

**ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT
FOR PROPOSED CREDIBLE BLOOMS FRUITS TREES AND
HORTICULTURAL CROPS FARM ON. LR. 3264/2, RUMURUTI
AREA, LAIKIPIA WEST SUB-COUNTY LAIKIPIA COUNTY**

GPS LOCATION:

TOR 483



| PROJECT PROPONENT | LEAD EXPERTS |
|--|--|
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OCTOBER 2022.

Director General,
NEMA,
P.O. Box 67839- 00200,
Popo Road,
Nairobi.

RE: PROPOSED CREDIBLE BLOOMS FRUITS TREES AND HORTICULTURAL CROPS FARM ON L.R. NO. LR. 3264/2, WITHIN RUMURUTI AREA, LAIKIPIA WEST SUB-COUNTY, LAIKIPIA COUNTY

This Environmental Impact Assessment study report was prepared in accordance with the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental Impact Assessment and Audit Regulations 2003 of the National Environmental Management Authority (NEMA). We the undersigned, confirm that the contents of this report are a true representation of the EIA report for the proposed Credible Blooms Fruits trees and Horticultural crops farm on L.R. No. LR. 3264/2, within Rumuruti area, Laikipia West Sub-County, Laikipia County.

SIGNATURES

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EXECUTIVE SUMMARY

This EIA Study report entails the description of the proposed Credible Blooms Fruits and horticultural crops farm on LR. 3264/2, within Rumuruti area, Laikipia West Sub-County, Laikipia County.

The project has been designed to cater for cultivation of a variety of vegetable and fruits for local consumption and for export.

The activities that are going to be undertaken are:

- Opening up the land for cultivation
- Cultivation of the area and construction of greenhouses, grading houses and cooling units
- Construction of water harvesting structures. (These include 2No. Boreholes, Earth dam, Water reservoirs and residential farm houses. Separate EIA reports will be prepared).
- Setting up of irrigation system
- Setting up of solid waste management system
- Setting up of an artificial wetland to manage sewage waste
- Setting up of associated support infrastructure. These include fencing of the farm, electrification, staff houses and offices.
- The proponent wishes to put 600 ha under cultivation of Fruits and vegetables.

It is expected that most of the infrastructure development will take place in the 1st two years of the Fruits trees and Horticultural crops farm establishment. Major farm operations will include;

- Preparation of the land and planting areas
- Soil fumigation and manure application
- Plant propagation,
- Pest and disease management
- Vegetable and fruits harvesting, sorting, storage and transportation
- Waste management (green waste, sanitary waste, and waste water from the grading shed)

In decommissioning of the farm, the activities will include dismantling of all farm structures and equipment in situ, covering of all waste management facilities, proper disposal of farm machinery and setting up the land for reuse or resale etc.

The primary objective of this EIA study report is to inform the project proponent and the Authorities on the Environmental impacts expected from the proposed activities of the proposed project that is; physical, ecological, sociological, economic, health and safety impacts.

The EIA was carried out by multi disciplinary team of experts as follows:

| NAME OF EXPERT | ACADEMIC QUALIFICATION | TELEPHONE CONTACTS |
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The findings have been included in the report, and an Environmental Management Plan that is going to be implemented by the Proponent has been made. The teams' conclusion is that the project is important for economic growth for the area and has enormous benefits to the people of Laikipia West area of Laikipia County and the country at large.

The EIA study team has given adequate measures to mitigate the negative impacts and recommends that the project be given the necessary permits to continue.

Attached to the report are:

1. Questionnaires used to collect views from the members of the affected public.
2. A copy of the Farm's Title Deed
3. Layout of the proposed farm
4. Practicing License for the Lead Experts

Cost Estimate Summary

The cost estimates are as shown below: -

| | ITEM | COST (KSH) |
|----------|---|-------------------|
| 1 | Bush clearing | 2,000,000 |
| 2 | Establishment of a Green 'Live' fence | 2,500,000 |
| 3 | Setting up of an electric fence | 10,000,000 |
| 4 | Opening up the land for cultivation | 3,000,000 |
| 5 | Setting up irrigation infrastructure | 12,000,000 |
| 6 | Construction of Offices, residential farm houses, | 10,000,000 |
| 7 | Setting up of Green waste management system/ manure processors | 3,000,000 |
| 8 | Setting up farm roads network | 10,000,000 |
| | Total initial project cost | 52,500,000 |

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ABBREVIATIONS

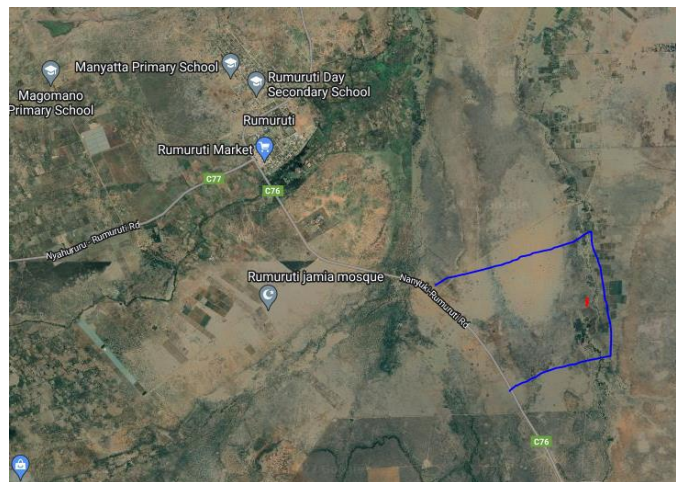
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|----------|---|
| ASAL- | Arid and semi- arid lands |
| Asl- | Above sea level |
| EA- | Environmental Audit |
| EIA- | Environmental Impact Assessment |
| EIAS- | Environmental Impact Assessment study report |
| EMCA- | Environmental Management and Coordination Act |
| EMP- | Environmental Management plan |
| ER | Environmental Report |
| FAO- | Food and Agriculture Organization |
| KARI- | Kenya Agricultural Research Institute |
| KFC | Kenya Flower Council |
| LR map - | Land Registration map |
| NEMA- | National Environmental and Management Authority |
| NEC- | National Environmental Council |
| NPEP- | National Poverty Eradication Plan |
| Q- | Flow rate for water |
| PRSP | Poverty Reduction Strategy Plan |
| WUA- | Water Users' association |
| WRUA- | Water Resources Users' Association |
| WSSD- | World Summit for Social Development |
| IPM | Integrated Pest Management |

CHAPTER ONE

INTRODUCTION

1.1 Project Location

The proposed Credible Blooms Ltd. Fruits trees and Horticultural Crops Farm, will be located on LR. 3264/2 Rumuruti, formerly George Mwai Farm, which is located in Lorian Location, Rumuruti Division of Laikipia West District of Laikipia County. The proposed farm lies about 25 Km from Rumuruti Town ship along the Rumuruti- Nanyuki Murram Road. The farm which is 1500 acres (625 ha) will be divided into 5 sections as follows:



1.2 Project Description

The project will involve setting up of a Fruit trees and horticultural crops farm mainly for growing of vegetable crops and various types of fruits. The proposed farm sits in an area that has not been cultivated before. The area that will be opened up for cultivation initially will be approximately 600 hectares and will be used for production of fruits, vegetables and herbs for local and export markets under irrigation. The water for irrigation will be drawn from:-

- Abstraction of flood water from adjacent Pesi River
- Surface runoff from the surrounding hills

Water for domestic use within the farm will be obtained from borehole that will be drilled within the farm.

1.3 Broad objectives of carrying out the EIA study

1. To assess the activities that will take place during the establishment and operation of the proposed Credible Blooms Fruits and vegetable farm on the environment
2. To assess the impacts of the proposed activities during construction and during operations of the farm.
3. To assess the Social Impacts of the proposed Farm in the proposed locality.
4. To increase the projects proponents awareness of Environmental Management (Environment Awareness Policy and Regulations)
5. To comply with the EMCA 1999
6. To prepare an Environmental management Plan for the proposed Credible Blooms Fruits trees and Horticultural crops farm Project.

1.3.1 Specific Aims and Objectives of the EIA study

1. To submit report findings acquired from the Environmental Impact Study acquired from the site that provided the basis for establishment and maintenance of internal environmental management program within the proposed Fruits trees and Horticultural crops farm.
2. To formulate an EIA Study report based on the Environmental (Impacts Assessment and Audit) Regulations, 2003 of National Environmental Authority (NEMA).
3. To establish recommended action plans and mitigating measures for the possible environmental impacts likely to be posed by the proposed farm project to the environment with a view to demonstrating its performance to other interested parties and affected groups.

1.4 The scope of the EIA study

This EIA covers the activities that will take place in the proposed farm and the immediate neighborhood. The enterprises that will be established at the farm are:-

- Bush clearing and opening up the land for cultivation
- Construction of the green-houses under which vegetables will be grown
- Setting up of the irrigation water supply system
- Cultivation of the vegetables and fruits for export markets.
- Establishment of an elaborate drainage system for storm and wastewater
-

1.5 Terms of Reference

The terms of reference agreed between the expert and the project proponent were as follows:-

1. To provide a description of the proposed project activities with a potential focus on potential adverse impacts in the design, construction, operation and abandonment (decommissioning) phases caused by the inputs, waste generated and disposal and social economic aspects.
2. To establish the legal and regulatory aspects, administrative frame of reference, to identify governing standards, legislation and guidelines, and to determine permits and authorizations which will be required for the different sectors agencies and institutions involved.
3. To describe the area of influence, and select methods of measuring the environmental aspects of concern including physical (water, air, soil and noise), biotic environment (vegetation, flora and fauna), chemical, socioeconomic (socio and economic structure, demographic, and socioeconomic background), cultural (aspects of cultural, archaeological, or anthropological interest) and landscape
4. To establish the methods to be used in identifying and quantifying environmental impacts, methodologies for predicting those impacts and how those impacts will be described in terms of; character (negative or positive), condition (reversible or irreversible), period (short, medium, or long-term), scope (cumulative, synergistic, direct, indirect) and establishing what standards will be used for the EIA.
5. To establish at what stages of the project the mitigating, corrective, compensatory and other measures will be used to eliminate, minimizing or mitigating adverse/significant impacts and how these measures will be selected.
6. To define a schedule of activities, reaction with regard to risk prevention and accident control, objectives, specific tasks and budget through an Environmental Management Plan (EMP) and a Social Impact Assessment Plan (SIAMP).
7. To provide a monitoring program of relevant environmental issues, specific variables to be included in the environmental follow-ups, detection limits and standards to be used and contents of the follow-up program.
8. To establish the stakeholders to be involved in the community/public participation process, methods of reporting the project to the public, procedures to be used for

community participation and aspects to be considered in the community participation plan during the development and review of the study.

9. To establish the criteria to be used in defining the composition of the working team of experts and the special requirements and information needed to form the team and characterize the same respectively.
10. To produce a systematic EIA report in accordance to the Environmental Impact Assessment and Audit Regulations of 2003
11. Final EIA Study report to the client which will be submitted to NEMA as required by law

1.6 EIA Study Methodology

In carrying out of the Impact Assessment, the following methodology aspects were incorporated:

1. **Semi structured interview:** this involved holding individual interviews with the project proponent and other stakeholders using a pre- prepared questionnaire and Impact Assessment checklists and recording the feedback. The importance of this methodology was to create confidentiality of the source of the information.
2. **Literature review:** this involved the review of all literature and data relevant to the project. The literature included legislation, data kept by the proponent, lead agencies, and government agencies.
3. **Site observation:** this involves a transect walk across the farm and the area to get acquainted with the natural environment and also to cross check issues, arising from the semi- structured interviews above.
4. **Public participation and consultation:** this involved holding public barazas with residents and stakeholders of the project to get their views regarding environmental/ social aspects of the project.

Other methodologies incorporated in the Impact Assessment include:

- Site reconnaissance
- Use of an observation schedule
- Recordings by use of camera
- Key informants
- Transect walks

1.7 Project Justification

The Significance of Fruits trees and Horticultural crops farming in Kenya

Horticultural crops in Kenya include flowers, fruits, vegetables and potatoes. The horticulture sub-sector of agriculture has grown since 2000 to become a major foreign exchange earner, employer and contributor to food needs in the country. Currently the horticulture industry is the fastest growing agricultural sub- sector and is ranked third in terms of foreign exchange earnings from exports after tourism and tea. Fruits, vegetable and cut flower production are the main aspects of horticultural production in Kenya.

Kenya has a long history of growing horticultural crops for both domestic and export markets. Kenya's ideal tropical and temperate climatic condition makes it favourable for horticulture production and development.

About two million are employed in the sub-sector, most of them small-scale growers who constitute 80 per cent of producers. This alleviates poverty and provides higher incomes to small scale farmers.

Fruits trees and Horticultural crops farmers in Kenya earned Kshs 3 billion more from exports in the first half of 2013 compared to the first six months of 2012. Production of cut flowers, fruits and vegetables for export went up from a cumulative 99,700 metric tonnes in the first half of 2012 to 111,892 metric tonnes in the corresponding period this year. The total value of these horticulture exports hit Kshs 43.5 billion, compared to Kshs 40.5 billion in 2012. Vegetable exports registered the highest growth in monetary terms, bringing an increase of Kshs1.67 billion to stand at Kshs11 billion for the first six months of this year.

Main Features of Fruits trees and Horticultural crops farming in Kenya

1. The activity is scientifically oriented as advanced methods of crop production are employed. Such methods include, use of high yielding seeds, regular spraying to control pests and diseases and heavy application of fertilizers. All these ensure high yields.
2. The practice is capital intensive. Therefore a lot of farm inputs are required. However it is also labour intensive considering that much of the farm work is done using human labour.

3. In order to maximize on the produce, land is intensively used. This is mainly because horticulture is practiced in areas with land scarcity, hence farm sizes are small.
4. It is mainly practiced close to the urban centers this is because most of the products are perishable hence the need for production close to the markets.
5. Due to the perishability of the products, it mainly involves quick and expensive modes of transport e. g., the aeroplanes.
6. The activity is export oriented, in that most of the products are grown for export, due to their increasing demand.

1.8 Impacts of Fruits and horticultural crops farms development on the rural economy

Setting up of a Fruits trees and Horticultural crops farm in a rural setup has welfare-enhancing impacts derived from:

- Increased land utilization.
This land in Salama Location, Laikipia West Sub-County has in the past been left idle with some few farmers using it for grazing of animals. Setting up of a vegetable/ fruit farm on it will increase utilization of the land, and increase the land's economic productivity.
- Increased employment and wealth creation.
Fruit and vegetable farming development opens up opportunities to increase high income farming. These opportunities employ rural labor which would otherwise be idle. Increased farm incomes mean increased savings leading to increased investment and therefore wealth creation.
- Reduction in rural-urban migration.
Most young people migrate to urban areas to look for employment opportunities. Setting up of such a farm stems this outflow and could potentially reverse the trend because of the attractive farm incomes earned.
- Improvement of rural infrastructure. Fruits and horticultural crops farming development must be accompanied by infrastructure development to increase access to factor and product markets. Growth of incomes and wealth also mean that rural inhabitants can be able to cooperate and provide infrastructure like schools, health centers, market facilities, etc, particularly in areas where government has not been able to. On the other hand, increased taxes as a result of high farm incomes mean that government is more able to provide infrastructure and social services.

- Increased exposure of rural farmers to local and international markets following irrigation development enhances their participation and integration in the mainstream economy.

Types of vegetables and fruits grown in Kenya

i) Vegetables: There are five types of vegetables namely:

- The starchy tubers: These are vegetables which have stems which swell and ripen underground e.g., cassava, yams and sweet potatoes. They are mainly for local consumption.
- The root crops: These are types of vegetables which store food in swollen roots, for example, carrots, turnips, parsnips, beet and swedes.
- Pulses: These are leguminous vegetables which include plants such as peas, beans, lentils, soya beans and groundnuts.
- Green vegetables: These include cabbages, cauliflower, broccoli, Brussels sprouts, green grams, spinach, spruce, kales (sukuma wiki), strawberries and brassicas.
- Miscellaneous vegetables: These include onions, tomatoes, chillies and mushrooms.
- The major vegetables grown in the Fruits and horticultural crops farms in Kenya are divided into two categories, namely the Asian vegetables and European vegetables.
- Other vegetables which are exported include: Turia, Gwar (winged beans), Papri, Tindori, and Siragwa.
- The European vegetables which are exported from Kenya include French beans, cauliflower and several cabbage families.

(ii) Fruits: Most of the fruits grown in Kenya are for local consumption. A few are exported.

Generally fruits grown in Kenya include:

- Citrus fruits: Grapes, oranges, lemons and tangarines.
- Deciduous fruits: Apples, pears, peaches, plums and apricots. They are also called temperate fruits.
- Tropical fruits: Bananas, loquat, dates, pawpaws, pineapple and avocados.

1.9 Description of the Project Cycle

A project cycle involves several principal stages including project concept, feasibility study, construction and implementation and decommissioning phases. Each phase is associated with certain unique activities. Some of the activities associated with the setting up of the Credible Blooms Fruits trees and Horticultural crops farm are described below.

1.9.1 Construction phase/ Setting up Phase.

The following activities will be undertaken during the construction phase:

- Land clearance and leveling to allow ploughing, harrowing and application of organic manure
- Construction of administration offices
- Installation of irrigation water supply system.
- Construction of fertigation stations, spray chambers, septic tanks
- Establishment of rain water harvesting system and the rain water storage dam(s).

1.9.2 Operation phase

This phase shall involve the following activities

- Procurement of inputs
- Procurement of labour force
- Planting of different varieties of fruits and vegetables
- Application of fertilizers
- Irrigation
- Disease and pest control
- Plants management i.e. pruning etc
- Harvesting, storage and packaging of vegetables and fruits
- Transportation of harvested products to Nairobi
- Waste management activities

1.9.3 Decommissioning phase

General decommissioning of a facility and property include the removal of hazardous materials and wastes, cleaning and removal of equipment, decontamination and remediation and the termination of the operational permits and licenses, land physical reconstitution.

Although the decommissioning of this project is not probable it is still a probability. It is therefore prudent to develop a decommissioning strategy.

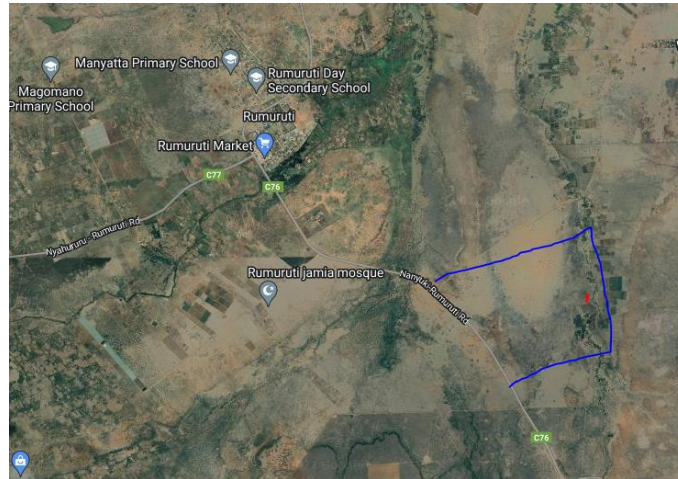
The decommissioning plan will probably include:-

- Farm decommissioning
- Environmental reconstitution
- Equipment dismantling and removal
- Dams and waste water pans demolition
- Decontamination of the reservoir area to allow development of a different or a new activity.

CHAPTER TWO

2.0 DESCRIPTION OF THE PROJECT AREA

The proposed Credible Blooms Ltd. Fruits trees and Horticultural Crops Farm, will be located on LR. 3264/2 Rumuruti, formerly George Mwai Farm, which is located in Lorian Location, Rumuruti Division of Laikipia West Sub-County of Laikipia County. The proposed farm lies about 25 Km from Rumuruti Town ship along the Rumuruti- Nanyuki Murram Road. The farm which is 1500 acres (625 ha) will be divided into 5 sections as in 2.1:



2.1 The Project Description and Layout Plan

| Enterprise | Proposed Area in Acres |
|---|------------------------|
| Avocado Farm | 200 |
| Mango/ Citrus Farm | 200 |
| Other various types of fruits | 100 |
| Protected forest along the riverine | 100 |
| Horticultural crops | 200 |
| Traditional crops (maize, beans, wheat) | 200 |
| Hilly area that cannot be utilized | 100 |
| Grazing land | 200 |
| Water reservoirs, roads and other farm's infrastructure | |
| Total | 1500 |

2.2 Topography.

The site lies at an altitude of about 2260 m above sea level. Being on the escarpments of the Rift Valley, the farm has very gentle slope towards the Pesi River.

2.3. Climate

The agro-ecological zone of the project area is LH5 (Lower highlands zone 5). The average annual rainfall is 750MM distribution is bimodal with long rains (average 350mm) falling in April-July and the short rains (average 150mm) falling in October-mid December. The average annual temperatures are 17.3^oc – 15.3^oc with mean maximum and minimum temperatures being 25.9^oc and 7.4^oc the annual evapotranspiration is 2400mm.

(Source: District Profile & Laikipia District Fertilizer Ext. Project).

2.4 Soils

Soil in the project area is well drained deep, very dark grayish brown, firm cracking clay with thick humic topsoil. The soil description is verto-luvic phaeozems. The smaller section at the upper part has sandy loam and deep. The design is based on sandy clay loam soil. [Source: fertilizer use recommendation project phase 1, Laikipia District June 1987 (NAL)].

2.5 Agriculture

The people of Rumuruti are Kikuyu farmers and Samburu Herdsmen. The farmers mostly grow subsistence crops like maize, beans and potatoes. Horticultural crops are also grown using irrigation along the rivers. The herdsmen keep mostly cattle and goats.

2.6 Land use in Rumuruti area

Other land use methods in Rumuruti other than small scale agriculture are large scale Fruits and horticultural crops farms, Wildlife sanctuaries and trading. Other projects similar to the proposed project in Rumuruti are the AAA farms.

2.7 Commercial activity

The area has only one commercial trading centre i.e. the Rumuruti township which also has the District Headquarters of Laikipia West Sub-County.

2.8 Water sources

The residents of Lorian location draw water mainly from the Pesi River.

2.9 Communication

The project area is accessible from Nyahururu Town through the tarmac Nyahururu- Rumuruti-Marallal road. The farm is only a few Km from Rumuruti town along a murram road.

2.10 Other infrastructure

The area is served with electricity by Kenya Power and Lighting Company, and telephone communication is good.

2.11 River Pesi

The Pesi river arises from the Aberdare Ranges, and passes through Ndaragwa, Salama and Muhotetu area before draining into the Ewaso Narok River at Rumuruti. The river is utilized for domestic water and irrigation of horticultural crops right from the upper course to the lower course.



CHAPTER THREE

3.0 RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORK

3.1 Environmental Problems in Kenya

There are many environmental problems and challenges in Kenya today. Among the cardinal environmental problems include: loss of biodiversity, land degradation, water management and environmental pollution. This has been aggravated by lack of awareness and inadequate information amongst the public on the consequences of their interaction with the environment. In addition, there is limited local communities' involvement in participatory planning and management of environmental natural resources. Recognizing the importance of natural resources and environmental in general, the Kenyan Government has put in place wide range of policy, institutional and legislative framework to address the major causes of environmental degradation and negative impacts on ecosystem emanating from industrial and economic development programme.

3.2 Environmental Policy

According to Kenya Subsidiary Legislation, 2003 part V of the EIA and EA regulation, provides for environment Audit and monitoring. The Act provides that an environmental audit study shall be undertaken on the following development activities, which are likely to have adverse environmental impacts- :

- a. Ongoing projects commenced prior to the coming into force of these regulations; or
- b. New projects undertaken after completion of an environmental impact assessment study report report.

It is against this background that any project instituted is likely to impact on the environment and hence a need to be subjected to the right mechanisms to establish the significance of the impacts could be militated against. The policy recommends the need for enhanced reuse / recycling of residues including wastewater, use of low non-waste technologies, increased public awareness rising and appreciation of clean environment. It further recommends participation of stakeholders in the management of wastes within their localities. Regarding human settlement the policy encourages better planning in both urban and rural areas and provision of basic needs such as water, drainage waste disposal facilities among others.

Regulation 31 of paragraph (3) of EIA and EA 2003, states that in case of the ongoing projects:

- (i) An initial environmental audit study followed by the subsequent environment control studies as may be necessary at such times as shall be agreed upon by the authority and proponent; and
- (ii) An initial environmental audit study to provide baseline information upon which subsequent environmental control audit studies shall be based.

3.3 Institutional Framework

Two institutions are in place for the purpose of administration of the Environmental Management and Coordination Act, namely, National Environmental Council (NEC) and National Environmental Management Authority (NEMA)

3.4 National Environmental Council (NEC)

The act establishes the NEC chaired by the Minister for Environment and natural resources with membership from all the relevant ministries as well as broad range of other interests. The functions of the council shall be to formulate national policies, goals and objectives and determination of policies and priorities for the environmental protection. The council also promotes co-operation among all the players engaged in environmental protection programmes.

3.5 National Environmental Management Authority (NEMA)

NEMA is the organization responsible for the administration of the environmental act. The Director General appointed by the president heads it. Among the functions of NEMA, include;

- a. Co-ordination of various environmental management activities.
- b. Initiation of legislative proposals and submission of such proposals to Attorney General
- c. Research, investigate and carry out surveys in the fields of environment
- d. Enhance environmental education and awareness on the need of sound environmental management.
- e. Advise the government on regional and international agreement to which the country should be a party and issue an annual report on the state of environment.
- f. Charged with the responsibility of the execution of Environmental Impact Assessment (EIA) and Environmental Audit (EA).

3.6 Environmental Legal Framework

It was not until recently that the Government of Kenya provided a bill for the establishment of an appropriate legal and institutional framework for the management and protection of the environment. The same was enacted into law as the Environmental Management and Co-ordination Act, 1999 and received the presidential assent on 6th January 2000. The key national laws governing the management of environmental resources in the country are as outline:

3.7 Environment Management and Co-ordination Act, 1999

Part II of Environment Management and Co-ordination Act, 1999 states that every person in Kenya is entitled to clean and healthy environment and has duty to safeguard the same. In order to ensure this is achieved EIA / EA is prepared to very existing and new projects as already stated above. The second schedule of the Act proposes that urban development activities are among the facilities to undergo EIA.

3.8 Environment (Impact Assessment and Audit) Regulations, 2003

The Minister for Environment, Natural Resources and Wildlife gazetted the regulations in June 2003, empowered under section 147 of EMCA. These regulations provide the framework for carrying out EIAs and EAs in Kenya by NEMA licensed Lead Experts or Firm of Experts.

3.9 Public Health Act (Cap 242)

Part IX, section 115 of the act states that no person/institution shall nuisance or condition liable to be injuries or dangerous to human health. Section 116 requires that Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injuries or dangerous to human health.

Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into the public street or into the gutter or side channel or watercourse, irrigation channel, or bed not approved for discharge is also deemed as nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin.

On responsibility of the Local Authorities, Part XI, section 129, of the Act states in part “It shall be the duty of every local authority to take all lawful, necessary and reasonably practicable measures for preventing any pollution dangerous to health of any supply of water which the public within its district has a right to use and does use for drinking or domestic purpose...”

Section 130 provides for making and imposing regulations by the authorities and others the duty of enforcing rules in respect of prohibiting use of water supply or erection of structures draining filth or noxious matter into water supply as mentioned in section 129. this provision is supplemented by section 126A that requires local authorities to develop by laws for controlling and regulating among others private sewers communication between drains and sewers and between sewers as well as regulating sanitary conveniences in connection to buildings, drainage, cesspools, etc for reception or disposal of foul matter.

Part XII, section 136, states that all collections of water, sewage, rubbish, refuse and other fluids which permits or facilitates the breeding or multiplication of pests shall be deemed nuisances and are liable to be dealt with in the matter provided by this Act.

3.10 Physical Planning Act (Cap 286)

The County Governments are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area.

Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local authority.

Finally, section 36 states that in connection with a development application, local authority is of the opinion that the proposed development activity will have injurious impact on the environment, the application shall be required to submit together with the application an environment impact assessment EIA report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by the NEMA and should be followed by annual environmental audits.

3.11 Land Planning Act (cap 303)

Section 9 of the subsidiary legislation (The Development and Use of Land Regulations, 1961) under this Act requires that before the local authorities submit any plans to then Minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted. This intended to reduce conflict with the interest such as settlement and other social and economic activities.

3.12 Water Act, 2002

Part II, section 18, of the Water Act 2002 provides for national monitoring and information system on water resources. Following on this, sub-section 3 allows the Water Resources Management Authority (WRMA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority.

Section 73 of the Act allows a person with a license (licensee) to supply water to make regulations for the purposes of protecting against degradation of water resources. Section 75 and sub-section 1 allows the licensee to construct and maintain drains sewers and other works for intercepting, treating or disposing of any foul of arising or flowing upon land for preventing pollution of water sources within his / her jurisdiction.

Section 76 states that no person shall discharge any trade effluent from trade premises into sewers of a licensee without the consent shall be issued on conditions including payment of rates for the discharge as may be provided under section 77 of the same Act.

3.13 Building Code 2000

Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect to the sewer line and all the wastewater must be discharged into sewers. The code also prohibits construction of structures or buildings on sewer lines.

3.14 Penal Code Act (Cap 63)

Section 191 of the penal code states that if any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence.

Section 192 of the same act says persons / institution is dwelling or business premises in the neighborhood or those passing along public way, commit an offence.

3.15 Food, Drugs, and Chemicals substances Act (Cap 254)

The Food, Drugs and Chemicals Substances Act (Cap 254) whose purpose is to make provision for the prevention of adulteration of food, drugs and chemical substances. This Act (which has been invoked for the consumption of genetically modified food), requires that food, drugs, cosmetics, devices and chemical substances should not be sold if they are unwholesome, poisonous, or adulterated. It further prohibits deceptive labeling.

3.16 Forest Act 2006

The Forest Act, 2005 recognizes that forests play a vital role in the stabilization of soils and ground water, thereby supporting the conduct of reliable agricultural activity, and that they play a crucial role in protecting water catchments in Kenya and moderating climate by absorbing green house gases. The Act also recognizes that forests provide the main locus of Kenya's biological diversity and a major habitat for wildlife.

Clause 21 of the Act states that all forests in Kenya other than private and local authority forests are vested in the state, subject to any rights of user in respect thereof, which by or under this act or other written law, have been on are granted to any other person.

The Act in clause 41 stated that all indigenous forests and woodlands shall be managed on a sustainable basis for purposes of conservation of water, soils and biodiversity among others. The act emphasizes in clause 45(1) that any activities within a forests area which are not included in a management plan shall only be undertaken with the consent of the Board granted in accordance with this section and 45(2) that states that the person intending to undertake any activity referred to in sub section 1 within a forest area shall apply in that behalf to the Board, and the application shall be accompanied by the results of an independent environmental impact assessment conducted in respect to the proposed activity.

3.17 Agriculture Act (Cap 318)

The Agricultural Act cap 318 of the laws of Kenya seeks to promote and maintain a stable Agriculture to provide for the conservation of the soil and its fertility and to stimulate the development of Agricultural land in accordance with the accepted practices of good land management and good husbandry.

3.18 The Work Injury & Benefits Act, 2007

An act of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes.

3.19 Occupational Health and Safety Act 2007

An Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes.

3.3 Regulatory Framework

3.3.1 EIA/EA Regulations 2003

The environmental (Impact Assessment and Audit) Regulations 2003, provide the basis for procedures for carrying out Environmental impacts Assessments (EIAs) and Environmental Audits. The Environmental Impact Assessment and Audit regulations states that the regulations should apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the second schedule of the act.

Regulation 4(1) further states that

“..... no proponent should implement a project

- (a) Likely to have a negative environmental impact; or
- (b) For which an environmental impact assessment is required under the act or these regulations unless an environmental impact assessment has been concluded and approved in accordance with these regulations

3.3.2 EMCA (Waste Management) Regulations 2006

These are described in legal notice No 121 of the Kenya Gazette supplement no 69 of September 2006. These regulations apply to all categories of waste as provided in the regulations. These include;

- Industrial wastes
- Hazardous and toxic wastes
- Pesticides and toxic substances
- Biomedical waste
- Radioactive substances

These regulations outline requirements for handling, storing, transporting and treatment/ disposal of all waste categories as provided therein

3.3.3 EMCA (water quality) Regulations 2006

These are described in legal notice 120 of the Kenya Gazette supplement No 68 of September 2006. These regulations apply to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes.

These include the following

- Protection of sources of water for domestic use
- Water for industrial use and effluent discharge
- Water for agricultural use

These regulations outline

Quality standards for sources of domestic water

Quality monitoring for sources of domestic water

Standard for effluents discharge into the environment

Monitoring guides for discharges into the environment

Standard for effluents discharged into the public sewers

Monitoring for discharge of treated effluents into the environment

3.3.4 Conservation of Biological Diversity (BD) Regulations 2006

These regulations are described in legal notice No 1600 of Kenya Gazette supplement of No 84 of December 2006. These regulations apply to conservation of biodiversity, which includes conservation of threatened species, inventory and monitoring of BD and protection of environmentally significant areas.

These are the regulations for conducting the EIA and EA concerning the general principle in the Act that entitles every Kenyan with the basic right to a clean and health environment.

1. Part 5 sections 31.

It stipulates that an Environment Impact Assessment should be undertaken on proposed projects that are listed as mandatory, to minimize the negative impacts such projects may have.

2. Section 72 (1) (EMCA, 1999) Water Pollution Prohibition

It prohibits the discharge of poisonous, toxic, noxious or obstructing matter, radioactive wastes or other pollutants and faulty dumping or discharge of such matter into aquatic environment in contravention of water pollution control standards established by the Act.

Contravention of the above is an offence punishable by imprisonment for a term of not exceeding two years or a fine not exceeding one million or to both such imprisonment and fine. In addition to any sentence or fine imposed by the court, the offender shall pay costs of the removal of the substances mentioned in section 72 (1) above.

Notwithstanding sentence, fine or payment of costs for removal the offender shall pay third parties reparation, restitution by such third parties.

3. Effluents to be discharged only into the sewerages system Section 74

The Environmental Management and Coordination Act (EMCA 1999) requires every owner or operator of a trade or industrial undertaking to discharge effluents or other pollutants originating from trade or industrial undertakings into existing sewerage systems and the local authority, the relevant supervising body, shall issue a prescribed fee or the license necessary for the discharge. License of

discharge effluents into the environment shall only be granted upon installation of an appropriate plant for the treatment of the above effluents.

4. Air quality standards Section 78 (2)

The Act (EMCA 1999) prohibits emission of any substances that causes air pollution and the offender is liable to imprisonment of two years, a fine of Ksh. 7,500, payment of the cost of removal of the pollution and any third party costs for reparation, restoration, restitution or compensation as may be determined by the court.

5. Section 82 Emission by motor vehicles and other conveyances

The environmental management and coordination Act (EMCA 1999) prohibits emission of any pollution by operator of motor vehicles, train, ship, aircraft or other similar conveyances [Homes equipment devices etc] whose operation will be in contravention of the established emission standards of NEMA.

3.4 Policy and Institutional framework.

Different policies in connection to the environmental audits of such project site do exist. They are sectoral in nature and in most cases, before the enactment of EMCA 1999, they tended to conflict leading to detrimental impacts to the environment.

National Environmental Management Authority (NEMA) is the environmental watchdog in the country. It is responsible in ensuring that projects are subjected to EIA before commencement. An annual, audit in line to the set regulations should be conducted in all establishments or projects and license obtained from NEMA.

CHAPTER FOUR

4.0 PROJECT OPTIONS & DESIGN.

4.1 Project objectives

The objective of this project is to set up a Fruits trees and Horticultural crops farm at LR. 3264/2, within Rumuruti area, Laikipia West Sub-County, Laikipia County. It is expected that the project will be in full production at the end of 2027.

4.2 Project options

The proponent of the farm has decided on cultivation of fruits and vegetables after considering the following options.

4.2.1 Horticultural crops farming.

The production of horticultural crops offers lucrative business opportunities for Kenyan farmers, who earn an estimated 1 billion Kenya shillings per Month. (Study done by Tegemeo Institute of Egerton University, 2006).

However the industry relies heavily on use of agrochemicals for production especially in high altitude area. The large scale farmers who invest highly in irrigation infrastructure have to compete with small scale farmers whose investment is not so high.

4.2.2 Vegetable and Fruit farming in the open fields

There are vegetables and fruits that thrive in temperate climates of Europe that would grow very well in Kenya. These crops however are referred to as summer crops grow in summer in Europe when the sunlit hours of the day are longer. In Kenya these flowers are produces under night light from electricity thus raising the costs of production. The high temperatures in the area and high winds would be good for production of only some fruit and vegetable varieties.

4.2.3 Vegetable production under greenhouses.

Greenhouses provide the best environment under which plants can be produced. This is because greenhouses shield plants from air borne disease carrying organisms, insect manifestation and extreme weather conditions. Greenhouses also minimize plant water requirements by minimizing

water loss through high winds and temperatures. However the infrastructural development is capital intensive.

4.2.4 No project alternative

The farm would remain under-utilized under bush land conditions and the proponent, the community and the country would lose out on the economic and social benefits that will accrue from the project.

4.3 Proposed Fruits and Horticultural crops development activities

The following are part of the activities that will be carried out to develop the farm:

- Farm roads development
- Fencing of the farm perimeter with available local materials
- Construction of green houses for vegetable production only
- Farm offices
- Water harvesting dams
- Waste water treatment dams/ wetland
- Farm workers rain shelters.
- Laying out the irrigation water supply system.

4.3.1 Materials to be Used, Products and By-Products

Land: there is land available for the setting up of the farm. A total of 1500 acres Hectare is currently available to be used for production.

Water: water is also available. The proponent can abstract water from the River Pesi , runoff from the hills carry out rain water harvesting and/or drill boreholes to supplement the other two sources.

4.3.2 Construction materials and machinery

Farm machinery such as tractors shall be used during the construction phase. Materials for construction shall include pools from recycled plastic, wood, shade net, polythene, water pipes, and pumps among others.

4.3.3 Planting materials

The planting of fruits and vegetables will be done from propagates propagated at the farm. In some cases seeds will be used.

Agrochemicals

The Chemicals to be used include fertilizers, pesticides, lime, fumigants and compost.

Fertilizers

The total range of pesticides fertilizers to be used as in the list provided in the annexes.

4.4 Solid waste generated and Waste management

Categories of waste generated

The proposed project will generate waste in these categories

1. Green matter waste from the vegetables being grown and trimmings
2. Containers of agrochemicals e.g. fertilizer bags, chemical containers. These will be disposed off appropriately through burning or recycling.
3. Oil and fuel containers will be recycled.
4. Greenhouses plastic linings
5. Human waste and sanitation

4.5 Decommissioning phase

General decommissioning of a facility and property include the removal of hazardous materials and wastes, cleaning and removal of equipment, decontamination and remediation and the termination of the operational permits and licenses, land physical reconstitution. Although the decommissioning of this project is not probable it is still a probability. It is therefore prudent to develop a decommissioning strategy.

This will probably include:-

- Horticulture and Fruit trees farm decommissioning
- Environmental reconstitution
- Equipment dismantling and removal

- Dams and waste water pans demolition
- Decontamination of the reservoir area to allow development of a different or a new activity.

4.5.1. Farm Decommissioning

Prior to the decommissioning of the horticulture crops farm the following steps will be undertaken:

- The current conditions, areas of concern and alternatives for future action will be put into consideration
- An environmental assessment (EA) will be performed to identify and determine the nature and extent of any hazardous construction materials or environmental contaminants in the Fruits trees and Horticultural crops farm. This assessment will be directed to areas of concern.
- An equipment inventory will be undertaken, as it is important to determine the equipment and materials present inside the farm before it can be decommissioned.
- A farm inspection will be done to provide valuable information for deciding on alternative for future use. There will be an inspection of the facility design, materials or construction and current condition. The structural integrity of the facility will be used to evaluate whether the horticulture crops farm should be reused or demolished.

From this assessment the decommissioning will include:

- **Remediation:** whereby the immediate environmental concerns will be remedied and the rest of the horticulture crops farm area left as they are, for a future buyer or occupier.
- **Hazardous** materials that are found will be dismantled and the contaminated construction materials sent to an appropriate landfill in lieu of cleanup or decontamination of these materials.
- **Equipment:** equipment that cannot be used at the farm will be cleaned and taken to another facility of the same nature of business or sold. This will include components to water systems, process piping and other reusable specialized equipment.
- **Decontamination and remediation:** Equipments that may be contaminated and require decontamination will be identified. Decontamination will involve removal, purging and proper disposal of liquids and solids contained in equipment, and rinsing or high pressure washing with water and detergent. Chemical analysis of

wipe samples taken from washed equipment surfaces will be performed to document that residual hazardous substances have been removed.

Adaptive Phase and Material Recycling

Once the structures that make the horticulture and fruit trees farm have been decommissioned, the search for recycling and reuse will begin.

- If the horticulture crops farm is completely demolished, the remaining property will be used for new construction or rehabilitated as green space.
- If part of the farm remains it will be ready for modifications to prepare it for its new intended use.

During decommissioning the existing laws and regulations shall be taken into account to ensure full compliance with respect to EHS.

4.5.2. Waste management during decommissioning

- Organic wastes will be composted and sold to other farmers as manure
- Hazardous wastes (chemical containers e.t.c) to be incinerated
- Re-usable wastes e.g drip lines, polythene sheets will be sold to other farmers,

4.6 Public Participation and Stakeholders Engagement.

4.6 .1 Importance of Public Participation

Public participation is basically concerned with involving, informing and consulting the public, planning, management and other decision-making activities which can be considered part of the Environmental Impacts Assessment process. It offers and encourages the public to express their views. Public participation tries to ensure that due consideration will be given to public values, concerns and preferences when decisions are made.

For large projects, such as the one proposed in this case various stakeholders should be consulted and involved in all Stages of project planning, project implementation and decommissioning.

4.6.2 Stakeholder Mapping and Engagement

| STAKEHOLDER | ROLE |
|--|---|
| Ministry of Agriculture | Advice on appropriate technology for crop production |
| Irrigation Department | Advice on appropriate technologies for irrigation water application |
| Water Resources Authority | For water use permits |
| Water Resources Users Association (River Pesi WRUA) | For river water use monitoring |
| Local Administration (Chiefs and ward administrators) | For resolving conflicts and various local issues |
| Public Health | For issues dealing with Public health |
| Area politicians (MCA) | Community issues |
| Neighbours | Community issues |
| Other Farmers | Technology transfer |
| Herders | Resolution of conflicts and technology transfer. |

4.7 Project Alternatives

4.7.1 The Proposed project

The proposed project is aimed at satisfying the proponent's objective of raising fruits and vegetables for export.

4.7.2 No Project Alternative

The No Project option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to the landowner and the community as a whole. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following

- The economic status of the Kenyans and the local people would remain unchanged.
- The local skills would remain under-utilized.
- Reduced interaction both at local, national and international levels.
- No employment opportunities will be created for thousands of Kenyans who will work in the proposed fruits and vegetables farm.
- Increased urban poverty and crime in Kenya.

From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people, Kenyans, and the government of Kenya.

4.7.3 Relocation Alternative

Relocation option to a different site is an option for the project implementation. At the moment, the proponent has no alternative sites for relocation. Looking for land to accommodate the scale, type and size of the project and completing official transaction on it may take a long period. Besides, the proponent has already invested in purchasing the land and is looking for more land for further expansion.

4.7.4 Alternative design and Technology

This would involve raising other types of crops other than fruits and vegetables. The proponent may consider planting other crop species which will be friendlier to the environment. In consideration of other species, due consideration must be given to biodiversity, the climate as well as the usefulness of the species for the proponent needs. In arriving at the proposed option, the proponent had given due consideration to all this factors.

4.7.5 The Comparison of Alternatives

- i) Under the relocation alternative, the proponent would have to look for another piece of land in a favorable area. Land is nowadays a scarce commodity. This would not be a preferred option as the proponent has already procured this land and it would not be wise to leave it bare.
- ii) Under alternative design and technology, the proponent would be required to plant other types of crops. The proponent has considered this option in line with the suitability of the area and the demand factors and settled for fruits and vegetables growing. The proponent may however in future consider growing of flowers for export.
- iii) Current action: - having assessed all the options, the proponent settled for the current action. There are however associated environmental degradation with the project implementation but provided the recommended Environmental Impact mitigation measures are adopted and implemented, negative impacts will be avoided /minimized.

4.7.6 Proposed Mitigation Action

The mitigation measures would be appropriately designed and implemented to protect the environment and especially the biodiversity in fauna and flora, water, soil, land conflict and land degradation in the proposed site. The conditions to be highlighted in the environmental licence (that would be issued) and mitigation measures included in the report would help to control damage to the environment.

CHAPTER FIVE

5.0 ANALYSIS OF ANTICIPATED NEGATIVE IMPACTS

5.1.1 Loss of vegetation and bio-diversity

The land on which the proposed project is to be constructed currently has natural trees and shrubs as it has never been cultivated before. The change in land use will lead to a significant loss of vegetation biodiversity. The proposed project has an agro forestry component thus giving numerous tree species. These provide sanctuary to different bird and insect's species of in the farm. The costs associated with disturbance of vegetation and biodiversity are considered negligible.

5.1.2 Noise

Noise is an unwanted or undesired sound. Extremely high noise levels may cause rupture of the basilar membrane with resultant severe hearing loss. High-frequency noise will produce more damage than low frequency noise. However, the longer the duration of exposure, the greater the potential hazard. Noise that is continuous for more than 5 hours a day at a level of 85 to 90 decibels or more is injurious to hearing.

Other than causing permanent hearing impairment, noise is known to cause a host of other non-auditory effects. It may interfere with speech communication, cause annoyance or distraction. It has been reported to reduce output and efficiency and lead to fatigue.

Predicted noise source at this proposed farm is that emanating from the construction equipment and vehicles. This noise is predicted to be intermittent in nature and will most likely not exceed the statutory limit of 90dBA. This means that both the magnitude and the time of exposure of both the personnel and the people in the neighborhood will be limited. As such, occurrence of noise induced hearing loss is unlikely. Rather, the noise will in fact lie well below 90 Dba and hence will be a disturbance or distraction.

5.1.3 Ground water

The construction areas of the project will not excavate lands to depths greater than 4 meters except for the boreholes. The excavation of the water storage dam's area will cover a depth of 3.5 meters. The water table of this area is over 150 meters deep. The proposed reservoir will therefore have no or minimal effect on the ground water as it will be lined.

5.1.4 Soil erosion

The construction activities in the project site may cause minimal soil erosion. The farm has implemented soil conservation terraces to curb soil erosion.

5.1.5 Human health and occupational safety

Human health and occupational safety may be threatened where adequate facilities and equipment do not exist to support the population within an area, project or locality. However, the locality of the proposed project has a number of nearby health facilities that can adequately cater for the anticipated labor force. The company will engage the services of qualified and licensed consultants to develop an up-to-date occupational health and safety policy. These will minimize occupational health and safety hazards associated with this type activity.

5.1.6 Water pollution

The issue may arise during the working of the project. Water pollutants may arise mainly from fertigation effluents, chemical residue slurry and wash off from spray equipment and chemical containers. This may be a threat to both surface and groundwater. The possibility of water pollution has however been eliminated through carefully considered management system for chemical policy on rational use of fertilizers has been considered to ensure that only amounts, which are deemed necessary to substitute for soil nutrients, are utilized. This will be done by ensuring that soil sampling is carried out prior to the implementation or fertilizer application regimes.

5.1.7 Waste disposal

Waste products if not recycled or properly disposed of may be costly to the safety of the environment. The proposed project report has an elaborate waste management strategy to manage and minimize wastes in section 8.7.

5.1.8 Air quality

Air pollution may be caused by gas emissions from construction equipment and dust in the area of construction. The impact will be localized and low.

5.1.9 Aesthetics

There will be a temporary interference with the aesthetics of the area concerned during construction activities. This however will be reversible. More vegetables and aesthetical plants will be planted.

5.1.10 accidents

These will be reduced with the development and implementation of the developed health and safety policy,

5.2. Surface water quality and hydrogen

The threat of siltation and sedimentation of the adjacent rivers is reduced by the project idea of beginning an afforestation programme, maintaining the riparian vegetation and soil and water conservation measures. This project will completely eliminate erosion and siltation problem.

5.3. Cost-Benefit Analysis

A cost benefit analysis has been performed in order to weigh the advantages associated with the proposed project against the disadvantages. In this way the viability of the project can be reasonably determined through comparing the positive effects against the negative effects.

The positive effects are reflected as benefits while the negative effects are reflected as costs. The cost-benefit analysis (CBA) technique used in this report assigns arbitrary values of 1 to 5 on the total benefits and costs for each anticipated parameter in the project. An overall evaluation of the costs and benefits is done to determine the projects' feasibility. A ratio of benefits to costs is computed, if the ratio is more than one (1), the project benefits (both environmental and socio-economic) are more than the total costs and hence suitable. The larger the Benefit-cost ratio, the more suitable the project is, in environment, social and economic terms. The scores are assigned as follows:

- | | | |
|---|---|------------------------|
| 1 | = | Very low benefit/cost |
| 2 | = | Low benefit/cost |
| 3 | = | Moderate benefit/cost |
| 4 | = | High benefit/cost |
| 5 | = | Very high benefit/cost |

Where:

Very high: the impact is considered as constituting a major and permanent change to the natural and social-economic environment and affecting large area or large number of people.

High: the impact constitutes long-term change affecting wide area and large number of people.

Moderate: constitute major change but limited, do not affect large number of people. They are of medium term benefits or costs.

Low: Results in short-term benefits or costs on the natural and socio-economic environment. Affects small number of people directly

Very low: No benefit or cost can be directly related to the parameter under consideration,

Table 2: Cost-Benefit analysis

| POTENTIAL IMPACT | BENEFITS | COSTS |
|---|-----------------|--------------|
| 1. Soil conservation | 4 | 1 |
| 2. Loss or vegetation and biodiversity | 1 | 2 |
| 3. Soil erosion | 1 | 2 |
| 4. Human health and occupational safety | 2 | 3 |
| 5. Water pollution | 1 | 2 |
| 6. Waste disposal | 4 | 1 |
| 7. Infrastructure development | 4 | 1 |
| 8. Economic empowerment | 4 | 1 |
| 9. Employment opportunities | 4 | 1 |
| 10. Government revenue | 5 | 1 |
| 11. Improved livelihood | 4 | 1 |
| 12. Increased land use values | 4 | 1 |
| 13. National economy | 4 | 1 |
| 14. Aesthetics | 3 | 1 |
| 15. Surface water quality and hydrology | 3 | 1 |
| 16. Ground water | 3 | 1 |
| 17. Noise | 1 | 3 |
| 18. Air quality | 1 | 3 |
| 19. Accident | 1 | 3 |
| Totals | 54 | 33 |

Calculations:

Benefits - Cost ratio: = Total benefits/Total costs

=54/33

= 1.64

Total benefit expressed as a percentage of total costs = 164%

Inference:

The Benefit-Cost ratio was to be 1.6 which is above 1, signifying that the project is feasible,

CHAPTER SIX

6.0 PROJECTS SOCIAL AND ENVIRONMENTAL IMPACTS PREDICTION AND MANAGEMENT

6.1 Introduction

Development projects are aimed at providing good and services to improve community's living standards. Such projects therefore present an opportunity for the community to achieve economic and social development for the ultimate well-being of a community or nation. While there development projects are a key driver of economic and human development, the nexus between development and environment is intricate and delicate. Short-term benefits accruing from development projects may significantly impact on the ability of human and natural ecosystems to meet the needs and aspirations of the future generations. The concept of sustainable development envisages development that not only allows the present generation to meet its developmental and natural needs but also ensure intergenerational equity through application of precautionary principle where there are uncertainties. An important component of sustainable development is the process of assessing the potential environmental, economic and social impacts of a project prior to its implementation. This is aimed at identifying, evaluation and predicting possible impacts of a project with the sole aim of enhancing anticipated positive impacts while at the same time incorporating into the project design measures for minimization of negative impacts. In order to establish and assess the likely social and economic impacts of the proposed Credible Blooms fruit and vegetable farm in Rumuruti area, Laikipia West, Laikipia County, views were obtained from the members of the public residing close to the project site. In addition, the assessors reviewed reports on similar projects and other literature. This section discusses the anticipated social and economic impacts of the project based on the aforementioned sources.

The major purpose of high value crop agriculture is to increase agricultural production and consequently improve the economic and social well-being of the area of the project and the country at large. Projects of high value cut-flower production usually achieve this objective, and they can be more if proper measures are put in place.

6.2 Social Impacts associated with large scale horticultural production projects.

6.2.1 Population Change

Horticultural projects are labour intensive and tend to encourage population densities to increase because the increased prosperity of the area attracts incomers. The increase of the labour raises local demand for food, housing and other social amenities.

6.2.2 Income and Amenity

Horticultural projects introduce a large labour force that is better paid than the local labour. This decreases available labour force for the existing farmers as well as drives labour fees up.

6.2.3 Human Migration

Large, new horticultural projects attract temporary populations both during construction and during production periods of agricultural labour demands and provision for their accommodation needs to be anticipated.

6.2.4 Change of family values

Large scale Fruits and horticultural crops farms employ a large number of female workers. These workers will be derived from a female population that was previously not earning money. This may change perception at family level and change of roles previously held by men.

6.2.5 Loss of grazing land

The land earmarked for development has been un-developed for many years. Consequently, the land has been previously used for grazing of livestock by the pastoralists in the area. Once developed, this land will no longer be available for grazing and hence will have an impact on livestock production. This impact is not likely to be significant since only a small area will be affected by the development at the initial stages.

6.2.6 Creation of employment

The proposed Fruits and horticultural crops farm will create employment opportunities for both skilled and unskilled labour. The project is expected to employ more than 500 persons within the first two years of operation. Much of the work will be manual and will not require any specialized training. This will thus open opportunities for the rural women and youths who comprise the largest proportion of the rural population. Priority will be given to persons from the local community to ensure that the project uplifts their living standards. Unemployment is rampant in rural areas and especially in areas that have low agricultural potential.

6.2.7 Boost local economy

The proposed project will boost the local economy through payment of royalties, taxes, levies and other charges to the County and central governments. The project will also open up the area for similar and other varied investments. The net effect will be improved infrastructure in the area and better living standards.

6.2.8 Moral decadence

The presence of large workforce in an area, some of whom will move away from their families in order to reside near the place of work may ultimately lead to vices such as prostitution, drug abuse, increased incidence of HIV/AIDS among the workers and neighbouring community. Cases of insecurity may also increase targeting the working class.

6.2.9 Impact on culture

Movement of new comers into the area will expose the local culture to integration with cultures of other people leading to gradual cultural change as has happened in other areas. The loss of culture not only eliminates the harmful practices in a community but may also interfere with the norms and value systems that helps sustain peace and harmony within a community. There may be changes in traditional livelihood strategies, conflict resolution mechanisms e.g. that may have a significant impact on development of the community (either negative or positive).

6.2.10 Exposure to new technologies

The development of the proposed Farm will expose the local community to new agricultural technologies that could help boost agricultural production in the area.

6.3 Analysis of public views

Views were collected from 19 persons drawn from the local community using semi-structured questionnaires (Annexed to the report). The respondents were persons aged 18 years and above and residing in the project area. The respondents cited the following as the anticipated environmental and social impacts;

| | |
|---|-------|
| Negative impacts | |
| Impact on health of workers and community | 36.8% |
| Moral decadence | 21.1% |
| Movement of people into the area | 5.3% |
| Positive impacts | |
| Creation of employment | 100% |
| Improved livelihoods | 15.8% |
| Infrastructural development | 15.8% |
| Economic development | 10.5% |
| Improved security | 21.1% |

All the respondents were in support of the proposed project. The following measures were suggested to mitigate against the negative environmental and social impacts.

- Adherence to set regulations
- Develop policies outlining how impacts will be prevented or controlled
- Plant trees
- Provision of PPEs
- Safely store agrochemicals
- Use agrochemicals in moderation
- Use green houses to reduce waste water management flowing from the farm
- Use the right type of chemicals

CHAPTER SEVEN

7.0 MITIGATION OF ENVIRONMENTAL AND SOCIAL IMPACTS

7.1 Aesthetic value and soil erosion

After completion or construction, the management should ensure that the aesthetics of the area is restored. Continual monitoring of the soil components in the farm is advised. This will ensure that the effectiveness of soil erosion control measures. The proponent needs to;

- Ensure that that the activities of farm do not encroach into riparian reserve
- Plant trees along the perimeter fence and other area within the farm.
- Carry out soil conservation measures

7.2 Noise Pollution and Air quality

Control at source:

- Use of ear protectors and dust masks by workers.
- Minimize generation of air pollutants through modification/replacement or worn out process equipments and use or alternative better methods to achieve the same goals.
- Ensure all containers containing volatile products are kept closed.
- Regular monitoring of air quality in the farm. Monitoring items include: SO₂, dust and other pollutants.

Maintenance of an optimum level of green spaces in the compound is important. Vegetation extracts pollutants from the air, stimulates turbulence and interrupts sound and shock waves. Furthermore, green spaces have beneficial effects on microclimate and also on the psychological state of the inhabitants due to its aesthetic appeal.

7.3 Water use

Economical use of water should be encouraged as availability is not always ensured. Water supply for the Credible Blooms Farm will be from water reservoirs, and rainwater. Water conservation measures within the farm will be encouraged. The method of irrigation which will be used in all greenhouses will be drip irrigation which is one of the most efficient irrigation methods.

7.4 Health and safety

7.4.1 Personal Protective Equipment (PPE)

Provision of appropriate protective clothing such as dust masks, gloves, and safety goggles to workers during construction and farm operations.

7.4.2. Employees' pro-active safety attitudes

Regular training on pro-active safety attitudes for employees would instill a sense of responsibility upon the employees, and in this way, increase employee's efforts towards avoiding occurrence of accidents due to negligence, ignorance or carelessness.

7.4.3 Training in Occupational Health Safety

This is most important and should be regular. Health and safety audits should be carried out every year.

7.4.4 First Aid

Training and availing First Aid kits is recommended

7.4.5 Sanitary provision

These should be provided. Toilets should always be clean and drinking water should be free of pathogens. There will be separate toilet facilities for male and female workers, with those for females being fitted with disposable sanitary towels receptor bins. In addition, hand washing facilities should be provided near the toilets to promote personal hygiene.

7.4.6 Control of Health Hazards

There should be adequate medical supervision personnel comprising pre-hiring clinical screening, periodic medical examination and rehabilitative care for any affected workers. A comprehensive risk assessment should be carried out on commencement of operations so that specific measures for control and mitigation of workplace hazards and risks are put in place.

7.4.7 Ergonomics

All personnel should be trained on the basic ergonomics principles. This should cover the correct lifting, carrying and setting down techniques to prevent incidences of hernias, sprains, strains, back injuries and other muscular-skeletal disorders due to improper handling heavy objects.

7.5 Irrigation Water

Regular monitoring of irrigation water is advised. Monitoring items should include temperature, pH and heavy metals among others. (*The water quality is within limits set out in the eighth schedule of the Environmental Management and Co-ordination (Water Quality) Regulations, 2006.*)

7.6 Waste management

- Organic wastes could be composted and re-used on the farm as manure
- Hazardous wastes (chemical containers e.t.c) to be incinerated
- Re-usable wastes e.g. drip lines, polythene sheets,
- Wastewater from chemical store and grading halls could be directed into soak pits
- Office wastes to be burnt on site
- Storm water to be harvested for use at the farm
- Medical wastes (from first aid services) to be incinerated

7.7 Environmental monitoring

The company will formulate a comprehensive environmental monitoring programme. This will among others include;

- Regular environmental audits
- Health and safety audits
- Water quality monitoring
- Soil analysis on regular basis
- Internal inspections by EHS team
- Maintain waste tracking records at the farm

- Monitor water and power consumption
- Air quality monitoring
- Monitor temperature and humidity in key areas such as cold rooms and greenhouses
- Conduct noise survey
- Apply for effluent discharge license

CHAPTER EIGHT

8.0 PROPOSED FARM HEALTH AND SAFETY AND ENVIRONMENT POLICY

The Credible Blooms Farm Proponent is in the process of developing a comprehensive HSE policy as detailed herewith.

8.1 Goal of the HSE Policy

The Farm understands that its activities will interact with the environment in a very complex manner and economic prosperity is dependent on how well the environment is taken care of.

The goal of the proposed policy will therefore to assist the proponent of Farm to maintain position as a quality supplier of vegetables and fruits with full commitment to minimize the negative impacts of the company's activities on the environment, to conserve existing habitats, reduce use of agrochemicals, improve its efficiency in the use of natural resources and ensure good health, safety and welfare of employees and the neighborhood. The Farm will be fully committed to complying with all Kenyan regulations and the highest standards of Good Agricultural Practice.

8.2 Elements of the HSE Policy

This policy will have the following essential elements:

- i. **Impact assessment guidelines:** These guidelines will provide for the assessment of the impacts of the Credible Blooms Farm operations on the natural environment and in particular the effects of the pesticides and fertilizers used their effect on workers. Spray operators, consumers, wildlife, aquatic life and water resources.
- ii. **Pollution prevention and control:** The policy will provide for adoption of processes, practices, materials or products that avoid reduce or control pollution.
- iii. **Efficient natural resource utilization:** To better utilize natural resources including water, the company wherever possible will incorporate recycling, treatment, process changes, control mechanisms, resource conservation and material substitution.

- iv. **Risk Reduction:** The HSE will lay down a strategy for minimizing. Health and safety risks to workers. The company will regularly conduct health, Safety and Environmental audits whose outcomes will enable the company to fully understand the impacts of its operations and corrective actions to be put in place. Based on the outcomes, the company's health. Safety and Environment Committee will set objectives and targets for continuous improvement, prevention of pollution and reducing risks to workers and the environment.
- v. **In-house training:** All the farms personnel in positions of responsibility will be trained to ensure full understanding of the reasons, targets and requirements of the HSE policy.
- vi. **Effective communication:** The policy will provide guidelines to ensure effective communication channels, both internal and external, and at all levels.
- vii. **Enforcement:** To ensure that Farms operations are conducted in a safe and healthy environment and that the welfare of employees is monitored and maintained, managers, heads of departments and supervisors will be required to ensure that the HSE policy is enforced and observed by employees and those who may be affected by the company's activities.
- viii. **Right to know:** The Farm will emphasize that employees and other persons affected by the rules contained in the HSE Manual must know, understand and adhere to the risks. Awareness-raising enhances the understanding of the risks and responsibilities of each worker.
- ix. **HSE Committee:** In accordance with the KFC Code of Conduct (KFC, 2002) and Work Place Injuries and Benefits Act 2007, Subsidiary Legislation, Legal Notice: No. 31 of 2004, the Farm will establish a HSE Committee that will meet regularly review current policy programmers and related mailers that arise from weekly and monthly reports from within each department. The Committee will be responsible for the identification and design of action plans for continuous improvement.
- x. **Participatory processes:** Employees will fully participate and make suggestions in the development of the HSE guidelines.
- xi. **Personal Protective Equipment (PPE):** The HSE policy will require provision of PPE to ensure that the workers are adequately and appropriately protected from injury.

8.3 Pesticides Management

The overall aim of the proposed Credible Blooms Farm with respect to pesticides is to reduce the pesticide load on the environment year after year whilst ensuring that pesticides application is safe. This takes place within set guidelines laid down by Codes of Practice and Statutory regulations subscribed to. The Farm will maintain a continuous improvement strategy based upon audit and risk analysis using the following guidelines:-

- A system of ordering, transporting, receiving, storing and applying pesticides
- Methyl Bromide and other banned/restricted pesticides will not be used by (Methyl bromide has been replaced with Methane Sodium).
- Efficient and economical use of pesticides and fertilizers. These will be monitored daily, monthly, yearly, crop by crop and on a square meter basis.
- Prophylactic use of all pesticides is discouraged. Scouting will be done to ensure that prophylactic use and blanket spraying are avoided whenever possible.
- Pesticides with least impact on mammalian avian and aquatic life are of first choice.
- The spray programme will be a supervised exercise that links the levels of pest and disease monitoring and control through scouting and spot spraying. Once spraying has been done adequate warning signs on country will be displayed.
- Efforts to develop and implement an alternative pest and disease control strategy through the use of biological, physical and cultural control will be continually pursued. Integrated Pest Management (IPM) and Integrated Chemical Management (ICM) will also be encouraged.
- Over- or under-application of pesticides will be avoided and confirmation of this will be done through analytical examination of tissue samples.
- Knowledge of the various pesticides and their toxicity by the Technical Manager which ensures that the right pesticide is applied.
- A report of pesticides usage is submitted to the Horticultural Crops Development Authority (HCDA) after every 4-week period (28 days). The aim is to achieve continuous annual reduction of pesticide usage.
- Ensuring that individual operators do not exceed the Operator Exposure Limit (OEL) through an efficient logging system. All operators will be screened once every three months to monitor cholinesterase to ensure safe levels are adhered to and they are rotated once a month and assigned other duties.

- According to KIT, monitor all pesticide usage in respect to relative toxicity and provide justification for the use of class I pesticides.
- Ensuring that the technical personnel with overall responsibility for spray programmes and decisions on their application are suitably qualified and trained.
- Policy on professional development of senior and supervisory staff relating to pest and disease control and the minimizing of pesticide usage.
- Investigate ways of reducing waste and how to dispose of waste properly.
To continually improve production practices so as to be more socially responsive and environmentally friendly.
- On-going research and development
- Worker training on pesticide toxicity/classification and first aid measures.
- Empty pesticide containers will be triple-rinsed, punctured and flattened and then sent to the incinerator. The company will investigate the possibility of suppliers taking back the containers for disposal. Dilute pesticide residue (rinsate) from the containers will safely be disposed of by flushing it into the soak pit and constructed waste water ponds.

8.4 Fertilizers Management

The Proponent of the Credible Blooms Farm will promote the rational use of fertilizers so as to minimize negative environmental impacts while consistently attaining production of high quality crops. The following guidelines will be used: -

- Utilization of fertilizers and Compost in line with Code of KFC Good Agricultural Practices
- Applying fertilizers based on sound principles, leaf tissue analysis and soil analysis to provide a guideline to the soil nutrient levels and in particular nitrates, phosphates, potash and magnesium levels. Leaf samples and soils are tested on a 2 monthly rotational schedule to check on any compound build-ups or depletions in the soil fertilizers will then be applied based strictly upon these results.
- All fertilizer usage will be recorded and every four weeks, a report will be given to the KFC within 21 days of previous period.
- Only qualified personnel will have responsibility for fertilizer programmes and decisions on their application
- Training of all personnel involved in and the rational use of these fertilizers.
- Fertilizers will not be applied to conservation areas, wildlife corridors or within 25 meters of watercourses,
- All of the organic waste will be composted to maximize nutrient recycling and maintain soil fertility.
- Fertilization will be tied to soil, tissue and water analysis from the laboratory results
- The Farm will recycle waste water
- Any increases in fertilizer usage for the same period over the previous year must be justified in consultation with KFC.
- The composition of each fertilizer material used will be determined and a report submitted to KFC. All fertilizer applications will be monitored and audited. Storage facilities will be constructed to contain any possible spills that could contaminate soil or water.

8.5 Water Resources Management

The proponent will foster efficient use of water through a range of conservation techniques. To ensure continual improvement, the following guidelines will be observed:-

- Record and report to the KFC the total water consumption, per production unit, in m³/ha/day.
- There will be efforts to develop and implement effluent degradation strategies in order to avoid environmental pollution. The Farm will use soak pits to clean spray wastewater. Constructed waste water ponds will be put in place to polish the effluent release to a water course. Efforts will be made to identify adequate and efficient macrophytes for this eco-technological facility.
- Application of water to the soil will be based on sound agronomic principles of soil-water relations (using tensiometer readings) to provide a guide to the soil water status.
- All water utilized will be metered and recorded
- Water will be harvested from greenhouse roofs and stored in a lined reservoir.
- Drip irrigation will be used to supply water to the crop to avoid water wastage.

8.6 Soil Resource Management

The objective here is to ensure that all land use pesticides are carried out in an environmentally responsible manner in line with the Code of Good Agricultural Practice provided by the KFC (KFC, 2002).

As indicated above, fertilizers will be applied based on sound principles, leaf tissue and soil analysis to provide a guide to the soil nutrient levels and in particular nitrates phosphates, potash and magnesium levels.

The following "best practice" methods for soil conservation will be applied:

- **Grassing:** all earth areas not specifically required to be tilled will be grassed and terraced to minimize erosion.
- **Drainage:** all drainage will be in concrete or precast culverts to avoid soil erosion and siltation of the Pesi River.

- Maintenance or indigenous vegetation along the river bank.
- No cultivation will be carried out on land with a slope or more than 35% in accordance with the Agriculture Act.

8.7 Waste Management

8.7.1 Polythene

To minimize environment pollution caused by polythene, the proponent will ensure:

- That all used polythene is collected, bailed and transported to a recycling facility
- That all used polythene is returned to the storage facility.
- That no polythene is incinerated.
- That drivers and turn-boys are trained on polythene disposal.

8.7.2 Paints and thinners

To minimize soil pollution by plant disposal, the will be done:

- Training of painters on safe disposal of thinners and paints.
- Implementing a system for collecting waste material and incineration.
- Implementing a system for safe disposal paint Containers.

8.7.3 Inorganic waste

Fertilizer sweepings will be re-used.

- Chemical spillage will be soaked in sawdust and disposed in approved disposal sites.
- Waste oil/grease from the garage will be returned to Kenya Shell for incineration.
- Vegetable sleeves and rubber bands will be separated from plant debris and incinerated.

8.7.4 Organic waste

- Plant refuse, the result of pruned, discarded or broken in the field and grading halls will be composed to provide organic manure.
- Biodegradable materials like cartons and other packing materials will be re-used or shredded and composted.

8.7.5 Waste timber

Waste timber will be re-used on the farm.

8.7.6 Toilet & Septic Tanks

Toilets and sewage water treatment units will be constructed in accordance with KFC Guidelines (KFC, 2002).

8.8 Biological Resources Management

To protect and conserve wildlife, natural habitats, respecting and enhancing the landscape character, the company will emphasize efficient use of resources including energy, water, land use practices, use of pesticides, fertilizers, compost, prevention of pollution and conservation of natural flora and fauna and the landscape. To ensure no damage is done to these resources, the company will strictly follow guidelines regarding avoidance of use of pesticides and has a full understanding of:-

Mammalian Toxicity - WHO Classification Red List

Aquatic Toxicity - Red List

Avian Toxicity - Green List

8.9 Air Pollution Management

To reduce negative impacts on the air, the following measures will be observed:

- Non-use of methyl bromide for fumigation due to its ozone depleting effects.
- Incineration of materials will be minimized and all organic waste will be composted and polythene wastes recycled.
- Use of unleaded petrol and regular servicing of the company vehicles to reduce emissions.
- Use of products with chlorofluorocarbons (CFCs) will be avoided as much as possible.

To minimize air pollution when spraying, the following measures are observed:-

- Minimizing and monitoring use of all pesticide products.

- Effective scouting will be done to minimize blanket spraying
- Use of Integrated Pest Management (IPM) methods.

8.10 Health and Safety Management

The Proponent of the Credible Blooms Farm will be responsible for the care, health and safety of all employees and any other person within its premises. The Farm is subject to the Work Place Injury and Benefits Act 2007 under the laws of Kenya. This law lays down the rules for Safety, Health and Welfare within factories and other places formwork with a view to ensuring suitable conditions of work and good health of workers. Under these regulations, Health and Safety Audits are required to identify risks to employees and other persons. These risks will be then analyzed and corrective action plans drawn up.

The Proponent has a responsibility, so far as is reasonably, practicable, to prevent injuries or harm to its employees and every reasonable effort will be made to provide safe and healthy working conditions. These general guidelines shall apply:

- Ensuring management at all levels is aware their responsibilities for health and safety
- Ensuring supervisors and workers are aware of their roles to care for their health and safety and that of others.
- Training workers on health and safety techniques and that these are combined with production techniques in the following areas:-
 - The use and handling chemical.
 - Machinery and equipment use and upkeep.
 - Electrical equipment use & upkeep.
 - Garage /workshop.
 - Land preparation,
 - Post-harvest procedures,
 - Transportation.
 - Personnel and home hygiene,

- To minimize risk of personnel injury in violence during possible industrial disputes. will:
 - The Farm will support the formation of Health, Safety & Environmental Committee as required by the law. It will be responsible for HSE programs,
 - Ensures that workers committee and management are in place and working together to prevent any potential problems.
 - Ensuring freedom of association of all workers,

CHAPTER NINE

9.0 ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED FRUITS TREES AND HORTICULTURAL CROPS FARM

9.1 ENVIRONMENTAL MANAGEMENT PLAN DURING FARM ESTABLISHMENT

| Impact | Source of impact | Mitigation measures | Time frame | Responsibility | Cost (Kshs) | Remarks |
|--|-----------------------------------|--|---------------------|------------------------|--------------------|--|
| 1. Landscaping and other civil works | Land preparation for construction | Ensure that land is leveled and practice soil trapping | During construction | Proponent (contractor) | 50,000 | No landscaping will be done. The area is flat |
| 2. Loss of vegetation and biodiversity | Land clearing | Greening of the farm area Establish biodiversity banks | During construction | Supervisor | 8,000 | The area for the proposed vegetable crops cultivation is under bush. |
| 3. Air pollution | Construction and landscaping | Sprinkling of water on soil surface to minimize the generation of dust | During construction | Proponent (contractor) | 5,000 | |
| | Transport of | Emphasize on switching | Always | Proponent | Nil | |

| | | | | | | |
|---|---------------------------------------|---|--|-----------|--------|--|
| | horticulture products and farm inputs | off of engine when not in use | | | | |
| | Pesticide use | Scouting, spot spraying and integrated pest management | Always | Proponent | | |
| 4. Disregard to environmental issues- pollution | Lack of Environmental Monitoring | Ensure incorporation of environmental issues in activity calendar. Proper records should be kept on waste analysis, Ensure annual environmental audit is carried out. | This should be part and parcel of all project activities, from construction to decommissioning Not more than one year after project commissioning | Proponent | 80,000 | To ensure continuous surveillance of environment and avoid deterioration of standards. |
| 5. Water pollution | Pollution from agrochemicals | Continuous monitoring of irrigation, water. Safe disposal of waste | Twice a year Always | Manager | 40,000 | To prevent water pollution |

| | | | | | | |
|-----------------|--------------------------|---|-----------------------------------|---------|--------|---|
| | | water through constructed wetlands | | | | |
| 6. Soil erosion | Soil quality monitoring | Ensure good soil conservation measures Safe water disposal to discharge points | Always | Manager | 30,000 | To prevent soil erosion To ensure constant water availability. |
| 7. Water misuse | Water storage facilities | Installation of storage dams. Encourage roof harvesting of the commodity | During construction Always | Manager | 80,000 | To ensure constant water availability |

9.2 ENVIRONMENTAL MANAGEMENT PLAN DURING OPERATION OF THE FARM

| Impact | Source of impact | Mitigation measures | Time frame | Responsibility | Cost (Kshs) | Remarks |
|---------------------------------------|---|---|--|----------------|-------------|--|
| 1. Occupational Health and safety. | Horticultural crops production and handling | Have a Safety and Health Work Plan | On commencement of farm operations | Proponent | 100,000 | OSHA Expert |
| 2. Air pollution | Dust produced by various activities | Dust control measures like sprinkling water Use of dust masks | always | Proponent | 50,000 | |
| | Transport of Horticultural crops products and farm inputs | Emphasize on switching off of engine when not in use | Always | Proponent | Nil | |
| | Pesticide use | Scouting, spot spraying and integrated pest management | Always | Proponent | 20,000 | Farm supervision |
| 3. Disregard to environmental issues- | Lack of Environmental Monitoring | Ensure incorporation of environmental issues in activity calendar. Proper records should be kept on | This should be part and parcel of all project activities, from | Proponent | 80,000 | To ensure continuous surveillance of environment and |

| | | | | | | |
|--------------------|------------------------------|---|---|---------|--------|---|
| pollution | | waste analysis, Ensure annual environmental audit is carried out. | construction to decommissioning Not more than one year after project commissioning | | | avoid deterioration of standards. |
| 4. Water pollution | Pollution from agrochemicals | Continuous monitoring of irrigation, water. Safe disposal of waste water through septic tanks. | Twice a year Always | Manager | 40,000 | To prevent water pollution |
| 5. Soil erosion | Soil quality monitoring | Ensure good soil conservation measures Safe water disposal to discharge points | Always | Manager | 30,000 | To prevent soil erosion To ensure constant water availability. |
| 6. Water misuse | Water storage facilities | Installation of storage dams. Encourage roof harvesting of the commodity | During construction Always | Manager | 80,000 | To ensure constant water availability |

9.3 ENVIRONMENTAL MANAGEMENT PLAN FOR THE DECOMMISSIONING PHASE

| ENVIRONMENTAL MANAGEMENT PLAN (EMP) | | | |
|--|--------------------------|-------------------|-------------------------|
| Planned activities and Mitigation Measures | Responsible Party | Time Frame | Cost (Kshs) |
| 1. Pre-decommissioning requirements | | | To be determined |
| 1. Obtain all licenses necessary for demolition to kick off from NEMA and other relevant authorities. | Proponent | 2 months | |
| 2. Provide information to workers on project termination and create awareness to workers who are losing employment about alternative income generating activities (includes giving notes of termination of contracts). | Proponent | 1 month | |
| 3. Payment of compensation and terminal benefits to workers | Proponent | 1 month | |
| 2. Demolition waste management | | | |
| 1. All buildings, machinery, equipment, greenhouse structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible | Contractor, Proponent | 2 months | |
| 2. All foundations must be removed and recycled, reused or disposed of at a licensed disposal site. | Proponent | 3 weeks | |
| 3. Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, | Contractor, Proponent | 2 weeks | |

| | | | |
|--|--------------------------|----------|--|
| the materials should be taken to a licensed waste disposal site | | | |
| 4. Donate/ sell reusable demolition waste to other organizations, individuals and institutions in need. | Proponent | 1 month | |
| 3. Rehabilitation of the project site | | | |
| 1. Leveling of site to match its original state | Proponent | 2 months | |
| 2. Implement an appropriate re-vegetation programme to restore the site to its original status | Contractor, Proponent | 3 months | |
| 3. Consider use of indigenous plant species in re-vegetation | Contractor, Proponent | One-off | |
| 4. Trees should be planted at suitable locations so as to interrupt sight lines (screen planting), between the adjacent homesteads area and the development. | Contractor, Proponent | Once-off | |

CONCLUSION AND RECOMMENDATION

The project has clear social and economic benefits and will contribute to the improvement of the quality of life for the people associated with it and the neighbors and the society in general. The project will not be in any serious conflict with any major national physical or environmental protection policies. The on-site or off-site anticipated impacts identified are of varying significance and these could be adequately mitigated to reduce any threat to the environment. When the environmental management plan developed in the assessment is fully implemented and the health and safety and environment policy is set up. Then this will result in an overall improvement in the environmental quality of the project area and its surrounding.

From the foregoing discussions, it is recommended that;

1. The proponent shall ensure that the development camouflages within the setting and offers a serene environment to allay concerns. All activities concerning construction and maintenance such as work execution, site inspection and material testing shall be strictly monitored by a contractor or a designated official who shall be trained and experienced enough to judge the appropriateness of the works being carried out.
2. Implementation of an environmental management system is an integral part of growth and development of any company and makes employees and contractors aware of the need to take a responsible approach to the management of the environment in their operations. This overall objective is to achieve continual improvement through monitoring and measuring performance.
3. Waste management strategy is critical to such a facility's operations. Otherwise 7Rs- refuse, return, refill, reduce, reuse, recycle and recover- are good practices for the facility.
4. The proponent shall comply with the relevant principle laws, by-laws and guidelines issued for the development of such projects.
5. Annual environmental audits should be carried out on the project in order to ensure the compliance of the project with mitigation measures outlined in the Environmental Management Plan (EMP).

REFERENCES

- Government of Kenya, (2000). Environmental Management and Coordination Act No 8 of 1999. Kenya Gazette Supplement. Government Printers, Nairobi.
- Government of Kenya (2003) Environmental (Impact Assessment and Audit) Regulations. Kenya Gazette Supplement No 56, Legal notice No 101, Government printers Nairobi.
- Government of Kenya The Pest Control Products Act (CAP 346, 1997)
- Government of Kenya The Public Health Act
- Government of Kenya The Local Government Act (CAP 265)
- Government of Kenya The Physical Planning Act (CAP 286):
- Government of Kenya The Wildlife (Conservation and Management) Act (CAP 376),
- Government of Kenya Food, Drugs and Chemical Substance Act (CAP 274),
- Government of Kenya The Chiefs Authority Act (Cap 128),
- Government of Kenya The Penal Code Act (Cap 63),
- Government of Kenya The Forest Act, 2005.

Attachments

1. Certificate of Incorporation and PIN
2. Practising Licenses for the Experts who prepared the report
3. Public Participation Forms