed, and rehabilitated • All maintenance should be restricted to appropriately designed workshops • Vehicle service areas must be paved or compacted. • Water runoff traps should be constructed at the vehicle service sites to prevent polluted water runoff into local streams • Soil hydrocarbon and agrochemical contamination should be cleaned up using bio-remediation and clean-up kits when deemed necessary • Implement the emergency response plan in event of disaster • Spill kits must be available at all hydrocarbon, chemical storage and handling areas and at workshop areas • Adhere to the Waste Management Guidelines			
	• Ensure stockpiles are placed on a free draining location so as to limit erosion loss • Erosion of the topsoil must be prevented by using vegetation to control the surface flow velocity in conjunction with berms and drains • Monitor and control access to chemical stores and their usage • Separate vehicle hard park area from clean water areas with berms or channels and oil separators. • Implement of storm water management system/plan • Implement emergency response plan in event of disaster • Avail spill kits at all suspicious sites			
Water contamination	• Disposing of wastes according to a waste management plan • Appropriate storage of fuel and other chemicals • Implement an appropriate water monitoring plan • Spill detecting kits must be available at all hydrocarbon, chemical storage and handling areas • If polluted immediate cleanup campaign must be implemented using appropriate remediation techniques • Separate vehicle hard park area from clean water areas with berms or channels and oil separators. • Implement of storm water management system/plan • Implement emergency response plan in event of disaster • Avail spill kits at all suspicious sites	*Whole phase* Measure hydrocarbons, solvents, pesticides, agrochemicals, heavy metals such as lead, zinc, cadmium, manganese, mercury and the radioactive metals. Metalloids (arsenic, polonium), BOD, COD and Coli in water.	Luna	Environmentalist Woreda Environment Office

Issue/Environmental Component	Mitigation measures	Mitigation schedule / Technical Details on Monitoring	Responsibility	
			Implementation	Supervision
Flora	• Avoid cutting of trees and any other plants in the area • Ensure stockpiles and farm boundaries are planted and minimize open grounds or free draining area • Develop progressive rehabilitation plan or schedule to address exposure of degraded areas • Limiting the construction activities within the demarcated areas to an area that is as small as possible. • Preserving, wherever technically feasible, indigenous plant species • Implement a replanting program • Establish nursery for planting trees	*Whole phase* Record planted trees, size of gardens Record incident of cutting trees outside the project area by the staff (malpractice) Record the number of people who took seedlings from nursery for planting	Luna	Environmentalist Woreda Environment Office
Fauna	• Prohibit poaching and killing of wildlife by the workforce • Put signs, bunds and fences around dangerous areas • Put in place noise barrier/absorption methods • Awareness creation for the project personnel about environmental issues and natural resources conservation	*Whole phase* Record death of any animal Record new fauna in the area Record killing of any animal (malpractice)		
Noise and vibration	• Reduce noise at source if possible, by using silencers on vehicles, using rubber linings, enclosing sources if possible • Switch off equipment when not in use • Keep as much vegetation as possible to aid in the noise absorption of the construction activities • Choose low noise plant alternatives • Training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events. • Conduct occupational monitoring system for employees working in high noise level areas • Avoiding unnecessary transportation of materials to reduce traffic. • Limitation of transport activities to day-time as much as possible to reduce noise. • Programmed maintenance of vehicles and equipment	*Whole phase* Measure noise levels Record any seismic tremors		
Operational Health and Safety	• Prepare OHS guideline and train the workforce • Provision of protective wearing • Appropriate warning signs must be placed in areas where accidents are expected to occur • Strict prohibition of operation of equipment by unauthorized personnel • Isolating the working areas • Following safety procedures	*Whole phase* Ethiopia has ratified about 20 ILO conventions, including core conventions such as - Occupational Safety and Health Convention, 1981 (No. 155) (3). .Follow the	Luna	Environmentalist Woreda Environment Office

Issue/Environmental Component	Mitigation measures	Mitigation schedule / Technical Details on Monitoring	Responsibility	
			Implementation	**Supervision**
		national level policy on Occupational Safety and Health (OSH) which has recently been developed and approved (July 2014) by the Central government.		
Employment and livelihood enhancement	• Establishment of a "skilled labor list at the mine offices to identify a local labor pool • Implementation of skills development programs to ensure support local population in obtaining employment opportunities • Give priority to PAPs and vulnerable groups • Provide training on skill enhancement for the workforce and community living in the area • Create good marketing condition and service provisioning veterinary and farming • Establish livelihood restoration plan specially to compensate grazing land loss and bee hiving	*Whole Phase* Record number of skilled and unskilled workers employed Duration and number of trainings Survey how the livelihood of the community is enhanced due to project implementation		
• Decommissioning/Ranch closure Phase				
• Demolishing of infrastructures	• Encapsulating potentially reactive wastes • Monitoring water and soil quality and conduct all clean up measures to bring the area to pre project levels, etc. • Keeping vehicles on dedicated roads to avoid compaction; • Revegetating areas where infrastructure was removed using site specific species; • Minimizing footprint area during decommissioning; • Putting into place erosion control measures at all disturbed areas • Monitoring erosion and compaction in areas of rehabilitation; • Maintaining storm water management measures during closure • Managing accidental chemical spillages as per norms and rehabilitating the affected soil; • If some infrastructures are going to be used by the local community after decommissioning train them and make the area safe and usable for the intended purpose	Whole phase Monitor particulate matter Monitor the work is being done as pert the OHS guidelines	Luna	Environmentalist Woreda Environment Office

Issue/Environmental Component	Mitigation measures	Mitigation schedule / Technical Details on Monitoring	Responsibility	
			Implementation	Supervision
• Ambient air	• Dust suppression by water sprinkling • Setting speed limits to vehicles and moveable farm machineries • Proper maintenance of vehicles and construction machinery • Use smoke suppression methods • Implement a vehicle speed limiting mechanism and monitoring system • Introduce a regular maintenance procedure and inspection of site vehicles emission • Introduce soil stabilization at areas that are prone to erosion • Securely cover all waste skips	*Whole phase* Measure particulate matter, NOx and CO_2, CO and SO_2, SO_3, Pb	Luna	Environmentalist Woreda Environment Office
• Noise and vibration	• Reduce noise at source if possible, by using silencers on vehicles, using rubber linings, enclosing sources if possible • Switch off equipment when not in use • Keep as much vegetation as possible to aid in the noise absorption of the construction activities • Training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events. • Conduct occupational monitoring system for employees working in high noise level areas • Avoiding unnecessary transportation of materials to reduce traffic. • Limitation of transport activities to day-time as much as possible to reduce noise. • Programmed maintenance of vehicles and equipment	*Whole phase* Measure noise levels (DBL) Monitor the implementation of the OHS guidelines to reduce noise and vibration		Environmentalist Woreda Environment Office
• Soil and water contamination	• Providing sanitation facilities to workers • Use most measures mentioned above for farming activities • Implement appropriate erosion prevention measures so as to also minimize siltation of streams • Avoid any chemical spill from machineries and vehicles • Proper drawdown and detoxification of the leach facility • Encapsulating potentially reactive waste • Containing and returning water into the catchment • Keeping vehicles on dedicated roads to avoid compaction; • Revegetating areas where infrastructure was removed using site specific species; • Minimizing footprint area during decommissioning; • Putting into place erosion control measures at all disturbed areas • Monitoring erosion and compaction in areas of rehabilitation; • Maintaining Storm water management measures during closure; • Managing accidental hydrocarbon spillages as per norms and rehabilitating the affected soil; • Monitoring water quality, • Prepare manure management plan, etc.	Whole phase Measure soil pH, salinity, sodium hazard level, petroleum hydrocarbons, solvents, pesticides, agrochemical, heavy metals Measure hydrocarbons, solvents, pesticides, agrochemicals, heavy metals such as lead, zinc, cadmium, manganese, mercury and the radioactive metals. metalloids (arsenic, polonium), BOD, COD and Coli in water.	Luna	Environmentalist Woreda Environment Office

Issue/Environmental Component	**Mitigation measures**	**Mitigation schedule / Technical Details on Monitoring**	**Responsibility**	
			Implementation	**Supervision**
• Flora and fauna	• Revegetate the area • Water spraying on gravel roads while decommissioning • Select proper location to avoid damage of very important flora species • Use indigenous species as much as possible during planting • Although no significant fauna exists instruct workers not to kill or harm animals and other species while leaving the site • Convert the area in such a way that it will be convenient for the flora and fauna to flourish again	*Whole phase* Record planted plants Check land cover recovery Record any fauna affected	Luna	Environmentalist Woreda Environment Office
• Operational Health and Safety	• Giving orientation to workers about safety procedures during decommissioning • Remove all traffic and other faming posts • Providing protective wear to workers • Availing first aid kits and services • Strict prohibition of operation of equipment by unauthorized personnel • Prepare and follow appropriate decommissioning or ranch closure plan	*Whole phase* Instruct and monitor OHS guidelines for decommissioning	Luna	Environmentalist Woreda Environment Office
• Community development and rehabilitation	• Give compensation to the workforce up on closure based on the rules and regulations of the country • Train them on livelihood enchantment and different skills • Liaise them for job opportunity as appropriate • Give more emphasis to vulnerable groups	*Whole phase* Record staff leaving the project Monitor the community Development (CDP) Evaluate how effective the CDP is	Luna	Environmentalist Woreda Environment and Labor Offices
Livestock	• Prepare livestock management plan • Mobility scheduling • Feed schedules • Prepare detailed plan for veterinary service	*Whole phase* Prepare proper livestock management plan and assign appropriate staffing	Luna	Environmentalist Woreda Agriculture Office

Remark: *After the preparation of this document the site has been abandoned due to lack of e enough groundwater for irrigation. A new site has been awarded. New ESIA study will be carried out for the new site. Therefore, time lines for mitigation measures are not proposed here.*

8.2. Environmental Monitoring Plan

Environmental monitoring is an essential tool to implement the environmental management plan. It provides the basis for rational environmental protection decisions regarding adverse impact control. Monitoring should be performed during all stages of the project (mobilization, construction, operation/implementation and decommissioning) to ensure that the impacts are not greater than predicted, and to verify the impact predictions. The monitoring program will indicate where changes to procedures or operations are required, in order to reduce impacts on the environment or local population.

The environmental monitoring program for the project will be undertaken to meet the following objectives.

- To monitor the environmental conditions of the project area and its environs;
- To check on whether mitigation and benefit enhancement measures have actually been adopted, and found to be effective; and
- To provide the means whereby any impacts which were subject to uncertainty at the time of the preparation of the ESIA, or which were unforeseen, can be identified, and provide a basis for formulating appropriate additional impact control measures for any new impacts revealed.

Monitoring methodology involves:

- Identification of the relevant monitoring standards;
- Identification of components to be monitored;
- Identification of parameters to be used for monitoring
- Setting the monitoring frequency and responsibilities of different institutions and individuals
- Visual observations and testing of environmental parameters
- Identifying or defining the financial, technological and human resources required for monitoring

Table 8.1 summarizes the major issues to be monitored and responsible bodies. The methods and type of environmental parameters to be checked may vary depending up on the accuracy required and the instruments to be used.

For very big projects it is mandatory to establish Environmental Management and Safety Unit or Environment Department. But, for the proposed project it is recommended to employ senior experienced and versatile environmentalist with very good knowledge of environmental monitoring of projects of similar nature at the project initial implementation stage. Furthermore, other regional and federal institutions working on environmental issues will conduct environmental monitoring. Some of these areas are:

- Environment, Forest and Climate Change Commission
- SNNPR Sectoral Office looking after Environmental issues
- Environment Unit of the Ministry of Agriculture

- Woreda Agriculture and Environment Office

The federal and regional institutions that take care of environmental issues will have their own schedule for monitoring different projects. The woreda sectoral offices working on land environment and labor issues will have direct link with the monitoring process. The Environmentalist to be assigned by Luna must monitor on regular basis on sensitive areas and occasionally or as deemed necessary in some areas which are suspiciously affected by project activities to avoid or minimize any adverse impact on the biophysical and social environment.

Table 8.2 summarizes the general indicative monitoring schedule and estimated budget. As appropriate this schedule could be modified.

Table 8.2: Environmental Monitoring Plan and Estimated Budgets

Items/ Target groups		Issues to be addressed	Frequency	Monitoring Party	Quantity	Estimated Budget in Birr
Awareness creation training	Unskilled workers	Environmental protection (flora, fauna, waste disposal, etc.) HIV-AIDS and STDs OHS issues etc.)	Beginning of the implementation phase and whenever new employees join	Woreda Environment and Labor Offices Environmentalist	150 workers at Birr 400 for 2 days	150,000
	Semi-professional and skilled workers and sub-contractors	Environmental protection, maintenance requirements, site management and OHS	Beginning of Project	Woreda Environment and Labor Office Environmentalist n	50 workers at Birr 500 for 2 days	50,000
Air quality	Pit and waste dump, haul road, License boundary, near crusher, gold room	TSP, PM10, PM2.5, NOx, SO3 etc.	Annually	Woreda Environment and Health Offices Environmentalist	10 points, 8 qualities at Birr 750 each	60,000/year
Noise	**Noise from construction vehicles and farming activity**	The noise measurements should be taken at areas where there are machinery and feed processing plant and any other suspicious points	As deemed necessary	Woreda Environment and Health Offices Environmentalist	10 points, Birr 750/point twice a year	15,000/year
Soil	Excavation and back filling and farming areas	Disturbed areas & farm plots	Annually	Woreda environment office Environmentalist	1 man for 2 days per month at Birr 750/person	18,000/year
Soil Erosion	Erosion	Areas demarcated for	Biannually	Woreda environment office Environmentalist	1 man for 2 days per month at Birr	18,000/year

Items/ Target groups		Issues to be addressed	Frequency	Monitoring Party	Quantity	Estimated Budget in Birr
Soil contaminati on	Contamination	pH; organic matter, nutrient (NPK); sulfur/sulphate; agrochemicals)	Once a year	WLEO Environmentalist	15 qualities, 5 locations at Birr 750 each	56250/year
Groundwat er	Water level	Monitor boreholes	Monthly	Environmentalist Woreda Environment Office	All wells (As deemed necessary by the Woreda Environment Office	24,000/year
	Water quality	Common physical parameters, major ions and agrochemicals	Biannually	Environmentalist	All wells and local surface waters	75,000/year
Flora	Change in land cover monitoring and planting trees (nursery development and planting)	The type and growth condition of trees and other indigenous flora	At the beginning and end of the project and occasionally as deemed necessary	Environmentalist Woreda Environment Office	Farming areas and its immediate environs	150,000 Birr/year (LS)
Fauna	Number and/or distribution of indicator species	Change in number and/or distribution of indicator species	The time period used to sample will be determined by the *perio*d organisms and the relevant technique being used. Time *p*eriod used for sampling can be defined by the Environmentalist	Environmentalist Woreda Environment Office		75, 000 Birr/year (LS)
TOTAL ESTIMTED INDICATIVE BUDGET (EXCLUDING SALARY)					**691,250**	

Remark: Luna will assign its own site manager (Environmentalist) and work together with all stakeholders which monitor the environmental issues related to the project activities. If simple environmental quality monitoring gadgets are purchased, the monitoring can be made easy in a cost-effective manner. As there is no decommissioning plan by the proponent no budget is allocated for it. This budget is only for monitoring. Roughly the annual salary for the six persons indicated above could be around 1.1 million Birr Yearly.

8.3. Establishment of Environmental Safety Unit

As part of the environmental management and monitoring plan it is important to establish Environmental Safety Unit for the proper implementation of the project in an environmentally friendly manner in the long run. The manpower requirement for this unit is indicated in Table 8.3. At the beginning of the project senior versatile environmentalist could handle the environmental issues of the project. Ones this unit is established at least the following activities have to be

monitored. Manage and control the testing of environmental variables

- Monitor the safe operation of all the farming and ranch activity
- Follow up the Operational Health and Safety (OHS)
- Give training on Environmental and OHS issues
- Work with all stakeholders at woreda, regional and national level on issues of environment and operational health and safety
- Measure key environmental parameters on the biophysical environment in situ and collect samples for laboratory analysis as appropriate
- Send samples of the biophysical environment to accredited laboratories which may not be done by the company on site
- Involve in EPRP as deemed necessary
-

Table 8.1. Manpower Requirement for the Environment Safety Unit

No.	Required Professional	Qualification	Number	Estimated Monthly Salary (Birr)	Remark
1	Environmentalist	M.Sc.	1	30,000	With OHS background
2	Public Health Expert	M.Sc.	1	30,000	Good background knowledge on instrumentation and analytical procedures
3	Electromechanical Engineer	M.Sc.	1	30,000	With good background knowledge on farm machinery water wells
4	Nurse	B.Sc.	1	20,000	With added knowledge on sampling and analytical chemistry
5	Secretary	B.Sc.	1	20,000	
5	Janitor	Read and write	1	3000	

***Remark**: The salary for these professionals is not included in the Environmental Monitoring budget. All of the above indicated staffs may not be employed at the beginning.*

Some gadgets for simple in situ environmental parameters monitoring include pH meter, EC meter, DO meter, air quality monitoring kits, simple flame photometer, kits for titration, glass wares and chemicals (standards) could be purchased through time. The laboratory facility could be integrated with the veterinary service units for providing analytical services under the same unit.

8.4. Environmental Rehabilitation during Decommissioning

At the end of the project period Luna has to rehabilitate the area and allocate appropriate budget

for this. It is important to make the landscape habitable or usable for farming or other related activities that can be of help to the local community. Especially, any effluents from the leaking tanks or any farming activities and animal feedlots should not pollute the biophysical environment. It is important to consult the baseline condition so that the environment maintains the initial baseline conditions after ranch closure. If possible, a better habitable/usable area must be established. For this decommissioning plan is required in due time.

At present the project life time is not well defined. Based on the then decommissioning plan appropriate budget can be set.

8.5. Emergency Preparedness and Response Plan

8.5.1. Background

The Emergency Preparedness and Response Plan (EPRP) is outlined briefly as part of the ESIA. In fact, for very large project separate EPRP document is required. The plan is outlined in accordance with the IFC guidelines and EHS standards and procedures.

The Emergency Preparedness and Response Plan is a "living document" and will be updated as needed during the course of the development of the project, initially to cover the construction phase and then for the operational and implementation phase. During the operational phase, the plan will be independently reviewed and updated periodically (every 2 to 5 years) as part of the ongoing management of environmental and social issues documented in the Environmental and Social Management Plan (ESMP).

This initial EPRP sets out the steps which must be taken into account to develop the details of the plan, which will initially be drawn up to cover the construction phase, then modified to cover the implementation/operational phase. Thus, this section draws heavily on the various good practice notes described below but does not aim to reproduce those or to provide all the possible details of each step in the process; various documents are available that serve the purpose very adequately in every phase based on the nature of the project and local conditions.

8.5.2. Framework and Requirements

8.5.2.1. IFC Performance Standards

The IFC Performance Standards that relate to emergency preparedness and response are PS3, Pollution Prevention and Abatement, and PS4, Community Health and Safety. The document aims to address the Emergency Preparedness requirements of both PS3 and PS4.

Performance Standard 3 – Pollution Prevention and Abatement

The Client will be prepared to respond to process upset, accidental, and emergency situations in a manner appropriate to the operational risks and the need to prevent their potential negative consequences. This preparation shall include a plan that addresses the training, resources, responsibilities, communication, procedures and other aspects required to effectively respond to emergencies associated with project hazards such as fire hazards,

chemical spills, and accidents related to machine and equipment that may cause pollution etc.

Performance Standard 4 – Community Health and Safety

The Client will assess the potential risks and impacts from project activities and inform affected communities of significant potential hazards in a culturally appropriate manner. The Client will also assist and collaborate with the community and the local government agencies in their preparations to respond effectively to emergency situations, especially when their participation and collaboration is necessary to respond to such emergency situations. If local government agencies have little or no capacity to respond effectively, the Client will be responsible for responding to emergencies associated with the project. The Client will document its emergency preparedness and response activities, resources and responsibilities and will disclose appropriate information to affected communities and relevant government agencies.

Performance Standard 4 – Community Health and Safety

When the Client uses employees or contractors to provide security to safeguard its personnel and property, it will assess risks to those within and outside the project site posed by its security arrangements. In making such arrangements, the Client will be guided by the principles of proportionality and good national and international practices in terms of hiring, rules of conduct, training, equipping and monitoring of such personnel. The Client will make reasonable inquiries to satisfy itself that those providing security are not implicated in past abuses and will ensure that those engaged to provide security are adequately trained in the use of force (and where applicable, firearms) and appropriate conduct toward workers and the local community and require them to act within the law. The Client will not sanction any use of force except when used for preventive and defensive purposes in proportion to the threat. The Client will also investigate any credible allegations of unlawful or abusive acts of security personnel, take action (or urge appropriate parties to take action) to prevent recurrence, and report unlawful and abusive acts to public authorities when appropriate. A grievance procedure or mechanisms should allow the affected community to express concerns about the security arrangements and acts of security personnel.

If government security personnel are deployed to provide security services for the Client, the Client will assess risks arising from such use, communicate its intent that the security personnel act in accordance with these requirements, and encourage the relevant public authorities to disclose the security arrangements for the Client's facilities to the public, subject to overriding security concerns.

8.5.2.2. UNEP/ICMM Good Practice Guides

One of the key areas of Emergency Preparedness and Response relates to accidents that may occur at the mine, plant or tailings dam that have the potential to affect communities living in the vicinity of the mine complex or dams. In fact, mine or dam safety issue is not relevant to this project.

However, most of the points here stated could be applied for this project in terms of safety at the ranch facilities and associated infrastructures and people who are working there and in the course of transporting environmentally harmful agrochemicals. Preparation for this type of emergency has been addressed by the UNEP/ICMM Good Practice in Emergency Preparedness and Response, published in September 2005. Emergency planning for the transport of dangerous goods is also addressed in UNEP Technical Report No. 35, Trans APELL, published in 2000.
APELL stands for Awareness and Preparedness for Emergencies at Local Level and is an approach born out of disasters such as the Bhopal chemical factory disaster, which affected many members of the local community in which the factory was situated.

APELL follows a ten-step process, which will be used as a framework for emergency planning at the proposed project. This framework can be used to address both potential accidents at the project site and also during the transport of reagents and materials to the site.

8.5.2.3. Security Response

Dealing with civil and military disturbance in the project area and its immediate environs is becoming a focus of concern for the project and it is therefore important to have a carefully thought-out strategy in place to deal with every eventuality, and the necessary resources to deal with them. IFC PS4, which deals with Community Health and Safety, requires that physical and personnel security in the case of disturbances and other incidents are carefully planned and prepared for.

It is recommended that the EPRP should follow the Voluntary Principles on Security and Human Rights (www.voluntaryprinciples.org). Tthe Voluntary Principles have been developed from a dialogue between the Governments of the US, UK, Norway and the Netherlands, businesses engaged in the energy and extractive industries and NGOs on the importance of respecting human rights in project operations. The principles serve to guide companies in maintaining the safety and security of their operations within an operating framework that ensures respect for human rights and fundamental freedoms. The Voluntary Principles include guidelines on risk assessment surrounding security issues and the interactions between companies and both public and private security companies.

8.5.3. The APELL process

8.5.3.1. Introduction

The Awareness and Preparedness for Emergencies at Local Level (APELL) program is a process which helps people prevent, prepare for and respond appropriately to accidents and emergencies which may affect the community at a particular site. The process is focused on effective communication between the Client, the local community and local authorities. The overall goal of APELL is to prevent loss of life or damage to health and social wellbeing, avoid property damage and ensure environmental safety.

The Ten Steps of APELL are the following.

1. Identify the emergency response participants and establish their roles, resources and

concerns

2. Evaluate the risks and hazards that may result in emergency situations in the community and define options for risk reduction
3. Have participants review their own emergency plan for adequacy relative to a co-ordinated response, including the adequacy of communication plans
4. Identify the required response tasks not covered by the existing plans
5. Match these tasks to the resources available from the identified participants
6. Make the changes necessary to improve existing plans, integrate them into an overall
7. emergency response and communication plan and gain agreement
8. Commit t h e integrated plan to writing and obtain approvals from local governments
9. Communicate the integrated plan to participating groups and ensure that all emergency responders are trained
10. Establish procedures for periodic testing, review and updating of the plan
11. Communicate the integrated plan to the general community

8.5.3.2. Pre-APELL steps

There are main activities that will be undertaken before commencing the APELL process. The first of these is to run an APELL workshop internally, initially with the Contractor to cover the construction phase, and later with the operating team, to raise the awareness of APELL, of the need to have such a plan in place, and to ensure that sufficient resources are available. This workshop can be used to confirm the requirements of legislation, assemble relevant documentation, and to examine any plans which may already exist, either in the project area or for dealing with construction or operating phases.

The second pre-APELL step is to raise awareness of the process in the local community. This will best be done through the Public Liaison Committee (PLC) which will be established. The Community Liaison Officer or the senior Environmentalist in charge of the issue, through key community informants, will also be used to raise awareness in more outlying communities. While the knowledge and understanding of the farming and animal breeding process is comprehensive in the area, the concept of preparedness for accidents and emergencies will almost certainly be new, so needs to be carefully introduced.

Step 1- Identify the emergency response participants and establish their roles, resources and concerns

The first step in the development of an EPRP will be to identify the likely participants and to establish their roles, what resources they may have, and the concerns that they have surrounding the operation of the proposed ranch project. These individuals, representing a range of organizations and sectors of society, will make up the Local Emergency Planning Coordinating Group ("the Coordinating Group")

The Luna Slaughterhouse PLC modern ranch is located close to the town of Berhane, where there are few surrounding small villages administered by kebele administration offices. The Woreda

and Kebele administrators have overall control of the local governments of townships and villages. In particular, it should be noted that there are a few small settlements in the vicinity of the project area, which are likely to be most affected by the project due to their proximity to the new facilities. In case of any accident or security concerns the local authority must be urgently informed.

The villages to be included in the Coordinating Group will include all those who may be affected by an incident at the project site or any of its facilities, which will include the effluent management pipeline. This will therefore include villages in the project area and the kebele and woreda administration, initially meetings will be held with local communities or Kebele administration office through the woreda administration, to assist in the identification of emergency response capability in the project area. From these initial consultations, a list will be drawn up of potential emergency response participants; details will be obtained of any existing emergency plans, and the outstanding concerns in addressing emergencies.

From the ESIA document it can be assumed that there is no effective emergency response capability within the project area (for example fire engines and ambulances). The capacity of the local health infrastructure to deal with emergencies will be examined in more detail as part of this planning process. Consultations with the communities already carried out have identified the traditional chiefs in the area and these may also be invited to join the Coordinating Group. As the steps of the process progress, it may be appropriate to invite other community leaders, who represent communities in other areas, to become involved. Community consultations have indicated that it would be effective to have representatives of key religious organizations, local well-known individuals and women's and youth representatives on the Coordinating Group, as these people can play a key role in communicating information to the wider communities and feeding back any concerns.

The make-up and leadership of the Coordinating Group will require careful consideration. Individuals could come from a number of organizations such as:

- Farm managers, Luna community and communication officers, and environmentalist
- Chemical suppliers
- Transport operators
- Members of locally active NGOs (if there is any)
- Members of local cooperatives (if there is any)
- Local representatives of agencies with responsibility for fire, health, water supply and quality and emergency response planning
- Hospital or clinic/medical representatives
- Teachers and community education representatives
- Local Religious leaders
- Representatives of the private sector
- Translators or public relation officers, etc.

Effective leadership of this group is critical to the success of the APELL process, so the leader must be chosen with care. The leader needs to be respected by all the other members of the Group, but also have sufficient time or resources available to carry out the tasks, to manage the Group and be skilled in cross-cultural communication.

Step 2 - Evaluate the risks and hazards that may result in emergency situations in the community and define options for risk reduction

This step aims to identify the accidents that could happen, both during construction and operation, which could affect the communities around the site. During construction these accidents may be more likely to be related to spills of construction materials and transport incidents, while during operation, accidents such as fire, explosion, failure of pipelines, small water retention structures, dykes etc.

The potential accidents will be identified by the Coordinating Group, assisted by a specialist team of engineers from the construction team, plant or irrigation system design team as appropriate. The accidents will be identified along with the probability of their occurrence and their possible consequences. This will enable different accidents mitigation to be planned for, but also allows opportunities for risk reduction through design and operation.

For each possible impact the Group will assess the potential severity of the impact, for example:

- The size and nature of area potentially affected;
- The number of people at risk;
- The type of risk (physical harm, toxic, acute, chronic etc.)
- Long term residual effects;
- Impacts on environmentally sensitive areas;
- Financial consequences; and
- Secondary risks and impacts.

In some cases, this may require specialists to carry out numerical or analytical modeling and design of mitigation systems. The probability of the incidents occurring should also be assessed by the specialist team, for example:

- The probability of individual events;
- The probability of simultaneous events; and
- Complications from unique environmental considerations (such as an accident occurring in the middle of the wet season when some roads to outlying communities may be impassable or flooding events).

The most likely environmental accidents are fire, chemical spills and accidents at work place. Under any unforeseen accidents the Client must prepare emergency preparedness plan and operational safety guidelines. In any large accidents the project needs to have a plan to evacuate staff as well as

members of the local community if required.

Once the hazards have been identified and their probability and consequences defined, some areas of risk may be identified which can be eliminated or reduced through simple actions. These should be communicated to the Company management and responsibility assigned for making these changes. This is not the job of the Coordinating Group or the specialist team. Once these tasks are undertaken, the progress and results should be communicated to the Coordinating Group to enable them to focus on the remaining risks.

Step 3 - Have participants review their own emergency plan for adequacy relative to a coordinated response, including the adequacy of communication plans

The participants in the Coordinating Group will review any EPRPs that may exist. The emergency preparedness plan should include:

- Criteria for triggering the plan and alarm signals, with back-up;
- Clear reporting procedures both within the Company and upwards to head office, and externally to appropriate authorities;
- Communications equipment that can reach all participants, such as mobile phones, pagers, or short-wave radio;
- Media contacts and a media relations strategy, including relevant descriptive material of the operation;
- Specialized hazard monitoring and training, such as for dealing with chemical fumes or water pollution;
- Adequate emergency equipment for spill containment or collection, such as booms and absorbent materials;
- Methods of alerting the public and coordinating evacuation using sirens or other warnings, with rehearsed warnings, evacuation procedures and easily accessible shelters;
- Define clear roles for participants in different areas of response, such as fire-fighting, community protection etc.;
- Alternative drinking water supplies in case where usual supplies are contaminated;
- Rapid test kits for chemical spills;
- Readily available information on dealing with chemical hazards; and
- Examination of options for clean-up following the accident – both immediate and in the case of a longer clean-up program. This should include disposal of contaminated materials, run-off etc.

Usually, this step would involve contacting the agencies involved in emergency response and asking them to evaluate their plans against this list, but in the case of the modern ranch project it will almost certainly be more efficient for the Coordinating Group to lead the development of the plan.

Of particular importance in this list is the involvement of the media. With the immediacy of news coverage globally, news of accidents reaches the rest of the area very fast. Senior members of the Company may be called upon by the media at short notice to respond to an incident which

may have happened many thousands of kilometers away at one of its operations. Briefing packs and media training are therefore of considerable importance in "getting it right from the start" should an accident occur.

Step 4 - Identify the required response tasks not covered by the existing plans

Once the plan has been drawn up in outline, and any other plans evaluated, the gaps can be identified and responsibilities assigned. This will involve identifying any missing or weak elements or tasks not being covered by any group. The significance of these weaknesses will be discussed in the context of a coordinated response. However, it should be noted that as facilities and capabilities are likely to be very weak locally, it will become the responsibility of the Company to provide the necessary materials for e.g. Fighting certain types of fire or providing sufficient equipment to deal with certain types of casualties that may arise from an accident at the chemical or any other sensitive storage site.

The person ultimately responsible for the overall control of an incident must be identified as part of this planning process. The overall EPMP will be handled by the assigned environmentalist or any responsible body the company.

Step 5 - Match these tasks to the resources available from the identified participants

As stated above in step 4, it must be assumed that local capacity in this area is very limited and that the Company will take responsibility for providing all the necessary equipment and training. This may include training volunteer emergency helpers such as fire fighters, traffic control officers, where the numbers of regular staff are limited. These volunteers may be drawn from the workforce as well as the community, but their workplace role in dealing with emergencies must not be compromised.

Even in the light of this, some tasks may be allocated to existing organizations that are then assisted to complete them, providing knowledge and capacity that can be used in other scenarios that may arise. The completion of the various tasks should be monitored before moving on to the next step.

Step 6 - Make the changes necessary to improve existing plans, integrate them into an overall emergency response and communication plan and gain agreement

Completion of steps 4 and 5 should have identified any problems related to the lack of resources and these should by now be addressed. This step aims to integrate any existing plan with the new plan. The tasks involve:

- Preparing a draft integrated plan;
- Ensuring that the plan is consistent with any regional disaster plans;
- Ensuring its conformity with legislation and codes of practice;
- Checking that the plan is robust in relation to areas of weakness previously identified;
- Conducting a role-playing exercise as a preliminary test, with key participants from various agencies describing how they would respond to a variety of different emergency

scenarios;

- Identifying weaknesses in the plan and if necessary, repeat the role-playing exercise to ensure that issues have been addressed;
- Revising the plan as often as necessary until the Coordinating Group agree that it is appropriate and workable;
- Ensuring that any plans held by different agencies to organize their own responses are also updated in line with the latest revision.

The aim should be to keep the plan as clear and simple as possible, with the detail provided in a range of appendices which may address a range of different scenarios or combinations thereof. The plan should include the following:

- Telephone list, including mobile and home telephone number as well as office numbers;
- An up-to-date duty roster or immediate access to one;
- An action plan/checklist;
- List of resources and capabilities that can be shared;
- An action list for field use.

The action plans should include measures to deal with the immediate aftermath of clean-up, such as designated areas to store/dispose of contaminated materials, or how to deal with the run-off from a chemical leak or fire, for example. These should be carefully considered (using a risk assessment approach if necessary) during the planning process.

Step 7 - Commit the integrated plan to writing and obtain approvals from local governments

Once the plan has been tested and agreed by the Coordinating Group, it will be documented in its final form for approval/acceptance by the community, local government and other agencies. In fact, such procedures are required in very large projects. If deemed necessary all the procedures have to be followed by Luna and relevant stakeholders.

A small group, drawn from the Coordinating Group and its technical support team, should write the plan. As far as possible the plan should be made up of a series of clear flowcharts and checklists which can be laminated for ease of use. The information needs to be available on the Company intranet, but hard copies should also be available in different locations, as some accidents may disrupt computer and power systems.

A standard document should be prepared for presentation to the various groups involved. A series of posters, notices and instructions for use at site and by any other agencies involved should also be prepared. The presentations to local government and other agencies should as far as possible be made by the same team. Queries raised at the presentations should be recorded for future reference. The object of the presentation is to transfer "ownership" of the plan from the

Coordinating Group, who have developed it, to the representatives of the community and other organizations who will play a key role, and to gain their endorsement of the plan.

The final plan may also need to be approved by the local, regional government or any other agency such as IFC and IDC. Sufficient time must be allowed in the schedule to accommodate this requirement.

Step 8 - Communicate the integrated plan to participating groups and ensure that all emergency responders are trained

Once the plan has been endorsed by all the groups involved, it must be communicated to the members of the groups providing input to the plan. Their roles and responsibilities must be clearly spelt out and any training that they may require, such as in specialist equipment or procedures, should be identified and carried out. Once the training has taken place, practicing the procedures and handling the equipment should become part of their routine activities.

- Notices and posters should be prepared and distributed for participating groups, and additional training provided to community leaders who would play a role in the event of an emergency.
- Field exercises should take place involving the various agencies in monitoring, use of communications, traffic control, evacuation procedures, etc.
- Communication and media training should be undertaken for key spokespersons within the Company and the other relevant staff involved in the project.

Step 9 - Establish procedures for periodic testing, review and updating of the plan

The Coordinating Group will ensure that the plan is thoroughly tested; initially without involving the public, but with the various other agencies involved. Once this has been satisfactorily achieved, a full-scale test will take place. The following are useful pointers for the drill:

- Form a group to prepare an emergency scenario. This group will not include members of the emergency response group;
- This group will prepare a written scenario that identifies the objectives of the drill, components of the plan to be tested, the sequence of events and the simulated hazard levels;
- Designate a group of observers to evaluate the test drill using prepared checklists;
- Using local community liaison personnel, the media and other outlets, inform the public that a test is scheduled. It is critically important that the public do not confuse the test with a real emergency, which could result in panic;
- Conduct the test using the prepared scenario;
- Hold evaluation sessions to consider the observers record sheets, results and

experiences;

- Interagency and community co-operation should be a particular focus;
- Assign participants to correct deficiencies and revise the plan; and
- Prepare a guideline to ensure that the plan is regularly reviewed and updated.

This should include triggers that could affect emergency response and which should therefore lead to a review of the plan. A different scenario will be tested each time; if there are a number of very different scenarios leading to different responses, the testing of all these should be considered.

Tests will also be carried out in the wet season as well as the dry season as responses and consequences may be different during the two extremes, especially the wet season.
EPRP will be designed to last for the projected life of the operation but there are certain triggers that will mean that the EPRP is reviewed and updated.

Step 10. Communicate the integrated plan to the general community.
The community will be involved, through its representatives, as far as possible at all stages of the APELL process. However, the final step is to ensure that each member of the communities that may be affected knows what the warnings will be and what to do, how to get further information and when to evacuate if necessary.

The local rural and urban communities are not familiar with the sounds of sirens to mark shift changes and blasting times, but as the plant will be some distance from the community, a different community will need to be alerted to the warning signals, as well as the nearby towns and villages.

The information that is given to the community should be done so in a culturally appropriate manner – the consultation exercises undertaken so far indicate that Tigrigna is not suitable for technical information, so English/Amharic will be used, with symbols and pictures on printed material as far as possible. Due to the large numbers of people involved, key community group personnel such as church and mosque leaders and local community leaders will be asked to assist in the dissemination of the information verbally as well as using the printed word. The radio has also been an effective means of getting messages to the communities, as have meetings with women's and youth groups, as women are sometimes excluded from the traditional village hierarchy.

A standard media kit should be prepared that gives emergency contact points in the Company and government agencies, such the Ministry of Mines, Petroleum and Natural Gas. The kit will contain details of the operation and also the EPRP.

A briefing session should be held with the media, in this case the local radio stations, presenting the kit and explaining what assistance may be required in the case of an emergency. This should

be repeated every time there is a significant change to the plan, particularly as the operation is designed to have such a long life.

Media training of key Company representatives, both locally and internationally, are crucial as part of this step (it has also been mentioned under Step 3). There have been any numbers of the Client executives called upon to speak to the media in a crisis, which have led to negative impressions of the project. It is therefore important for key personnel to be prepared for this role. In the event of an incident which may become the focus of international attention, it is worth considering the use of a Company website to distribute information, video clips, photographs etc. in an attempt to reduce or avoid media manipulation of the situation.

An ongoing series of public awareness talks should also be held, for example in schools, to inform the public further about the project, what it is doing for the community and the environment, and the risks of accident as well as the EPRP.

8.5.4. Trans-APELL Aspects Related to the Project

The safe transport of materials to and from the site is also of concern, and warrants a separate section due to its complexities. The UNEP document that deals with this was published before that dealing with mining, and is known as Transeptally (2000). Although this project is not mining, transportation of agrochemicals to and from the site may consider proper guidelines. Hence, it is taught prudent to recommend the Trans-APELL procedures as an option. It provides guidance for dangerous goods transport emergency planning in local communities. There is a separate APELL document (APELL for Port areas, IMO on behalf of IMO and UNEP, 1997) that covers ports and harbors and emergencies that may arise with the shipping and transfer of materials at such facilities.

During construction, large quantities of materials such as steel plate, sheet and girders, cement and specialist equipment will be moved to site, either by road or rail. A plan to respond to emergencies during this time will be important for a number of reasons, such as the condition of the road, the volume of traffic, the size of the loads, and the specialist nature of some of the materials.

During operations, considerable quantities of materials such as fertilizers, lime and limestone, herbicide, insecticide, and diesel as well as numerous reagents will be transported by road or rail from a number of sources. During the life of the project the sources of materials and modes of transport may change, so the EPRPs to various incidents may also have to change.

There has been considerable debate about the boundaries of responsibility for the movement of goods to site both during construction and operation. For example, chemical will be imported from outside of Ethiopia, but it is clearly impractical for Luna to take any responsibility for the transport of the material until it is much closer to the project site. The various routes being considered also involve crossing several international borders before reaching Ethiopia and this also raises very difficult issues of sovereignty as well as practical responsibility.

For these reasons it is proposed that a combined approach to responsibility be adopted, with Luna taking reasonable measures to ensure that the goods are transported in as safe a manner as possible, through its contractors and suppliers, but that specific provision is made for accidents and emergencies in closer proximity to the mine site. This approach will be spelt out in the steps below, which are the same as those in Section 3.

Step 1 - Identify the emergency response participants and establish their roles, resources and concerns

Initially, the Trans-APELL process will be an internal undertaking, using a group of construction team project staff including those suggested in the pre-APELL steps in Section 3 above, but also staff from the logistics and procurement sections of the company.
This team will carry out a review of the different routes intended to be used for different supplies, and the contractors who will use those routes. The routes will extend to the points of entry to Africa for the materials, i.e., the port at which the goods are unloaded.

The draft contracts of the contractors and suppliers using these routes will be inspected and the contractors will be asked to consider, *inter alia,* the following:

- The proponent must provide the correct classification, documentation, labeling and packaging of goods in accordance with the United Nations Recommendations on the Transport of Dangerous Goods ("the Orange Book") (this will be a contractual requirement);
- All vehicles must be equipped with the correct signage as specified in the UN Recommendations, but signs must be removed when the vehicle is not carrying the relevant materials, such as on return journeys (this will be a contractual requirement);
- The contractor will be asked to adhere, as a minimum, to the standards set out in the policies of FQM (this will be a contractual requirement);
- The contractor should consider carrying out an audit of the port facility/facilities and provide a report on the adequacy of the emergency response plans in place and the equipment provided to deal with any accidents or incidents;
- The contractor should consider the route(s) to be used and identify key sensitive areas, such as river crossings, routes through large settlements, areas of environmental sensitivity such as wetlands, and areas with any regional, national or international environmental designations such as national parks, where accidents may have greater significance;
- The contractor should consider how an accident resulting in a spill or loss of load will be dealt with, (for example using equipment carried by other trucks using the same route, owned by the same contractor).
- The contractor will ensure that all drivers are trained in certain behaviors and procedures, such as adhering to speed limits through built up areas, and what to do in certain

emergencies.

- The contractors will ensure that the drivers carry pre-prepared emergency procedure cards depending on the load being carried, with contact numbers and initial actions.

Step 2 - Evaluate the risks and hazards that may result in emergency situations in the community and define options for risk reduction

The haulage contractors should be asked to present their assessments of the risks and the proposed methods of dealing with them. The risks and hazards considered may result in the adoption of, for example, driver training, the use of different vehicles, and the use of different loading techniques or different packaging/containment arrangements. The requirement for these, weighed against the probability of the risk occurring, can then is considered by the Company team. A series of the incidents with the highest probability will be selected to be taken forward. In many cases it is likely that these will overlap with incidents identified by the main APELL process.

Step 3 - Have participants review their own emergency plan for adequacy relative to a coordinated response, including the adequacy of communication plans.

This will involve the haulage contractors and the Company reviewing their plans to address a coordinated response in the environs of the project sites, the only area within which project sites can realistically provide a timeous emergency response. In the case of an accident there must be strong coordination among all stakeholders.

Step 4 - Identify the required response tasks not covered by the existing plans.

The next step will be to address any issues not covered in the main APELL process such as the provision of equipment, techniques and training in the response to certain types of accident, such as a car accidents, fire and chemical spills.

Step 5 - Match the resources available from the identified participants

As with the main APELL process, it is assumed that local capability in responding to emergencies is low; therefore, all resources will have to be provided by the Company, particularly if it is specialist equipment. It is however likely that many of the requirements will be the same as those required for the main APELL process.

Step 6 - Make the changes necessary to improve existing plans, integrate them into an overall Emergency response and communication plan and gain agreement.

A series of clear plans will be drawn up once the types of incidents that could occur have been identified in Step 2 above. These will cover the teams who will be asked to respond in a variety of cases, the type of response, command and communications, as in the main APELL process. Wherever possible the existing plans should be used and the same preparation (such as media training) undertaken. Where they exist, emergency services will be involved. It will also be important in the case of road accidents to involve the security services, both Police and Armed Forces, as these people will almost certainly be called on to attend the incident by local

authorities, in the absence of other emergency services. This overlaps to some degree with the response to security incidents, and also the use of the Police and Military in the community during an APELL type incident outlined in Section 3 above.

Step 7 – Commit the integrated plan to writing and obtain approvals from local governments
The plans will be drawn up following Step 6 above, and as before committed to paper as well as electronic media. The plans will be available at several key locations around the project facilities once the plans have been agreed by the various participants. It will be most efficient to present these plans at the same time that the main APELL process is developed and approved.

Step 8 - Communicate the integrated plan to participating groups and ensure that all emergency responders are trained

As above, these plans are best communicated at the same time as the overall APELL plan, and the training requirements are treated together. It may be necessary to train some additional groups but this is unlikely. Where drivers need to be trained, this will largely be the responsibility of the haulage companies and this will be an ongoing process.

Step 9 - Establish procedures for periodic testing, review and updating of the plan
The transport related scenarios can be tested alongside the main APELL drills, for example as a developing incident during a „dry run". For example, a scenario could envisage an accident such as a fire at the project site being exacerbated by severe weather, which causes flooding on the road which results in a vehicle turning over.

As with the main APELL process, a number of different scenarios will be tested over time, and all the emergency response participants involved.

Step 10 - Communicate the integrated plan to the general community.
The transport related plans will be communicated to the general community alongside the overall APELL plan. If appropriate, communities along the main road lines approaching the project site and the villages and towns will be involved as these are the communities most likely to be affected by an incident of this type.

8.5.5. Resources and Responsibilities
The development of the Emergency Response Plans will be the joint responsibility of the Environmentalist and/or OHS Officer of the Client or any relevant local authorities working with the Client. These appointments will be at the same level as the Commercial, Financial, Engineering and Project Managers.

These plans will involve sitting with the engineering or farming team to identify the potential accidents both during construction, the movement of goods to site, commissioning and operations,

and how these should be dealt with in an emergency. In particular, the specialist equipment needs to deal with these emergencies must be identified so that it can be obtained and sent to site in readiness. This exercise will also assist in determining the training requirements which can be scheduled into the timetable for the construction/farming workforce and also for the operations staff as they are brought on stream.

The Environmentalist, Farm Managers and OHS and Community Liaison Manager (that will be employed as appropriate by the company) will work together to organize the storage and maintenance of equipment on site and the training necessary for staff to fulfill their emergency response functions properly.

Once construction is underway, planning for the full APELL process will commence in advance prior to any plant or farming system commissioning. This will ensure that these new plans are in place for when the operations begin. This process should have an 8broader scope than the construction APELL but will be able to build on the relationships, documentation and skills developed during the first exercise. The equipment supplies may need to be increased as the potential for different accidents to occur increases, and the training requirements may also be different.

8.5.6. Reporting

The status of the Emergency Response Plans will be reported each year in the Environmentalist Manager's report to the Board or Company Management team and will contain details of any significant changes to the plans, and whether the plans were reviewed and/or tested during the reporting period.

Should an environmental audit or review be carried out, for example as a requirement for accreditation to a recognized Environmental Management System (EMS) such as ISO 14001, the EPRP and the management requirements of the plan, will almost certainly be reviewed.
The other case in which a report will be required is in the case of an incident occurring. In this situation, the effectiveness and performance of the systems, the management team, the equipment and the emergency responders will be carefully reviewed and any inadequacies or discrepancies noted and addressed in a revision to the plan.

9. LAND ACQUSITION AND COMPENSATION PROCESS

9.1. General

It should be noted that the land has already been acquired by the client from appropriate government body. The land acquisition certificate is already acquired. There is no also resettlement issue, as no one is permanently settled within the project area. Hence, there is no Resettlement Action Plan (RAP) issue in this project. However, in future expansion and probably some claims while constructing access roads land acquisition issues may be raised. Hence, it is important to briefly outline the land acquisition and compensation frameworks and associated legal issues.

Large projects often affect settlement areas. This leads involuntary resettlement that required RAP which in turn addresses land acquisition and compensation. The land acquisition will lead to adverse socioeconomic impacts, such as, loss of income and assets, loss of farm lands, loss of trees (perennial and other types); displacement of community and social networks and associations; disintegration of close relatives, family members, neighborhoods; and it may also create adverse impact on social values, assets; and as well as psychological and other related social problems.

In order to minimize the effect of the project on the biophysical and social environment the client needs to strictly follow all relevant laws and regulations related to involuntary resettlement. For any project, the client has made effort to avoid adverse impacts by choosing the site with no settlement. The compensation and resettlement of the PAPs are made on the basis of the Constitution of the Federal Democratic Republic of Ethiopia, Resettlement and Rehabilitation Policy Framework and the World Bank's Operational Policies and Procedures (OP/BP 4.12). Below some key legal and administrative issues are addressed in relation to the land acquisitions issues and involuntary resettlement processes.

9.2. Policies on Land Tenure, Expropriation and Compensation

9.2.1. National Policies and regulations

Article 40 (7) of the constitution of the country states that every Ethiopian has the full right to the ownership of private property he/she has invested on the land, and the immovable property he/she builds and to the permanent improvements he/she brings about on the land by his/her labor or capital. If the land that is owned by an individual is expropriated by the government for public use, the person is entitled for compensation. In this regard, article 44 (2) of the constitution states that all persons who have been displaced or whose livelihoods have been adversely affected as a result of state programs have the right to commensurate monetary or alternative means of compensation, including relocation with adequate state assistance.

The 1960 Civil Code of Ethiopia has also several important provisions and procedures that are pertinent to expropriation of land and compensation for private property for public purposes. Pertain

to this Act. 1460 states "…competent authority has the right to compel the owner to surrender the ownership of an immoveable property for public purposes."

Under the Ethiopian Civil Code, the owner may be compelled to surrender the ownership of land for public purpose. Furthermore, it is also stipulated in the Civil Code that a project or a program that necessitated the expropriation of private property needs to be declared that it is in the public interest. This is supported by Article 1463 that states "…the project which makes expropriation necessary shall be declared by notice to be in the public interest." and Act 1465 that states "… where public inquiry is necessary, the declaration of public utility will not be made until the public interest has been consulted."

The Civil Code also provides for valuation of and compensation for loss of property. For example, it is stated in the Civil Code that compensation for lost property should follow the replacement cost principles. Pertain to this Act 1474 states "The amount of compensation or the value of the land that may be given to replace the expropriated land shall be equal to the amount of actual damage caused by expropriation."

The proclamation on expropriation of land and compensation No 455/2005 implies repealed the outdated provisions of the Ethiopian civil code of 1960 regulations land acquisitions and compensation for the purpose of public project. This legislation established detail procedures setting the time limits within which land could be acquired after a request is received from a proponent, principles for assessment of compensation for properties on the land as well as for displacement compensation.

It also empowered the Woreda (district) administration to established valuation committees to value private properties in the case of public owned infrastructures to be removed the barriers for planned land acquisition, substantially raised the amount of compensation payable to expropriated owners of properties and displaced people.

Regulation No 135/2007 is for payment of compensation for property situated on land holdings expropriated for public purpose is issued for the proper implementation of the proclamation No. 455/2005. These regulations issued for the purpose of not only paying compensation but also to assist displaced persons to restore their livelihood. This regulation set forth details to determine the amount of compensation for different assets found on land holdings expropriated for public purpose and stipulated the formula to calculate the amount of compensation payable for different assets.

Regarding the determination of compensation, in part three articles 7 of the proclamation No.455/2005, the basis and amount of compensation is clearly explained in article 7(1) and 7(2). Act 7(1)a states that land holder whose holding has been expropriated shall be entitled to payment of compensation for his/her property situated on the land and for permanent improvements he/she made on the land. Act. 7(2) states that the amount of compensation for property situated on the expropriated land shall be determined on the basis of replacement cost of the property.

Under article 8(1) of this proclamation a survival land holder whose land holding has been permanently expropriated in addition to the compensation payable under article of this proclamation will be paid displacement compensation, which shall be equivalent to ten times the average annual income he secured to bring the five years preceding the expropriations of the land. Recently, there is proclamation that replaced Proclamation No.455/2005. Therefore, the new proclamation and related regulations will be accounted in the RAP preparation.

All PAPs and organization (whether public or private) that loss houses, crops or sources of income have co been compensated or rehabilitated according to the type and amount of their losses.

9.2.2. World Bank Policies and Procedure for Involuntary Resettlement

World Bank issued an operational policy on involuntary resettlement policy OP 4.12 which is applied to all World Bank financed projects. The World Bank's OP 4.12 underlines the need to identify, understand and mitigate various "impoverishment risk social cultural economic, and environment that may arise as a result of a development project that entails displacement of people.

The objective of the Bank's resettlement policy is to ensure that population displaced by a project should receive benefits from it. The policy has the following key objectives:

i. To avoid involuntary resettlement where feasible, or minimize resettlement impacts where population displacement is unavoidable, exploring all viable project designs.
ii. Particular attention must be given to socio-cultural considerations, such as cultural or religious significance of land, the vulnerability of the affected population, or the availability of in-kind replacement for assets, especially when they have important intangible implications. When a large number of people or a significant portion of the affected population would be subject to relocation or would suffer from impacts that are difficult to quantify and to compensate, the alternative of not going ahead with the project should be given a serious consideration:
    - To ensure that displaced people receive resettlement assistance, preferably under the project, so that their standards of living, income earning capacity and production levels are improved;
    - To provide explicit guidance to Bank staff and to the borrowers on the conditions that need to be met regarding involuntary resettlement issues in Bank operations in order to mitigate the negative impacts of displacement and resettlement and establish sustainable economy and society and
    - To set up a mechanism for monitoring the performance of involuntary resettlement programs in Bank operations and remedying problems as they arise so as to safeguard against ill-prepared and poorly implemented resettlement plans.

According to World Bank's involuntary resettlement program the plan should include measures to ensure that displaced persons should be:

- Informed about their options and rights pertaining to resettlement.
- Consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives.
- Provided prompt and effective compensation at full replacement cost for losses.
- Provided assistance (such as moving allowances) during relocation.
- Provided with residential housing, or housing sites, or as required agricultural sites for which a combination of productive potential, location advantages and other factors is at least equivalent to the advantages of old sites.
- Provided with development assistance in addition to compensation measures, such as land preparation, credit facilities, training, or job opportunities and
- Offered support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standard of living.

9.3. Project Land Acquisition Process

The Federal and Regional constitutions as well as land laws issued so far declare that all land in the country –urban and rural- is state property and private ownership is not allowed. Land users (cultivators and pastoralists) have only use rights over the land in their care which they cannot sell, mortgage or exchange in any way. The power to administer land, which includes land allocation, disposal, use, registration and adjudication, has been given by law to the regional authorities but such administration must be consistent with the federal constitution issued in 1995 and federal land laws, the most recent of which were issued in 2005.

The use right of land holders is dependent on residence in a kebele (locality or sub-district), personal engagement in agricultural, "proper" management of the land, and other restrictive conditions. Holders who are found to have violated any of these conditions are subject to penalties including the loss of their right to the land. Holders may also lose the land if they are absent from their farms and the land is left idle for three or more consecutive years. The government has the right to remove holders from the land if it decides that the land is needed for "public purposes" or if it considers that the land will be more valuable if utilized by investors, cooperative societies and other public or private entities. The government will pay compensation in the event of land expropriation but many holders whose land has been alienated have often complained that the compensation paid has been unfair and inadequate. The government has implemented a program of land certification and registration in the last few years, and while the program has been welcomed by many land holders, it has not prevented public authorities from expropriating land and natural resources. In this same period a considerable number of peasants have been expropriated and their land leased out to private investors, especially from the early 2000s when land for the floriculture business which was booming at the time was in high demand. In brief, what exists is a land system in which holders have only limited rights that are conditional and subject to abrogation at any time, and in which they do not enjoy robust security of tenure. In the past as well as today, land rights have always defined relations of power between the states on the one hand and small holders and their communities on the other,

though the specific circumstances of and justifications for these relations have been different under different political contexts.

As long as an investor come to know access right and the requirements that come with it land can be obtained easily, especially in pastoralist and semi-pastoralist peripheral regions like the project area. In fact, the availability and accessibility of huge high-value and virgin lands suitable for a range of agricultural activities and attractive incentive packages are provided by the Government of Ethiopia for new and existing investors who wish to develop new areas or improve existing ones.

The investor should collect information on opportunities and potentials with regards to land for commercial agriculture or ago-processing with a focus on specific subsector or activity of the intended purpose of the project before application. Ones the site is identified, depending on the scale of the project applications could be submitted to different administration levels starting from the Federal to the lowest administration level, which is the kebele. Before, deciding the project site and in the course of feasibility study, valuable information could be obtained from different governmental and non-governmental organizations.

The client has collected relevant information and followed proper procedures starting from the Federal relevant offices all the way to regional, Zonal, woreda and kebele administrations. After agreement with the Zonal, Woreda and Kebele relevant government offices the South Nations, Nationalities and Peoples Regional State Investment Office has approved the application. Finally, land holding certificate was given to the client by South Omo Zone, Investment Development and Expansion Office. After acquiring the landholding certificate, the PAPs were identified, affected property determined and compensation was made as per the national and regional laws and regulations.

9.4. Livelihoods of the Community around the Project Site

There are no directly Project Affected People (PAPs) inside the project site. However, there few houses along the gravel access road to the project site. Among the different livelihood activities of the population, subsistence farming and animal rearing is the major livelihood activity where large majority of the population is engaged. In addition to farming, small scale trade and business are some of the activities where small group of the population is engaged.

Women and other vulnerable groups have to be treated properly in the process. In the process of land acquisition and compensation the following issues have to be given emphasis.

- Identification of the socioeconomic conditions, needs, and priorities of women; and the impact on women is monitored and evaluated separately.
- Entitlement criteria recognize Female Headed Households.
- Entitlements ensure that women are not disadvantaged by the process of land acquisition and resettlement.
- Land titles at the resettlement site or any grants included are in the name of both spouses.

- Women's groups are involved in resettlement planning, management, and operations and in job creation and income generation.

As there are no inhabitants within the project area Resettlement Action Plan and livelihood restoration plan is not required. There is n also land ownership claim inside the project area. The land is a natural bushland associated with grass owned by the government.

9.5. Valuation and Compensation for Loss of Assets

The strategy adopted for the expropriation and compensation of the affected properties/assets follows the Federal Government laws and regulation for valuation and compensation estimate. In addition to the FDRE laws and regulations, WB policies and Regional Government laws and other supplementary guidelines are considered to achieve replacement cost for the lost assets. This process builds on World Bank's policy on involuntary resettlement (OP/BP 4.12). The Bank's policy addresses the need for the treatment of project impacts, which cannot be avoided. The policy objectives of OP 4.12 are either to avoid or minimize involuntary resettlement; if carried out to execute as sustainable development programmed and to provide assistance to displaced persons so that they could be able to restore or improve their livelihood. The policy also sets eligibility criteria, resettlement instruments and monitoring, and other provisions.

The compensation and resettlement process are within Ethiopia's existing legal and administrative framework and World Bank's policy on involuntary resettlement (OP4.12). Valuation of assets was conducted by experienced persons in the presence and deep involvement of experts from the woreda and kebele relevant offices.

The compensation approach adopted reflects the FDRE's proclamation 455/2005 and WB policy on involuntary resettlement (OP 4.12). Compensation for land structures, fixed improvements and other temporary impacts are based on among other things on market valuation, productivity valuation, negotiated settlements, material and labor valuation, disposition of save materials and other fees paid. The compensation approach was determined on the willingness and readiness of owners of a resource to give up their rights. Compensation for temporary impacts was calculated on the basis of the criterion/principles;

- Compensation equivalent to lost income required for the duration of impact,
- Compensation equivalent to lost income required for loss of access, and
- Physical restoration of assets (or access) required prior to return.

In addition, PAPs are entitled to transitional assistance which includes moving expenses, residence, employment training and income support. In general, the compensation approach addressed the following four questions:

- What to compensate for (e.g., Land, structures, business, fixed improvements or temporary impacts, lost income);
- How to compensate;
- When to compensate; and

- How much to compensate.

The compensation approach is determined based on the willingness and readiness of owners of a resource to give up their rights. The compensation procedures included three steps; Establishment of compensation committees, Assessment of replacement values of identified assets; Establishment of compensation rates for all assets to be expropriated.

9.6. Entitlement/Eligibility and Income Restoration

To determine the eligible person for compensation the national proclamations and regulations (proclamation 455/2005; Regulation No, 135/2007) and World Bank involuntary resettlement policy are taken in to account. Therefore, the criterion for eligibility for affected persons is contained in World Bank involuntary resettlement policy and the national proclamation No 455/2005 which are adopted in the compensation process.

All project affected structure owners and users who lose land, houses, or sources of income were compensated or rehabilitated according to the type and amount of their losses based on the census and inventory of lost assets conducted. The date of census establishes the cut-off date to record the PAPs in a project area who can receive compensation for lost assets and /or resettlement and rehabilitation assistance were set. A person who occupies the land after the inventory of household and assets is completed will not be eligible for compensation.

Other important issue is income restoration which refers reestablishment of income levels for the PAPs prevalent at the time of displacement. Income restoration is an important component for the resettlement of PAPs who have lost their productive base, jobs, or other income sources, regardless of whether they have also lost their houses.

In income restoration, issues such as source of livelihood (monetary and non-monetary), availability of land for replacement (if possible), existing skills of PAPs, employment opportunities and income restoration options will be provided. For PAPs who have lost their assets, income restoration plans or programmers may require support and services in the long- and short-term basis.

10. CONCLUSION AND RECOMMENDATIONS

Ethiopia is home to the largest herd of cattle in Africa over 60 million heads that represent about 45 percent of the total livestock and to approximately 61 million shoats (50.2 percent sheep and 49.8 percent goats). The livestock sector occupies an important place in the Ethiopian economy, contributing 16-19 percent of total Gross Domestic Product and about 35-40 percent of the agricultural Gross Domestic Product and it is estimated to contribute directly and indirectly to the livelihood of 60-70 percent of the Ethiopian population. Unfortunately, this sector has never been modernized. It has very low contribution to nations' economy. The proposed project by Luna Slaughterhouse PLC will be an eye opener in the development of modern ranches in Ethiopia.

In this study through evaluation of the ESIA has been carried out on the proposed project using all data collection instruments and tests. The different stakeholders at different administration levels including the local community have been consulted and their views entertained. The community and stakeholder consultation meetings have been carried out and the view are minute (see annexes).

The ESIA study involved in scoping, through baseline survey, impact identification analysis and proposing mitigation measures and setting the Environmental management and Monitoring Plan with indicative budgets. The positive impact of the project was found to be overweighing the negative impacts in the study.

The proposed project area is inhabited by semi-pastoralist Berhane community with few households inside the project area. The proponent has already acquired 5000 ha of land in the first phase of the project. No settlement exists inside the project area. The project area is government owned. The entire local communities including experts in sectoral offices and key administrators are in support of the implementation of the project.

The environmental adverse impacts are related to deforestation, land morphology modification, OHS and health issues related to migration of new work force and impacts on the mobility of fauna and air and water pollution that comes from any activity of a modern ranch. For all the adverse impacts proper mitigation measures are proposed.

The obvious positive impact of the project is enhancing the local and national economy, knowledge transfer to the local community, providing some basic services to the community (e.g., water), employment opportunity and above all the income generation through its grower services to the local community and veterinary services play vital role in changing the lives of the people. The benefits that can be achieved from such investment by far outweigh the negative impacts.

After assessing the baseline conditions and capturing the views of all stakeholders the consultant has come to the conclusion that the project should be implemented by strictly observing the Environmental management and Monitoring Plan outlined in Chapter 8.
The following recommendations could also be suggested.

- *PRAP and RPRP*: Luna has to prepare risk assessment procedure and more refined Emergency Preparedness and Response Plan.
- *Livelihood Restoration Plan* – Although there are no inhabitants within the project area, the local community in neighboring villages use the forest for honey production and grazing. Therefore, livelihood restoration plan must be prepared. Some of the interventions could be training in fodder production, modern behaving and any other alternative livelihood enhancement such as facilitating small business in the area.
- *Community development plan:* as it is indicated above the affected community might face a lot of social and psychological disturbances. To that end, there is a need to have a community development plan which should focus on the smooth transition of the l9cal community to a better living condition and increase productivity. Particular emphasis must be given to women and vulnerable groups.
- *Employment opportunity:* give employment opportunity to the local community members, especially to women and vulnerable groups.
- *Public awareness creation:* Timely information is believed to be a key to have public involvement on the project activity for the successful implementation of the project. To this effect the client should undertake promotional activities particularly on the objectives of the project and planned impact on the lives of the local community.
- Negative impacts cold be anticipated from non-standard operating conditions, (i.e., equipment failure or unusual environmental conditions such as flooding), accidents and emergencies etc. In this connection Luna needs to prepare a risk assessment procedure and develop godliness to avoid risks.
- The local community could be trained on modern animal production and agriculture and environmental conservation. There are many unemployed youths that seek job opportunity in the area to be trained.
- The local community and the woreda and kebele administrations are interested to see the implementation of the project as urgently as possible. Therefore, it is recommended to account their view and commence the project activities on schedule.

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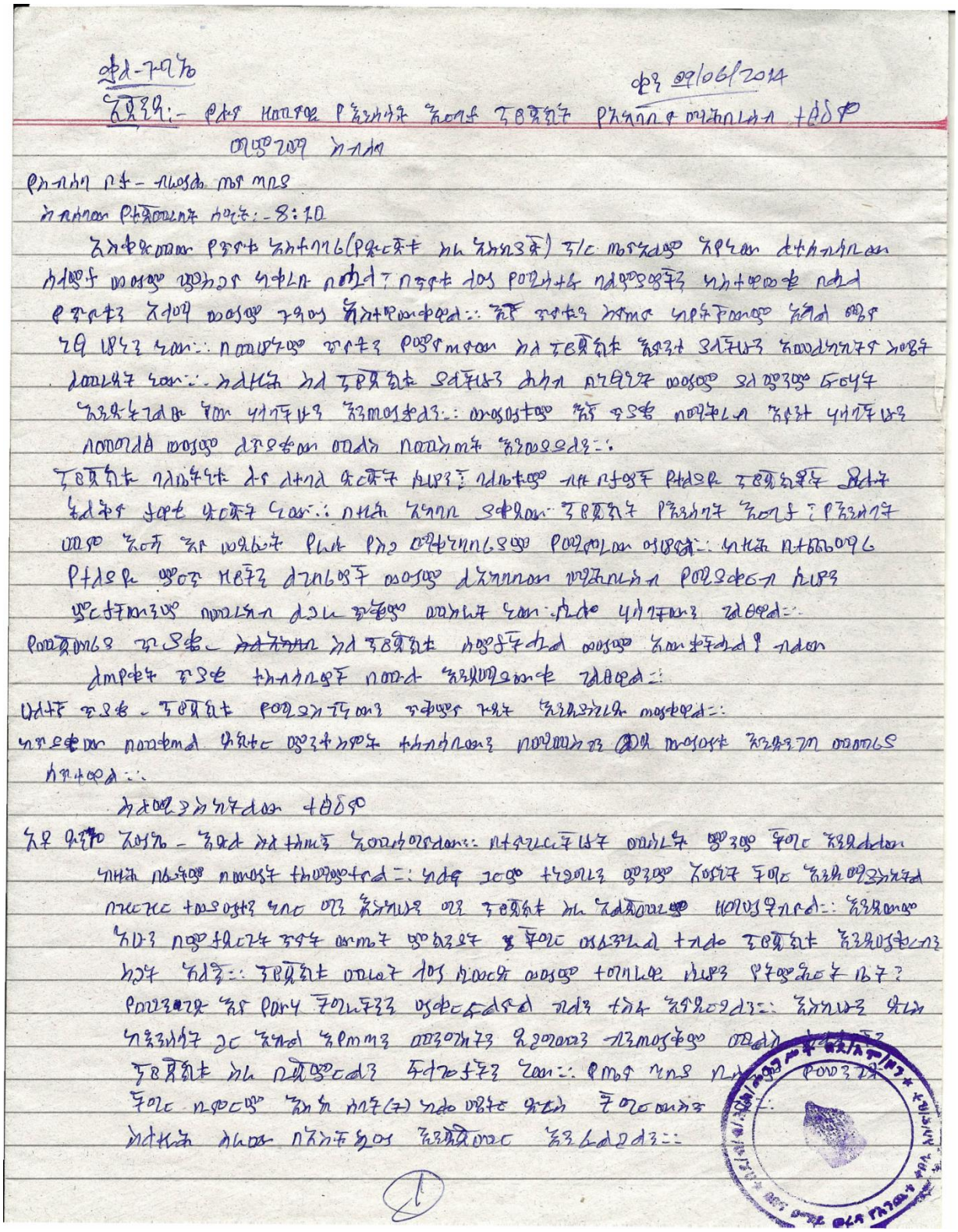
ANNEXES

Annex 1. Minutes of stakeholder and community consultation meetings



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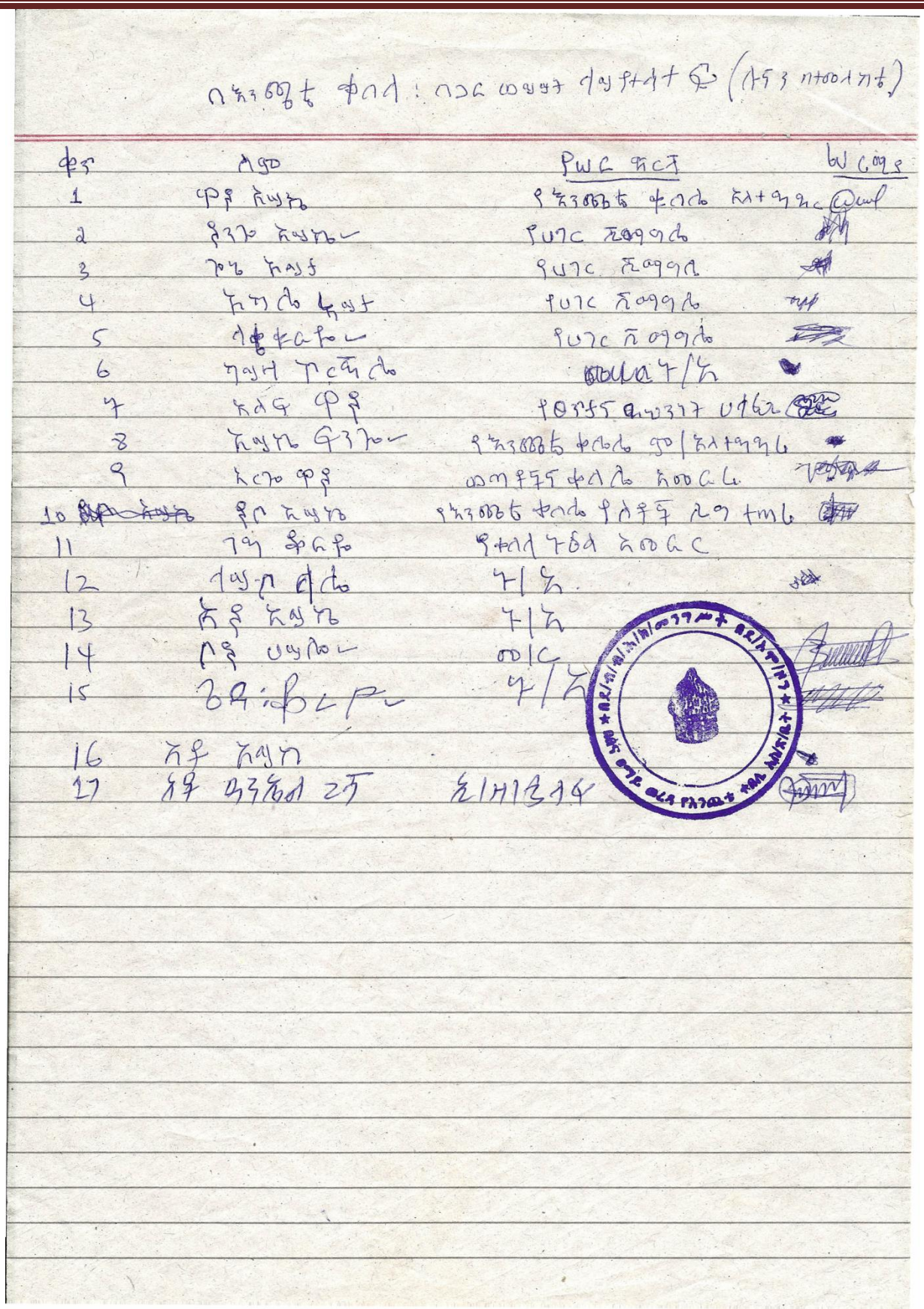
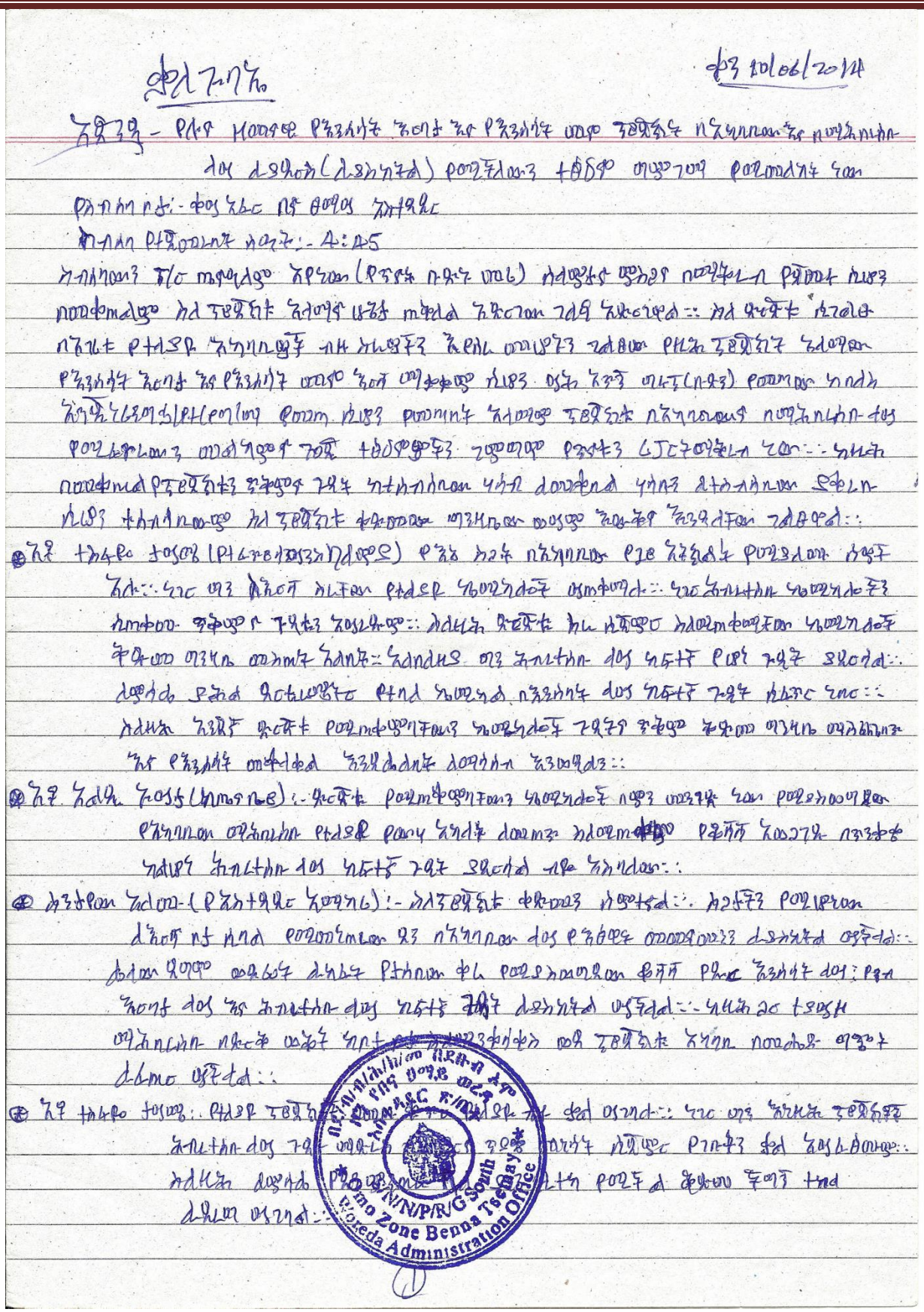



Zone Benna Tsemay
Woreda Administration Office

⑩ ሰፊ ስጋት የለም፡- በጎሳ አርሶአደሮች ወይም ፕሮጀክቱ በመሬት መቀመጥ ጉዳይ ላይ አልተቃወሙም። አርብቶአደሩ ለእንስሳ በመሆኑ የሚያስፈልገውን ግጦሽም በቅርብ በሚቀርብልን ፕሮጀክት ተጠቃሚ ስለሆንን ሰፊ የተሻለ ጥቅም እንደሚያስገኝ እምነታችን ነው። አርብቶአደሩ ከምርቱ ዘር ተጠቃሚ ይሆናል።

⑪ መሬት ስለመውሰድ በተመለከተ፡- ለፕሮጀክቱ እንደ አካባቢ ሌላ የሰጠን ለሀገር ልማት ሲባል በፈቃዳችን ነው ስለሆነም ገበሬን የምንከፍልበት ነገር የለም።

⑫ አጠቃላይ አስተያየት ፡- በአጠቃላይ ለፕሮጀክቱ 500 ሄክታር የተሰጠው ሲሆን 21 ሄክታር ለግጦሽ ቀሪው የሚሆነው ሲሆን 7 ሄክታር ደግሞ ለሌላ የሚያስፈልግ ነገር ነው። ስለዚህ ወረዳው ግን መንግስት ለመጠቀም ካለው አካባቢያዊ ሰላም ጉዳይ ጋር የሚስማማ ለወደፊትም መንግስት ሊሆን ይገባል። በመሰረተ ልማትም የቀበሌ አርብቶአደሮችን ተጠቃሚ በማድረግ እንዲሁም ስራ አጥ ወጣቶችን የስራ እድል እንዲፈጥር ተገቢውን እንዲያደርግ በማድረግ ለማህበረሰቡ እንዲሰራ ሲባል ፕሮጀክቱን በመተግበር እንዲያበረታታ።

ስብሰባው የተጠናቀቀበት ሰዓት

Bena Tsemay Woreda Administration stamp: ... በደቡብ ብሔ/ብ/ሕ/ክ/መ ... ደቡብ ኦሞ ዞን ... ወረዳ ... ጽ/ቤት S/N/N.P.R.G South Omo Zone Benna Tsemay Woreda Adm... Office

2

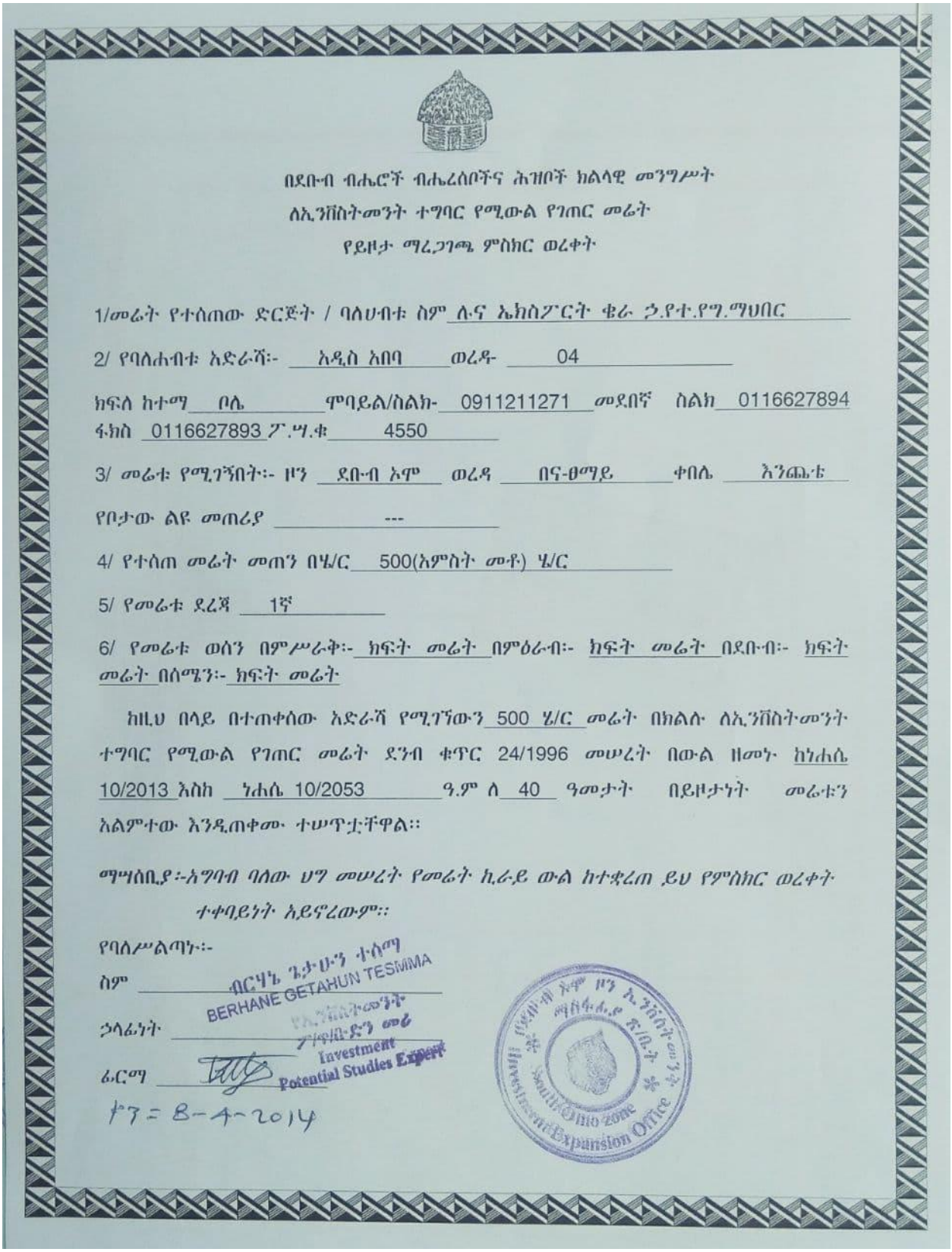
Date:- 10-06- 2014 E.C

Focused - Group - Discussion About Luna
with key steak holders
Place:- Tsemay Bena Administrative Office.

No	Name	Sign	Office
1	TEWODROS DEREJE (0967537573)	[signature]	
2	Dawit Uri (0945629083)	[signature]	Eadecator Cent
3	Aidi - Oyta	[signature]	Health Sector
4.	Sintayehu Alemu	[signature]	Adminstrator (Advisor)
5	Tesfaye Gaye (0916144689)	[signature]	Agricultural Sector
6.	Aliyare Kotas	[signature]	Adminstrator
7	Mestawat Bezabih (0916713236)	[signature]	W/C/office
8	Esubalew Tesfaye	[signature]	LUNA

S/N/N/P/R/G South Omo Zone Benna Tsemay Woreda Administration Office

Annex 2. Landholding certificate



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1/መሬት የተሰጠው ድርጅት / ባለሀብቱ ስም ሉና ኤክስፖርት ቄራ ኃ.የተ.የግ.ማህበር

2/ የባለሐብቱ አድራሻ፡- አዲስ አበባ ወረዳ- 04

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የቦታው ልዩ መጠሪያ ---

4/ የተሰጠ መሬት መጠን በሄ/ር 500(አምስት መቶ) ሄ/ር

5/ የመሬቱ ደረጃ 1ኛ

6/ የመሬቱ ወሰን በምሥራቅ፡- ክፍት መሬት በምዕራብ፡- ክፍት መሬት በደቡብ፡- ክፍት መሬት በሰሜን፡- ክፍት መሬት

ከዚህ በላይ በተጠቀሰው አድራሻ የሚገኘውን 500 ሄ/ር መሬት በክልሉ ለኢንቨስትመንት ተግባር የሚውል የገጠር መሬት ደንብ ቁጥር 24/1996 መሠረት በውል ዘመኑ ከነሐሴ 10/2013 እስከ ነሐሴ 10/2053 ዓ.ም ለ 40 ዓመታት በይዞታነት መሬቱን አልምተው እንዲጠቀሙ ተሠጥቷቸዋል።

ማሣሰቢያ፡-አግባብ ባለው ህግ መሠረት የመሬት ኪራይ ውል ከተቋረጠ ይህ የምስክር ወረቀት ተቀባይነት አይኖረውም።

የባለሥልጣኑ፡-

ስም ብርሃኔ ጌታሁን ተሰማ BERHANE GETAHUN TESMMA

ኃላፊነት የኢንቨስትመንት ፖቴንሻሊቲዲን መሪ Investment Potential Studies Expert

ፊርማ

ቀን 8-4-2014

Project Name Luna Export Slaughterhouse

Region S/n/n/p/r Zone South Omo

Woreda Bena Tsemaye Kebele Enchete

Servey by Afework Abraham

Locaton In North Open Land

South Open Land

East Open Land

West Open Lan

Luna Slaughterhouse Service Area 468.43 ha X and y coordinat Data

station	x-coordinat	Y-coordinat	Gps Type	REMARK
1	276565	605789	Garmin 72H	
2	274935	606225	Garmin 72H	
3	274319	603493	Garmin 72H	
4	275977	603119	Garmin 72H	

Luna for ground water Re.pond A.22.98 ha X and y coordinat Data

station	x-coordinat	Y-coordinat	Gps Type	REMARK
1	275492	600623	Garmin 72H	
2	275950	600623	Garmin 72H	
3	275950	600121	Garmin 72H	
4	275492	600121	Garmin 72H	

Luna for irrigation Canal Purpese 8.59 ha X and y coordinat Data

station	x-coordinat	Y-coordinat	Gps Type	REMARK
1	275715.34	600623.44	Garmin 72H	
2	275745.88	600623.01	Garmin 72H	
3	275781.49	603166.24	Garmin 72H	
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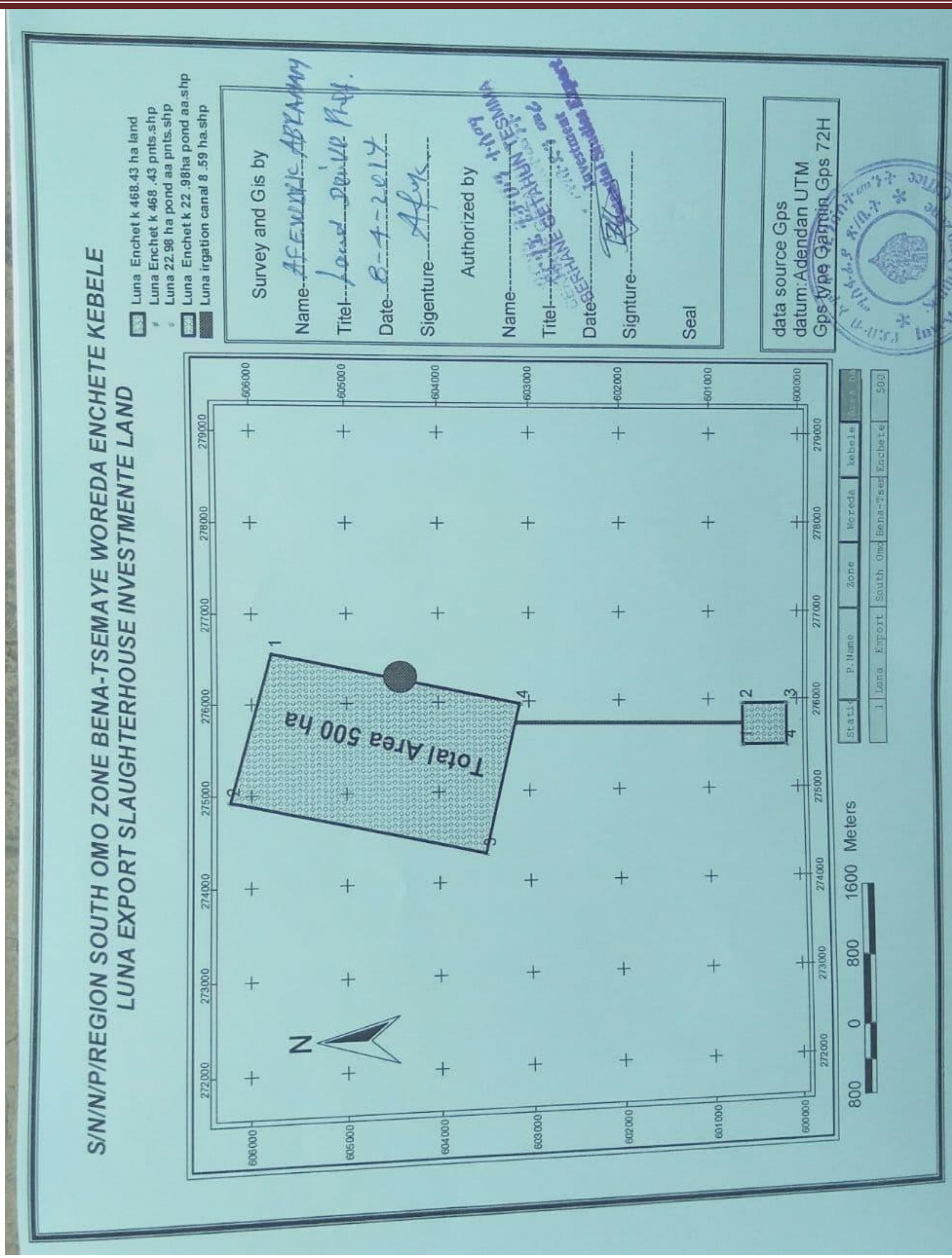
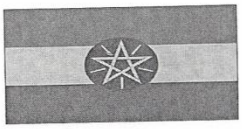

S/N/N/P/REGION SOUTH OMO ZONE BENA-TSEMAYE WOREDA ENCHETE KEBELE
LUNA EXPORT SLAUGHTERHOUSE INVESTMENTE LAND
Luna Enchet k 468.43 ha land
Luna Enchet k 468 .43 pnts.shp
Luna 22.98 ha pond aa pnts.shp
Luna Enchet k 22 .98ha pond aa.shp
Luna irgation canal 8 .59 ha.shp
Survey and Gis by
Name-
Titel-
Date-
Sigenture-
Authorized by
Name-
Titel-
Date-
Signture-
Seal
data source Gps
datum:Adendan UTM
Gps type Garmin Gps 72H
Total Area 500 ha
N
800 0 800 1600 Meters
Statis
P.Name
Zone
Woreda
kebele
Area ha
1
Luna Export
South Omo
Bena-Tsem
Enchete
500

Annex 3. Legal documents of the consultant



በኢትዮጵያ ፌዴራላዊ ዴሞክራሲያዊ ሪፐብሊክ
የኢትዮጵያ ገቢዎችና ጉምሩክ ባለሥልጣን
ስለግብር አክፋፈል የሚሰጥ ማስረጃ

ቀን: 23 ጥቅምት 2014

የደብዳቤ ቁጥር: 1609995220010

ለሚመለከተው ሁሉ

ከላይ በርዕሱ እንደተጠቀሰው ስለግብር ክፍያ ማስረጃ መጠየቅዎ ይታወሳል።

በዚሁ መሠረት በለስ ኢንጂነሪንግ ኃላ/የተ/የግ/ማህበር የተባሉት ግብር ከፋይ የግብር ከፋይ መለያ ቁጥር 0011730824 ሆነ የሚፈለግባቸው የግብር ክፍያ ግዴታ የተወጡ ስለሆነ የግብር ዘመን የሚፈለግባቸውን የግብር ክፍያ የከፈሉ ሲሆን ፤ የ 2014 ዘመን የንግድ ፈቃዳቸው ቢታደስላቸው እና/ወይም በግብር ከፋዩ ስም የተመዘገበ ተሽከርካሪ ከላውዶ ቢደረግ የማንቃወም መሆኑን አንገልጻለን።

ይህ የግብር አክፋፈል ምስክር ወረቀት ጨረታ ለመሳተፍ የሚያገለግለው እስከ 24 MEAZIA 2014 ቀን ነው።

ማስታወሻ፦ ይህ ማስረጃ የንግድ ድርጅት ወይም/እና የንግድ ሥራ ንብረትን [illegible] ለመመለስ አያገለግልም።

FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
ETHIOPIAN REVENUES AND CUSTOMS AUTHORITY

TAX CLEARANCE CERTIFICATE

Date : 02-NOV-21

Certificate No.: 16099952200

To Whom It May Concern,

We refer to your request regarding the above subject.

We would like to confirm that BELES ENGINEERING PLC , TIN 0011730824 has settled his/her Tax obligation for the Tax Year and that he can renew his/her Business Licence and/or conduct annual inspection service for motor vehicle owned by the Taxpayer for the year 2021/2022.

For the purpose of participation in bids and auctions, this Tax Clearance Certificate is valid until 24 MEAZIA 2014.

Tax Official's Name & Signature

JAA BRANCH EAST

በአዲስ አበባ ከተማ አስተዳደር ንግድ ቢሮ
Addis Ababa City Administration Trade Bureau

ሴሪ ቁ. № 2887710

የግብር ከፋይ መለያ ቁ. /TIN 0011730824
የንግድ ምዝገባ ቁ . BL/AA/2/0002746/2005
Principal Registration No.
የቀድሞው ንግድ ፈቃድ ቁጥር 06/2/24703/03
Previous License No.
የንግድ ሥራ ፈቃድ ቁጥር 14/673/9911/2005
Business License No.
ቀድሞ ተሰጠበት ቀን 1/10/2003
Previous Date of issuance
የተሰጠበት ቀን 9/1/2005
Date of issuance
የታደሰበት ቀን : 10/3/2014
Renewal Date

የንግድ ሥራ ፈቃድ
በንግድ ምዝገባና ፈቃድ አዋጅ ቁጥር 980/2008 መሰረት ተሰጠ

Business License
Issued Under Commercial Registration and Busines license proc.No 980/2016

1. የግለሰቡ/ድርጅቱ ስም በለስ ኢንጅነሪንግ ኃላፊነቱ የተወሰነ የግል ማህበር	**1. Owner/Company Name** BELES ENGINEERING PRIVATE LIMITED COMPANY
2. ዜግነት በኢትዮጵያ የተመዘገበ	**2. Nationality** Registered in Ethiopia
3. የንግድ ስም	**3. Trade Name**
4. ሥራ አስኪያጅ ስም አቶ ጤናዓለም አየነው ትግያ	**4. General Manager Name** Mr. TENALEM AYENEW TGYA
5. የንግድ ድርጅቱ አድራሻ	**5. Business Address**
ክልል አዲስ አበባ ዞን/ክፍለ ከተማ ቦሌ	Region Addis Ababa Zone/Sub City Bole
ወረዳ 06 ቀበሌ -----	Woreda 06 Kebele -----
የቤት ቁጥር አዲስየቢ.ቁ417 ስልክ ቁጥር 0116634843	House No. አዲስየቢ.ቁ417 Tel.No 0116634843
ፋክስ ---- ኢ-ሜይል ----	Fax ---- E-mail ----
6. የንግድ ሥራ መስክ (86515)በውሃ ስራዎች የማማከር አገልግሎት	**6. Field of Business** (86515)Consultancy service on water Works
7. ካፒታል በኢት ብር 1,873,000.00	**7. Capital in ETB** 1,873,000.00
ይህ የንግድ ፈቃድ ዛሬ 10/3/2014 በ አዲስ አበባ ተሰጠ።	This Business License is issued in Addis Ababa this day 11/19/2021
የሃላፊ ስም/Name of Official ማህተም Seal	
ፊርማ/Signature	

ለ2014 ታድሷል

ማሳሰቢያ- N.B.
1. ይህ የንግድ ፍቃድ በዓዋጅ ፈቃድ ቁጥር 980/2008 መሠረት እንደ የበጀት ዓመቱ በአዋጅ በተቀመጠው መሰረት መታደስ አለበት።
This License Shall be renewed in accordance with Proclamation No. 980/2008 as per the fiscal year.
2. ይህ የንግድ ፈቃድ የምስክር ወረቀት በዋስትና ወይም በእዳ ሊያዝ አይችልም።
The holder of this License is forbidden for surety ship or debt

በአዲስ አበባ ከተማ አስተዳደር ንግድ ቢሮ
Addis Ababa City Administration Trade Bureau

ሴሪ ቁ. № 2887711

የግብር ከፋይ መለያ ቁ. /TIN 0011730824
የንግድ ምዝገባ ቁ . BL/AA/2/0002746/2005
Principal Registration No.
የቀድሞው ንግድ ፈቃድ ቁጥር
Previous License No.
የንግድ ሥራ ፈቃድ ቁጥር 14/673/988424/2007
Business License No.
ቀድሞ ተሰጠበት ቀን
Previous Date of issuance
የተሰጠበት ቀን 15/2/2007
Date of issuance
የታደሰበት ቀን : 10/3/2014
Renewal Date

የንግድ ሥራ ፈቃድ
በንግድ ምዝገባና ፈቃድ አዋጅ ቁጥር 980/2008 መሰረት ተሰጠ

Business License
Issued Under Commercial Registration and Busines license proc.No 980/2016

1. የግለሰቡ/ድርጅቱ ስም	በለስ ኢንጅነሪንግ ኃላፊነቱ የተወሰነ የግል ማህበር
2. ዜግነት	በኢትዮጵያ የተመዘገበ
3. የንግድ ስም	
4. ሥራ አስኪያጅ ስም	አቶ ጤናዓለም አየነው ትግያ
5. የንግድ ድርጅቱ አድራሻ	
ክልል	አዲስ አበባ
ዞን/ክፍለ ከተማ	ቦሌ
ወረዳ	06
ቀበሌ	-----
የቤት ቁጥር	አዲስየቢ.ቁ417
ስልክ ቁጥር	0911230110
ፋክስ	----
ኢ-ሜይል	----
6. የንግድ ሥራ መስክ	(51114)ጠቅላላ ስራ ተቋራጭ ከውሀ ፣ኤሌክትሪክ እና ኤሌክትሮ መካኒካል ስራ በስተቀር
7. ካፒታል በኢት ብር	1,873,000.00
ይህ የንግድ ፈቃድ ዛሬ	10/3/2014 በ አዲስ አበባ ተሰጠ ።

1. Owner/Company Name	BELES ENGINEERING PRIVATE LIMITED COMPANY
2. Nationality	Registered in Ethiopia
3. Trade Name	
4. General Manager Name	Mr. TENALEM AYENEW TGYA
5. Business Address	
Region	Addis Ababa
Zone/Sub City	Bole
Woreda	06
Kebele	-----
House No.	አዲስየቢ.ቁ417
Tel.No	0911230110
Fax	----
E-mail	----
6. Field of Business	(51114)General Contractor Except water; Electric And Electro Mechanical
7. Capital in ETB	1,873,000.00
This Business License is issued in	Addis Ababa
this day	11/19/2021

ማህተም Seal

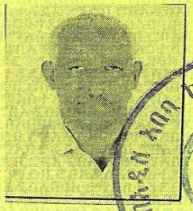
የሃላፊ ስም/Name of Official
ፊርማ/Signature

ለ2014 ታድሷል

ማሳሰቢያ- N.B.
1. ይህ የንግድ ፍቃድ በዓዋጅ ፈቃድ ቁጥር 980/2008 መሠረት እንደ የበጀት ዓመቱ በአዋጅ በተቀመጠው መሰረት መታደስ አለበት።
This License Shall be renewed in accordance with Proclamation No. 980/2008 as per the fiscal year.
2. ይህ የንግድ ፈቃድ የምስክር ወረቀት በዋስትና ወይም በእዳ ሊያዝ አይችልም።
The holder of this License is forbidden for surety ship or debt

በአዲስ አበባ ከተማ አስተዳደር ንግድ ቢሮ
Addis Ababa City Administration Trade Bureau

ሴሪ ቁ. № 2887712



የግብር ከፋይ መለያ ቁ. /TIN 0011730824
የንግድ ምዝገባ ቁ . BL/AA/2/0002746/2005
Principal Registration No.
የቀድሞው ንግድ ፈቃድ ቁጥር
Previous License No.
የንግድ ሥራ ፈቃድ ቁጥር BL/AA/14/673/493684/2007
Business License No.
ቀድሞ ተሰጠበት ቀን
Previous Date of issuance
የተሰጠበት ቀን 22/11/2007
Date of issuance
የታደሰበት ቀን : 10/3/2014
Renewal Date

የንግድ ሥራ ፈቃድ
በንግድ ምዝገባና ፈቃድ አዋጅ ቁጥር 980/2008 መሰረት ተሰጠ

Business License
Issued Under Commercial Registration and Busines license proc.No 980/2016

1. የግለሰቡ/ድርጅቱ ስም	በለስ ኢንጅነሪንግ ፕላፈነቱ የተወሰነ የግል ማህበር
2. ዜግነት	በኢትዮጵያ የተመዘገበ
3. የንግድ ስም	
4. ሥራ አስኪያጅ ስም	አቶ ጤናዓለም አየነው ትግያ
5. የንግድ ድርጅቱ አድራሻ	
ክልል	አዲስ አበባ
ዞን/ክፍለ ከተማ	ቦሌ
ወረዳ	06
ቀበሌ	-----
የቤት ቁጥር	አዲስየቢ.ቁ417
ስልክ ቁጥር	0116634843
ፋክስ	----
ኢ-ሜይል	----
6. የንግድ ሥራ መስክ	(86312)በአካባቢ አዲትና አካባቢ አጠባበቅ የማማከር አገልግሎት
7. ካፒታል በኢት ብር	1,873,000.00
ይህ የንግድ ፈቃድ ዛሬ	10/3/2014 በ አዲስ አበባ ተሰጠ።
የሃላፊ ስም/Name of Official	
ፊርማ/Signature	

1. Owner/Company Name	BELES ENGINEERING PRIVATE LIMITED COMPANY
2. Nationality	Registered in Ethiopia
3. Trade Name	
4. General Manager Name	Mr. TENALEM AYENEW TGYA
5. Business Address	
Region	Addis Ababa
Zone/Sub City	Bole
Woreda	06
Kebele	-----
House No.	አዲስየቢ.ቁ417
Tel.No	0116634843
Fax	----
E-mail	----
6. Field of Business	(86312)Environmental auditing and environmental protection consultan service
7. Capital in ETB	1,873,000.00
This Business License is issued in	Addis Ababa
this day	11/19/2021

ማህተም Seal

ለ2014 ታድሷል

ማሳሰቢያ- 1. ይህ የንግድ ፍቃድ በዓዋጅ ፈቃድ ቁጥር 980/2008 መሠረት እንደ የበጀት ዓመቱ በአዋጅ በተቀመጠው መሰረት መታደስ አለበት።
N.B. This License Shall be renewed in accordance with Proclamation No. 980/2008 as per the fiscal year.
2. ይህ የንግድ ፈቃድ የምስክር ወረቀት በዋስትና ወይም በእዳ ሊያዝ አይችልም።
The holder of this License is forbidden for surety ship or debt

በአዲስ አበባ ከተማ አስተዳደር ንግድ ቢሮ
Addis Ababa City Administration Trade Bureau

ሴሪ ቁ. № 2125293

የግብር ከፋይ መለያ ቁጥር/TIN 0011730824
የንግድ ምዝገባ ቁጥር BL/AA/2/0002746/2005
Principal Registration No
የቀድሞው የምዝገባ ቁጥር 06/2/30203/02
Previous Registration No
የቀድሞው የምዝገባ ቀን 10/10/2002
First Registration Date 9/1/2005
መጀመሪያ የተመዘገበበት ቀን
የተሻሻለበት ቀን : 7/5/2010
Modification Date

የንግድ ምዝገባ ምስክር ወረቀት
በንግድ ምዝገባ የፈቃድ አዋጅ ቁጥር 980/2008 መሰረት የተሰጠ

Commercial Registration Certificate
Issued under Commercial Registration and Business license proc No. 980/2016

፩.የግለሰቡ/ድርጅቱ ስም	በለስ ኢንጅነሪንግ ኃላፊነቱ የተወሰነ የግል ማህበር
2. ዜግነት	በኢትዮጵያ የተመዘገበ
4. የሥራ አስኪያጅ ስም	አቶ ጫናዓለም አየነው ትግያ
5. የንግድ ድርጅቱ አድራሻ	
ክልል	አዲስ አበባ
ዞን/ክፍለ ከተማ	ቦሌ
ከተማ	አዲስ አበባ
ወረዳ	06
ቀበሌ	------
የቤት ቁጥር	አዲስየቢ.ቁ417
ፖ.ሳ.ቁ	
ስልክ ቁጥር	0116634843
ፋክስ	----
ኢ-ሜል	----
6. ካፒታል በኢት. ብር	1,873,000.00
7. የተሰማራባቸው የንግድ ሥራዎች	በጀርባው ገፅ ይመልከቱ

1.Owner/ Company Name	BELES ENGINEERING PRIVATE LIMITED COMPANY
2. Nationality	Registered in Ethiopia
4. General Manager Name	Mr. TENALEM AYENEW TGYA
5. Business Address	
Region	Addis Ababa
Zone/Sub City	Bole
City	Addis Ababa
Woreda	06
Kebele	------
House No.	.417
P.O.Box	
Tel. No	0116634843
Fax	----
E-mail	----
6. Capital in ETB	1,873,000.00
7. Type of activities engaged	See Back Page

በግብር ከፋይ መለያ ቁጥር 0011730824 የተመዘገበ መሆኑን እናረጋግጣለን ።
ይህ የምዝገባ የምስክር ወረቀት ዛሬ 7/5/2010 ዓ.ም
በ አዲስ አበባ ተሰጠ ።

has duly been registered under TIN 0011730824
This Registration Certification is issued in 1/15/2018
on Addis Ababa

የኃላፊ ስም
Official's Name

ፊርማ
Signature

ማህተም
Seal

ማሳሰቢያ፡-
1. ይህ የንግድ ምዝገባ በአዋጅ ቁጥር 980/2008 መሠረት በየዘጠኙ ዓመቱ ከሐምሌ 1 ቀን እስከ ጥቅምት 30 ቀን ድረስ የሚታደስ ሲሆን በጊዜ ገደቡ ያልታደሰ ንግድ ምዝገባ ይሰረዛል።

N.B. This License Shall be renewed annually in accordance with Regulation no 980/2016 from July 1 to October 30 E.C with out penalty otherwise Commercial Registration Certificate would be Cancelled

2. ይህ የንግድ ምዝገባ የምስክር ወረቀት በዋስትና ወይም በእዳ ሊያዝ አይችልም።
The holder of this License is forbidden for surety ship or debt

የቅርጫፍ አድራሻ :

Branch Address :

8. የፋይናንስ ኢንሹራንስ የሪል እስቴት እና የንግድ ስራዎች
6. የጅምላ እና ችርቻሮ ንግድ፣የመኪና እና የሞተር ብስክሌት ጥገና፣የቤት ውስጥ እቃዎች የሆቴል እና ሬስቶራንት የአስመጪና ላኪነት ንግድ ስራዎች
5. ኮንስትራክሽን
1. ግብርና ፣አደን፣የደን ልማት እና የአሳ ማስገር
3. ማኑፋክቸሪንግ

8. FINANCIAL INTERMEDIATION, INSURANCE, REAL ESTATE AND BUSINESS SERVICES
6. WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES, MOTOR CYCLES AND PERSONAL AND HOUSEHOLD GOODS; HOTELS AND RESTAURANTS; IMPORT & EXPORT
5. CONSTRUCTION
1. Agriculture, Hunting, Forestry, And Fishing
3. MANUFACTURING

የኢትዮጵያ ፌዴራላዊ ዴሞክራሲያዊ ሪፐብሊክ
የኢትዮጵያ ገቢዎችና ጉምሩክ ባለሥልጣን
Federal Democratic Republic of Ethiopia
ETHIOPIAN REVENUES AND CUSTOMS AUTHORITY

የግብር ከፋይ ምዝገባ ሰርተፊኬት
TAXPAYER REGISTRATION CERTIFICATE

የግብ ከፋይ መለያ ቁጥር: Taxpayer Identification Number:	0011730824
የድርጅት/የግለሰብ ሥም: Name of Business/Individual:	በለስ ኢንጂነሪንግ ኃላ/የተ/የግ/ማህበር BELES ENGINEERING PLC
የተመዘገበ አድራሻ/Registered Address:	
ክልል: Region:	አዲስ አበባ ADDIS ABABA
ዞን/ክ.ከተማ: Zone/Sub City:	ቦሌ BOLE
ወረዳ: Woreda:	
ቀበሌ /በአማርኛ/: Kebele/Farmer's Assoc.:	WOREDA 06 WOREDA 06
የቤት ቁጥር: House No.:	NEW/O.417
ESIC Sub-group: ESIC Sub-group:	50230 - GENERAL CONTRACTOR EXCEPT WATER WORK CONTRACTOR 88222 - CONSULTANCY SERVICE FOR ENVIRONMENTAL AUDITING AND ENVIRON 88730 - WATER WORKS CONSULTANCY
የሰጠው ተቋም: Issuing Authority:	የኢትዮጵያ ገቢዎችና ጉምሩክ ባለሥልጣን ETHIOPIAN REVENUES AND CUSTOMS AUTHORITY
የተሰጠበት ቀን: Date of Issuance:	08 TIRR 2010 16-JAN-18

ይህ የምስክር ወረቀት የግብር ከፋዩን ብቸኛ የግብር ከፋይነት ምዝገባ ሲሆን ከዚህ ቀደም የነበሩ የግብር ከፋይነት ምዝገባ ሰነዶች ካሉ በዚህ ሰነድ የተተኩ መሆናቸውን ነው።
ከላይ በተጠቀሰው መረጃ ላይ ማንኛውም አይነት ለውጥ ቢደረግ ግብር ከፋዩ ለሚመለከተው የግብር ሰብሳቢ ጽ/ቤት የማሳወቅ ግዴታ አለበት።

This certificate represents the sole and only registration as a taxpayer and supersedes all prior registration documentation.
The taxpayer is responsible for notifying the appropriate Tax Office of any changes to the above information.

Tinsae Shalemo Sabiega
Registration & Deregistration Officer

የሰርተፊኬት ቁ.: Certificate No.: 1321218610010

የባለሥልጣኑ መ/ቤት ማህተም
Seal of Issuing Authority

በኢትዮጵያ ፌዴራላዊ ዲሞክራሲያዊ ሪፐብሊክ
የኢትዮጵያ ገቢዎችና ጉምሩክ ባለሥልጣን
የተጨማሪ እሴት ታክስ
የምዝገባ የምስክር ወረቀት
The Federal Democratic Republic of Ethiopia
Ethiopian Revenues and Customs Authority
Value Added Tax
Registration Certificate

አቶ/ወ/ሮ ወይም የድርጅት ስም በለስ ኢንጂነሪንግ ኃላ/የተ/የግ/ማህበር

የንግድ ስም (ካለዉ) በለስ ኢንጂነሪንግ ኃላ/የተ/የግ/ማህበር

አድራሻ/ክልል/ አ.አ ዞን/ ክፍለከተማ ቦሌ ወረዳ 06

ቀበሌ/ገ/ማህበር የቤት ቁጥር NEW/ቢ.ቁ417 ስልክ ቁጥር 116634843 ፖ.ሣ.ቁ

የሆነና በግብር ከፋይ መለያ ቁጥር 0011730824 የሚታወቁት በተጨማሪ እሴት ታክስ አዋጅ ቁጥር 285/ 1994

አንቀጽ 16 ወይም አንቀጽ 18 መሰረት በተጨማሪ እሴት ታክስ ቁጥር 3037400010 ከ መስከረም 01 ቀን 2003 ዓ.ም ጀምሮ ስለተመዘገቡ ይህ የምዝገባ ሰርተፊኬት ተሰጥቷቸዋል::

Mr./s or Company Name BELES ENGINEERING PLC

Trade name /If any/ BELES ENGINEERING PLC

Address (Region) ADDIS ABABA Zone / Sub city BOLE Woreda NO WOREDA-144

Kebele/Farmers Ass. WOREDA 06 House No. NEW/O.417 Telephone No. 116634843 P.O. Box

Whose Taxpayer Identification Number (TIN) is 0011730824 has been registered in accordance with VAT Proclamation No. 285/2002

Article 16 or Article 18 and hence, this VAT registration Number 3037400010 has been issued starting from 11-SEP-2010 .

16-JAN-2018/ 4324930010

የደንበኞች አገልግሎት ዳይሬክቶሬት ዳይሬክተር

Customers' Service Directorate Director

ኮንስትራክሽን ሚኒስቴር
MINISTRY OF CONSTRUCTION

ሴሪያል ቁጥር № 01068
Serial

የምዝገባ ቁጥር: WRCF/5/35
የተሰጠበት ቀን 14/11/2007

የአማካሪ ድርጅት የብቃት ማረጋገጫ ምስክር ወረቀት

የኮንስትራክሽን ሚኒስቴር የኢትዮጵያ ፌዴራላዊ ዴሞክራሲያዊ ሪፐብሊክ አስፈፃሚ አካላትን ሥልጣንና ተግባር ለመወሰን በወጣው አዋጅ ቁጥር 916/2008 አንቀፅ 27/1/መ በተሰጠው ስልጣን መሰረት፡

የድርጅት ስም በለስ ኢንጂነሪንግ ኃ/የ/የተ/የግ/ማህበር ዜግነት ኢትዮጲያዊ

የቴክኒካል ሰራ አስኪያጅ ስም፡ ጤናአለም አየነው ትግያ

አድራሻ፡ ከተማ፡ አዲስ አበባ ክ/ከተማ፡ ቦሌ

ወረዳ/ቀበሌ፡ 14 ፖ.ሣ.ቁ. ስልክ.ቁ. 0911230110

የተመዘገቡበት መስክ፡ የውሃ ሃብት አማካሪ

ደረጃ፡ 05/አምስት

ለደረጃው የሚያስፈልገውን መስፈርት (የሰው ኃይል ፡ መሳሪያ ፡ ቢሮ እና የቢሮ ፋሲሊቲ) ያሟላ መሆኑን በማረጋገጥ የብቃት ማረጋገጫ ምስክር ወረቀት ሰጥቷል፡፡

እስከ ሰኔ 30 /2014 ዓ.ም የሚያገለግል

ከሠላምታ ጋር

Registration No. WRCF/5/35

Date of Issue 21/07/2015

CERTIFICATE OF COMPETENCE FOR CONSULTANT

MINISTRY OF CONSTRUCTION, BY VIRTUE OF THE AUTHORITY GIVEN TO IT BY SUB ARTICLE (1) (D) OF ARTICLE 27 OF THE PROCLAMATION No. 916/ 2015 PROVIDED FOR THE DEFINITION OF THE POWERS AND DUTIES OF EXECUTIVE ORGANS OF THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

NAME - OF- FIRM BELES ENGINEERING P.L.C

NATIONALITY ETHIOPIAN

NAME - OF-TECHNICAL- MANAGER : TENALEM AYENEW TEGAYE

BUSINESS ADDRESS CITY ADDIS ABABA SUBCITY BOLE

WEREDA/KEBELE 14 P.O. BOX TELE 0911230110

REGISTERED - AS WATER RESOURCE CONSULTANT CATEGORY 05/FIVE

THIS CERTIFICATE OF COMPETENCE IS ISSUED IN COMPLIANCE WITH THE PROVISIONS OF THE GUIDELINES FOR THE REGISTRATION OF PROFESSIONALS AND CONSULTANTS.

WITH REGARDS.

VALID Up to JUNE 07 /2022

B.S.S.P.E.

ቁጥር : 11/1.1/3520/13
ቀን : 18/12/2013

የአካባቢ, ደንና የአየር ንብረት ለውጥ ኮሚሽን Environment, Forest & Climate Change Commission

የብቃት ማረጋገጫ የምስክር ወረቀት

የአካባቢ፣ ደንና የአየር ንብረት ለውጥ ኮሚሽን የአካባቢ እና ማኅበረሰብ ተዕዕኖ ግምገማ ጥናት የማማከር አገልግሎት ብቃት ማረጋገጫ ምስክር ወረቀት አሰጣጥ መመሪያ ቁጥር 03/2010 መሠረት **ለበለስ ኢንጂነሪንግ ኃ/የተ/የግ/ማህበር** በአካባቢ እና ማኅበረሰብ ተዕዕኖ ግምገማ ጥናት የማማከር አገልግሎት ላይ ደረጃ 1 የብቃት ማረጋገጫ ምስክር ወረቀት ስጥቷል። የባለሙያዎቹ ዝርዝር ተያይዟል።

ከሠላምታ ጋር

ሽፈራው ነጋሽ
የአካባቢና ማህበረሰብ ተዕዕኖ ግምገማና የአካባቢ ፍቃድ መስጠት ዳይሬክተር ጀነራል

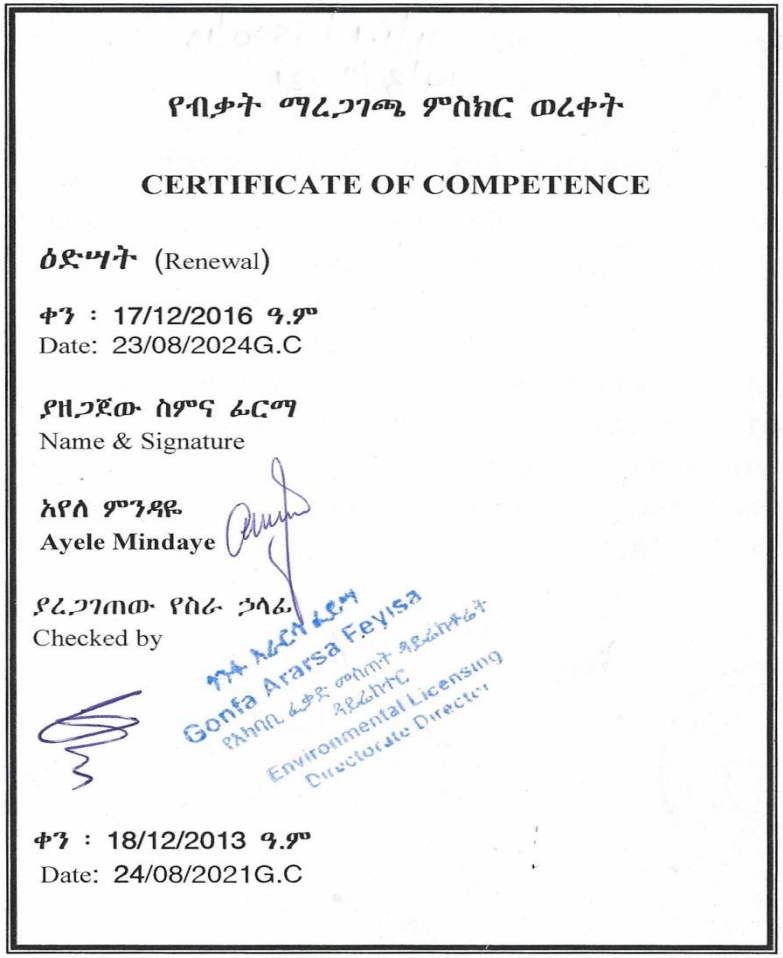
Ref No : 11/1.1/3520/13
Date : 24/8/2021

CERTIFICATE OF COMPETENCE

COMMISSION OF ENVIRONMENT, FOREST AND CLIMATE CHANGE, BY VIRTUE OF THE POWER VESTED TO IT BY ENVIRONMENTAL COMPETENCE ISSUING DIRECTIVE NO **03/2017,** HAS ISSUED THIS CERTIFICATE OF COMPETENCE TO **BELES ENGINEERING PLC** AS CONSULTANCY IN ENVIRONMENTAL IMPACT ASSESSMENT AS **ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT CONSULTING FIRM IN** CATEGORY OF **LEVEL 1.** LIST OF EXPERTS ARE ANNEXED WITH THIS CERTIFICATE.

WITH REGARDS

Shiferaw Nogesh
Environmental & Social Impact Assessment & Environmental Licensing Director General



የብቃት ማረጋገጫ ምስክር ወረቀት

CERTIFICATE OF COMPETENCE

ዕድሣት (Renewal)

ቀን ፡ 17/12/2016 ዓ.ም
Date: 23/08/2024G.C

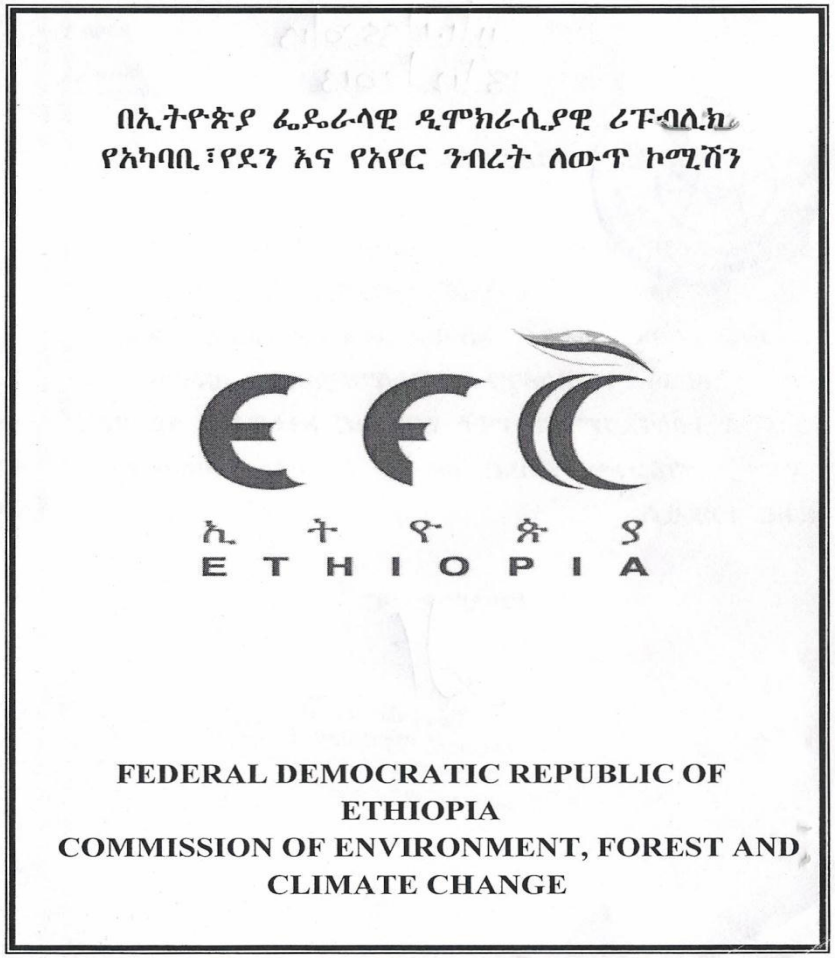
ያዘጋጀው ስምና ፊርማ
Name & Signature

አየለ ምንዳዬ
Ayele Mindaye

ያረጋገጠው የስራ ኃላፊ
Checked by

Gonfa Ararsa Feyisa
የአካባቢ ፈቃድ መስጠት ዳይሬክቶሬት
ዳይሬክተር
Environmental Licensing
Directorate Director

ቀን ፡ 18/12/2013 ዓ.ም
Date: 24/08/2021G.C



በኢትዮጵያ ፌዴራላዊ ዲሞክራሲያዊ ሪፑብሊክ
የአካባቢ፣የደን እና የአየር ንብረት ለውጥ ኮሚሽን

ኢ ት ዮ ጵ ያ
E T H I O P I A

FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
COMMISSION OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

Annex 4. License list of professionals of the consultant involved in the project

የአካባቢ ፣ የደንና የአየር ንብረት ለውጥ ኮሚሽን
Environment , Forest & Climate Change Commission

ቁጥር: ፲፩/፲፩/35ጸ0/13

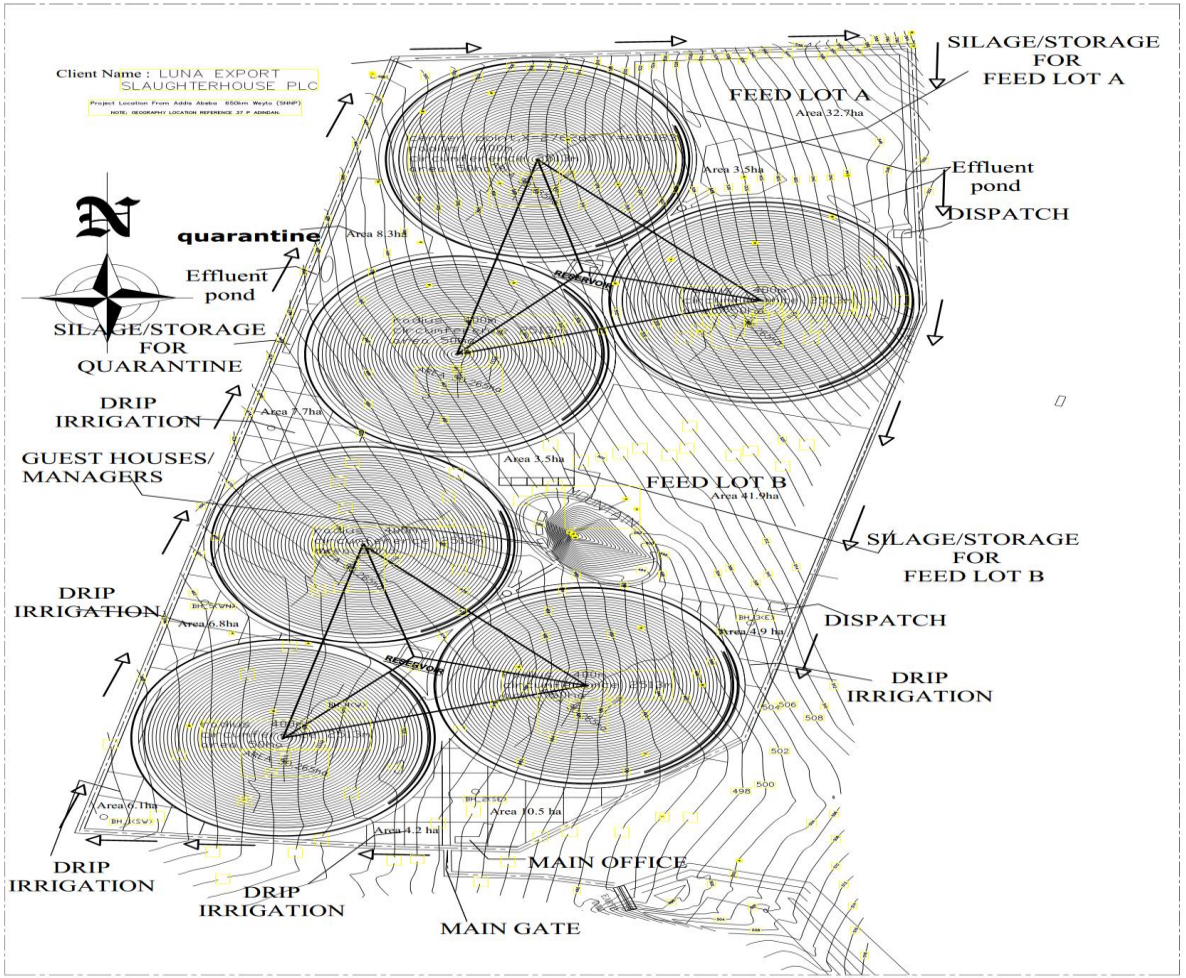
ቀን: 18/12/2013ዓ.ም

ለበለስ ኢንጂነሪንግ ኃ/የተ/የግ/ማህበር የማማከር አገልግሎት በአካባቢ እና ማህበራዊ ተፅዕኖ ጥናት ዘርፍ የአማካሪ ድርጅት የባለሙያዎች ዝርዝር

ተ/ቁ	የባለሙያዎች ስም	ደረጃ	የሚያማክሩበት ሙያ	ስልክ	ቋሚነት
1	ፐ/ሮ ጤናዓለም አየነው ትግያ	ከፍተኛ አማካሪ	የውሃ ሀብት አጠቃቀም አጥኚ ባለሙያ	0911230110	ሥራ አስኪያጅ
2	ወ/ሮ አልማዝ ሽቴ ቢያድግልን	ከፍተኛ አማካሪ	የሙቀት አማቂ ጋዝ ልቀት ተንታኝ ባለሙያ	0913354916	
3	አቶ አብርሃ ሙሉ ሃይሉ	ከፍተኛ አማካሪ	የአካባቢ ጤና ተንታኝ ባለሙያ	0913499472	
4	አቶ ተሾመ ሶሬሳ ተመስገን	ከፍተኛ አማካሪ	የብዝሐ ሕይወት እና የስርዓተ-ምህዳር ተንታኝ ባለሙያ	0911421674	
5	አቶ ፍጹም ታረቀኝ ጃባሞ	ከፍተኛ አማካሪ	የማህበራዊ ጉዳዮች ተንታኝ ባለሙያ	0911637722	
6	አቶ ማርቆስ ተመስገን	ከፍተኛ አማካሪ	የኢኮኖሚ ጉዳዮች ተንታኝ ባለሙያ	0912937145	
7	ዶ/ር ምንተስኖት ግዛው	ከፍተኛ አማካሪ	የአካባቢ ብክለት ተንታኝ ባለሙያ	0942540471	

ከሰላምታ ጋር

Annex 5. Plan view of the irrigation system (Center Pivot) design (Detail design is available in soft copy)



Annex 6. Demographic data of the Bena-Tsemay Woreda

የ2013 ዓ/ም የበናፀማይወረዳ ቀበሌያት፣ሕዝብ ብዛትና ቀት በኪ.ሜ

ተ.ቁ	የቀበሌስም	ወንድ	ሴት	ድምር	ኪ.ሜ
1	ቀይአፈር	1543	1509	3052	-
2	አልካኪቦ	1422	1439	2861	2.6
3	ሻባአርገመንዳ	855	1090	1945	7
4	አርጐ	1374	1103	2477	8
5	መቀጫ	1204	1217	2421	10
6	ጉርማሜሮ	855	869	1724	7
7	ድዝአማ	694	701	1395	22
8	አልዱባ	1003	886	1889	20
9	አልተአርጉዴ	1140	1115	2255	20
10	ቃቆ	1468	1555	3023	21
11	ቡነከር	3005	3125	6130	21
12	ጎልድያ	3241	3224	6465	27
13	ጫሊ	2687	1640	4327	28
14	ይርጋ	1422	1438	2860	31
15	ሲትምባ	812	820	1632	28
16	ሞርጉላ	1386	1367	2753	35
17	ጉርዶ	653	704	1357	28
18	ቦሪ	1568	1589	3157	29
19	ስሌ	695	704	1399	38
20	አንሶዳ	1384	1330	2714	32
21	ኡፊ	729	733	1462	33
22	ሉቃ	1241	1254	2495	21
23	ውሩሪ	812	813	1625	26

24	አይመሌ	876	942	1818	38
25	ሻላጉያዬ	1134	1072	2206	41
26	አሎ	1094	1108	2202	47
27	በፎ	837	849	1686	47
28	ጐኔ	765	765	1530	51
29	ብራይሌ	257	311	568	42
30	እንጨቴ	476	484	960	42
31	ዱማ	1131	1023	2154	48
32	ጊስማ	1021	1034	2055	68
33	ቦላ	508	518	1026	70
34	ቡራ	655	668	1323	76
ጠ/ድምር		39,947	38,999	78,946	

የ2013 ዓ/ም የበና ፀማይ ወረዳ የበኔ አከባቢቀበሌያት፣ሕዝብ ብዛትና ርቀት በኪ.ሜ

ተ.ቁ	የቀበሌስም	ወንድ	ሴት	ድምር	ኪ.ሜ
1	ቀይአፈር	1543	1509	3052	-
2	አልካኪቦ	1422	1439	2861	2.6
3	ሻባአርገመንዳ	855	1090	1945	7
4	አርጐ	1374	1103	2477	8
5	መቀጫ	1204	1217	2421	10
6	ጉርማሜሮ	855	869	1724	7
7	ድዝአማ	694	701	1395	22
8	አልዱባ	1003	886	1889	20
9	አልተአርጉዴ	1140	1115	2255	20
10	ቃቆ	1468	1555	3023	21
11	ቡነከር	3005	3125	6130	21
12	ጎልድያ	3241	3224	6465	27
13	ጫሊ	2687	1640	4327	28
14	ይርጋ	1422	1438	2860	31
15	ሲትምባ	812	820	1632	28
16	ሞርጉላ	1386	1367	2753	35
17	ጉርዶ	653	704	1357	28
18	ቦሪ	1568	1589	3157	29
19	ስሌ	695	704	1399	38
20	አንሶዳ	1384	1330	2714	32
21	በፎ	837	849	1686	47
22	ውሩሪ	812	813	1625	26
ጠ/ድምር		30060	29087	59,147	

የ2013 ዓ/ም የበና ፀማይ ወረዳ የፀማይ አከባቢ ቀበሌያት፣ሕዝብ ብዛትና ኪ.ሜ

ተ.ቁ	የቀበሌስም	ወ	ሴ	ድምር	ኪ.ሜ
1	ኡፊ	729	733	1462	33
2	ሉቃ	1241	1254	2495	21
3	አይመሌ	876	942	1818	38
4	ሻላጉያዬ	1134	1072	2206	41
5	አሎ	1094	1108	2202	47
6	ጐኔ	765	765	1530	51
7	ብራይሌ	257	311	568	42
8	እንጨቱ	476	484	960	42
9	ዱማ	1131	1023	2154	48
10	ጊስማ	1021	1034	2055	68
11	ቦላ	508	518	1026	70
12	ቡራ	655	668	1323	76
ጠ/ድምር		9887	9912	19799	

የ2013 ዓ/ም የበናፀማይወረዳ የቀበሌያት አባወራና እማወራብዛት መረጃ

ተ.ቁ	የቀበሌስም	አባወራ	እማወራ	ድምር	ኪ.ሜ
1	ቀይአፈር	619	213	832	-
2	ጉርማሜሮ	581	197	778	7
3	ሻባአርገመንዳ	283	94	377	7
4	አርገ	323	110	433	8
5	መቀጫ	342	115	457	10
6	አልዱባ	263	397	660	20
7	አልቴአርጉዴ	412	262	674	20
8	ሉቃ	355	119	474	21
9	ቃቆ	517	260	777	21
10	ቡኔከር	1042	486	1528	21
11	ድዝአማ	415	144	559	22
12	ውሩሪ	227	76	303	26
13	አልካኪቦ	312	205	517	2.6
14	ጎልድያ	1645	556	2201	27
15	ሲትምባ	276	93	369	28
16	ጫሊ	822	277	1099	28
17	ጉርዶ	246	82	328	28
18	ቦሪ	363	122	485	29
19	ይርጋ	399	138	537	31
20	አንሶዳ	574	193	767	32
21	ኡፊ	276	106	382	33
22	ሞርጉላ	445	150	595	35
23	ስሌ	332	122	444	38
24	አይመሌ	255	65	320	38
25	ሻላጉያዬ	301	102	403	41

26	እንጨቴ	223	187	410	42
27	ብራይሌ	91	31	122	42
28	ኦሎ	234	78	312	47
29	በፎ	343	116	459	47
30	ዱማ	496	167	663	48
31	ጐኔ	595	202	797	51
32	ጊስማ	531	178	709	68
33	ቦላ	666	119	785	70
34	ቡራ	225	76	301	76
	ጠ/ድምር	**15,029**	**5838**	**20,867**	