ENIVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

(ESIA)

FOR THE PRODUCTION, PROCESSING AND MARKETING OF MORINGA OLEIFERA/STENOPETAL INVESTMENT PROJECT

IN ADAMI-TULU (BECHISA AREA) FINAL REPORT

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List of Acronyms

ADLI - Agricultural Development Led Industrialization
BoARD - Ministry of Agriculture and Rural Development
^{0}C - Degree Celcius
CBOs -Community Based Organizations
CSA - Central Statistics Authority
CRV -Central Rift Valley
CSE - Conservation Strategy of Ethiopia
Das - Development Agents
DAP - Di ammonium phosphate
EHS - Ethiopian Health Standards
EIA - Environmental Impact Assessment
ESMP -Environmental Management system and Social Management Plan
EMP -Environmental Management Plan
EMS -Environmental Management system
ESIA - Environmental and Social Impact Assessment
EPA - Environmental Protection Agency
EPE- Environmental Policy of Ethiopia
EPU -Environmental Planning Unit
FDRE-Federal Democratic Republic of Ethiopia
FGDs -Focus Group Discussion
GPS - Global Positioning System
Ha - Hectare
IHSP -International Health and Safety Plan
ISO - International Standard Organization
MEDaC - Ministry of Natural Resources Development and Environmental Protection
MSS - Monitoring and Surveillance System
MOEF - Ministry of Environment and Forest
MoNREP - Ministry of Natural Resources Development and Environmental Protection
MPPM - Moringa Production, Processing and Marketing
MoPED - Ministry of Planning and Economic Development
MoWR - Ministry of Water resources
MSDS - Material Safety Data Sheet
NGOs - Non-Government Organization
NOx - Nitrogen Oxides
Pas - Peasant Associations
PPE- Personnel Protective Equipment
POP- Persistent Organic Pollutants
OHS - Occupational Health and Safety
RSA -Roundtable Sustainable Agriculture

EXECUTIVE SUMMARY

The main body of the ESIA report is organized in 7 parts. The first section deals with the introduction; Section 2 talks about the preliminary environmental assessment and scoping; Section 3 examines the policy, legal and institutional frameworks that are related to the project under consideration. Then, section 4 describes the project background. Section 5 explains details of the baseline socio-economic, cultural and environmental conditions of the project area. Section 6 presents the environmental and social impact assessment and the proposed mitigation measures. In this section, the probable positive and negative impacts as well as their mitigation measures are covered. Section 7 of the report presents Environmental Management Plan for the accomplishment of the mitigation measures and the proposed Environmental Monitoring Program. The last section 8 of the conclusion and recommendation part of the report provides remarks and recommendations.

Description of Project Activities

This investment project will implement the following major activities:

- Once the land is obtained, electricity and water pipe lines will be installed. Stores, leaf drying and grinding facilities, seed extraction rooms will be constructed
- The land will be fenced, and a nursery focusing on the production of locally adaptive trees and shrub seedlings having aesthetic and forage value will be established, these seedlings and shrubs will be planted along the peripheral edge of the project site to protect and conserve the soil from surface and gulley erosions.
- With strong participation of the community water shed management work will be establish, suitable to the particular catchment area.
- In order to prevent the flooding and over flow of lake Zeway water onto the project site excavation work will be conducted.
- Depending on the climatic conditions of the project area, on a 5 ha of land moringa seed production farm will be established using rain water and/or irrigation system. The purpose of this farm will be to produce significant quantities of seeds and pods and extract seed oil, pack and export to domestic and export markets.
- Separately on a 10 ha of land two varieties of Moringa species (Moringa Oleifera and Moringa stenopetala) will be established for leaf production purposes.
- The leaves will be harvested 60 days after sowing /planting the cuttings leaving 60 cm height on the ground. To keep the trees bushy and manageable the branches will be regularly pruned and harvested at least 5 to 6 times a year.
- The leaves along with the flowers branches fruits will be ground into fine particulate, packed and labeled. Seed oil can be extracted and annually 350 kg of oil per hectare can be produced, packed in different sizes and supplied to local and export market.
- The production of forage seedlings, sowing the adjacent grazing land with perennial legumes and grasses, enclosure and protecting the community grazing and adoption of cut & carry system will be implemented as part of the project activities.

- In collaboration with district office of agriculture and staff from Adami-Tulu agricultural research centre, the local communities will be trained on how to practically utilize moringa leaves and pods to be used for livestock fodder
- The project will prevent or minimize the potential for community exposure to water-borne, water based, water-related, vector-borne disease, and other communicable diseases that could result from project activities.
- Wastewater expected to be generated from moringa production and processing will be treated with powdered moringa pods and seeds and will be used for irrigation purposes.
- Develop procedures to direct and control the application of pesticides/fertilizers in the farm fields. Plan and implement the use of organic green manure and composts
- The project will provide workers with a safe and healthy work environment, and take steps to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work

Existing Safeguard Instruments and Rationale for the ESIA

Pertinent to the Ethiopian Environmental Impact Assessment (EIA) Proclamation (No. 299/2002), the project has commissioned Environmental Protection and Food Security consulting firm to conduct a full environmental impact assessment study on the proposed project. In view of this, the report is prepared in line with the EIA requirements specific to the EIA proclamation of the government of the Federal Democratic Republic of Ethiopia, proclamation No. 299/2002.

The fundamental principle of the Environmental and Social Impact Assessment (ESIA) study is to identify, predict and analyze the magnitude of environmental and social impacts and propose potential mitigation measures for significant environmental and social effects that are expected to arise from the various activities of the MPPM farm project during pre-construction, construction and operational phases.

The integration of environmental and social considerations into the operational stage of MPPM is an essential part to understand the environmental and socio-economic impacts of the interventions and its contribution towards sustainable development. Environmental and Social Impact Assessment (ESIA) is internationally accepted as being effective way of achieving this integration in a method that is efficient and also meets the requirements of regulators, project financing institutions, civil society and project affected communities.

In line with this, the key objective of the ESIA for moringa production, processing and marketing (MPPM) interventions is to address the adverse environmental impact of the project implemented, enhance project benefits, and introduce standards of good environmental practice in the existing and proposed intervention projects for the production and processing of moringa in the state.

Administrative, Legal and Policy Framework

The guiding strategy under the National Economic Development is known as the 'Agricultural Development Led Industrialization' (ADLI). This strategy further developed into sectoral strategies that include Agriculture, Industry, Mining, Population growth, technological progress,

Economic and Social infrastructure, etc. The following can be identified as the core elements of the agro-industrial development strategy component of ADLI.

The Agricultural Sector Policy and Strategy

The policy objectives include:

- To significantly advance the production and productivity of agricultural sector for improvement of the living conditions of the people,
- To conserve and rational utilization of natural resource for sustainable agricultural development,
- Policy fundamentals on crop protection focus on non –migratory and Migratory pests.

Investment Strategy

Proclamation No.37/1996: Investment proclamation of the federal Democratic Republic of Ethiopia, Proclamation of Ministers Regulation No. 7/1996: Council of Ministers regulations to provide for investment Incentives constitute the building blocks of the current Ethiopian investment strategy.

Environmental Policies and Strategies

The FDRE Constitution (Proclamation No. 1/1995 as amended) is the basis for human rights, and natural resources and environmental management. The Constitution states that: Government and all Ethiopian citizens shall have the duty to protect the country's environment and natural resources, design and implementation of programs and projects of development shall not damage or destroy the environment,

The People have the right to full consultation and expression of views in the planning and implementation of environment policies and projects that affect them directly.

The concepts of sustainable development and environmental rights are enshrined in the Constitution of the FDRE Article 44 of the revised Constitution of the FDRE.

The Conservation Strategy of Ethiopia

The CSE defines detailed strategies and action plans and the institutional arrangements required for the implementation of sectoral as well as cross-sectoral interventions for the management of Ethiopia's natural, man-made and cultural resources. The CSE provides a strategic framework detailing principles, guidelines and strategies for the effective management of the environment.

The Environmental Policy of Ethiopia

There are two cross-sectoral policy constituents with a mainstreaming effect in the Environmental Policy of Ethiopia. Article 4.6 of EPE covers different aspects of the importance of incorporating environmental costs and benefits in the development planning process. Under this Article, the initiation of a pilot project on the application of Environmental accounting in Ethiopia was identified as one of the policies directions.

Environmental Impact Assessment Guideline Document

Operationally the document aims at being a reference material to ensure effective environmental assessment and management practice in Ethiopia for all parties engaged in the process.

National Rural Land Administration and Use (Proclamation No. 456/2005)

The Rural Land Administration and Use Proclamation (Proclamation No. 456/2005) defines the state ownership of rural land and the tenure rights of the land occupant, including rights to "property produced on his land", rights of inter-generational tenure transfer, and rights of exchange land and limited leasing rights.

Proclamations No. 42/1993 Labour Proclamation

The proclamation specifies that an employer shall take the necessary measures to safeguard adequately the health and safety of the workers; he shall in particular:
Comply with the occupational health and safety requirements provided for in this proclamation, take appropriate pre-cautions to ensure that all the processes of work shall not be a source or cause of physical, chemical, biological, agronomical damages.

Special Decree No, 20/1990 Council of State Special Decree to Provide for the Registration and Control of Pesticide

It states that the purpose of the proclamation is to make it possible to minimize, to the extent reliable, the adverse effects that utilization of pesticides might cause to human beings, animals, plants and the environment.
According to the this proclamation, any substance, mixtures thereof or a living organism intended for use in preventing, destroying or controlling any pest; the following in particular is termed as "pesticide":

National Biodiversity Policy and Strategies

The National Biodiversity Policy (NBP) was established in 1998 based on a holistic ecosystem approach to conserve, develop and utilize the country's biodiversity resources.

Legislative and Administrative Frame Work

Environmental Impact Assessment (Proclamation No. 299/2002)

This Proclamation (No 299/2002) aims primarily at making the EIA mandatory for categories of projects specified under a directive issued by the MOEF. The law specifies the projects and activities that will require an environmental impact assessment (EIA). The proponent of the project must prepare the EIA following the format specified in the legislation. The MOEF will then review the EIA and either approve the project (with or without conditions) or reject it. Under this legislation, the MOEF has to prepare procedures, regulations, environmental

guidelines and standards for the EIA. Environmental guidelines are among the tools for facilitating the consideration of environmental issues and principles of sustainable development and their inclusion in development proposals.

Environmental Pollution Control (Proclamation No. 300/2002)

Proclamation No. 300/2002 on Environmental Pollution Control primarily aims to ensure the right of citizens to a healthy environment and to impose obligations to protect the environment of the country. The law addresses the management of hazardous waste; establishment of environmental quality standards for air, water and soil; and monitoring of pollution.

Solid Waste Management (Proclamation No. 513/2007)

Measures associated to waste handling and disposal:

• Any person shall collect waste in an especially designated place and in a manner, which does not affect the health of the society.

• No person shall dispose solid, liquid or any other waste in a manner which contaminate the environment or affects the health of the society.

Institutional Framework

Proclamation on Institutional Arrangements

This proclamation establishes the Ministry of Environment and Forest MOEF/EPA as an autonomous Federal agency with the objective of formulating Environmental policies, strategies, legislatives, standards and directives. The proclamation also provides for the establishment of the Environmental council to ensure integration of Environmental concerns with development policies, strategies and plans, as well as coordination among sectors.

Federal Ministry of Environmental and Forest (MOEF)

The federal MOEF is the key national level environmental organ, with a mandate to address environmental issues. The environmental legislation gives the MOEF powers to fulfill its role, support all federal agencies in establishing environmental units, and develop skills in strategic environmental analysis of policies and public instruments. The MOEF is involved in the development of environmental policy and legislation, setting environmental quality standards for air, water and soils, monitoring pollution, establishing MOEF procedures and an environmental information system, and undertaking capacity development in relevant agencies to ensure the integration of environmental management in policy development and decision making.

Regional State

The executive body of regional state is structured under cabinet offices guided by the office of the president and the vice president. When it comes to ESIA, the national provisions indicate the Federal MOEF passes responsibility to the regional environmental offices, especially for projects that are fully under the jurisdiction of the regional governments.

Summary of the Environmental and Socio-economic Impact and Mitigation Measures

Positive Impacts	Negative Impacts	Proposed Mitigation Measures
+ Food Security Benefit	– Loss of grazing land	Production of forage seedlings, sowing the adjacent grazing land with legumes and grasses, enclosure and protecting the community grazing lands, adopt cut & carry system
+ Medicinal /Health Benefits	– Loss of flora and fauna	Select, propagate and rehabilitate the area with indigenous trees and shrubs and ornamental plants having aesthetic values.
+ Moringa as a Livestock Fodder	–Removal of vegetation, landscape	Conduct soil and water conservation activities, suitable and applicable to the project area and collection, production and plantation of indigenous shrubs and trees surrounding the project area conservation of indigenous flora
+ Water Purification Benefit	– Air Quality	Sprinkle water on fresh construction spoil, in line with EHS and OHS guidelines, applicable for project staff
+ Benefit as Plant growth enhancers	– Nuisance Noise	Use modern mills and machineries having less nuisance noise effect
+ Benefits of moringa seed oil	– Work Place Injuries and Accident	Aware and train workforce on the safety issues during site operation and on road safety
+ Moringa as a source of biogas	– Ground water	Project will implement preventive and curative mitigation measures that are implemented at different levels during the design and operational phases of the farm
+ Mitigating climate change and Desertification	– Soil surface and Gulley Erosion	Conduct special soil and water conservation activities, and develop sustainable water shade management system
+ Creation of Employment	– Soil contamination from Chemicals	Select pesticides low in toxicity, effective against target species, with minimal effects on non-target species and the environment. Develop procedures to direct and control the application of pesticides/fertilizers. Plan and implement the use of

		organic green manure and composts
+ Benefits of rehabilitated Road	– Loss of social service	The moringa plantation covers (15 ha land) area, there are no social service facilities, and potable water supply schemes to be affected.
	– Water related disease	The project will ensure communities are not exposed to any pollutants and that security guards are adequately trained, while accepting the public authorities' role in promoting the health, safety and security of the public.
	– Households	As the project site is a grazing land for the communities living in the area, there are no households living in the project site. Hence, no family member will be affected as the result of implementing the project activities.
	– cultural and/or religious values	There is no officially recognized and registered sites of cultural or religious values were identified by the culture and tourism bureau of the district
	– Flooding/over flow of water	With strong participation of the community establish water shed management work, suitable to the particular catchment area. Plan and implement an excavation work to prevent the flooding and over flow of lake Zeway onto the project site
	– Loss of land under various land use patterns	Changing this area into intensive moringa production land does not affect the livestock production of the area.
	– Safe water supply and basic sanitation	MPPM project will provide workers with a safe and healthy work environment, and take steps to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work
	– Health Care Facilities and Health Programs	The project will maintain workplaces, working environment and work, provide ongoing training to eliminate or minimize any risks to workers. The project is dedicated to design an OHS policy for its workers.

– Contamination from Solid and Liquid waste	Wastewater expected to be generated will be r small in amount. It will be treated with powdered moringa seeds and dispersed back in the farm land.

Consultation with Communities

During the impact assessment, individuals and group community members were discussed with on the project social, economic and environmental impacts.
The consultation discussion engaged those local communities who are expected to be involved in the project implementation. The participants were community elders, locality representatives and youth group members in the target communities. Following the consultation meeting, an agreement was reached on the issues of the community and their opinions and ideas were incorporated in the statement report.

Environmental and Social Management Plan

Environmental management is concerned with implementation of the measures necessary to minimize or offset adverse impacts and to enhance beneficial impacts. Unless the mitigation and benefit enhancement measures identified in the EIA are fully implemented, the prime function of EIA, which is to provide a basis for shaping the project so that overall environmental performance is enhanced, cannot be achieved.
In order to be effective, environmental management must be fully integrated with the overall project management effort at all levels, which itself should be aimed at providing a high level of quality control, leading to a project which has been properly designed and constructed and functions efficiently throughout its life. Hence, the overall aim of the Environmental Management Plan (EMP) of MPPM project is to minimize adverse impacts of the project by implementing and monitoring the proposed mitigation and improvement measures.
Under this section, the way specific mitigation and enhancement measures implemented and monitored at the pre-construction, construction and operational phases to overcome possible impacts of the project are outlined.

Environmental Monitoring Plan

The Project will formulate a detailed Environmental and Social Monitoring Plan to monitor key elements of both the biophysical and social environments. The underlying principle of this monitoring will be to ensure that significant impacts were properly identified in the assessment process, then to monitor the effectiveness of the mitigation measures. The results of monitoring activities will be regularly reviewed to determine if existing management measures are adequate, or if those measures should be revised, deleted, or supplemented.

Conclusion and Recommendations

The identified impacts are minor; the recommended mitigations are able to address the issues resulting in slight or no effect on the environment.

1. INTRODUCTION

Moringa Production, Processing and Marketing (MPPM Limited) planned to establish Moringa Development farm in Eastern Shewa Zone, Adami-Tulu district, in Oromiya Regional State particularly in Bechisa kebele, about 135 km away from the capital city Addis Ababba. The project is intended to grow two varieties of Moringa species on 15 hectares of land. The farm in its production process, will involve modern development and production methods. It utilizes tractors, ploughs, disc cultivators and planters in the development of the farm. The development objective of the project is to produce high quality moringa seed oil, various sizes of moringa tea bags, pack the pods, leaves, stems and flowers together or separately and supply diversified processed moringa products to domestic and international markets there by significantly contribute to the enterprise and to the national economic growth, create employment opportunity and generate foreign currency earnings.

Pertinent to the Ethiopian Environmental Impact Assessment (EIA) Proclamation (No. 299/2002), the project has commissioned Environmental Protection and Food Security consulting firm to conduct a full environmental impact assessment study on the proposed project.

In view of this, the report is prepared in line with the EIA requirements specific to the EIA proclamation of the government of the Federal Democratic Republic of Ethiopia, proclamation No. 299/2002.

The fundamental principle of the Environmental and Social Impact Assessment (ESIA) study is to identify, predict and analyze the magnitude of environmental and social impacts and propose potential mitigation measures for significant environmental and social effects that are expected to arise from the various activities of the MPPM farm project during pre-construction, construction and operational phases.

Various ESIA techniques (methods) for identification, prediction and analysis of impacts were used. Biophysical resources survey, field observation and socioeconomic assessments and utilization of secondary data sources were utilized. In addition, national Environmental Impact Assessment Guidelines and relevant National and Regional development Policies and strategies together with Biophysical resources survey, field observation and socioeconomic assessments

and utilization of secondary data sources were employed to prepare the document and to identify, predict and analyze procedures. Significant positive and negative project impacts have been identified. Besides, environmentally friendly and socially acceptable impacts augmentation and management options were also forwarded.

Public consultations were held with the communities living in the vicinity of the project site, and the outcome of consultations included in the report. During discussions, emphasis was given to public participation and procedures by which their participation could be initiated and promoted from the early planning of the project up to its implementation, monitoring and evaluation.

The integration of environmental and social considerations into the operational stage of MPPM is an essential part to understand the environmental and socio-economic impacts of the interventions and its contribution towards sustainable development. Environmental and Social Impact Assessment (ESIA) is internationally accepted as being effective way of achieving this integration in a method that is efficient and also meets the requirements of regulators, project financing institutions, civil society and project affected communities (stakeholders).

1.1. Objective of ESIA Study

The key objective of the ESIA for moringa production, processing and marketing (MPPM) interventions is to address the adverse environmental impact ofthe project implemented, enhance project benefits, and introduce standards of good environmental practice in the existing and proposed intervention projects for the production and processing of moringa in the state. The specific objectives of the ESIA are to:

- Pinpoint the significant adverse environmental and social impacts resulting from the MPPM interventions;
- Enable and facilitate the implementation of the mitigation measures identified by providing the technical details of each impact ;
- Describe the positive social and economic benefits local communities can gain from implementation the proposed project,
- Define the responsibilities of project proponents and other role players, and effectively communicate regarding environmental and social safeguards matters among them;

- Develop a monitoring mechanism and identify monitoring parameters to guarantee that all mitigation measures are implemented entirely and effectively;
- Identify training requirements at various levels and provide a plan for implementation;

- Devise strategies for the successive operation, and preparation of plans and recommendations vis-à-vis measures that can reduce adverse impacts and advance beneficial impacts.
- Safeguard that the proposed Moringa production project is environmentally friendly, economically viable, and socially acceptable, and thus significantly contribute to the development of environmental and socio-economic development of local communities.

1.2. Impact Assessment Methodology

The methodology implemented for conducting the environmental and social impact assessment study of MPPM project follows the conventional methods that meet the requirements of the Federal and Regional Environmental Protection Organs Environmental Impact Assessment Guidelines. The collection of primary data, baseline information and secondary data on environment and social components, relevant documents and literature sources, desktop study, impact analysis, choosing mitigation and enhancement measures using different optimization tools and developing environmental protection, monitoring and management plans were made. Focus group discussions and meetings were the common techniques by which local community consultations conducted.

1.2.1. Public Consultation

Public Consultation was commenced in two phases, one during identifying social and environmental issues (scoping) and during impacts assessment study. During the impact assessment, individuals and group community members were interviewed and consulted on the project social, economic and environmental impacts.

The consultation discussion involved those local communities who directly affected by the project implementation. The participants were community elders, locality representatives and youth group members in the target communities. The meeting was used by the participants to air their issues of concern in relation to the proposed development project. Following the consultation meeting, an agreement was reached on the issues of the community and their opinions and ideas were incorporated in the statement report.

1.2.2. Prevailing Conditions

In order to identify potential impacts, an understanding of the existing conditions was establishedregarding the MPPM project activities. This was based on primary data acquisition by the employed experts and consultants. The practical study showed that the projects have generally impacted positively.

1.2.3. Mapping the Project Area

Mapping of the study area and the intervention projects was implemented using GPS data collection. Essentially, data used for capturingspatial condition of the project area was based on location of the project area identification of specific intervention project. This was conducted in collaboration with Adami-Tulu district investment office and staff from land administration office together with some of the communities living in the project area.

1.2.4. Surveying the Socio-economic Status

Both qualitative and quantitative data were collected and analyzed in order to understand the expected impacts of the intervention. The qualitative data collection involves the use of Focus Group Discussion (FGD) and in-depth interview with key informants in the study area. The FGD was used as a tool to obtain information from people of similar or near similar age group.

1.2.5. Impact Significance Assessment

An impact is defined as “Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization’s environmental aspects (activities, products or services)” (Environmental Management system (EMS), ISO14001:2004).Where project activity and environmental receptor interactions occur, an impact is defined. The ESIA assesses impacts according to their “significance” determined by considering project activity “event magnitude” and “receptor sensitivity”. Determining event magnitude requires the identification and quantification of the sources of potential environmental and social effects from routine and non-routine project activities. Determining receptor (Biological/Physical/Ecological and Human) sensitivity requires an understanding of the biophysical environment of the project area.

1.2.6. Impact Mitigation and Monitoring

A wide range of different measures to mitigate impacts have been identified in the ESIA Report.

In addition an Environmental and Social Management Plan (ESMP) for the Project describes how the mitigation will actually be delivered and reporting. The ESMP will be in line with National and Regional performance Requirements.

The potential environmental and social impacts likely to arise as a result of the production processing and marketing of Moringa project (MPMP) were assessed by harmonizing the project components with the surrounding environmental and social and cultural resources. This section presents observed impacts resulting from the intervention projects. Information regarding the social, cultural, natural and coastal resources, etc, was sourced from related literature, visits to the project site and consultation with relevant stakeholders. Stakeholders were involved in the identification of the potential impacts of the MPMP.

2. SCOPE OF THE REPORT

To define the limits of the study area for the project and outlining lists of activities and possible expected impacts to be considered during the assessment, team of experts carried out an initial environmental examination and scoping. The main objectives of the scoping work were:

- To designate the limits of the project area and list of valued ecosystem mechanisms expected to be impacted within the project area,
- To outline lists of activities, category and magnitude of the proposed project, and
- To evaluate and embrace the views and concerns of key stakeholders on the scope of ESIA study.

In order to accomplish the above tasks, the study team employed different tools and techniques relevant to the proposed project like using environmental scoping checklists, consultations with different stakeholders (including experts, project affected communities, local administrators and sector institutions, etc) and informal discussions with prominent individuals, local elders in the project area.

The scope of work covers the assessment of the impacts of MPPM interventions at Adami-Tulu (specific to Bechisa Kebele).

2.1. Limit of the Study Area Valued Ecosystem to be Impacted

The Environmental and Social Impact Assessment study was conducted for those areas that would be expected to be impacted by the Moringa development project activities. The project site is defined as Moringa development areas located in the Adami-Tulu district on 15 ha of land. The study also considers the surrounding farming communities in the project area which could be directly or indirectly affected during the execution of the project.

3. ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

This section describes the appropriate policy, legislative and institutional issues which are applicable to MPPM. The first part discusses the national economic development policies and strategies. The second section deals with sectoral policies and strategies related to the project. The third part focuses on existing environmental policies and strategies at the national and Regional levels. Lastly, the fourth section presents the existing institutional framework for environmental protection and management.

Besides the national environmental legislations, the federal democratic republic of Ethiopia is also a member to various regional and international conventions and protocols on environment.

The government of the Federal democratic Republic of Ethiopia has recently established Ministry of Environment and Forest which is designated as focal point for the implementation of these conventions and protocols.

3.1. Policy Frame Work

3.1.1. Economic Development Policies and Strategies

(a). The National Economic Development Strategy

The guiding strategy under the National Economic Development is known as the 'Agricultural Development Led Industrialization' (ADLI). This strategy further developed into sectoral strategies that include Agriculture, Industry, Mining, Population growth, technological progress, Economic and Social infrastructure, etc. The following can be identified as the core elements of the agro-industrial development strategy component of ADLI (MoPED, 1993).

The promotion of labor intensive technologies and utilization of domestic raw materials,

• Determination of the composition of industrial output based on the needs and income levels of the population, and

• Government intervention to motivate the choice of labor intensive technology that makes extensive use of domestic raw materials.

ADLI has provided foundation for the development of the other national and sectoral policies and strategies that can promote and enhance the development of export oriented agriculture in the country.

(b). The Agricultural Sector Policy and Strategy

The policy objectives include:

• To substantially enhance the production and productivity of agricultural sector for improvement of the living conditions of the people,

• To conserve and rational utilization of natural resource for sustainable agricultural development,

• Policy elements on crop protection focus on non –migratory and Migratory pests.

• The policy statements include:

Importation and handing over of crop protection technologies should be based on testing their effectiveness,

• spraying pesticides considered as effective control of Migratory pests,

• the need for the establishment of plant quarantine system to prevent intrusion of exotic pests or move out of the country,

• Development of pesticide registration and control system, etc.

(c). Ethiopian Investment Strategy

Since 1992, there have been a number of investment proclamation and regulations issued by successive governments as the country started to move away from 'centralized economy' to 'mixed economy'. These policy issues influence the project in different aspects.

The following two documents that constitute the building blocks of the current Ethiopian investment strategy, directly affect investment in the country in general.

Proclamation No.37/1996: Investment proclamation of the federal Democratic Republic of Ethiopia,

Proclamation of Ministers Regulation No. 7/1996: Council of Ministers regulations to provide for investment Incentives.

According to the Investment Proclamation No.37/1996, the objective of the investment policy of the federal Democratic Republic of Ethiopia (FDRE) are designed to improve the living

standard of the peoples of Ethiopia through the realization of sustainable economic and social development. Article 13 of the proclamation specifies the required information for submitting an application for investment permit. The first sub article under article 14, prescribes the procedure for issuance of investment permit, stating the following:

Upon receiving an application for investment permit made in full compliance with the provisions of Article 13 of this proclamation, and after ascertaining within 10 days that the included investment activity would not be contravening the operational laws of thecountry and that, in particular, it complies with conditions stipulated in environmental protection laws, the appropriate investment organ shall issue an investment permit to the applicant.

The Council of Ministers regulation No. 7/1996 provides the terms and conditions under which investment incentives provided for investors. The investment incentive is divided into the following two categories: exemption from income tax and exemption from customs duty on imported machinery and equipment. The exemption from income tax is based on the following two criteria. The first criterion is the class of the investment as pioneer investment, promoted investment, or expansion and upgrading of existing investment. The second criterion is the location of the investment with respect to its potential contribution to equitable distribution of regional development.

In 1998, the government of FDRE issued the following proclamation and regulations with the objective of amending the investment proclamation and regulation issued in 1996. Regulation No. 116/1998: A proclamation to amend the investment proclamation, Proclamation No. 35/1998: Council of Ministers Regulations on Investment Areas Reserved for Domestic Investors, and Regulation No. 36/1998: Council of Ministers Regulations to Amend the Investment Incentives Regulations.

3.1.2. Environmental Policies and Strategies

(a). Constitution of the Federal Democratic Republic of Ethiopia

The Constitution is the supreme law of the country, whose provisions all other policies, regulations and institutional frameworks must comply with. The Constitution of the FDRE (Proclamation No. 1/1995 as amended) is the foundation for human rights, and natural resources and environmental management. The Constitution states that:

• Government and all Ethiopian citizens shall have the duty to protect the country's environment and natural resources,

• Design and implementation of programs and projects of development shall not damage or destroy the environment,

The People have the right to full consultation and expression of views in the planning and implementation of environment policies and projects that affect them directly.

The concepts of sustainable development and environmental rights are enshrined in the Constitution of the FDRE. Article 44 of the revised Constitution of the FDRE states that all persons who have been displaced or whose livelihood has been adversely affected because of state programs have the right to commensurate monetary or alternative means of compensation, including relocation with adequate state assistance. However, the compensation does not take into account the value of land

(b). The Conservation Strategy of Ethiopia (CSE)

The major environmental and natural resources management issues facing Ethiopia are well documented in the Conservation Strategy of Ethiopia (FDRE, 1997). The CSE sets out detailed strategies and action plans as well as the institutional arrangements required for the implementation of sectoral as well as cross-sectoral interventions for the management of Ethiopia's natural, man-made and cultural resources. The CSE provides a strategic framework detailing principles, guidelines and strategies for the effective management of the environment. The most important areas that are considered in the document include the following:

• Improvement of soils, crop and animal husbandry for sustainable agricultural production.

• Management of forest and woodland resources.

• Development of water resources for irrigation, hydroelectricity and water supply.

• Rangeland management and pastoral development.

• Promotion of individual participation in sustainable development of natural, artificial and cultural resources, and environmental protection.

• Land resource use policy and strategies; physical land use planning.

- Integration of social, cultural and gender issues in sustainable resources and environmental management.
- Development of environmental education, public awareness and human resources.

(c). The Environmental Policy of Ethiopia

The most important policy framework document with regard to environmental management of Ethiopia is the Environmental Policy (EPE) of the FDRE approved by the Council of Ministers in April 1997. The Policy was prepared under the joint-effort of the Environmental Protection Authority (EPA) and the Environmental Planning Unit (EPU) of the then Ministry of Economic Development and cooperation (MEDaC).

The policy contains elements that entail the importance of main streaming socio-ecologic aspects in development programs. More specifically, there are two cross-sectoral policies components with a mainstreaming effect in the EPE. Article 4.6 of EPE covers different aspects of the importance of incorporating environmental costs and benefits in the development planning process. Under this Article, the initiation of a pilot project on the application of Environmental accounting in Ethiopia was identified as one of the policies directions. Furthermore, Article 4.6 states (EPA 1997, 21):

- ✓ To explicitly consider in 5- , 10-, and 100- years' time perspective the economic costs & benefits to the environment in the planning of all Major Development Programs, projects and activities.

Article 4.9 of EPE covers the policy directive on E1A. The Article contains eleven sub-articles covering different aspects of EIA and the conditions under which EIA must be performed. Article 4.9.g (EPA 1997, 23) provides a provision:

- ✓ To create a law on EIA process this requires appropriate Environmental Impact Statements and Environmental Audits for private and state development projects.

The sectoral policies of EPE contain policy directions that may ensure the the promotion of sustainable industrial development in the country. More specifically, Article 3.8 of EPE provides policy directions for the control of hazards materials and pollution from industrial waste. This

sectoral policy emphasizes the importance of pollution prevention and minimization as the primary approach for pollution control. To this effect, Article 3.6 states (EPA 1997, 15):

- ✓ To adhere to the precautionary principle of minimizing and where possible preventing discharge of substances and to disallow the discharge when they are likely to be hazardous.

Article 3.8., more specifically (EPA 1997, 16) states:

- ✓ To promote waste minimization processes including the efficient recycling of materials wherever possible.

(d). Environmental Impact Assessment Guideline Document

The guide to EIA document that was prepared by EPA provides a background to EIA and environmental management in Ethiopia. In effect the document aims at being a reference material to ensure effective environmental assessment and management practice in Ethiopia for all parties engaged in the process. The fundamental objectives of the guide are:

• Providing all interested parties with a consistent approach in EIA
• Providing background information for the context of EIA in Ethiopia
• Assisting proponents in identifying their EIA responsibility
• Assisting communities and NGO groups in realizing their environmental rights regarding EIA
• Assist the authority in determining their roles and responsibility as decision makers in the EIA process: and
• Assisting in decision-making regarding cost and benefits of proposed development projects.

3.1.3. Sectoral Policies and Strategies

(a). Water Resources Management Policy and Strategies

Water resources management and administration in the country should be based on Ethiopia's Water Resource Management Policy and the water resources laws of the country as indicated in Proclamation No. 197/2000. The Ministry of Water resources (MoWR) is assigned with broad powers of "planning, management, utilization administration and protection of water resources". This includes promoting the implementation of medium and large multipurpose dam projects. According to Proclamation No. 197/2000, MoWR's duties include inventory of water resources, allocation of water resources, establishment of standards for design and

construction of waterworks, issuance of guidelines and directives for the prevention of water resources pollution as well as water quality and health standards, establishment of water users' associations, and settlement of disputes. Water Resource Utilization Proclamation No. 92/2002 is another important proclamation put in place with a view to proper management of the country's water resources.

(b). National Rural Land Administration and Use (Proclamation No. 456/2005)

The Rural Land Administration and Use Proclamation (Proclamation No. 456/2005) defines the state ownership of rural land and the tenure rights of the land occupant, including rights to "property produced on his land", rights of inter-generational tenure transfer, and rights of exchange land and limited leasing rights. Provisions are made for the registration and certification of tenure rights. Part three of the proclamation presents regulations relating to the use of rural land, particularly as it relates to soil and water conservation and watershed management. The rural land administration and land use laws are to be implemented by the regional states.

Land holding right gives the right to use the land for agricultural purposes as well as to lease it and, while the right remains in effect, bequeath it to family members, as well as the right to acquire property there on, by labour or capital, and to sell exchange and bequeath the same. The proclamation also addresses environmental concerns, including non-compliance with directives on environmental protection.

An important feature of this proclamation is that it stipulates rural land use and restrictions based on proper land use planning, providing for the proper use of various types of land, such as slopes, gullies and wetlands, as well as the utilization of rural land for villages and social services. In addition, it is envisaged that the proclamation will create a sense of ownership among the vast majority of the rural population and enable them to take initiatives and collectively engage in environmental management activities.

(C). Measures Related to Occupational Health Control

Any employer shall ensure the availability of occupational health service to his employees. The use of any machinery or instrument which generates excessive noise is prohibited. Any person who uses such machinery or instruments shall install noise reducing apparatus or instrument.

(D). Proclamations No. 42/1993 Labor Proclamation

The proclamation stipulates that an employer shall take the necessary measures to safeguard adequately the health and safety of the workers; he shall in particular:

- Comply with the occupational health and safety requirements provided for in this proclamation,
- Take appropriate pre-cautions to ensure that all the processes of work shall not be a source or cause of physical, chemical, biological, agronomical damages.

(E). Special Decree No, 20/1990 Council of State Special Decree to Provide for the Registration and Control of Pesticide

It is states that the purpose of the proclamation is to make it possible to minimize, to the extent reliable, the adverse effects that utilization of pesticides might cause to human beings, animals, plants and the environment.

According to the this proclamation, any substance, mixtures thereof or a living organism intended for use in preventing, destroying or controlling any pest; the following in particular is termed as "pesticide":

- unwanted species of plants or animals causing harm during, or otherwise interfering with, the production, processing, storage, transport or marketing of food commodities, agricultural produces, wood and wood products or animal feedstuffs;
- insects or other pests in or on the bodies of animals and causing harm to their health
- vectors of human and animal disease: it also includes substances or mixtures thereof intended for use as a plant-growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature fall of fruit and substances applied to crops, either before or after harvest, to protect the commodity form deterioration during storage or transport.

The proclamation bans;

• The manufacture, import, sells or use of pesticide not registered in accordance with this special decree,

• The import, storage, transport or offer for sale of pesticides where not packed or labeled as provided in this special decree and directives issued hereunder.

• Authorization of registration is granted if the pesticide is used or handled according to the instructions contained in its proposed label, would constitute a risk to human beings, animals and the environment of such a minimal extent or degree as to be outweighed by the necessity or advantages of using it.

(F). National Biodiversity Policy and Strategies

The National Biodiversity Policy (NBP) was established in 1998 based on a holistic ecosystem approach to conserve, develop and utilize the country's biodiversity resources. Integration of biodiversity conservation and development in federal and regional sectoral development initiatives, and mobilization of international cooperationand assistance, have been identified as the principal strategies for implementation of the policy.

The policy provides for guidance towards effective conservation, rational development and sustainable utilization of the country's biodiversity, and contains comprehensive policy provisions for the conservation and sustainable utilization of biodiversity. Protection of biodiversity-related traditional indigenous knowledge and communities' benefit sharing arrangements are not yet effective. Similarly, the potential of biodiversity-related opportunities has not yet been exploited to enhance sustainable livelihood to the desired level. However, there is a general understanding with respect to changing the management approach in order to bring about the desired benefits.

Wetlands are considered among the most productive type of ecosystem in the world, providing benefits far in excess of those obtained from alternative uses to which they are subjected. Ethiopia is endowed with vast wetlands, including a tract in the project area; however, efforts towards their conservation and sustainable utilization are very limited, and no clear policy and legislative framework have been designed.

3.2. Legislative and Administrative Frame Work

3.2.1. Legislative Instruments

The Federal Government of Ethiopia passed a number of proclamations that are aimed at providing the legislative instruments for the implementation of the national environmental policy objectives and strategies. The following environmental protection proclamations were enacted by the council of Representative of FDRE.

(a). Environmental Impact Assessment (Proclamation No. 299/2002)

This Proclamation (No 299/2002) aims primarily at making the EIA mandatory for categories of projects specified under a directive issued by the EPA. The law specifies the projects and activities that will require an environmental impact assessment (EIA).

The proponent of the project must prepare the EIA following the format specified in the legislation. The EPA will then review the EIA and either approve the project (with or without conditions) or reject it. Under this legislation, the EPA has to prepare procedures, regulations, environmental guidelines and standards for the EIA. Environmental guidelines are among the tools for facilitating the consideration of environmental issues and principles of sustainable development and their inclusion in development proposals. The Proclamation requires, among other things:

• Specified categories of projects to be subjected to an EIA and receive an authorization from the EPA or the relevant regional environmental agency prior to commencing implementation of the project.

• Licensing agencies to ensure that the requisite authorization has been duly received prior to issuing an investment permit, a trade or operating license or a work permit to a business organization.

The EPA or the relevant regional environmental agencies may issue an exemption from carrying out an EIA in projects with an insignificant environmental impact.

A licensing agency may suspend or cancel a license that has already been issued where the EPA or the relevant regional environmental agency suspends or cancels environmental authorization.

Procedures that need to be followed in the process of conducting an environmental impact assessment are described in the Proclamation. Thus, a project developer is expected to act as follows:

• Undertake a timely environmental impact assessment, identifying the likely adverse impacts, incorporating the means of their prevention, and submitting the environmental impact study report accompanied by the necessary documents to the EPA or the relevant regional environmental agency.

• Ensure that an environmental impact assessment is conducted and an environmental impact study report is prepared by an expert who meets the requirements set forth by the directive issued by the EPA.

• Submit an environmental impact study report to the EPA or the relevant regional environmental agency for review.

(b). Environmental Pollution Control (Proclamation No. 300/2002)

Proclamation No. 300/2002 on Environmental Pollution Control primarily aims to ensure the right of citizens to a healthy environment and to impose obligations to protect the environment of the country. The law addresses the management of hazardous waste; establishment of environmental quality standards for air, water and soil; and monitoring of pollution. The problem of improper handling of hazardous substances related to activities such as pest management and industrial development are becoming a serious environmental concern. In this connection 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. Such wide powers derive from Ethiopia's serious concern and commitment to protecting the environment from pollution.

(c). Solid Waste Management (Proclamation No. 513/2007)

Measures related to waste handling and disposal:

• Any person shall collect waste in an especially designated place and in a manner, which does not affect the health of the society.

• No person shall dispose solid, liquid or any other waste in a manner which contaminate the environment or affects the health of the society.

3.2.2. Institutional Framework

National

(a). Proclamation on Institutional Arrangements

This proclamation establishes the EPA as an autonomous Federal agency with the objective of formulating Environmental policies, strategies, legislatives, standards and directives. The proclamation also provides for the establishment of the Environmental council to ensure integration of Environmental concerns with development policies, strategies and plans, as well as coordination among sectors.

The Environmental council is chaired by the prime minister (or his designate) and is composed of the relevant line ministries, heads of other government agencies and representative of trade associations and NGOs. The executive Director of MOEF/EPA will serve as member and secretary of the environmental Council. Furthermore, the proclamation requires every competent agency to establish or designate its own environmental unit, which shall ensure collaboration with EPA and be responsible to coordinate and follow up that activities of the agency are taking place in harmony with this proclamation and other Environmental requirements.

(b). Environmental Protection Council

The proclamation for the establishment of the Environmental protection Authority establishes Environmental protection council to ensure the integration of Environmental concerns with development policies, strategies and plans as well as coordination among sectors. The council is composed of the Ministry of Agriculture, Ministry of Trade and Industry, Ministry of Health, Ministry of Mines and Energy, the commissioner of Science and technology, the Ministry of water resources and the general manager of EPA. An official to be designated by the government chairs the council.

(c). Federal Environmental Protection Authority (EPA)

In 1995, the EPA was created by means of the Environmental Protection Authority Establishment Proclamation (Proclamation No. 9/1995). At the same time, an Environmental Protection Council (EPC) was established, with representatives from most of the federal ministries to supervise the EPA's activities. The Director-General of the EPA was to serve as the Secretary to the Council and the EPA took on the duties previously assigned to the Ministry of Natural Resources Development and Environmental Protection (MoNREP). The mandate and duties of the EPA were subsequently clarified in the Establishment of Environmental Protection Organs Proclamation (Proclamation No. 295/2002).

The EPA is an independent authority, acting outside the main ministerial structures and reporting directly to the prime minister. The federal EPA is the key national level environmental agency, with a mandate to address environmental issues. The environmental legislation gives the EPA powers to fulfill its role, support all federal agencies in establishing environmental units, and develop skills in strategic environmental analysis of policies and public instruments. The EPA is involved in the development of environmental policy and legislation, setting environmental quality standards for air, water and soils, monitoring pollution, establishing EIA procedures and an environmental information system, and undertaking capacity development in relevant agencies to ensure the integration of environmental management in policy development and decision making.

Regional State

The Oromiya regional state is one of the nine regional states under the Federal System of the Federal Democratic Republic of Ethiopia. The executive body of regional state is structured under cabinet offices guided by the office of the president and the vice president. When it comes to ESIA, the national provisions indicate the Federal MOEF/EPA passes responsibility to the regional environmental offices, especially for projects that fully under the jurisdiction of the regional governments.

Zone

There are eighteen administrative zones in Oromiya regional state in which Eastern Shewa zone is one of them. The zone administration is the highest organ and is composed of the offices headed by the cabinet members.

District

Administrative structure of the district is similar all over the country. The District administration is a major decision-making government organ. The District administration has the following duties and responsibilities, among others:

- Implementation of the policies, laws and directives of the state,
- Coordination of the activities of various offices in the District,
- Maintenance of peace and security in the District, directing the police and security forces,
- Planning and implementation of projects,
- Supervision of development programs within the District, and
- Proper use and accounting for the annual budget.

At the district level, the District is the key focus of the government's commitment to decentralized delivery of services. The various departments at District level have specialists who advise Development Agents (DAs) working at the village level. They are called upon to provide inputs and management controls relating to soil and water conservation, small-scale irrigation development, rainwater harvesting, road development, water supply, sanitation and waste management associated with rehabilitated schools and clinics.

Peasant Associations (PAs)

The PA is the lowest administrative level structure. It generally comprises cabinet member headed by an elected chairman. These PA areas fall partially or fully within the project area. The main responsibilities of the PA administration include preparation of an annual PA development plan; ensuring the collection of land and agricultural income tax; organizing local labour and in-kind contributions for development activities; and resolving conflicts within the community through the social courts. Three representatives from the each PA administration will be drawn to be members of the District council. The council will assign nine cabinet members for the District Administration. Some of the cabinet members are heads of the District offices.

Community Based Organizations (CBOs)

Similar to the other rural parts of Ethiopia, community based organizations are there with the aim of providing services of one kind or another to the community. Among the notable once are the farmer's cooperatives, woman's association, youth associations and community Idir associations.

The farmer's cooperative is engaged in facilitating agricultural extension services such as plant/crop protection, provision of fertilizers and distribution of improved seeds. The woman and youth association works in close cooperation with the farmers association they usually work with their respective members in improving their social and economicalwell being as well as promoting relevant government policies. The community Idir (burial Society) is one of the oldest traditional institutions which are unique to the country. The principal function of these associations is to organize funerals of its deceased members and usually they undertake all responsibilities from feeding the mourners to digging the graves and providing financial and moral support to the families to which death has taken place. And it also creates a loan service to the members in need.

4. PROJECT BACKGROUND AND DESCRIPTION

This investment project proposal is designed to establish a moringa plantation farm in Adami-Tulu areas of East Shewa Zone of the Oromiya Regional State and produce high quality and quantity of processed value added moringa products in selected areas of the Oromiya Regional State.The main aim of the project is to strategically produce high quality moringa seed oil, powdered moringa pods, leaves, stems and flowers together in various forms and sizes and supply high quality and quantity of diversified processed products to domestic and export markets and generate substantial profit in the short and medium terms. And in the long run to significantly contribute to economic growth, create employment and increase foreign currency earnings.

The total budget allocated is 5,746,651 ETB, the source of this finance will 100% be covered by the owner of the project (Private Equity).

The benefits of supplying increased processed moringa products helps the country to be able to meet domestic supply requirements associated with its current strong domestic demand for moringa as well as expand potential opportunities for export markets.

The strategic context and the rationale of the project is to produce and supply moringa as a commodity is summarized below:

Increasing interest in the health and nutritional benefits of moringa is attracting several investors to engage in the production and supply of moringa to various markets, and the Ethiopian Institute of agricultural Research has also given due attention and currently some research works are also being conducted on its nutritional and medicinal properties of the plant.

Hence, such increased awareness of the multiple benefits of moringa leaves, pods and seed oil both for domestic and industrial purposes is leading to increased domestic and foreign demands. This is creating the need to find more efficient ways of producing diversified moringa products to meet the growing domestic and export demands.

Thus, one of the focuses of this project is to utilize improved moringa species such as Moringa Oleifera and Moringa Stenopetala, using organic fertilizers together with appropriate agronomic and integrated pest management practices to produce high quality and quantity of processed moringa products and supply to local and export markets and increase the profitability of the enterprise, thereby considerably contribute to the country's food security, poverty reduction and prevention and cure of many diseases and facilitate the implementation of the regional and national health policies and strategies.

The basic assumptions behind the financial analysis are, high quality certified moringa seeds will be planted in 5ha of land for the purpose of leaf, flower and pod production, also separately on 10 ha of land moringa seed will be sown for seed as well as seed oil production. Annual yields of dried moringa leaves (10 ton/ha/yr), seeds (7.5 ton seed/ ha/yr) and 375 kg seed oil/ ha are expected.

During the analysis, commodity prices are assumed to stay constant and 15% annual depreciation rate on fixed assets were considered. In addition to this, the average cost of

capital (discount rate) is assumed to be at the level of 12%., Results of the analysis indicated that NPV value is 12,263,821 ETB, showing that the project is financially viable.

The main beneficiary of the project will be the investor but also the local communities, small holder agroforestry farmers, University and college students and non-government organization who are engaged in moringa research and development.

High financial NPVs value is observed and due attention and priority will be given to efficiently implement the proposed project, the positive NPV value indicates that the production and marketing of moringa is financially viable and economically feasible because the benefits of the project are expected to outweigh the costs and has the capacity to generate significant economic profits to the investor as well as can substantially contribute to the regional and national economy.

4.1. Project Location

Adamitulu Jido Kombolcha Woreda is located in east Shoa zone of Oromia Regional sate. The total area of the Woreda is estimated to be 1403.25 Sq.Km and it is structured by 6 urban and 32 Kebeles. The Woreda agro climatic zone is situated in dry and tropical rainy / woina dega / climatic zone constituting about 60% and 40% respectively. By elevation the Woreda is situated between 1560 and 2300 meters above sea level. As per information obtained from Woreda agriculture and rural development office the Woreda annual average rainfall is 750 mm.

The project area (Adami-Tulu wereda) is categorized under the Rift Valley Maize and Haricot Bean livelihood zone, with 135,521 populations. In particular the project is located in Bechisa kebele with 2,912 moderately dense populations.

Figure 1.1 Map of Adami-Tulu in the Rift valley Maize and Horse Bean Livelihood zone

4.2. Project Objective

To establish moringa plantation farm, process and package the leaves, stems, fruit and seeds in various forms, sizes and supply clean and organic moringa products to domestic and export markets and generate substantial profits.

4.3. Project Justification

To produce high quality moringa seed oil, various sizes of moringa tea bags, pack the pods, leaves, stems and flowers together or separately and supply diversified processed moringa products to domestic and international markets there by significantly contribute tothe enterprise and to the national economic growth, create employment opportunity and generate foreign currency earnings.

4.4. Raw Material

The main raw materials that will be utilized to start the project activities include two varieties of moringa seeds (Moringa Stenopetala and Moringa Oleifera species), urea and DAP fertilizers, Green manure compost, glyphosate herbicide, water supply, barbed wire and poles for fencing the site.

4.5. Product Process

After harvesting the leaves with the smaller branches along with the flowers, unwanted materials will be removed by hand and washed with sterilized water and dried with minimum temperature (50-55^{0}C) dried leaves will be placed in a sealed bag and transported to store for grinding purpose. The leaves along with the flowers branches fruits will be ground into fine particulate. The ground leaves, flowers and stems with branches will be packed into three different sizes. Samples of ground powder will be taken and sent to quality and standard agency and analyzed for multi proteins, multi minerals, multi vitamins and multi antioxidants compositions.

In collaboration with a public health professional, the daily intake or requirement gm/ person /day will be determined and these values along with the analytical chemical composition will be compared with the relevant scientifically credible literature and will be used for labeling. Moringa tea can also be prepared by separately harvesting the leaves, flower and stems, drying, grinding and packing in tea bags of different sizes.

Depending on the demand from consumers, fresh moringa leaves, pods, seeds, root mass will be packed and supplied to domestic market.

Moringa seed kernels contain oil that is valued for culinary and cosmetic use. The oil contains 60–75% oleic acid and is comparable to olive oil in taste and value in cooking characteristics. The oil has a high antioxidant content, which makes it slow to go rancid.

Oil yields using a screw press can be improved to 20% if the seed is first crushed, and 10% by volume of water is added, followed by gentle heating over low heat for 10–15 minutes, taking care not to burn the seed

Seed oil can be extracted and annually 350 kg of oil per hectare can be produced. Samples of moringa seed oil will be analyzed for chemical composition. The seed oil will be packed in various sizes and forms and labeled. Packed oil and moringa tea bags will be supplied to both domestic and export markets.

5. BASELINE INFORMATION OF THE PROJECT PROPOSAL

5.1. Biophysical Information

5.1.1. Climate/Soil Types

The centre of the Central Rift Valley is formed by Lake Ziway and the surrounding area, which is characterized by arid and semiarid climatic conditions.

There are four local seasons: bira the short dry season (October to November); *bona* the long dry season (December to March); arfasa the short rains (April to May); and genna the long rainy season (June to September).

The soils are moderately fertile sandy and sandy clay loams. The annual rainfall received is 500-800 mm. Crop production is rain fed with limited irrigation in some villages.

The consumption year extends from November to October. Maize, which is a long cycle crop, is planted during *arfasa* season. The harvesting period for maize is November to December. Consumption of green maize starts in September. Teff, a short cycle crop, is planted in July and harvested in November. October and July are the in-heat and birth periods for livestock as the water and pasture availability is better during this time. The sale of livestock runs from June to September (long rainy season) and during the holidays and when the physical condition of the livestock is improved.

Local labor augments the income of the poorer households. The very poor and poor people usually engage in weeding (July to September) and harvesting (November to December) in the fields of better-off and middle households. The hunger season period from July to August is the time when food stocks show sign of decreasing; this coincides with a period of increased labor and food purchases. Food purchases increase from May through September pending the availability of green maize in September. The prevalence of malaria increases at the end of the main rainy season and the start of short dry season.

The zone is well known as a high potential surplus producing area. The main crops grown are maize, haricot beans and teff, all of which are both consumed and sold. Land preparation and cultivation are done by plow oxen.

5.1.2. Water Resources

Lakes include Shala and Ziway and major rivers include the Awash, Arbaguracha and Bulbula.

The major types of vegetation are bush scrub and grasslands. Lake Ziway receives most of its water from two tributaries, being the Meki River and Ketar River. Lake Ziway is connected with Lake Abiyata through the Bulbula River.

Lake Ziway is an open lake, connected to the terminal Lake Abiyata via the Bulbula River. It is the largest lake in the Central Rift Valley. The Katar and Meki Rivers originate in the highlands and drain to the lake. The lake's water level has declined over the past few decades as a result of water diversion from the two main feeder rivers for irrigation, as well as direct pumping from the lake. The lake is home to many endemic birds and a wide variety of wild animals. It also is one of the main sources of commercial fish farming in Ethiopia.

In Adami Tulu Jido Kombolcha Woreda, according to obtained information from Woreda water resource office and the 1997 budget year report of the Woreda finance and economic development office, there are about 82 water supply schemes of different types.

Out of the total water supply schemes it is reported that 31 schemes are reported to be functional while the rest 51 schemes are not functional for different reasons including technical and fluoride problem.

Since the Woreda is located in the rift valley the problem of high fluoride content is very common almost in all Kebeles. As per information obtained from Worked water resources office there is undergoing effort by the NGO called Salisian Sisters to address the high fluoride content problem.

Concerning maintenance particularly to undertake minor maintenance the office has technical capacity but budget is reported as a major constraint. On other hand, as far as the management activity of the community on functional schemes is concerned it is informed that there is good management practice by the community and committee members. The reason for this is believed to be the sensitivity of water in the Woreda both for human and livestock consumption and the attention given by the community at large.

For such reasons it seems that most of the rural communities have developed the awareness of water is economic good. This reflected by the regular payment that is made by the community

for operation and maintenance almost in all water supply schemes. In the Woreda the average water tariff is Birr 4.00 for 1m3.

Apart from this, the communities who have no access to safe water supply depend on three rivers, 75 ponds and 375 traditional hand-dug wells for human consumption and for their livestock. Indeed among the community who use the traditional sources of water for human consumption and cattle consumption the problem of water particularly the distance and the shortage is very crucial affecting their development activities that is reflected in terms of poor health and poor economic status.

5.1.3. Topography and Land scapes

The agro ecology is mostly midlands or woina dega with some lowland or *kola* areas. The varied topography includes hills, plains and undulating landscapes with lakes and the rift valley escarpment.

5.2. Socio-Economic Baseline Information

5.2.1. Population

According to information obtained from Woreda administration office, the Woreda total population for the year 1999 is estimated to be 136587. Out of this the males are 76437 constituting 56 %, while the females are 60150 constituting 44 percent.

5.2.2. Health Facilities

According to information obtained from the district health office the district health coverage is reported to be 84% for the year 1998. In the Woreda there is only 1 health center and 13 health posts. All the health posts are suited in 13 rural Kebeles to give the first level health service for the needy person.

By health professional workers in the district there are 2 health assistants, 6 senior nurses, 2 junior nurses and 12 front line health workers. Along this at the community level there are also health volunteers who undertake promotion among their respective communities.

For the year 1998 Malaria is reported to ranking first among the ten top diseases. On this report diarrhoea is reported to be at the fourth stage indicating the prevalence of water related problem in the district.

Regarding sanitation situation in the district according to the health office information out of the total 24869 households18406 have latrine where as 6463 have no any. In same development all health institutes are reported having latrine and waste pits. As far as waste pit for the household is concerned it is reported that there is no household who have that facility.

5.2.3. Schools

The education coverage of the district is reported to be 93.3%. According to obtained information from district education office there are 27 first cycle schools, 21-second cycle schools and 1 high school. In all schools in 1998 budget year there were 32,675 students and 338 teachers. Particularly, the first cycle schools are distributed almost in all kebeles except for a few kebeles being a good opportunity for rural children to get school at a near distance from home.

5.2.4. Infrastructure and Services

(a). Electricity Supply

In the district all the six urban kebeles have a 24-hour electric power supply with hydropower source. Regarding rural kebeles only three kebeles are supplied with the electric power where the rest 35 rural kebeles have not the opportunity.

(b). Communication Service

In Adami Tulu Jiddo, Kombolca Woreda there are four Telecommunication stations in urban Kebles serving the surrounding communities. In addition to this 36 rural kebeles have got the service which is very encouraging one, this shows that except the two kebeles' communities the rest have an easy access to communicate with telephone mainly for the market purpose.

Regarding postal service, in the Woreda there is one post office that is found in Ziway town and two agents in Bulbula and Adami Tulu.

(c). Road

The district is crossed by 42.5 km. Asphalt road that stretches from Addis Ababa to Awassa. Within the Woreda there is 42 kms all weather roads that connect different kebeles and neighbor Woredas.

Apart from this there are numerous access/ all weather/ roads connecting all kebeles with the capital town of the district all the seasons.

The road access in the livelihood zone is good and includes many large trading centers. Haricot beans, maize and teff are traded in local towns within the zone including Shashemene, Aje, Ziway, Meki and Adama as well as nearby (though outside the zone) Addis Ababa. The peak time for crop sales is from December to June. The trade route and business interaction for the sale of cattle, shoat and chicken is from local villages to Shashemene, Aje, Ziway, Meki and Adama towns and in Addis Ababa as well. Maize and other pulses are bought from Shashamane and Adama from April to August, during the hunger season.

5.2.5. Religious Affiliations

The Woreda population follows different religions but the very majority of the people are the followers of Muslim. Accordingly, 90% of the total population is reported to be the followers of Muslim that is followed by Orthodox religion followers constituting 5% of the total population.

5.2.6. Settlement Pattern

The population settlement pattern in the rural areas of the district is observed to be dispersing as influenced by topography, agro-climate and water resource. The settlement is dominated by village type that is formed by extended family. Regarding the land use pattern as per district rural and agriculture development office data most of the land that is estimated to be 61,599 ha (43.9%) is under cultivation and this is followed by grazing land that covers about 25,405 consisting 18.1 percent indicating the domination of cattle rearing activity. Along this, the water coverage is reported to be 22,100 ha constituting 15%. The Minimum land holding size is reported to be 0.5 ha and in this respect about 215 household heads consisting 1.1 percent of the total households are reported to have the minimum size where as the majority of the households hold more than 2 ha constituting 58.9 percent. In general this shows, as there is no land shortage in the district when compared to other areas.

6. ENVIRONMENTAL AND SOCIAL IMPACT IDENTIFICATION AND SIGNIFICANCE

The environmental and social impacts of the project implemented are highly positive, the beneficial impacts greater and outweighs the expected negative impacts. Most of the respondents noted that the proposed project will encourage high productivity and creation

of jobs for the local communities, significant contribution to food security, community health, livestock forage and for soil and water conservation activities.

6.1. Economic and Social Benefits

(a). Food Security Benefit

Moringa has long been considered a panacea for improving the nutrition of poor communities in the tropics and subtropics. Protein content of leaves is high (20–35% on a dry weight basis). Most important is that the protein is of high quality having significant quantities of all the essential amino acids. This amino acid balance is very unusual in plant foods. Moringa leaves also contain high quantities of nutrients (per 100 g fresh weight): vitamin A (7564 IU), vitamin C (51.7 mg), calcium (185 mg) and potassium (337 mg).

Almost all parts of the moringa tree are used for food, oil, fiber, and/or medicine. In the Pacific, the most important products are pods and leaves. Young pods are consumed as a vegetable. Very young pods are fibreless, and can be cooked like string beans. Because the weight is low on very young pods, most commercial production involves larger, more fibrous pods that are used in soups, stews, and curries. The nutritious leaves are eaten in many dishes including soups, stews, and stir fries, young leaves and flowers are also eaten.

Moringa powder is utilized heavily in Africa and other parts of the world as a food supplement, where 1-2 tablespoons of dried powder are added to soups and stews daily to enhance the protein content and nutritional value of food. In Africa, 25 g of moringa powder is administered to pregnant women daily to improve prenatal nutrition.

The tree has in recent times been advocated as an outstanding indigenous source of highly digestible protein, Ca, Fe, Vitamin C, and carotenoids suitable for utilization in many of the "developing" regions of the world where undernourishment is a major concern.

Moringa is especially promising as a food source in the tropics because the tree is in full leaf at the end of the dry season when other foods are typically scarce.

Leaves can be eaten fresh, cooked, or stored as dried powder for many months without refrigeration, and reportedly without loss of nutritional value.

The young leaves are edible and are commonly cooked and eaten like spinach or used to make soups and salads. They are an exceptionally good source of provitamin A, vitamins B, and C, minerals (in particular iron), and the sulphur-containing amino acids methionine and cystine. The composition of the amino acids in the leaf protein is well balanced. The young green pods are very tasty and can be boiled and eaten like green beans. The pods are best for human consumption at the stage when they can be broken easily without leaving any visible strings of fibre. These are rich in free leucine. The seeds must first be boiled for a few minutes to remove thefine transparent hull and the water drained before they are eaten. Seeds should be eaten green before they change color to yellow. The hull is not desirable as food because it tastes bitter. The dry seeds can be ground to a powder and used for seasoning sauces. The roots from young plants can also be dried and ground for use as a hot seasoning base with a flavor similar to that of horseradish. This is why the Moringa tree has been given the name "Horseradish Tree" (Delaveau and Boiteau, 1980). A tasty hot sauce from the roots can also be prepared by cooking them in vinegar. The flowers can be eaten after being lightly blanched or raw as a tasty addition to salads. The resin from the trunk of the tree is also useful for thickening sauces.

(b). Medicinal /Health Benefits

The most common direct medical use of the plant is as dressing of the leaves and bark applied directly to wounds as an anti-microbial and to promote healing. The anti-fungal and anti-bacterial properties of moringa extracts are well documented in the scientific literature. The plant contains specific compounds (Isothiocyanates) which is particularly effective against

Helicobacter pylori, a bacterial pathogen of human beings in medically underserved areas and poor populations worldwide.

Isothiocyanates and related products from the cabbage family have been shown to have anti-tumor and anti-carcinogenic effects. Work at Johns Hopkins University and elsewhere is supporting traditional use of moringa to treat cancer.

The strong tradition of medical uses of moringa combined with recent scientific work supporting these traditions has resulted in increased marketing of supplements and so-called "super foods" based on moringa.

Moringa contains multivitamins, multiproteins, multiminerals and nearly 46 antioxidants that can slow down the aging processes and also prevent and cure more than 300 different types of diseases. It has also been cited in the scientific literature as having antibiotic,anticancer, antitrypanosomal, hypotensive, antispasmodic, antiulcer, anti-inflammatory, hypo-cholesterolemic, and hypoglycemic activities, as well as having considerable efficacy in water purification by flocculation, sedimentation, antibiosis and even reduction of Schistosomecercariae.Numerous studies now point to the elevation of a variety of detoxication and antioxidant enzymes and biomarkers as a result of treatment with Moringa or with phytochemicals isolated from Moringa plant.

(c). Moringa as a Livestock Fodder

Leaves are readily eaten by cattle, sheep, goats, pigs, chickens and rabbits and can also be used as food for fish. Several studies demonstrate that significant proportions of traditional fodder can be replaced with moringa leaf. It can increase milk production by 43-65% and cattle weight by 32% respectively.

The nutritional characteristics of the Moringa tree are excellent so it can easily be used as a fresh forage material for cattle. The leaves are rich in protein, carotene, iron and ascorbic acid and the pod is rich in the amino acid lysine. Another important advantageous characteristic of Moringa is its high productivity of fresh material per unit area compared with other forage crops (see below; Productivity of Moringa plantations). Moringa is especially useful as forage for cattle both economically and productively given the problems facing typical cattle breeders which includes:

- Low availability of feed during the dry season, which extends from December through May.
- Lack of capacity for pasturing animals as farmers generally own small areas and these are typically not well worked or managed.
- Nutritional imbalances caused by a lack of access to proteins, carbohydrates and minerals.
- Farmers have little control over the reproductive activities of their animals either as regards timing of mating or quality of sire.

The crude protein content of extracted and unextracted Moringa leaves was 43.5 and 25.1 % respectively, suggesting that both the extracted and unextracted leaves are good sources of protein for livestock.

(d). Water Purification Benefit

The anticoagulant activity of crushed moringa seed indicated that it is one of the best natural coagulant with polypeptides that makes it useful for water treatment, While crushed seed are viable replacement of synthetic coagulant.

Moringa seeds could reduce turbidity up to 99%., moringa seed also have softening properties in addition to alkalinity reduction as well as exhibiting a natural buffering capacity, which could handle moderately high to high alkaline surface and ground water. Moringa seed can be used as an antiseptic to treat drinkable water.

Moringa seed possess antimicrobial properties, while a recombinant protein in the seed that is effective against Gram-positive and Gram-negative bacteria cells, it was also stated that the seed may act directly upon microorganisms and results in growth inhibition.

Moringa seed could inhibit the replication of bacteriophages, and could be used as a less expensive biosorbent for the removal of Cadmium (Cd) from aqueous media, and useful in binding of some metals.

Moringa seeds contain between 30-42 % oil and the press cake obtained as a by-product of the oil extraction process contains a very high level of protein. Some of these proteins (approximately 1 %) are active cationic polyelectrolytes having molecular weights between 7-17 K Dalton. The cationic polyelectrolytes neutralize the colloids in muddy or dirty water since the majority of these colloids have a negative electrical charge. This protein can therefore be used as a non-toxic natural polypeptide for sedimenting mineral particles and organics in the

purification of drinking water, for cleaning vegetable oil, or for sedimenting fibers in the juice and beer industries. It thus works as a primary coagulant as natural bridges are continuously formed between the colloid particles. In contrast, industrial coagulants such as alumina can be toxic. Their proper use requires qualified personnel and the majority of underdeveloped countries don't have the means of producing them. In addition, these industrial coagulants are expensive and represent a considerable drain on the hard currency reserves of developing countries.

The seeds from Moringa can be used for the final treatment in wastewater treatment units. In oxidation lagoons, 80 % of the oxygen demand of water is caused by unicellular algae. These algae also contain between 40-60 % of the nitrogen and phosphorous found in the pre-treated wastewater.

To avoid eutrophication of rivers or lakes by the release of high loads of both phosphorous and nitrogen, the seeds can be used to coagulate algae and remove them by sedimentation. Up to 98 % of the algae can be removed by this treatment. After sedimentation the residual wastewater is both clear and transparent. The treatment also reduces the oxygen demand of the water by approximately 70 % and its content of both phosphorous and nitrogen by 60 %. The algae recovered by sedimentation after drying and pulverization have a protein content of about 46 % and can be used as a protein supplement for cows, pigs, chickens and even shrimps thereby reducing the cost of feeding substantially.

For the final treatment of wastewater in a town of 10,000 inhabitants, approximately 960 kg of Moringa flour is required per day. This means that a plantation of about 105 hectares with 1,100 trees/ha would be needed to produce sufficient seed to treat the wastewater for this community. It has been suggested that a flocculation quality of M. stenopetala is higher than M. oleifera seeds.

(e). Benefit as Plant growth enhancers

The extract obtained from the leaves of Moringa in 80 % ethanol contains growth enhancing principles (i.e. hormones of the cytokinine type). The extract can be used in the form of a foliar spray to accelerate the growth of young plants. Use of the growth hormone spray will also

cause the plants to be firmer and more resistant to pests and disease. Plants that are treated with this growth hormone spray will also produce more and larger fruit and will consequently have a higher yield at harvest time. The extract can be obtained either through press extraction or by using an ultra-turrax and filtering 20g of tender leaves in a total volume of 675 ml of 80 % aq. Ethanol.

Spraying the leaves of plants with the Moringa extract prepared in 80 % ethanol and then diluted with water produced some notable effects such as a longer, more vigorous life-span, heavier roots stems and leaves, bigger fruits and higher sugar levels etc. The extract produces an overall increase in yield of between 20-35 % based on data such as the stem diameter, number of nodules, number of axels, number of flower buds, and number of fruits per flower bud.

(f). Industrial Benefits of moringa oil

The oil content of de-hulled seed (kernel) is approximately 42 %. The oil is brilliant yellow. It is used as a lubricant for fine machinery such as timepieces because it has little tendency to deteriorate and become rancid and sticky. It is also useful as vegetable cooking oil. The oil is known for its capacity to absorb and retain volatile substances and is therefore valuable in the perfume industry for stabilising scents. The free fatty acid content varies from 0.5 to 3 %.

The seed oil of Moringa contains approximately 13 % saturated fatty acids and 82 % unsaturated fatty acids. It has a particularly high level of oleic acid (70 %). Other vegetable oils normally contain only about 40 % oleic acid.

Moringa seed contain 19 to 47% oil which is commercially known as ben-oil, it is similar to olive oil, rich in palmitic, stearic, and oleic acids. Moringa Seed oil is a sweet non-sticking, non drying oil that resists rancidity reported that the sterol composition of the major fractions of Moringa seed oil differs greatly from those in the convectional edible oils. Moringa seed oil is used for human consumption. Moringa oil is applied externally to treat rheumatism and gout and is highly valued by perfumers and watchmakers for its power of absorbing and retaining odours, and as a lubricant, respectively. While the oil is used for making hair care products, it also has specific protein fractions which make it useful for skin and hair care. Moringa seed oil cake (defatted seed cake) is used as fertilizer. Usage of Moringa seed for household water

purification produced substitute for imported flocculant, thus reducing expenditure by rural poor population. It is completely biodegradable and will help the rural poor who suffer from a lot of water borne disease such as cholera, dysentery and typhoid in purification of their water and saved them from getting ill. Also, the uses of Moringa in water treatment and various evidence of its efficacy will increase demand for Moringa seed, thus economically empowering local Moringa farmers.

(g). Moringa as a source of biogas

Moringa plants (approximately 30 days old) were milled together with water. The fibre was separated by filtration through a mesh with 5 mm pores and the liquid fraction produced was then added to a biogas reactor. With an average feed of 5.7 g of volatile solids the gas production was 580 liters of gas per 1 kg of volatile solids. The average methane content of the gas was 81 %.

(h). Impacts in Mitigating climate change and Desertification

For hundreds of millions of people the threat of famine is connected to climate change. The planting of trees, including the planting of the Moringa tree, can play one important role in mitigating the effects of climate change.

The effects of climate change are making droughts more of a norm than an exception. This is a pattern that places some of the most vulnerable communities in an increasingly risky position when it comes to meeting basic food needs. By the time shortages and hunger reach "crisis" levels and warrant aid; families, communities, agricultural practices and lands will have suffered greatly.

Moringa can also grow in areas where strong winds and long dry spells occur simultaneously, causing serious soil erosion.For smallholder farmers in dry lands, a failed harvest can mean months of malnutrition and hardship. "Conventional" crops are often not native and require expensive inputs, significant irrigation and land preparation in order to produce a successful harvest. This means that they are more vulnerable to droughts. Trees, on the other hand, often survive when other crops fail.

The Sub-Saharan Africa is also the only major region in the world that has failed to progress in terms of food security with more or less stagnant levels of production per capita in recent years. Climate change presents a new major concern, often interacting with or aggravating existing problems. Since poverty is a rural phenomenon in this region, it is only agriculture that holds the key to resolving the problem.

As climate change takes firmer hold and the global population grows and market fluctuate, there have to be alternative options to find ways of resisting the shocks associated with it in order not to make an already fragile situation worse.

The environmental impacts caused by human industry are compromising the sustainability of current economic activities, and degrading the natural life support systems, on which human and all other species depend. Climate change is expected to trigger severe consequences to smallholder poor farmers who dominate the agriculture sector in Africa. The impact of climate change are felt at the level of natural resource base upon which rural communities depend, at the farming system level and at the level of individual species. Farmers will therefore need to devise mechanisms and adaptation strategies to reduce the impacts of climate change.

One practical step to compensate for the several unpreventable carbon dioxide emissions is to plant trees. This is because trees take carbon dioxide out of the atmosphere and they release oxygen in return. The type of trees planted will have a great influence on the environmental outcome. According to a Japanese study, the rate of absorption or assimilation of carbon dioxide by the moringa tree is twenty times (20x) higher than that of general vegetation and fifty times (50x) higher when compared to the Japanese cedar tree. The moringa tree therefore will be a useful tool in the prevention of global warming in that, one moringa tree will be equivalent to the effectiveness of fifty Japanese cedar tree in absorbing carbon dioxide. For instance, If moringa plantation is expanded from one hundred thousand (100,000) hectares worldwide to one million (1,000,000) hectares, that would equate to five (5) giga tonnes of CO2e being sequestered. Studying how the demand for other super foods took their rightful positions in the world market would help us to develop policies and programs to greatly drive demand for moringa products in all markets.

It is fast growing and well adapted to growing in adverse conditions where many plants would not be able to requiring at least 400mm of rain per annum. It presents itself as an easy plant for agri-business, poverty mitigation and a climate smart choice of plant to be developed for the benefit of present and future generations.

(i). Impact on Creation of Employment

Improvement of agricultural productivity under the value chain has resulted in increased labour productivity. Diversification of farm production activities has increased labour demand (i.e. spot labour). It is also expected that the development of marketing services available to farmers will generate additional employment opportunities in the medium and long-term. The project has also created new employment in the out grower schemes and in the trade and agro-processing sectorand development of new investment opportunities. The project has also had a positive impact onemployment in the formal sector through job creation within the supply chain.

(j). Impacts Associated with Rehabilitated Road

This component of the Project involved upgraded/rehabilitated farm access roads structures. Although, the existing alignment was followed but improvement to the vertical and horizontal positions of isolated sections to expand the safety of road users will equally be made. Sincethe Earthworks will be limited to the shoulders and drainage repairs, and then the potential impacts will evenly be minimal.

Since the assessment was on all phases of the intervention, socio-economic benefits provided by road includes all-weather road reliability, decreased transportation costs, increased access to markets for local produce and products, better access to health care and other social services. In the long term, this will have positive benefits to local economic development.

6.2. Potential Adverse Impacts

6.2.1. Adverse Impact During Pre-construction Phase

Impact on Loss of grazing land

The Moringa development project is mainly situated in plain land with scattered acacia species in which community uses as common grazing area. Since, site is open for grazing of livestock of surrounding communities; livestock of immediate vicinities will be affected by alteration of land to moringa production farm.

6.2.2. Adverse Impact During Construction Phase

Potential negative impacts associated with the plantation phase activities of the project include loss of open grazing lands area in the wood lands.The plantation phase of the project involves clearing, land leveling, and transportation of ploughing materials, construction of access roads, and installation moringa grinding and packaging facilities.

Potential adverse impacts associated with these activities of the project are:

Removal of vegetation, landscape and land use pattern alteration, Impact on Air Quality, Impact on flora and fauna, Nuisance Noise, Work place accidents.

Measures were stated to mitigate the impacts of the project on the stakeholders in the project area. All identifiable components of the environment and social sphere were considered with respect to the projects implemented at the Adami-Tulu, Bechisa site in order to streamline theadverse impacts on the stakeholders. With respect to all the intervention projects, the best available control technology was stated as the principal mitigation measure while there are other stated for the specific impact. Proper waste disposal systems, planting of fire-resistant trees, speed limit indications and speed breaker, controlled chemical application, integrated vegetation management, engagement of the community on health, safety and environment, amongst others were stated as mitigation measures.

Impact on Removal of vegetation, landscape

Land clearing and removal of the existing vegetation from Moringa production and packaging facility sites can be a cause for the alteration of landscape integrity, grasses, perennial

vegetation and change in land use pattern in the project area. Besides, some of the acacia trees will be selectively removed for the farm.

Impact on flora and fauna

The project activities that will affect the vegetation and the terrestrial habitats will include land clearing and leveling, building access roads and establishment of site facilities. When the project is implemented there would be a slight change in the natural grass land vegetation of the area. The present grass lands will be changed to Moringa farms.

As the project area does not contain forest, there is no forest as habitat for wild animals. In some parts of the project footprint there are scattered acacia trees. The irrigation development will not affect areas of wildlife habitats, and not disrupt habitat use patterns of the wild animals.

Because the project site is mainly open grass land, negative impact on vegetation and wild animals is insignificant.

Impacts on Air Quality

Local land degradation due to earth moving operation during the site preparation and land leveling is the main air quality concern of the project during the construction stage. As the impact that can arise from the problem is localized, the contribution of the project construction to air quality degradation is not significant. However, as the dust storm can have visibility impact on site operation and decrease breathing because of the suspended particles in the air, the problem is an important issue that requires consideration.

Nuisance Noise

Construction engages in the operation of machinery and vehicles. As a result some noise pollution is expected in and close to the project site. Though, the construction doesn't involve the use of explosives or blasting machines that bring about significant noise effect, due care will be taken to minimize negative noise effects.

Work Place Injuries and Accident

Traffic load in the process of delivering supplies to the construction site together with the concentration of casual labour can potentially increase accident. Moreover, visibility problem

that may be caused by dusts during clearing and land levelling may create accident problem in the site operation.

6.2.3. Adverse Impact During Operation Phase

Impacts on soil contamination from Chemicals

One of the impacts that can be anticipated to arise as a result of the activities of the present development project is its impact on soil. The Fruit and vegetables production and processes will not generate wastes that would affect the soil in the project area. Therefore, impact prediction and analysis on soil will focus on the fertilization and pesticide application, irrigation related activities of the proposed investment project.

Impacts on soil surface and Gulley Erosion

As the project site is located near and adjacent the lake Zeway, land disturbances around the edge of the site which is adjacent to the lake may not only create surface soil erosion but also it is anticipated that in the long run it may trigger gulley erosion and the soil may be washed away into the lake as run off during the rainy season, resulting negative impact on soil fertility.

Impact ground water

Incase, there is fungal diseases and insect pest out breaks the utilization of pesticides, together with application of some fertilizers that may leach down the soil profile from the farm fields are expected to be the main contaminant sources that may cause a likely significant impact on soil and on the ground water bodies found in the project area.

Flooding / over flow of water from the surrounding Lake

During the community consultations and focus group discussions, it was noted that in some of the rainy seasons, there might be over flow of some of the Lake water on to the peripheral areas of the project site, negatively impacting some of the adjacent sites of the project.

Impacts on Terrestrial Fauna and Flora

As the project area does not contain forest, there is no forest as habitat for wild animals. In some parts of the project footprint there are scattered acacia trees. The irrigation development will not affect areas of wildlife habitats, and not disrupt habitat use patterns of the wild animals.

The project activities that will affect the vegetation and the terrestrial habitats will include land clearing and levelling, building access roads and establishment of site facilities. When the project is implemented there would be a slight change in the natural vegetation of the area. The present bush and grass lands will be changed to moringa production farm.

Socio-Economic Impacts

Impact on cultural and/or religious values

There is no any known culturally or historically important site at the project site.

Impact on water related disease

The Moringa development farm is planned to utilize the rain water for the plantation, however the project may use some irrigation system in case of emergency time or during severe drought condition hence there won't be risk of malaria epidemic as accumulation of water that creates favorable condition for breeding of malaria insect is almost insignificant.

Impacts on Households

As the project site is a grazing land for the communities living in the area, there are no households living in the project site. Hence, no family member will be affected as the result of implementing the project activities.

Impact on Loss of social service

As the irrigable moringa plantation covers small area (15 ha land) area, there is no social service like schools, health facilities, and potable water supply schemes to be affected by the project.

Loss of land under various land use types

The total area of land under the boundary delineated for the project area is about 15 hectares. At the time of the inception of the project, most of the land is covered by grass and scattered acacia trees and was used for casual livestock grazing; however, livestock keepers have adequate available land adjacent the project site to allow them to continue grazing activities.

Therefore, changing this area into an intensive moringa production land does not affect the livestock production of the area.

Construction involves the operation of moringa processing and packing. As a result some noise pollution is expected in and close to the project site. Though the construction doesn't involve the use of explosives or blasting machines that bring about significant noise effect, due care will be taken to minimize negative noise effects.

Impact on safe water supply and basic sanitation

The basic sanitary facilities in the project areas are few and those available may be properly used. MPPM will make sure that there is safe water supply throughout the project premises and basic sanitation systems are in place.

Impact on Health Care Facilities and Health Programs

The project area is located 7 km away from town of Zeway where there is adequate transport access and Standard health care facilities. It is expected that, the surrounding communities can get access to these health care facilities in case the need arises.

Impact on contamination from Solid and Liquid waste

The moringa production, processing and packaging activities generate effluents arising from washing of the various moringa plant parts which could affect the environment if not well managed. MPPM project will manage the waste water appropriately on the farm.

6.2.4. Significance of Impacts

An impact is defined as *"Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects (activities, products or services)"* (EMS, ISO14001:2004). Where project activity and environmental receptor interactions occur, an impact is defined. The ESIA assesses impacts according to their "significance" determined by considering project activity "event magnitude" and "receptor sensitivity". Determining event magnitude requires the identification and quantification (as far as practical) of the sources of potential environmental and social effects from routine and nonroutine project activities. Determining receptor sensitivity requires an understanding of the

biophysical environment.

6.2.5. Cumulative Impacts

In the long run, the Project has the potential to result in a number of cumulative impacts, such as:

- As the project progresses and expands, it may result in the gradual disappearance of grazing land
- Waste production due to multiple waste and dumping sites from uncoordinated waste management.

These can be mitigated through careful design of the project, implementing the required mitigation measures for different types of negative impacts, and ensuring through monitoring that activities and their outputs meet permissible limits (e.g. air emissions, chemical use, effluent treatment) under national law and Regional best practice.

7. PROPOSED IMPACTS MITIGATION MEASURES

This section describes the various mitigation measures that have been formulated and integrated into the design or that need to be adopted to minimise the occurrence and/or effects of the potential impacts. Mitigation measures aims to remedy or compensate for the predicted adverse impacts of the project (proposed or existing) on site. Sequel to impact evaluation, mitigation options for this study is developed with the ARRC framework i.e. Avoid–Reduce–Remedy–Compensate approach which follows the best practices for mitigation procedures.

The necessity of mitigation has been integrated into the study as a critical part of the methodology. This was stated in the ESIA methodological framework as an element of the scoping stage. The approach adopted is centred on consideration of all identified environmental and social variables that are connected to the agriculture development projects and prepare suitable mitigation measures. It should be stated that the measures stated in this chapter are based on the need to streamline the adverse impacts of the agriculture development projects in the study area as positive impacts require no mitigation. Thus, each of the environmental and social was scrutinised and respective mitigation measures provide with respect to fundamental elements of the former and latter. In general, there are two

fundamental intervention projects which were designed for the development of rural infrastructure particularly for the enhancement of agricultural productivity. These are networks of farm access roads and rural energy provision. For the study area, these have been provided in conjunction with others such as credit support schemes and extension services.

7.1. Mitigation Measures for Impacts During Pre-Construction Phase

Mitigation Measures for Impacts on Loss of grazing land

The alternative options of providing fodder by the district agricultural office through multiplication and propagation of improved forage legumes, grasses and shrubs in the existing nursery sites of the districts will minimize impacts associated with loss of grazing lands. The following are specifically mitigation measures for loss of grazing land due to land acquisition for the project and infrastructure developments are:

• Giving priority for the project affected people for job opportunities available in the project; and

• Implementing appropriate technical support package including training to ensure that the affected people would adapt to the new farming system.

The production of forage seedlings, sowing the adjacent grazing land with perennial legumes and grasses, enclosure and protecting the community grazing lands will be implemented as part of the project activities.

In collaboration with district office of agriculture and staff from Adami-Tulu agricultural research centre, the local communities will be trained on how to practically utilize moringa leaves and pods to be used for livestock fodder

• The project will assist in providing alternative to the livelihood of the affected community by encouraging farmers to start cattle fattening activities using crop by products for animal feed. In order to encourage the farmers the project proponent will supply by products to the farmers.

7.2. Mitigation Measures for Impacts During Construction Phase

Mitigation Measures for Loss of vegetation, landscape, Changes in land use

The following mitigation measures are proposed to minimize and/or prevent the anticipated impacts.

- Maintaining some trees and shrubs while clearing lands for preparation of moringa production and restoration of trees and shrubs in a designated area and other degraded areas outside the farm in collaboration with the local community;

- Conduct special soil and water conservation activities that are suitable and applicable to the project area
- Collection, production and plantation of indigenous shrubs and trees surrounding the project area conservation of indigenous flora
- Creating awareness on the value of conserving biodiversity in general and indigenous species such as acacia trees in particular among the workers engaged on the construction activity.

Mitigation Measures for Impacts on Terrestrial Flora and Fauna

Though the impact on flora and fauna loss is minimal, in order to avoid damages during the construction activities and keep the greenness of the environment, the following measures are recommended:

• Limit clearing and soil disturbance in the sites in such a way that acacia trees are maintained.

• Limit and control movement of trucks and construction machineries during construction in a manner that trucks will not damage vegetation.

• Record the type and number of trees and shrubs cut in order to replace after construction is completed

• Create awareness for the local people and workers in every opportunity about the importance of vegetation cover for soil and water conservation

• Grade disturbed areas and restore landscape.

- As the project site is surrounded by mountain/hills sceneries and lake Zeway, trees and shrubs and ornamental plants having aesthetic values which are adaptive to the area will be selected, produced and planted around the lake and hills areas with strong community participation and relevant staffs from agriculture, natural resource and land administration office.

Mitigation Measures for Impact on Air Quality

To avoid any adverse consequence of visibility loss due to dust creation during operation, the practical option is to sprinkle water on fresh construction spoil, in line with EHS and OHS guidelines, applicable for project staff and contractors.

Mitigation Measures for Nuisance Noise

• Conducting construction at the time where the majority of the people are in the field

• Using up to date mills and machineries that have less nuisance noise effect

Mitigation Measures for Work Place Related Injuries

The following proposed measures mitigate the impact:

• Aware and train workforce on the safety issues during site operation and on road safety

• Put in place necessary signpost on site and near the gate

7.3. Mitigation Measures for Impacts During Operational Phase

Mitigation Measures for Impacts on soil contamination

The majority of organic solid wastes that are expected to be generated in the production and processing of moringa leaves and powder will be incorporated back to the soils in the fields. That will be done not only to safely dispose the wastes but also to amend and enrich the soil with additional nutrients. Therefore, the mitigation measures for the appropriate management of these organic solid wastes will involve its beneficial and sustainable application to the soil in the moringa production farm.

The use of fertilizers and pesticides in the moringa plantation fields was identified as another source for soil salinity as well as for ground and surface water pollution. MPPM project will set its own procedures to direct and control the application of pesticides and fertilizers in the farm fields. The procedures to be established will help to implement good agrochemicals management and application practices in its moringa plantation farm activities. The procedures will ensure that pesticide and fertilizer application rates do not exceed those recommended. It will also maintain accurate records of date and conditions of application, rate applied and effectiveness in order to guide future decisions. The project will undertake chemical application only when environmental conditions are such that the risk of movement into waterways through spray drift is minimal. The application of the agrochemicals could be delayed near watercourses if environmental conditions are not favorable. In the medium term, the planned farm will also start to apply an integrated pest management practices that reduce chemical use to a minimum. The use of agronomic practices to minimize insect pests will also be applied in the project.

The proponent will select pesticides that are low in human toxicity, known to be effective against the target species, and have minimal effects on non-target species and the environment. The selection will be based on whether the pesticides are packaged in safe containers, are clearly labeled for safe and proper use, and have been manufactured by an entity currently licensed by relevant regulatory agencies.

The Project will design its pesticide application technique to minimize damage by pests and prevent the development of resistance in pests. In addition, pesticides will be handled, stored, applied, and disposed of in accordance with the Food and Agriculture Organization's International Code of Conduct on the Distribution and Use of Pesticides or other good international industry practice.

The MPPM project will not use products that fall in World Health Organization Recommended Classification of Pesticides by Hazard Classes A (extremely hazardous) and B (highly hazardous); or Class II (moderately hazardous).

The project offers efficient method of water utilization and its management will be an essential part. The project will introduce appropriate procedures to regulate water application and prevent overwatering of the irrigation fields thereby avoiding inefficient use of water.

The solid waste to be generated by the workforce of the proposed investment project should be collected and disposed appropriately. Currently, there is no designated site for solid waste disposal. MPPM project will work together concerned stakeholders at different levels to identify and designate a waste disposal site for the solid waste. All solid wastes generated in the living quarters and work areas will be collected and transported to the site for recycling.

Mitigation Measures for Impact on ground water

In order to mitigate the adverse environmental impacts of the various wastes generated, MPPM project will introduce and implement both preventive and curative mitigation measures that are implemented at different levels during the design and operational phases of the farm. The aim of the preventive mitigation measures is generally to minimize the generation of wastes at source and it will be implemented during the production operation phases. MPPM project will introduce necessary measures to implement the following preventive actions during production period.

- Setup operational procedures for good housekeeping; effective maintenance and efficient production operation. Checking the use of water and cleaning chemicals is optimized and efficiently used during operation. These will result in considerable reduction in the generation of waste water.
- The other pollutants of concern are oil and lubricants used for agricultural machineries, such as tractors, etc. Maintenance of agricultural machineries will be undertaken in a designated area and used oil and lubricants will be effectively managed.

- After implementing the above preventive mitigation measures, the liquid wastes expected to be generated by the plant will be relatively small in amount and will not be allowed to contaminate nearby water sources.

Mitigation Measures for Impacts on Terrestrial Fauna and Flora

The project activities that will affect the vegetation and the terrestrial habitats will include land clearing and leveling, building access roads and establishment of site facilities. The project will take all necessary measures to control the activities of the project that will affect trees on the farm. In general the project will endeavor its level best to protect the acacia trees in the project footprint.

Mitigation measures will be developed to address the potential impacts on biodiversity identified in the Social and Environmental Assessment. These measures designed shall achieve no net loss of biodiversity and favor impact avoidance and prevention over reduction and compensation.

On the project site, there are no critical habitats which includes areas with high biodiversity value including habitat required for the survival of critically endangered species areas, having special significance for endemic or restricted-range species; sites that are critical for the survival of migratory species;

Mitigation Measures for Loss of land under various uses

The mitigation measures for loss of grazing land due to land acquisition and infrastructure development are:

• Giving priority for the project affected people for job opportunities available in the project;

• Implementing appropriate technical support package including training and provision of basic social services to ensure that the affected people would adapt to the new farming system.

• The project will assist in providing alternative to the livelihood of the affected community by encouraging farmers to start cattle fattening activities using crop by products for animal feed. In order to encourage the farmers, the project proponent will supply by products to the farmers.

Mitigation Measures for Impact on cultural and religious values

The presence of any known culturally or historically important sites at the project site was not indicated by any of the consulted parties (District Authorities). Particularly no officially recognized and registered sites of cultural or religious values were identified by the culture and tourism bureau of the district.

Mitigation Measures for Impact on safe water supply and sanitation

The project will prevent or minimize the potential for community exposure to water-borne, water based, water-related, vector-borne disease, and other communicable diseases that could result from project activities.

MPPM project moringa production project will provide workers with a safe and healthy work environment, taking into account inherent risks in its particular sector and specific classes of hazards in the project's work areas, including physical, chemical, and biological hazards. MPPM project will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. It will address areas, including: the identification of potential hazards to workers, particularly those that may be life-threatening; provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; training of workers; documentation and reporting of occupational accidents, diseases, and incidents; and emergency prevention, preparedness and response arrangements.

Mitigation Measure for Occupational Health and Safety (OHS)

Occupational health and safety (OHS) refers to the variety of activities aimed at protecting workers from injury or illness associated with exposure to hazards encountered in the workplace or while working. Hazards may arise from materials (including chemical, physical and biological substances and agents), environmental or working conditions, or work processes (including tools, machinery and equipment).

Occupational health and safety practices include the identification of potential hazards and responses including design, testing, choice, substitution, installation, arrangement, organization, use and maintenance of workplaces, working environment and work processes

ongoing training to eliminate or minimize any risks to workers. MPPM project is dedicated to design an OHS policy for its workers.

Project activities, equipment, and infrastructure often expected to bring benefits to communities including employment, services, and opportunities for economic development. However, projects can also increase the potential for community exposure to risks and impacts arising from equipment accidents, structural failures, and releases of hazardous materials.

MPPM project will ensure communities are not exposed to any pollutants and that security guards are adequately trained.

Whereas accepting the public authorities' role in promoting the health, safety and security of the public, this Performance Standard addresses the promoter's responsibility to avoid or minimize the risks and impacts to community health, safety and security that may arise from project activities.

Mitigation Measures for contamination from Solid/Liquid waste

Wastewater expected to be generated moringa production and processing will be relatively small in amount. This waste water after being treated with powdered moringa pods and seeds will be dispersed back in the farm land. The sound handling and disposal of solid wastes generated from the production process is another important aspect which is given due concern. The mitigation measures for sound handling and disposal of the solid wastes involves packing materials production, reuse and safe disposal way. The solid waste will be disposed in the designated area following safe disposal methods.

8. ENVIRONMENTAL AND SOCIAL IMPACT MANAGEMENT PLANS (ESMP)

Environmental management is concerned with implementation of the measures necessary to minimize or counteract adverse impacts and to improve beneficial impacts. Unless the mitigation and benefit enhancement measures identified in the EIA are fully implemented, the prime function of EIA, which is to provide a basis for shaping the project so that overall environmental performance is enhanced, cannot be achieved.

In order to be effective, environmental management must be fully integrated with the overall project management effort at all levels, which itself should be aimed at providing a high level of quality control, leading to a project which has been properly designed and constructed and functions efficiently throughout its life. Hence, the overall goal of the Environmental Management Plan (EMP) of MPPM project is to minimize adverse impacts of the project by implementing and monitoring the proposed mitigation and enhancement measures.

Under this section, the way specific mitigation and enhancement measures implemented and monitored at the pre-construction, construction and operational phases to overcome possible impacts of the project are outlined.

8.1. Institutional Framework to Implement ESMP

The Moringa Production, Processing and Marketing Project retain ultimate responsibility for development and implementation of the ESMPs for the moringa production, processing and marketing Project Adami-Tula area. MPPM project will assign this responsibility to its MPPM project Environmental Specialists (Managers), who will report directly to the General Manager.

For proper environmental management and monitoring purposes, the arrangement of concerned institutions and key actors, which will have decisive roles to ensure effective and efficient implementation of the monitoring program are crucial.

The management of the proponent along with appropriate regulatory authorities would share the responsibility to supervise and coordinate all of the environmental protection measures outlined above, and to monitor the project according to existing environmental laws, regulations, and standards.

The Investor will employ an environmental Science officer to organize and supervise environmental protection measures and monitor the impacts of each component of the project. The officer will work under the guidance and supervision of the management of the proponent and in collaboration with the local environmental protection bureaus according to the requirement of the law relevant to the pollution control, environmental impact assessment, labour and public health.

The environmental Science officer will be assigned to take responsibility for implementation of environmental monitoring for the whole project. He will stipulate the monitoring techniques to be used the appropriate standards, and quality control measures. The proponent will compile all the relevant monitoring data and prepare regular monitoring reports.

The following sections of the chapter provide a framework for the content of the ESMPs envisioned for the MPPM project in the Study area. As the MPPM project progresses through agricultural development project in the Stat, these ESMPs will be expanded to include specific procedures to guide implementation by MPPM Project personnel and contractors, and to provide for periodic updating, as necessary.

8.2. Terrestrial Economic Management Plans

Flora and Fauna Management Plan

The primary purpose of the Flora and Fauna Management Plan is to protect the biodiversity of the area from any unintended damage due to MPPM project development and operation, and to protect the Project personnel from dangers associated with the native flora and fauna. This plan will include the following provisions as well as others that may be identified as it is further developed:

- Wild animals shall not be handled, removed, killed or unnecessarily disturbed by MPPM project or its employees, or by MPPM project contractors‟ or their subcontractors‟ employees.
- MPPM project will not tolerate poaching of fauna or flora by its personnel or by any of its contractors or subcontractors
- MPPM project will ensure through a High Conservation Value study that all High Conservation Value Forest sites are properly marked and left untouched.
- MPPM project will help to maintain the integrity and quality of biodiversity in the project area.
- MPPM project will assist in protecting the communities living in and around the Adami-Tulu (Bechisa) farm settlement from harmful effect of poor solid waste and liquid effluent generated in the farm.
- Land clearing operations are expected to force wildlife away from the clearing operations for the various MPPM project activities. MPPM project involvement is to occur over a period of five years. MPPM project should plan its investment projects in advance to minimize the impact on the fauna, help identify and control impacts such as flood zones and to result in a lower amount of biomass to manage.

- MPPM project shall monitor the general condition of the aquatic habitat downstream to ensure that its water withdrawals are not creating significant stresses to that habitat and if so, MPPM project shall develop plans to install wells to replace enough of the surface water usage to mitigate the significant impacts.
- MPPM project shall make sure that the site is kept clean, tidy and free of garbage that would attract animals.
- In order to reduce the risk from invasive species, the monitoring program for the interventions should track what types of invasive species occur, where they occur, how they were most likely introduced to the area, how they were eradicated, and the success of the various eradication measures. If any of the MPPM project identifies a continuing problem with invasive species, it should determine the root cause of that problem and investigate additional measures to address that root cause.
- In order to decrease the demand for local bush meat, MPPM project should take the following measures:
- decrease hunting pressure by ensuring that adequate supplies of meat other than local bush meat as well as other protein sources are available in stores and markets within the study area;
- instruct its employees on the adverse impacts of hunting and consuming bush meat;
- prohibit and enforce prohibitions on hunting inside the MPPM project area;
- MPPM project will work with conservation groups and other stakeholders around the Project area to help prevent poaching. Initiatives may include hiring guards, posting signs among others.

Erosion and Sedimentation Management Plan

The Erosion and Sedimentation Management Plan will give guidance to control soil erosion and the transport of sediment to surface waters. Soil erosion is a major soil degradation process affecting the soil quality not only by directly reducing nutrients and organic matter levels, but also by affecting soil properties such as infiltration rates.

Erosion could occur during forest clearing when the soil is left uncovered. Related activities that could cause this erosion include establishment of the base camps during the harvesting, construction of access roads and development of drainage works. The top layer of soil is the most vulnerable and regrettably tends to be the most fertile soil. Soil suspended as solids in the water column can physically enter waterways and obstruct them. Soil erosion can also transport agrochemicals such as fertilizers and pesticides, which adhere to the suspended solids.

All exposed soil areas in the MPPM project area will be managed through a diversified set of measures and strategies that minimize the risk of erosion and run-off, control the flow of storm water over exposed soil areas, retain sediments within the cleared areas as much as possible, and control erosion and run-off downstream of the cleared areas. These measures are grouped and presented below.

The MPPM project shall monitor effectiveness of erosion and run-off control through systematic verification of compliance with control measures implemented through monitoring of impacts to surface water quality downstream and run-off build-ups at streams and natural drainage channels downstream of construction fronts. Erosion and runoff will be minimized through the implementation of the following types of measures:

- Grassy and shrubs vegetations safeguard zones will be protected along streams to help control sedimentation.
- Leguminous cover crops will be used to help minimize soil erosion, and assist soil conservation and moisture retention by intercepting rainfall (absorbing the energy of the raindrops, thus reducing runoff), decreasing surface velocity, restraining soil movement, improving soil porosity, and, increasing biological activity in the soil.
- Gradients of all cut and fill areas will be rigorously controlled and will at no time be allowed to be greater than the slope established in the final design.
- Permanent erosion control on may be achieved through measures such as terracing along with a re-vegetation plan. The terraces would consist of low, broad-based earth levees constructed approximately parallel to the contours designed to intercept overload flow before it achieves great erosive force and to conduct it to a suitable discharge point.
- Careful considerations will be given to the drainage of all farm access roads, facility areas, borrow pits, and surplus soil deposit areas.
- All storm drainage will be discharged via surface drainage systems. Maximum use of natural drainage features will be used. Runoff from cleared areas will be collected in open channels or ditches for removal from the immediate area.

Vegetation Clearing and Biomass Management Plan

The Vegetation Clearing and Biomass Management Plan will guarantee that all vegetation clearing and biomass management for all aspects of the MPPM project activities will be conducted in accordance with thorough procedures that will meet the requirements of Ethiopia as well as best practices outlined by Roundtable Sustainable Agriculture (RSA). Site clearing for farm access road development, nursery establishment where applicable, plantation

development, mill development, and infrastructure development can damage the habitats of terrestrial flora and fauna species.

8.3. Water Quality Management Plans

The Water Management Plan will address water conservation, protection of water resources, responsibly using surface water and groundwater for farming and farming activities plantation and mill purposes, and practicing rainfall harvesting, if appropriate. The important aspects of this plan will be:

- training of all workers to ensure that they understand the significance of protecting all water sources;
- execution of measures contained in the Erosion and Sedimentation Management Plan to control sedimentation of surface water resources and minimize the loss of nutrients and therefore the need for chemical fertilizers;
- execution of the measures contained in the Chemical Management Plan to ensure that all chemicals used on the site are used properly and in the minimum necessary quantities to control adverse impacts to surface and groundwater;
- execution of the measures contained in the Waste Management Plan to ensure that all wastes generated on the site are properly stored and disposed to control adverse impacts to surface and groundwater by liquid effluents or by leachate from solid wastes;
- monitoring significant effluent streams on a periodic basis to ensure that they meet applicable discharge requirements;
- developing and implementing a site-specific water quality monitoring plan for both surface water and groundwater to ensure that management measures are accomplishing the desired results;
- supervising water quantity downstream of nurseries to ensure that withdrawals for nursery watering needs do not significantly affect downstream aquatic environment or human users; and

8.4. Chemical Management plan

The Chemical Management Plan will give details for the purchase, storage, application, use, and disposal of all pesticides, herbicides and fertilizers and other chemicals used in the nurseries, plantations and mills.

Improper usage and application of fertilizers can pollute the soil and the waterways in the area. The effect of phosphorous fertilizer runoff induces increased growth of vegetation that can affect aquatic life (eutrophication). This project plans to utilize chemical, cultural, biological, and physical practices to control the infestations. High levels of other chemicals (such as

pesticides, insecticides, and fungicides) in the waterways can affect the aquatic life and even the supply of freshwater for human use:

- Peripheral of the farm should be kept weed-free through manual weeding;
- green manure and composts and adoption of integrated pest management will be devised and implemented
- hormonal herbicides (e.g. 2,4-D amine) will be avoided and environmentally friendly herbicide (Glyphosate) will be used;
- too much spray drift and scorching on lower fronts should be avoided through careful control of areas that are sprayed; and
- spraying will be limited to the minimum amount required to treat specifically identified weed problems.

The Chemical Management Plan will comprise the following main aspects:

- agro-chemicals should be appropriately stored and handled to avoid spills;
- the utilization of pesticides and fertilizers will be in strict accordance with the manufacturers‟ instructions and generally established safety procedures;
- MPPM project will not make use of Persistent Organic Pollutants (POP) banned under the Stockholm Convention, which came into force on the 17th of May 2004
- MPPM project will install an oil/water separator for the workshop drainage system where it has the potential to convey petroleum products or wastes;
- MPPM project will implement a proper Monitoring and Surveillance System (MSS) for Pests.The MSS will provide information on the pests‟ presence and activity to determine the right time to control a particular pest. This systematic pest control strategy will result in effective control with minimal chemical usage and minimal damage to other living organisms and the environment.

8.5. Air Quality and Noise Management Plan

During operation of processing and grinding of moringa seeds, leaves and pods, the noise level may likely increase. In addition, vehicular emissions will certainly deteriorate the quality of air. This is based on the introduction of gaseous emissions from vehicles work the road thereby reducing the perfect status of air and the eventual introduction of a new local scale air quality issues. Health and safety issues emanating from dusts and other gaseous emissions inhalation by either road users or the community inhabitants is another instance of air quality issue that is connected to operation and maintenance of farm access roads in the study areas. Mitigation action to be taken to limit the impact of air quality and noise will include:

- Trees need to be planted with 5 metres distance between road and residential areas in

order to reduce noise.

- noise levels in mills and other Project areas shall meet Ethiopian requirements;

8.6. Employment, Training and Awareness Management Plans

The Employment, Training, and Awareness Management Plan will be necessary both during the implementation phase and operations. For both phases, the following will be incorporated, as appropriate:

- Throughout the new employee orientation process, all workers will receive health and safety training on standard work processes and other health and safety requirements applicable to their work activities.
- While on work all workers at work fronts will receive weekly safety orientations that last at least 1minutes. If significant accidents occur or other health and safety issues arise, these orientations may be supplemented.
- Health and safety training will be detailed in the Integrated Health and Safety Plan (IHSP) that will specify the contents, target groups, frequency and forms of evaluation of each type of training to be applied. It will include at least the following modules:
  - Induction health and safety training; Community relations training; First aid; Venomous animals; Use of PPE; and Safe Work Procedures.

Health, Safety, and Security Management Plan

The Health, Safety, and Security Management Plan for the Project will comply with all Federal and Oromiya Regional state requirements. It will address measures for hygiene, health, and safety at the work place and include an ongoing training program for all employees‟ project beneficiaries. MPPM project will provide the necessary safety equipment to its employees. The plan will address following issues:

- the right provision and use of personnel protective equipment (PPE) such as safety boots, respirators, eye protection, hearing protection, gloves, and hardhats;
- analysis of risks associated with job activities in order to develop standard requirements for PPE on a job-specific and station-specific basis;
- provision of training on the proper use of PPE and penalties for the improper use of PPE;
- training on the proper and safe use of all equipment in workshops, garages, the plantation, nurseries, and mills;
- training related to job-specific risks and activities, including electrical installations (e.g. electric shock on direct contact with conductors and indirect contact with masses powered up, burns, fire and explosion);

- mechanical equipment (e.g. tool blasting or matter risk, crushing of fingers, wounds, equipment shock);
- lifting devices (e.g. crushing risk, injury caused by appurtenances, falling, collision);
- hand tools and electric equipment (risk of injury, electrocution);
- workshops and garages (e.g. risk of mechanical injury)

8.7. Public Consultation and Disclosure Plans

Several Public consultations were held with the local communities and all other interested/affected parties during the months from May-July, 2014. These consultations identified the key issues and concerns of most social gatherings and addressed them with reference to the proposed sub-projects activities. The consultations included needy groups within the community, elderly, and women. Besides, the local Administrative governments, Baatu district investment offices and the staff from Baatu district Land Development office provided all relevant materials and information regarding the proposed projects prior to the consultation.

8.8. Waste Management Plan

The Water Management Plan will address water conservation, protection of water resources, responsibly using surface water and groundwater for farming and farming activities plantation and mill purposes, and practicing rainfall harvesting, if appropriate. The important aspects of this plan will be:

- training of all workers to ensure that they understand the significance of protecting all water sources;
- implementation of measures contained in the Erosion and Sedimentation Management Plan to control sedimentation of surface water resources and minimize the loss of nutrients and therefore the need for chemical fertilizers;
- implementation of the measures contained in the Chemical Management Plan to ensure that all chemicals used on the site are used properly and in the minimum necessary quantities to control adverse impacts to surface and groundwater;
- implementation of the measures contained in the Waste Management Plan to ensure that all wastes generated on the site are properly stored and disposed to control adverse impacts to surface and groundwater by liquid effluents or by leachate from solid wastes;

- monitoring significant effluent streams on a periodic basis to ensure that they meet applicable discharge requirements;
- developing and implementing a site-specific water quality monitoring plan for both surface water and groundwater to ensure that management measures are achieving the desired results;
- monitoring water quantity downstream of nurseries to ensure that withdrawals for nursery watering needs do not significantly affect downstream aquatic environment or human users; and

8.9. Emergency Response Action Plan

The Emergency Response and Incident Management Plan will include procedures for addressing all reasonably foreseeable and possible emergencies such as: fires; floods; spills or releases of hazardous chemicals or wastes to the ground or water; medical emergencies; and, other weather-related emergencies

The Emergency Response and Incident Management Plan will define the methods of intervention and required resources to be implemented by MPPM project in the event of an accident to protect staff and property and to prevent harmful effects on the local population and the environment. As part of the plan, MPPM project will facilitate the alert of rescue services and inform the competent relevant authorities. Spills are the release of substances (solids or liquids) in a magnitude that could cause substantial negative effects to the system receiving it; the system in question could be, for example, soil, river, lake, sea or the atmosphere. The spill response aspects of the plan will be outlined for all employees and relevant employees will be trained in specific spill response procedures for the substances for which they are responsible.

The impacts of spills can have adverse effects on the environment and humans. Spills can occur during many of the typical operations such as: refuelling of equipment, painting, changing oil, during transfer of the liquids or solid from container to another, rinsing drums containing liquid or solid that is harmful; they may also occur as a result of a burst hose or pipe, the malfunctioning of an overflow valve of a tank or road accident of a fuel tanker. The Emergency Response and Incident Management Plan will include the following features to address spills or releases of hazardous materials:

- identify the personnel responsible in the event of a spill as well as a hierarchy for notifications both within the investment project as well as Government and emergency response personnel;
- provide the structure for a spill response organization;
- characterize the different types of materials and potential quantities of spills that could occur as a result of the MPPM project intervention;
- outline spill response procedures as well as equipment, protective equipment, supplies, and materials to support the response;
- give training guidelines for recovery and disposal of all materials contaminated in the event of a spill.

The Emergency Response and Incident Management Plan will also define the procedures, training, supplies, and materials for designated personnel to respond to fires, medical emergencies, and other significant emergencies or incidents during both construction and operations of various MPPM intervention activities.

8.10. Environmental and social Monitoring Plan

The Project will develop a detailed Environmental and Social Monitoring Plan to monitor key elements of both the biophysical and social environments. The rationale of this monitoring will be to ensure that significant impacts were correctly identified in the assessment process, then to monitor the effectiveness of the mitigation measures. The results of monitoring activities will be regularly reviewed to determine if existing management measures are adequate, or if those measures should be revised, deleted, or supplemented.

Monitoring will include the following features:

- water quality and general aquatic health of streams receiving effluents from the MPPM Project;
- Periodical analysis of soils from the moringa production and processing field should be undertaken to monitor nutrient status.
- the water leaving the processing facilities should be monitored for potential contaminants.
- Invasive plant species;
- interactions between local fauna such as birds and the plantation to determine if additional mitigation measures are required and if implemented, how effectively they are working;
- the effectiveness of waste management activities;

- the effectiveness of sediment and erosion control measures and of storm water management measures;
- all clearing activities for compliance with the Vegetation Clearing and Biomass Management Plan;
- health and safety indicators, including accidents, for all workers and farmers working in the Project;
- grievances of workers, farmers and the local community;
- health indicators in the local communities to inform any modifications to the Community Health and Safety Plan; and,
- flora and fauna in the Project Area.

9. CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The aim of the government of Ethiopia for the promotion of agriculture sector is to advance its rapid rural development through its contribution to the export base. The Government is constantly on the watch to identify constraints to the development of the sector and advise on the best course of action to facilitate investment in the sector.

Ethiopia's government has been actively working to create a conducive investment climate that encourages investors through assisting long and short term loans.

The private sector development on agriculture has contributed to the above objectives in the following ways:

- Ethiopia's export of agricultural commodities is principal sources of foreign exchange earnings,
- The sector creates employment for many workers, which significantly contribute millions in wages to the rural economy.
- Provision of new opportunities for agricultural professionals and experts to develop technical skills and careers in modern agriculture,
- Contribution to rural stability through provision of jobs, incomes, public services and amenities to villages surrounding modern agricultural farms.
- Development of local expertise through on-the-job training of personnel, contribute to reduce rural-urban migration.

In view of the above facts, it is clear that the project has clear social and economic benefits and will contribute to the reduction of poverty. About 10-20 permanent and 30 seasonal employees will benefit from the project. Most of the project products will be exported and thus generate foreign exchange revenue, and contributing to promotion of economic development in the country.

The main adverse environmental impacts anticipated to arise from issues associated with the operation of the Moringa project are minimal. Impacts are related to the use and management of the agrochemicals and occupational health and safety for workers employed with the company. Mitigation measures are available for all of the predicted environmental impacts and have been included in the project design.

Generally, the project will have a positive impact on the environment, although there are some momentary adverse impacts during construction and operation phases could occur. Over all the positive impacts by far outweighs the negative ones, the project has overall beneficial effects. To properly manage those environmental impacts and tackle unanticipated situations that could occur during the project lifecycle, the project will develop a comprehensive environmental monitoring program and work on proposed mitigation measures so that recommended mitigation measures are executed and stay effectual.

RECOMMENDATIONS

- The investment project should assist the local community by offering employment opportunities.
- The investor should develop environmental management system at its project level and commence proper environmental management plan by assigning sufficient budget and the right experts.

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