

**The Environmental Impact Statement for the Proposed Soya
beans, Wheat and Maize Growing Project by Kanyenda Farming
Limited in Mpongwe District**

ENVIRONMENTAL IMPACT STATEMENT(EIS)

(SUBMITTED TO THE ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY)

OCTOBER 2012



**FOR THE PROPOSED COMMERCIAL FARMING OF MAIZE,
WHEAT AND SOYA BEANS IN KANYENDA FARMING BLOCK
IN MPONGWE DISTRICT**

**BY
KANYENDA FARMING LIMITED
FARM NO. F /10848 KANYENDA FARMING BLOCK
P.O BOX 90749
MPONGWE DISTRICT
ZAMBIA**

Prepared by

GREENLINE ENVIRONMENTAL SOLUTIONS LTD, LUSAKA.

**The Environmental Impact Statement for the Proposed Soya
beans, Wheat and Maize Growing Project by Kanyenda Farming
Limited in Mpongwe District**

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Contents

Table of contents.....	-1-
List of tables.....	-6-
List of figures.....	-8-
List of Acronyms and Abbreviations.....	-9-
List of appendices.....	-10-
Signature page	-11-
1.0 Executive Summary	- 16 -
2.0 Introduction.....	- 18 -
2.1 Background of the project.....	- 18 -
2.2 Summary description of the project including project rationale	- 18 -
2.2.1 Project Material requirements.....	-18-
2.2.2 Products and by products of the project.....	-19-
Preparation Phase.....	- 23 -
Construction Phases	- 23 -
Operational Phase Activities	- 24 -
Decommissioning and Closure Phase Activities.....	- 24 -
2.3 Objectives the project	- 24 -
2.3.1 Purpose of the Environmental Impact Assessment.....	- 25 -
2.4 Brief description of the Location	- 26 -
2.5 Particulars of Shareholders/Directors	- 26 -
2.6 The developer’s physical address and contact person.....	- 27 -
2.7 Track Record/Previous Experience of Enterprise Elsewhere	- 27 -
2.8 Total Project Cost/Investment.....	- 27 -
2.9 Proposed Project Implementation Date.....	- 28 -
3.0 Policy, Legal and Institutional Framework.....	- 29 -
3.1 History of the Environmental Regulatory Framework in Zambia	- 29 -

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

3.2	The Environmental Management Act No. 12 of 2011	- 29 -
3.3	The National Heritage Conservation commission Act.....	- 31 -
3.4	The Forest Act Cap 199 of 1973.....	- 31 -
3.5	The Zambia Wildlife Act No. 12 of 1998.....	- 32 -
3.6	The Fisheries Act of 2011 (Instrument No. 22 of 2011).....	- 32 -
3.7	Employment Act Cap 268.....	- 32 -
3.8	Workers Compensation Act No. 10 of 1999.....	- 33 -
3.9	The Water Resources Management Act of 2011	- 33 -
3.10	The Water Supply and Sanitation Act No. 28 of 1997	- 34 -
3.11	Public Health Act Cap 295 of 1978.....	- 34 -
3.12	Lands Act Cap 29 of 1995.....	- 34 -
3.13	The Local Government Act	- 34 -
3.14	The Petroleum Act Cap 439 and the Energy Regulation Act Cap 436.....	- 35 -
3.15	Factories Act Cap 441 (Amended by Act 21 of 1994)	- 35 -
3.16	Agricultural Lands Act	- 35 -
3.17	The Noxious Weeds Act, Cap 231	- 36 -
3.18	The Plant, Pests and Diseases Act.....	- 36 -
3.19	Plant Variety and Seeds Act (Amended by Act 21 of 1995).....	- 36 -
3.20	International Conventions.....	- 36 -
3.21	Agriculture (Fertilisers and Feed) Act 13 of 1994.....	- 38 -
4.0	DESCRIPTION OF THE PROPOSED PROJECT	- 39 -
4.1	Agricultural Activities	- 42 -
4.2	Land Preparation.....	- 42 -
4.2.2	Tillage	- 43 -
4.2.3	Planting	- 43 -
4.2.4	Tendering of the crop.....	- 43 -
4.2.5	Fertilizer, pesticide and herbicides application	- 44 -
4.2.6	Harvesting	- 44 -

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

4.2.7	Storage.....	- 45 -
4.2.8	Irrigation.....	- 45 -
4.3	Crops.....	- 45 -
4.3.1	SOYABEANS (<i>Glycine max</i>).....	- 45 -
4.3.2	MAIZE (<i>Zea mays</i>).....	- 49 -
4.3.3	IRRIGATED WHEAT (<i>Triticum aestivum</i>).....	- 55 -
5.0	PROJECT ALTERNATIVES.....	- 60 -
5.1	Site Alternative	- 60 -
5.2	Alternative Process	- 60 -
5.3	Power, Transport and Water Supply	- 60 -
5.4	Crops.....	- 60 -
5.6	Alternative Pollution Control Methods.....	- 60 -
5.7	Impacts of Alternatives	- 60 -
6.0	ENVIRONMENTAL BASELINE STUDY	- 62 -
6.1	Project overview	- 62 -
6.2	Location and Physiography.....	- 62 -
6.2.1	Physical Location	- 62 -
6.2.2	Topography	- 63 -
6.2.3	Soils.....	67
6.2.4	Visual Features.....	67
6.3	Climate.....	65
6.3.1	Rainfall.....	66
6.3.2	Temperature	67
6.3.3	Evaporation	67
6.3.4	Humidity	68
6.3.5	Wind.....	68
6.4	Agricultural Suitability and Land Capability.....	68
6.4.1	Agricultural Suitability.....	68

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.4.2	Land Capability	68
6.5	Land Use	69
6.6	Energy and Mineral Resources	69
6.7	Bushfire Hazard	69
6.8	Hydrology/Water Resources	70
6.8.1	Surface water	70
6.8.2	Groundwater	71
6.9	AIR QUALITY	72
6.9.1	GASEOUS EMISSIONS	73
6.9.2	DUST	74
6.9.3	Noise and vibration	75
6.10	FAUNA	79
6.10.1	MAMMALS	79
6.10.2	REPTILES	79
6.11	FLORA	79
6.11.1	Species Diversity	83
6.11.2	Volume of the tree	83
6.12	BIRDS	85
6.13	INSECTS	85
6.14	Geology	86
6.15	Socio-Economic baseline	87
6.15.1	Scope of work, Assumptions and methodology	87
6.15.1.1	Scope of work	87
6.15.1.2	Literature Review	87
6.15.1.3	Interviews	87
6.15.2	Background and Geographical Location	87
6.15.2.1	District background and Geographical Location	87
6.15.3	Government, Administration and Population characteristics	88

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.15.3.1 Provincial Government and Administration	88
6.15.3.2 Traditional Government and Administration.....	89
6.15.3.3 Social Fabric and structure of Mpongwe.....	89
6.15.3.4 Cultural Resources	90
6.15.4 Economic Activities.....	91
6.15.4.1 Agriculture and Timber.....	91
6.15.4.2 Mining.....	92
6.15.4.3 Employment and incomes.....	92
6.15.4.4 Kanyenda Survey Site findings.....	92
6.15.4.5 Housing and housing characteristics.....	92
6.15.4.6 Housing sizes(previous Vs current site).....	93
6.15.4.7 Lost land(cultivated Vs Uncultivated).....	94
6.15.4.8 Community Perception of Resettlement Programme.....	95
6.15.4.9 Lifestyle Disruption.....	95
6.15.4.10 Compensation.....	96
7.0 ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS	98
7.1 ENVIRONMENTAL IMPACTS.....	101
7.1.1 PREPARATION/ PLANNING AND CONSTRUCTION PHASE IMPACTS	101
7.1.2 OPERATIONAL PHASE IMPACTS	104
7.1.3 DECOMMISSIONING AND CLOSURE	106
7.2 SOCIO – ECONOMIC IMPACTS.....	107
7.2.1 Impacts of flooding of fields, houses	107
7.2.2 Impacts of possible drinking water contamination.....	108
7.2.3 Impacts of air pollution on residents	108
7.2.4 Pressure on existing facilities/social services.....	109
7.2.5 Impacts on Labour situation/employment	111
7.2.6 Impact on Settlements and private farms	111
7.2.7 Impacts on public/workers safety and health	112

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

7.2.8	Impacts of poor conditions of service	112
7.2.9	Impacts of HIV/AIDS	113
7.2.10	Impact of out grower scheme to local farmers.....	113
7.2.11	Improved Local Authority Revenue base	113
8.0	ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS.....	133
8.1	Mitigation Measures for Environmental Impacts	133
8.2	Mitigations for the Socio-economic Impacts	133
8.3	Emergency preparedness and Response Plan.....	154
8.4	Environmental and Social Monitoring Plan.....	152
9.0	Decommissioning and Closure Plan	160
9.1	Project background	160
9.2	Brief project description	160
9.2.1	Preparation phase	160
9.2.2	Construction phase	161
9.2.4	Decommissioning and closure phase	162
9.3	Closure objectives.....	162
9.4	Decommissioning during construction (abandonment of project).....	163
9.4.1	Potential Effects	163
9.4.2	Mitigation measures	165
9.5	Decommissioning after ceasing operation	165
9.6	Dismantling of equipment and farm machinery	166
9.6.1	Un-installation/ Removal of the Centre Pivot.....	166
9.6.2	Removal of Pumps and Burying of Boreholes.....	166
9.6.3	Movement of re-usable farm machinery	166
9.7	Demolition of the Farm House, Workers Compound and related infrastructure.....	166
9.8	Enhancement of Soil fertility on land used for growing crops	166
9.9	Removal of surface fuel storage tank and related structures.....	166
9.10	Installation of warning signage and symbols.....	167

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

9.11	Post closure sampling and analysis.	167
9.11.1	Water.....	167
9.11.2	Soil.....	168
9.11.3	Air and Noise.....	168
9.12	Environmental closure plan budget.....	169
9.13	Stakeholder consultation.....	171
9.14	Conclusion.....	172
10.0	REFERENCES	168

LIST OF TABLES

Table 1: Planned Cultivation Activities	- 19 -
Table 2: Project Material Requirements	- 20 -
Table 3: Estimated Crop Yield.....	- 21 -
Table 4(a): Particulars of Shareholders.....	- 26 -
Table 4(b): Particulars of Directors	- 26 -
Table 5: Summary of Proposed Investment.....	-25-
Table 6: Pesticides and Herbicides application.....	-41-
Table 7: Varieties of Soya Beans.....	-42-
Table 8: Herbicides application	-43-
Table 9: Lime soil requirements.....	-44-
Table 10: Insect Control Requirement for soya beans.....	-44-
Table 11: Disease control for soya beans.....	-45-
Table 12: Land Management.....	-47-
Table 13: Seed rates at different plant population.....	-48-
Table 14: Herbicides application for maize.....	-48-
Table 15: Soil Nutrient Requirements.....	-49-
Table 16:Conservation farming requirements.....	-50-
Table 17: Pest control Guidance.....	-51-

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 18: Common Diseases.....	-51-
Table 19: Wheat Seed Variety Characteristics.....	-53-
Table 20: Recommended Herbicides for weeding.....	-54-
Table 21: Fertilizer application for wheat.....	-54-
Table 22: Wheat Lime requirements.....	-55-
Table 23: Mean, Monthly Temperature, precipitation & Evapotranspiration.....	-66-
Table 24: Ground water analysis Results	-72-
Table 25: Ambient Air Quality Measurement results.....	-74-
Table 26: Dust Measurement Results.....	-75-
Table 27: Ambient Air pollutants guidelines.....	-75-
Table 28: Ambient Noise level Results(7 th April, 2012).....	-76-
Table 29: Ambient Noise level Results(8 th April, 2012).....	-77-
Table 30: Ambient Noise level Results(9 th April, 2012).....	-78-
Table 31: Species and Number of trees recorded.....	-82-
Table 32: Summary of Vegetation structure and composition.....	-82-
Table 33: Species Diversity estimated figures.....	-83-
Table 34: Volume of wood produced during site Clearance	-83-
Table 35: Summary Volume of wood to be cleared.....	-85-
Table 36: Mpongwe District population for 2010.....	-89-
Table 37: Impact Characterization Parameters.....	-99-
Table 38: Impact Characterization.....	-110-
Table 39: Environmental Management Plan.....	-129-
Table 40: Socio- Economic Management Plan.....	-144-
Table 41: Emergency Preparedness and Response Plan.....	-151-
Table 42: Environmental and Social Monitoring Plan.....	-154-
Table 43: Closure Objectives.....	-157-
Table 44: Project abandonment Potential Effects	-160-
Table 45: Water Analysis Parameters.....	-163-

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 46: Proposed Closure Budget estimate.....-165-

LIST OF FIGURES

Figure 1: Farming process flow diagram	- 62 -
Figure 2: Location of Mpongwe District.....	-53-
Figure 3: Site Map of Kanyenda Farm	- 63 -
Figure 4: Location Map of Kanyenda Farming Project.....	-64-
Figure 5: Topography of Kanyenda Farm.....	-65-
Figure 6: 3 D VISUALISATION OF KANYENDA FARM.....	-66-
Figure 7: Drainage Map of Kanyenda Area.....	67
Figure 8: Satellite Image of Kanyenda Area.....	69
Figure 9: Rainfall Hyetograph, Minimum and maximum Temperature Variation for Kanyenda	67
Figure 10: Surface Run Off Direction on Kanyenda Farm.....	71
Figure 11: Vegetation on the proposed project site1	80
Figure 12: Vegetation on project Site	81
Figure 13: General Geology of kanyenda Farm Area.....	86
Figure 14: Copperbelt District Map (<i>Source: Mpongwe E.S.A, 2005</i>)	88
Figure 15: Kanyenda Ward Population Distribution	90

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Acronyms and Abbreviations

TORs	-	Terms of Reference
EPB	-	Environmental Project Brief
EIA	-	Environmental Impact Assessment
EIS	-	Environmental Impact Statement
EMP	-	Environmental Management Plan
SMP	-	Social Management Plan
ZEMA	-	Zambia Environmental Management Agency
EMA	-	Environmental Management Act
UNZA	-	The University of Zambia
Mt	-	Metric tonnes
DRC	-	Democratic Republic of Congo
IAP	-	Interested and affected parties
N/A	-	Not applicable
Ha	-	Hectares
RHC	-	Rural Health Centre
MDC	-	Mpongwe District Council
ZESCO	-	Zambia Electricity Supply Company
NEAP	-	National Environmental Action Plan
NCS	-	National Conservation Strategy
GRZ	-	Government of the Republic of Zambia
ECZ	-	Environmental Council of Zambia
EPPCA	-	Environmental Protection and Pollution Control Act
SI	-	Statutory Instrument
ZAWA	-	Zambia World Life Authority
CRB	-	Community Resource Board

**The Environmental Impact Statement for the Proposed Soya
beans, Wheat and Maize Growing Project by Kanyenda Farming
Limited in Mpongwe District**

GMA	-	Game Management Area
WRMA	-	Water Resources Management Act
CBD	-	Convention on Biological Diversity
FAO	-	Food and Agricultural Organisation
HIV	-	Human Immune Virus
AIDS	-	Acquired Immune Deficiency Syndrome

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

LIST OF APPENDICES

APPENDIX 1: Construction drawings for kanyenda farms structures

APPENDIX 2: Site map for Kanyenda farming.

APPENDIX 3: Picture profile: Kanyenda farming area.

APPENDIX 4: Minutes of consultative meeting held at council chamber.

APPENDIX 5: Minutes of scoping meeting

APPENDIX 6: Minutes of the Disclosure meeting

APPENDIX 7: Invitation to scoping meeting

APPENDIX 8: Scoping meeting attendance list

APPENDIX 9: Consultative meeting attendance list

APPENDIX 10: Disclosure meeting attendance list

APPENDIX 11: Study Terms Of Reference approval letter

APPENDIX 12: Minutes of meeting held at Chief Kalunkumya's palace

APPENDIX 13: Ministry of lands Correspondences with Kanyenda Farms

APPENDIX 14: Proof of compensation and sale for land owners

APPENDIX 15: List of compensated land owners

APPENDIX 16: Certificate of title for Kanyenda Farms

APPENDIX 17: Certificate of incorporation for Kanyenda Farming Limited

APPENDIX 18: Approved Terms Of Reference for Kanyenda Farming EIA

APPENDIX 19: Kanyenda Farming Investment Licence

APPENDIX 20: Design drawings of Sewerage Management facility.

APPENDIX 21: Design drawings of the Fuel facility.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

1.0 Executive Summary

Kanyenda Farming Limited, the project proponent is a registered Zambian company (Company Registration No. 94255) located in Kanyenda Farming block in chief Kalunkumya's area in Mpongwe District of the Copperbelt Province. Kanyenda Farming Limited recently acquired farm No. F/10848 with a total of 669 hectares located along Kasamba Road, 4kilometers from Kanyenda township to the north east. The road leading to the project area is accessible throughout the year, though it is unpaved. Geographically, the farm is situated between latitudes 13°22'15''S and 13°24'18''S and between longitudes 28°13'24''E and 28°15'05''E.

The developer intends to develop the farm and grow Soya Beans, Maize and Wheat to be used for the production of animal feed for the poultry industry at Golden Lay Limited in Baluba area.

The main purpose of this Environmental Impact Assessment (EIA) is to improve project planning by ensuring environmental considerations are taken into account in all aspects of the project implementation from preparation to decommissioning phase. It is also in fulfilment of the requirements of the Environmental Management Act (EMA) of 2011.

The background to the project undertaking was due to the recent acquisition of ETC Bio-Energy by Zambeef Products Plc. Prior to the acquisition, ETC Bio-Energy was the main supplier of the Maize, Soya Beans and Wheat for the table egg business at Golden lay Limited. The project is estimated to attract an investment of United States Dollars Nine Hundred and Eighty Thousand (**US\$ 980,000.00**) to be invested in three phases beginning 2012 to 2015. The project proponents have conducted agricultural projects such as the Golden lay limited which is the largest supplier of table eggs in Zambia and exports to countries such as Congo DRC and Zimbabwe. The main objectives of the project are:

- To install one centre pivot in phase 3 of the project depending on the availability of underground water.
- To extend the power line from the 11 KV at Nkanga Hill to Kanyenda Farming Limited to utilize 300KVA for the project undertaking.
- To clear vegetation and plough the soil in a well-planned manner.
- To sink ten (10) water boreholes for both domestic water supply and for irrigation purposes.
- To sell the Soya Beans, Wheat and Maize to Golden Lay Limited to produce stock feed as a ready market.
- To construct all other relevant infrastructure such as a fuel storage tank, farm house, workers compound, sewage management system, workshop, fertiliser storage shed, chemical storage area, fencing around the farm and a security guard check point.
- To improve the economic standing of Kanyenda Farm Block as the project implementation will increase the revenue base of the area, creation of employment (both seasonal and permanent).

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

The farming project is expected to produce the following yields at full operation capacity; 1,450 Mt Soya Beans, 4,200 Mt Maize and 2,100 Mt Wheat.

The anticipated positive impacts of the project will include:

- Employment creation for the local people.
- Formulation of an Out Grower scheme to benefit local farmers.
- Improved access to electricity.
- Improved agricultural productivity.
- Increased disposable income.
- Market creation for locally grown and harvested crops.
- Improved road conditions.
- Creation of new housing units for workers.
- Water resource availability through drilling of community boreholes.
- Generation of government revenue.

The following negative impacts are anticipated from the project;

- Increased HIV/ AIDS prevalence rates due to mixing of locals, migrant labour and visitors.
- Increased prices for local products due to increased demand resulting from increased population.
- Increased traffic in the area due to movement of delivery and haul trucks.
- Increased noise and vibration during the construction and operation phases.
- Air pollution from dust due to machinery movement on dust roads on site.
- Occupation hazards associated with construction phase.
- Water flooding and run off due to increased tillage and soil orientation.

Mitigation measures for the anticipated environmental and socio-economic negative impacts will be dealt with using a planned Environmental Management Plan (EMP) and Emergency Preparedness and Response Plan.

Public consultations held in respect of the project indicated willingness on the part of the local authority, the Chief, local leaders and the community at large to welcome and support the implementation of the project because it will bring the much desired development in the area. Kanyenda Farming Limited therefore will implement the project in line with the provisions of the relevant laws and the support of the community in the project area.

Sincerely,

Fletcher Michael Broad

Director-Kanyenda Farming Limited

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

2.0 Introduction

Kanyenda Farming Limited, is a newly established privately owned Zambian Company (Registration No. 94255) located in the Kanyenda Farming Block in chief Kalunkumya's area in Mpongwe District. The company owns and intends to develop Farm F/10848 with a total area of 669 hectares and is located along Kasamba Road, off the Old Luanshya-Mpongwe road in the Kanyenda Farm Block. From Kanyenda Township, the farm is located 4 kilometres away on the north east.

Kanyenda Farming Limited intends to grow and harvest Soya Beans, Maize and Wheat for Golden Lay Limited which is located on plot Number 3031 Baluba road in Luanshya. Golden Lay Limited is a table egg business and produces 9000 trays of eggs per day. It is the largest supplier of eggs in Zambia. The company also exports to countries like Congo DRC and Zimbabwe bringing in much needed foreign currency.

2.1 Background of the project

The majority of raw materials (Soya Beans, Maize and Wheat) sourced for feed production for the poultry industry had become a challenge in the recent past on the Copperbelt due to two main reasons; firstly, ETC Bio –Energy which was the main source of the raw material was sold off to Zambeef Products Plc. Zambeef could no longer continue to supply the raw material to Golden Lay Limited as the arrangement had been with ETC Bio-Energy. Secondly, there was a nationwide shortage of Soya Beans affecting production at Golden lay limited. It is with this background that the developer established Kanyenda Farming Limited and acquired Farm F/10848 in Kanyenda Farming Block of Mpongwe District to grow Soya Beans, Wheat and Maize which shall in turn be used to produce stock feed for the layers in order to sustain the poultry industry and national food security.

2.2 Summary description of the project including project rationale

The proposed project will involve the growing of Soya Beans, Wheat and Maize both during the rainy season and by centre pivot irrigation during the dry season.

A total of 600 Ha of land at full operation capacity will be cultivated for the planting of the above named crops in phases depending on the water availability. In phase 1; a total of 210 Ha will be cleared and prepared for planting soya beans, maize and wheat in the 2012 farming season. Phase 2 will involve an addition of 300 Ha to increase the projected crop output. Phase 3 will include clearing of additional 90 Ha to make the total area for cultivation to 600 Ha in the first three phases. Phases 2 and 3 will be undertaken in 2013 and 2014 respectively depending on the availability of underground water. All the three phases will incorporate drilling of boreholes and installation of one centre pivot in the third phase. The centre pivot will have a 60Ha coverage capacity. The project will be undertaken for a period corresponding to the land tenure of 99 years as stipulated in the certificate of title.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 1: Planned Cultivation Activities

Phase	Planned activity	Implementation period	No. Of boreholes	Estimated area to be covered (Ha)
1	Installing power line ,borehole siting & drilling	4 th quarter-2012	3	210
2	Borehole siting & drilling	1 st quarter-2013	3	300
3	Borehole drilling, centre pivot installation	2 nd quarter-2013*	4	90

*Note: *dependent on sufficient ground water availability.*

Hydro electricity will be sourced from the nearest ZESCO 11 KV line located at Nkanga Hills (*co-ordinates; 13°24' 27.61" S and 28° 15' 48.48" E*) 3 Km on the southern side of the proposed project site as the first option. The second option is to connect to the grid originating from Kanyenda settlement area on the western end of the project site. This option will cover 6Km in order to reach the project site.

The power line receiving point (farm house) is at the following co-ordinates; *13° 23' 43.61" S and 28° 14' 48.48" E* making it approximately 3Km and 6Km from Nkanga Hills and Kanyenda Settlement area respectively.

An assessment of the path to be followed when installing the line from the two sources was made and option 1 was adopted considering that the distance to be covered is shorter and there are no notable settlements in the proposed passage of the power line. A full assessment will be made in collaboration with ZESCO's Environment and Social Affairs Unit ,ZESCO Mpongwe office , Mpongwe District Council and the Kanyenda Chiefdom to determine standard distances from settlements that will be used when installing the power line. The estimated total power consumption of the farm at full capacity will be 300 KVA. This will include centre pivots, borehole pumps and domestic (household) power consumption requirements.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

2.2.1 Project material requirements

During the operation phase of the project, various raw materials will be utilized at different stages of the project undertaking. Their application and storage on site are presented in the table below.

Table 2: Project Material Requirements

Raw materials/Equipment	Application	Storage Area	Responsible person
Wheat, Maize ,Soya Beans	Crop seeds for planting	Chemical store	Farm manager, Store keeper
Pesticides, herbicides	Crop protection, pest control	Chemical store	Farm manager, Store keeper
Fertilizer	Soil nutrition	Chemical store	Farm manager, Store keeper
Diesel fuel, oil, lubricants	Driving farm Machinery	Fuel storage tank, Lubricant/oil store	Workshop manager
Water	Irrigation of crops, Domestic use	Rainfall, boreholes	Farm manager, irrigation engineer
Agricultural lime	Soil PH stabilization	Chemical store	Farm manager, Store keeper
Tractors, Planters.	Ploughing and seed planting	Machinery workshop	Workshop manager
Boom sprayer	Pest, weed control	Machinery workshop	Farm manager
Combine harvester	Produce harvesting	Machinery workshop	Farm manager

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

At full production capacity (at the end of phase three), Kanyenda Farming limited will produce an estimated 1,450 Mt of Soya Beans, 4,200 Mt Maize and 2,100 Mt Wheat. Details of the estimated yields for each crop are summarised in table 3 below determined at total expected maximum yield capacity per crop.

Table 3: Estimated Crop Yield

Phase	Cultivated Area(Ha)	Planted crop	Estimated Yield (Mt/Ha)	Total Yield Estimate (Mt)
		Soya Beans	1.9-2.1	441
1	210	Maize	6.5-7.0	1470
		Wheat	3.0-3.5	735
		Soya Beans	2.6	780
2	300	Maize	6.5-7.0	2100
		Wheat	3.0-3.5	1050
		Soya Beans	2.6	234
3	90	Maize	6.5-7.0	630
		Wheat	3.0-3.5	315

The process flow of the activities to be undertaken at the farm during the operation phase are shown in the figure below.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

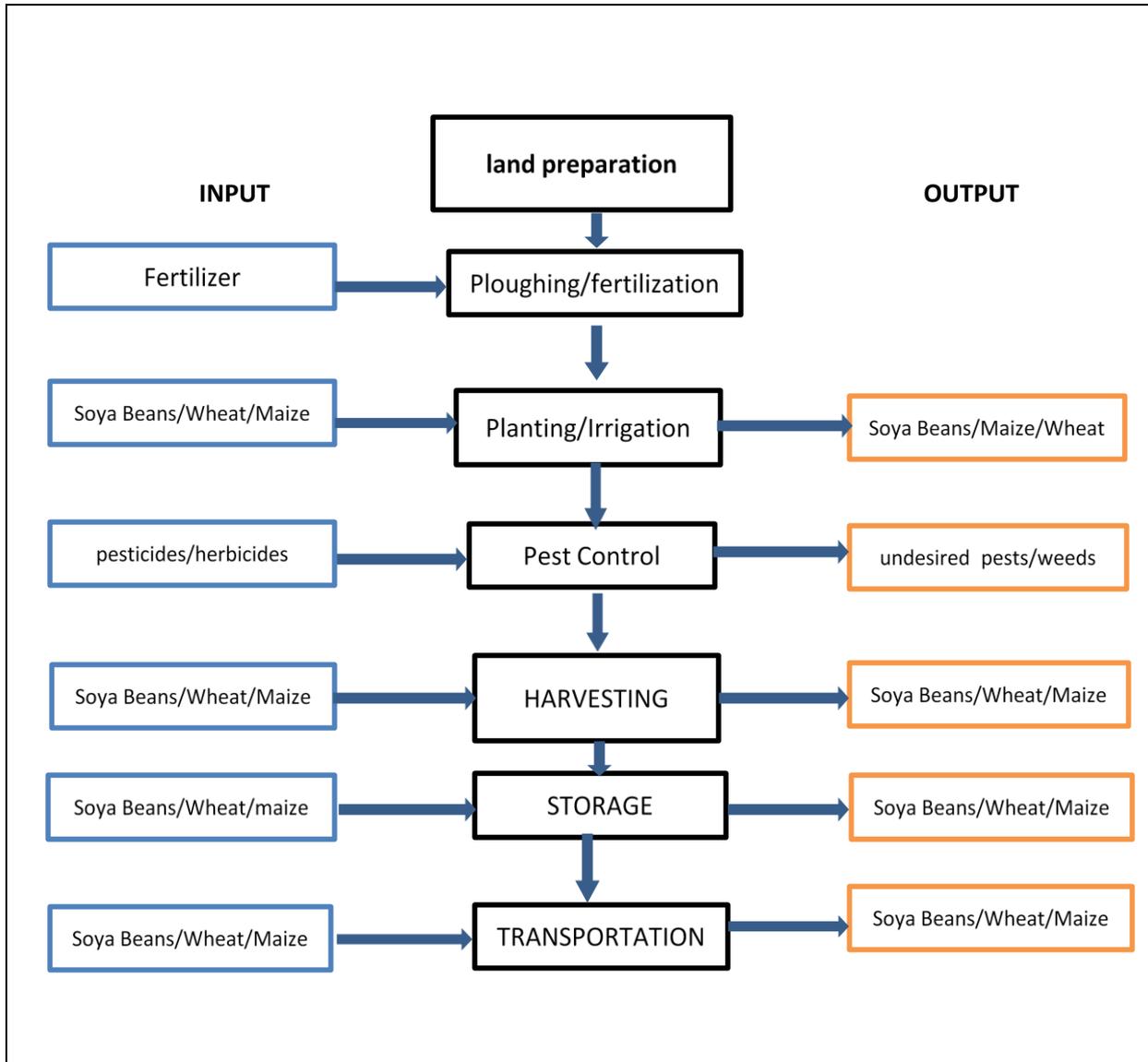


Figure 1: Farming process flow diagram

2.2.2 Products and by-products of the project

The expected products of the project are soya beans, maize and wheat with each crop’s estimated yield as indicated in table 3 above.

During the operation phase of the project, some by products in form of waste will be generated. Types of waste to be generated will include agricultural solid waste resulting from fertiliser, seed, chemical packaging material and rejected and/or unused seeds. Domestic waste from housing units will also be generated. This waste will be dumped at a local authority designated dumpsite in Mpongwe District. Kanyenda Farming Ltd will not operate a dump site. All the domestic waste generated at Kanyenda will be transported to the dump site owned and operated by the Mpongwe District Council. The empty containers and

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

packages will be re-used at the farm at the recommendation of the chemical suppliers for the storage of similar chemicals only.

In order to attain complete project success, Kanyenda Farming Limited will undertake the implementation of the project in three phases. Activities to be undertaken will be categorized under the following phases: Preparation, Construction, Operational and Decommissioning & Closure phase activities.

(i) Preparation Phase

The preparation phase, prior to the commencement of this project will include but not limited to the following activities:

- Obtaining relevant authorization and documentation from regulatory bodies including ZEMA, ZESCO, Mpongwe District Council (MDC) and other relevant authorities for the project undertaking.
- Delivery of construction and farm machinery to site.
- Borehole siting and drilling.
- Identification and liaison with local farmers for potential out grower schemes.
- Hiring of onsite local labour for the construction phase.
- Procurement and delivery of construction raw materials to site.
- Communication with relevant stakeholders on project commencement.

(ii) Construction Phases

- Site clearing to facilitate construction of Farm House, Workers Compound, chemical store, fuel storage tank and machinery workshop.
- Fencing off the area to demarcate the farm boundaries and avoid animal and human trespass into the farm area.
- Construction of a Farm House for the farm manager incorporating an office.
- Construction of Workers houses including all support infrastructure. The block of houses will comprise eight (08) by 3 roomed houses on a 6m by 24m block.
- Construction of a Sewerage Management Facility. The system will be composed of two (02) inspection manholes joining from the worker's house toilets. The manholes will then connect to a septic tank which will empty into a soak away. The system will incorporate a monitoring borehole for monitoring the likelihood of ground water contamination by the system.
- Power line extension, transformer installation and connection from Nkanga Hill to Kanyenda Farms.
- Construction and installation of one centre pivot, borehole water reservoir, piping and pump installation.
- Installation of a surface water storage tank and construction of pump house at the farm house.
- Access Roads and drainages along the main road to alleviate historical flooding problems.
- Clearing of Vegetation and stumping to prepare the land for farming.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

(iii) Operational Phase Activities

Activities to be undertaken in this phase will be repetitive as the farming system will be conducted in crop rotation one crop after the other. At full operation capacity, on complete centre pivot installation, the pivot will be used for crop per season basis with crop rotation done in the next season.

- Ploughing of the fields.
- Delivery and Storage of Farming Inputs (seed, fertilizer, agro chemicals, etc).
- Pumping of water from the Boreholes to the water reservoir.
- Planting, irrigation and growing of Soya Beans, Maize and Wheat.
- Harvesting of Soya Bean, Maize and Wheat.
- Temporary Storage of Soya Beans, Wheat and Maize at the Farm.
- Transportation of the Soya Beans, Wheat and Maize to the market.
- Obtaining of all environmental licences relating to the operation of the farm.
- Generation of domestic solid and hazardous waste.
- Fuel storage and use of lubricant on machinery.

(iv) Decommissioning and Closure Phase Activities

- Demolition of the Farm House, Workers Compound and all other infrastructure.
- General Cleaning, grading and levelling of areas demolished.
- Enhancement of Soil fertility in the areas graded and levelled.
- Enhancement of Soil fertility on land used for growing crops.
- Removal of the above ground fuel storage tank for alternative use.
- Rehabilitating all contaminated sites such as the workshop area and the surrounding of the fuel storage facility.
- Un-installation/Removal of the Centre Pivot.
- Removal of Pumps and Burying of Boreholes.
- Re-vegetation of the areas which had buildings and any other infrastructure.
- Re-vegetation of the land used for growing of crops.
- Post closure sampling and analysis of borehole water (some boreholes will be left for this purpose) and soil.

2.3 Objectives the project

The main objective of the project to be undertaken on site is to develop 669Ha of dry land into commercial farming land to plant, grow and harvest Soya beans, Maize and Wheat. In order to achieve this overall objective, the following sub-objectives need to be realized:

- To install one centre pivot in phase three of the project depending on the availability of underground water.
- To extend the power line from Nkanga Hill to Kanyenda Farming Limited.
- To clear vegetation and plough the soil in a well-planned manner.
- To sink ten (10) water boreholes for both domestic water supply and for irrigation purposes.
- To sell the Soya Beans, Wheat and Maize to Golden Lay Limited to produce stock feed as a ready market.
- To construct all other relevant infrastructure such as a fuel storage tank, farm house, workers compound, sewage management system, workshop, fertiliser storage shed, chemical storage area, fencing around the farm and a security guard check point.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

- To improve the economic standing of Kanyenda Farm Block as the project implementation will increase the revenue base of the area, creation of employment (both seasonal and permanent).

2.3.1 Purpose of the Environmental Impact Assessment

The Environmental Impact Assessment is conducted as a fulfilment of the requirement of the Environmental Management Act (EMA) of April, 2011 read together with the EIA regulations (statutory instrument No.28 of 1997).

The main purpose of this Environmental Impact Assessment (EIA) is to improve project planning by ensuring environmental considerations are taken into account in all aspects of the project implementation from preparation to decommissioning phase.

The process of conducting the EIA study and subsequent preparation of the Environmental Impact Statement will provide for:

- (a) Inclusion of all environmental considerations affecting the project from the planning stage.
- (b) Identification of all potential negative effects of the project at an early stage and prescribing mitigation measures. Enhancement of positive project impacts to the benefits of all stakeholders and the environment.
- (c) Ensuring that all interested and affected parties participate in decision making concerning the project.
- (d) Provision of a guide for carrying out mitigation and monitoring measures.

2.3.2 Approach and methodology used in the EIA study

The standard EIA process was followed in conducting the study in accordance with the provisions of the Environmental Management Act No.12 of 2011 read together with the Environmental Impact Assessment regulation (Statutory Instrument No.28 of 1997).

The following approach was undertaken in conducting the EIA study for the project:

- Detailed discussion with the project developer on the proposed project including all environmental and socio considerations.
- Reconnaissance survey of the project area.
- Organisation of the scoping meeting which included media advertising and written invitation of key stakeholders.
- Organisation of the district level stakeholders meeting to disclose the technicalities of the project.
- Holding of scoping meeting and preparation of scoping report thereafter.
- Preparation of the scoping report and terms of reference (TOR's) for subsequent submission to ZEMA.
- Mobilisation of the study team for specialised studies of the project.
- Conducting of the baseline study which included approved TOR based field work study, desktop studies, measurement, sampling and analysis of relevant parameters, oral interviews with the locals and expert stakeholders and/or interested and affected parties.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

- Formulation, preparation and submission of the Environmental Impact Statement (EIS).

2.4 Brief description of the Location

The proposed project site is located along Kasamba road 4km from Kanyenda Settlement Area off the Luanshya-Mpongwe road in the Kanyenda Farming Block on Farm F/10848 in Mpongwe District of the Copperbelt Province. It is located approximately 16Km from the Mpongwe Business District. The proposed project site was initially customary land in His Royal Highness Chief Kalunkumya's area which has since been converted to lease title in the name of Kanyenda Farming Limited. The proposed project area is approximately 669 Ha in total.

The site is bordered by Kasamba road on the east facing the Nkanga Hills and the nearest settlements are the villages on the other side of Kasamba road with most of the inhabitants being peasant farmers and charcoal burners. The northern end of the farm is bordered by Nyirenda's farm stretching over 60 Ha to the east. On the south-western boundary is Chimbila village located over 1Km from the proposed project site.

Kanyenda farming block's main activities include peasant farming mainly cultivating maize and charcoal burning. The area also has a market located 4km away from the site along the Mpongwe –Luanshya road where locals conduct their daily trading activities. Main goods sold are vegetables, agro supplies and household needs such as groceries (*appendix3*). Kanyenda Rural Health Centre (RHC) is located approximately 3km from the site along Kasamba road. The institution is surrounded by its staff houses on its north and Baptist Church on the east.

2.5 Particulars of Shareholders/Directors

Table 4(a): Particulars of Shareholders

NAME	NATIONALITY	% SHAREHOLDING
Fletcher Michael Broad	AUSTRALIAN	67
Mohammed Bushary	SRI LANKAN	33

Table 4(b): Particulars of Directors

NAME	POSITION	QUALIFICATION
Fletcher Michael Broad	Director	-
Mohammed Bushary	Director	ACCOUNTANT

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

2.6 The developer's physical address and contact person

Contact Person: Mr. Mohamed Bushary & Fletcher Broad

Designation: Directors

Mobile: +260 977 719540 or +260 977 366433

E-Mail: mbushary@zamnet.zm or broadfam05@yahoo.com

Postal Address: P.O. Box 90749

Physical Address: Plot No.3037, Baluba Road, Luanshya.

2.7 Track Record/Previous Experience of Enterprise Elsewhere

The Directors of Kanyenda Farming Limited, the project proponents have years of experience in conducting agricultural related projects that include poultry rearing and egg production at Hybrid poultry on the Copperbelt. The directors of the company are also co-owners of Golden Lay Limited, the largest producer of table eggs on the Copperbelt.

2.8 Total Project Cost/Investment

Kanyenda Farming Limited intends to invest Nine Hundred and Eighty Thousand Dollars (US \$ 980, 000) for the full implementation of the project. The investment will be conducted in phases depending on the availability of ground water to be used for irrigation for non rain fed cultivation of the proposed crops. The table below shows the summary of the estimated breakdown of the investment to the project.

Table 5: Summary of proposed investment

ITEM DESCRIPTION	QTY	RATE/UNIT COST(\$)	ESTIMATED COST(\$)	SUPPLIER/ COMMENT
1. IRRIGATION				
A. Centre Pivot *	1	210,000	210,000.00	Phase 3
B. Irrigation lines*	600m	22/m	13,200.00	
C. Reservoir	529m ³		10,000.00	Phase 3
D. Pumps/Fittings		-	10,000.00	
E. Electricity *			55,000.00	ZESCO
F. Borehole Drilling*	10	6,150	49,500.00	
G. Borehole lining	10	2,200	15,500.00	3 per phase
Subtotal A			363,200.00	
2. CONSTRUCTION				
A. Housing Units	8		140,000.00	
B. Workshop	1		9,000.00	
C. Chemical Store	1		6,000.00	
D.Sewerage Facility	1		4,000.00	
E. Fuel(diesel)	5000L	9,600/L	9,600.00	
F. labour			65,000.00	Throughout
G. Fuel storage tank	1	-	9,000.00	

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

H. Gravel Haul roads			22,000.00	
I. EMP			218,020.00	
Subtotal B			482,620.00	
3. EQUIPMENT				
A. Planter	2		12,000.00	Seasonal hire
B. Combine Harvester	1		19,000.00	Seasonal hire
C. Grader	1		8,580.00	Hire
D. Excavator	1		6,600.00	Hire
E. Boom Sprayer	2		14,000.00	Hire
F. Tractors	3		0	Owned
G. On site Equipment repair & service			9,000.00	In house
4. ENV. & SOCIAL MONITORING			65,000.00	Operation phase
Subtotal C			134,180.00	
GRAND TOTAL(US \$)			980,000.00	

*Note: * Estimated costs based on actual quotations obtained from suppliers of various goods and services.*

2.9 Proposed Project Implementation Date

Kanyenda Farming Limited intends to implement the project undertaking in November ,2012 upon obtaining approval from the Zambia Environment Management Agency (ZEMA) and other local authority establishments within the district.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

3.0 Policy, Legal and Institutional Framework

This section briefly describes laws, regulations, treaties and/ or conventions that have relevance and bearing on the proposed project.

3.1 History of the Environmental Regulatory Framework in Zambia

Due to the need for balancing environmental requirements, economic activities and social needs, the Government of the Republic of Zambia (GRZ) adopted the National Conservation Strategy (NCS) in 1985. This was upgraded to the National Environmental Action Plan (NEAP) in 1992 with the same aim of fostering sustainable development. The NCS and NEAP are the foundation pillars of environmental laws in Zambia.

The NCS facilitated development of the Environmental Protection and Pollution Control Act (EPPCA) in 1990 which also facilitated formulation of the Environmental Council of Zambia (ECZ) in 1992. The EPPCA was repealed in 2011 into the Environmental Management Act No. 12 of 2011, which is the current supreme environmental management law. Consequently, the name of the mother environmental regulatory body changed from Environmental Council of Zambia (ECZ) to Zambia Environmental Management Agency (ZEMA).

3.2 The Environmental Management Act No. 12 of 2011

This Act was immediately preceded by the Environmental Protection and Pollution Control Act No. 12 of 1990. Provisions of the Environmental Management Act require that all new projects begin with an Environmental Impact Assessment (EIA) and thereafter, licensing, auditing and compliance inspections follow.

Applicable Regulations under the Environmental Management Act No. 12 of 2011 are described below.

- a) **Environmental Impact Assessment Regulations, SI No. 28 of 1997.** These Regulations provides the main framework under which EIAs are conducted, submitted to ZEMA and considered for either approval or rejection.

These regulations are relevant as they give guidance to the developer (Kanyenda Farming Limited) as to what is supposed to be done at every stage of the EIA process. The requirements of conducting an EIA are all stipulated under these regulations and the developer shall ensure compliance at every stage. The EIA regulations also gives a guide line as to how much review fee will be paid to ZEMA for the purpose of reviewing the EIS for the proposed project.

- b) **Air Pollution Control (Licensing and Emissions Standards) Regulations of 1996 (SI No. 141).** These Regulations provide air quality standards and guidelines for mitigating air pollutants. The guidelines are for ambient air and point source emissions.

Though no air permit will be required at the proposed project site, the construction phase and operation phase (during ploughing) dust will be generated and will finally end in ambient air and cause dust fallout within and outside the proposed project site. The air

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

control regulations will help the developer to put up appropriate measures to curb this dust generation.

Also the air control regulations prohibit open air burning (section 15) for this reason the developer shall ensure no open air burning at the farm. In this air contamination from gases and dust will be regulated at the farm.

- c) **Water Pollution Control (Effluent and Waste Water) Regulations, 1993 (SI No. 72).** These Regulations provide for control of water pollution by providing standards for managing water pollutants and effluent discharge. The standards stipulated under these Regulations are for industrial effluent. The Regulations also provide requirements for licensing all effluent discharge points and they have a provision for monitoring criteria in terms of analytical methods.

The relevance of water pollution regulation to this project is that chemicals, fertilisers and hazardous waste might pollute both ground and surface water. Kanyenda farming Limited will adhere to these regulations to avoid contamination of ground and surface water.

The proposed project will comply with this regulation by proper transportation, storage and handling of chemicals and hazardous waste at the proposed project site. The chemicals, fertilisers and hazardous waste once it has mixed with irrigation and or storm water it will cause contamination of water. The developer will make sure none of these get into surface and ground water.

- d) **Waste Management (Licensing of Transporters of Waste and Waste Disposal Sites) Regulations, 1993 (SI No. 71).** Under these Regulations, activities relating to waste management such as waste generation, collection, storage and disposal are regulated. Kanyenda Farming will transport all its domestic waste to the licensed dump site owned and operated by the Mpongwe District Council. Therefore this regulation is very relevant to Kanyenda's waste management and transportation policies.

- e) **Hazardous Waste Management Regulations, 2001 (SI No. 125).** These Regulations make provisions for management of hazardous wastes such as used oil, used fluorescent tubes and used oil filters. The Regulations provides for management activities such as generation, storage, transportation, treatment, recycling, importation, exportation and disposal.

The relevance of this regulation is that the project will generate hazardous waste in form of used oil and batteries whose generation, handling, storage and disposal will need to be licensed.

- f) **Pesticides and Toxic Substances**
Statutory Instrument No. 20 of 1994 Pesticides and Toxic Substances Regulations – provides for licensing of importation, transportation, distribution and storage of pesticides and toxic substances. The proposed project will use Pesticides, herbicides and fungicides in controlling pests and weeds. There will be a possibility of contaminating the soil and or

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

ground water from the use of these chemicals. The developer will follow the guidelines according to this act in the use of these chemicals.

g) Ozone Depletion Substances Regulation of 2000

These regulations state provisions for the transpiration, use and storage of ozone depletion substances in the environment. Activities and or equipment that might contribute to ozone depletion at the farm will conducted, transported, used and stored in accordance to these regulations.

3.3 The National Heritage Conservation commission Act

The National Heritage Conservation commission Act CAP 173 of 1989 stipulates preservation and protection of ancient cultural and natural heritage resources and objects of aesthetic, historical and archaeological value. In this Act, “Ancient Heritage is defined as being among other things, any structure, settlement previously inhabited, land mark, burial place or any other item designated by the commission which is known or believed to have been erected, constructed or used before 1st January 1924. The Act also provides for the formation of the National Heritage and Conservation Commission which is the responsible institution.

This act is relevant since the clearing of vegetation, construction of the farm infrastructure may damage heritage sites if there are any. This act will guide the developer what to do in case such sites are found on the proposed project site on how to protect the site.

3.4 The Forest Act Cap 199 of 1973

The Forest Act of 1999 has not yet been enforced hence the 1973 Forest Act is still active. The legislation provides for establishment, gazetting and de-gazetting of forests. It also provides for monitoring, management and regulation of forest areas and forest products, nationwide, and particularly in National and Local Forests.

This Act provides for protection of Six (6) tree species in Zambia whether in a protected area or outside. These tree species are:

- a) *Azelia quanzensis* (Pod Mahogany);
- b) *Baikiaea plurijuga* (Teak);
- c) *Entandrophragma caudatum* (Mountain Mahogany);
- d) *Faurea saligna* (Beech wood);
- e) *Khaya nyasica* (Red Mahogany); and
- f) *Pterocarpus angolensis* (African Teak).

Although the area is not gazetted as a Forest Reserve, it has flora species which shall be cleared to pave way for construction of infrastructure and farming. The developer will follow the guidelines in this act when clearing the vegetation.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

3.5 The Zambia Wildlife Act No. 12 of 1998

The Zambia Wildlife Act No. 12 of 1998 provides for establishment of the Zambia Wildlife Authority (ZAWA) and provides the enabling legislation for the sustainable management of wildlife resources in Zambia. The Act also provides for regulation of all wildlife activities such as hunting, poaching and keeping of wild animals. The local management of wildlife resources and habitats is partly delegated to Community Resource Boards (CRBs) in designated Game Management Areas (GMAs). The CRBs in turn are given commission for the income generated from GMAs.

Although the proposed project site does not fall in a GMA, the ZAWA Act is relevant in that the area is habitant to animal and bird species which may or may not be endangered. The developer will follow the requirements of this act in order to conserve the animal and bird life.

3.6 The Fisheries Act, No. 22 of 2011 .

The act provides for the appointment of the Director of Fisheries and fisheries officers and provides for their powers and functions. It promotes sustainable development of fisheries and a precautionary approach in fisheries management, conservation, utilization and development. It establishes fisheries management areas and fisheries management committees and provides for the regulation of commercial fishing and aquaculture. It establishes the Fisheries and Aquaculture Development Fund. It has replaced the Fisheries Act, 1974.

The implementing institution for this Act is the Ministry of Fisheries and Livestock. The Act regulates all fishing activities in Zambia undertaken in any kind of aquatic ecosystem. This includes lakes, rivers and streams. It also regulates activities that may interfere with fisheries.

Although there are no streams and or rivers within and in the vicinity of the proposed project site, contamination of surface water runoff may eventually contaminate surface water after travelling for kilometres. The proposed project will follow the guidelines in this act to achieve sustainable development.

3.7 Employment Act Cap 268

This Act provides conditions under which employees should work in Zambia. The Act covers both temporary and permanent employees. Generally, this Act talks about employee protection and social security requirements. Major provisions include:

- Minimum contractual age;
- Establishment of employment contracts;
- Settlement of disputes arising from such contracts of employment;
- The appointment of Labour Officers and other staff for the administration of the Act; and
- Certain conditions of employment such as ordinary leave, sick leave, maternity, redundancy and welfare of employees.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

The developer will comply with this act by employing the required age, establishing contracts, conditions of service and settling disputes in accordance with this act.

3.8 Workers Compensation Act No. 10 of 1999

This is a social security Act which has provisions for employee compensation in case of injury or death of an employee whilst at work. It is a requirement under this Act that all employers register their employees with the Workers Compensation Fund and make periodic subscriptions for compensation of their employees.

The employer will remit subscriptions and will reward compensation to its workers in accordance with this act.

3.9 The Water Resources Management Act of 2011

The Water Resources Management Act (WRMA) of 2011 regulates the use of surface and ground water for any of the following purposes; environmental, training and research, municipal, agriculture, industrial, hydro-electric, mining, navigation and any other activity that may be specified by the water regulatory board.

Activities under these purposes may include but not limited to the following;

- a) Use water for purposes specified under section sixty, other than for domestic purposes specified under section seventy of the Water Resource Management Act No. 21 of 2011;
- b) Construct, acquire any water works, impound, supply or distribute water from any water or borehole to any other person;
- c) De-water any mine, quarry or water works;
- d) Drain any swamp, marsh, dambo, wetland, re-charge area or other land;
- e) Construct or acquire any water works for the purpose of draining into, conserving or utilizing, in any manner whatsoever, water from a water resource;
- f) (Construct water works necessary to restore the course of a water resource that has changed its course;
- g) Harvest any rainwater by means of a dam, weir or barrage that is on a water resource;
- h) Conduct any operation that would interfere with the bank or course of a watercourse;
- i) Sink, deepen or alter any borehole for any purpose in a water shortage area; or
- j) Carry any activity in relation to a water resource as may be prescribed.

The relevance of this act to Kanyenda farming is that it will regulate how Kanyenda will utilise the ground water resources, protect both surface and ground water from contamination.

Kanyenda Farming limited will comply with this act by doing all that is required. Being a new act, Kanyenda Farming Limited will extensively consult with the Water Board to make sure all the requirements are met and the environment and water resources are protected.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

3.10 The Water Supply and Sanitation Act No. 28 of 1997

The Water Supply and Sanitation Act provides for the regulation and standards applied in the provision of public water and sanitation services. It also provides for permitting of water supply and sanitation service provision.

Water supply and sanitation at the farm will follow the guidelines and standards as stipulated in this act. The farm house and the workers compound will be supplied with potable water from boreholes and sanitation will employ septic soak way arrangement. Water quality of the portable water will be monitored as required by the water supply and sanitation act to make sure quality water is supplied to the workers and the surrounding communities that will draw water from the farm boreholes. Sanitation of the area will depend on the management of sewer waste and the developer will at all cost follow the guidelines and requirements of this act to make sure that the health of the workers and the communities around the farm are safe guarded.

3.11 Public Health Act Cap 295 of 1978

This Act provides for prevention and suppression of public health hazards. It regulates all matters and activities that are connected to outbreak of diseases. Local Authorities, in this case Mpongwe District Council is the custodian of the Public Health Act. Provisions of the Act are implemented by Councils through licensing and inspections.

Activities such as sanitation, health and safety that border on public health at the farm will be dealt with in accordance with this act.

3.12 Lands Act Cap 29 of 1995

The Lands Act controls all matters pertaining to the management/use of land and land tenure systems.

The land was acquired from the local chief and has since been converted from customary land into title lease holder farm land. The act has been fully complied with and any further issues that may arise Kanyenda Farming Limited will endeavour to comply with this act.

3.13 The Local Government Act

The Local Government Act CAP 474 of 1991 provides for a system of local government administration in Zambia at city, municipality and district Council levels. Each local governance level has delegated statutory functions with respect to development planning. The Act also allows Councils to implement environmental protection and natural resources management functions which include prevention of pollution of water supplies and has some control in undertaking of its farming operations.

The act is relevant as issues of environmental protection and natural resource management will be affected by this developmental project. The developer will follow the provisions of this act.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

3.14 The Petroleum Act Cap 439 and the Energy Regulation Act Cap 436

The Petroleum Act provides for control of conveyance and storage of petroleum products such as diesel and petrol. The Act provides further provides for control measures regarding production, transportation, handling, distribution, re-sale and use of energy.

The Energy Regulation Act of 1995 makes provision with respect to the production and distribution of energy in Zambia and establishment of the Energy Regulation Board (ERB) for purposes of control and licensing of energy undertakings. In accordance with this Act, ERB shall, in conjunction with other Government agencies, formulate measures to minimize the environmental impacts of transportation, storage and use of fuels and enforce such measures by attachment of appropriate conditions to licences held by such undertakings.

Fuel transportation, storage and use at the farm may affect the environment negatively. The developer will follow the requirements of this act when transporting, storing and using petroleum products.

3.15 Factories Act Cap 441 (Amended by Act 21 of 1994)

The act states provisions for the regulation of the conditions of employment in factories and other places as regards the safety, health and welfare of persons employed therein; to provide for the safety, examination and inspection of certain plant and machinery; and to provide for purposes incidental to or connected with the matters aforesaid.

The Factories Act provides a framework for the setting of regulations to ensure the safety, health and welfare of persons employed on construction work sites and in factories. All construction sites are subject to provisions of the Act as a place of work.

Personal Protective Equipment (PPE) will be required to meet the provisions of this Act. Safety and operational procedures for the operation of the farm equipment during shall be governed by this Act.

3.16 Agricultural Lands Act

The Agricultural Lands Act Cap 187 gives provisions for the establishment of the agricultural lands board, alienation of agricultural lands, tenant farming schemes, valuations of agricultural lands and powers of the minister as far as agricultural lands is concerned. The act also discusses the use of timber on agricultural lands.

The act is very relevant to Kanyenda Farming Limited as all the provisions mentioned above will require to be conformed to and the use of timber of the farm land will be in accordance to the given provisions on use of timber. It is also relevant to the project in that the area will be used for Agriculture purposes.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

3.17 The Noxious Weeds Act, Cap 231

The Noxious Weeds act gives provisions for the regulation of weeds declared noxious in an area or agricultural lands. The relevance of this act to Kanyenda Farming Limited is that Kanyenda Farming Limited will not import, distribute, convey and or sale any noxious weed or any part thereof or of any seed with which the seed of any particular noxious weeds has become mixed with as provided in the act. Kanyenda Farming Limited will remove any noxious weeds as identified and instructed by an authorizing officer acting legally and in accordance with this act.

3.18 The Plant, Pests and Diseases Act

The plant, pests and diseases act cap 233 has provisions for eradication and prevention of spread of pests, control of importation of growing media, injurious organisms, invertebrates and plants, cured tobacco and miscellaneous.

In the farming process, pests will also come up and Kanyenda Farming Limited will take all necessary measures within the provisions of this act to eradicate and prevent the spread of pests within and outside the proposed project site. Importation of any growing media, injurious organisms, invertebrates and plants will be controlled in accordance with the provisions of this act. There will be no growing and or curing of tobacco at Kanyenda Farming Limited.

3.19 Plant Variety and Seeds Act (Amended by Act 21 of 1995).

The plant, pests and diseases act gives provisions on administration, registration of seed importation and cleaning, seed certification, inspection of seeds, prescribed seeds, import and export of seed, offences related to seeds and miscellaneous issues regarding seeds.

Kanyenda Farming Limited will only plant seed that has been certified by authorised agencies in Zambia. Only prescribed seeds inspected by authorities officers acting legally will be planted at the farm. In an event that Kanyenda Farming Limited may require to import seeds, it shall be done in accordance with this act. There will be no exportation of seed from Kanyenda Farming Limited.

3.20 International Conventions

Zambia is a signatory to a number of international conventions. Conventions of significance to the proposed project are briefly described below.

- a) **Ramsar Convention:** - The general objective of the Ramsar Convention is to curtail the loss of wetlands and to promote wise use of all wetlands. The convention addresses one of the most important issues in Southern Africa, namely the conservation of water supplies and use of the natural and the human environments in an intergenerational equitable manner.

In an event that the proposed project site has a wetland within its vicinity, Kanyenda Farming Limited will take all necessary measures to protect the wetland taking into consideration sustainability, inter and intra generation equity law norm.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

- b) **African Convention on the Conservation of Nature and Natural Resources (Algiers,1968), (Maputo, 2003):-** The objective of the convention is to encourage individual and joint actions for the conservation, utilization and development of soil, water, flora and fauna for the present and future welfare of mankind. This must be done from an economic, nutritional, scientific, educational, cultural and aesthetic point of view.

Kanyenda Farming Limited will put in place necessary measures to conserve the ecology within and in the vicinity of the proposed project site. Best available farming technologies/ methods will be used at the farm.

- c) **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES):-** The objective of this agreement is to ensure that international trade of wild flora and fauna does not endanger their existence. The convention is customized through the Zambia Wild Life Act No. 12 of 1998 and the implementing body is Zambia Wildlife Authority.

Kanyenda Farming Limited not in any way will temper with Endangered Species of Wild Fauna and Flora. The Ecologist will carry out a schematic and efficient study of the fauna and flora within and in the vicinity of the proposed project site. If any endangered species are found appropriate mitigation measures shall be put in place.

- d) **Kyoto Protocol to the United Nations Framework Convention on Climate Change: -** The aim is to further reduce greenhouse gases by enhancing the national programs of developed countries aimed at this goal and by establishing percentage reduction targets for the developed countries.

The Kyoto Protocol is relevant to Kanyenda Farming Limited as by all means Kanyenda is required to reduce on those activities that might increase on green house gas emissions and promote activities that will enhance carbon sequencing.

- e) **Convention on Biological Diversity (CBD):-** The major aim of the CBD is to effect international cooperation in the conservation of biological diversity and to promote sustainable use of living natural resources worldwide. It also aims at bringing about sharing of the benefits arising from utilization of natural resources. A number of plans in this convention fall under the Department of Agriculture, Forestry, Fisheries and ZAWA.

Kanyenda Farming Limited will comply with this convention by working hand in hand with the concerned line ministries and agencies in the sustainable use of the water, land and other natural resources available at the proposed project site.

- f) **Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal: -** The objective is to control import and export of hazardous wastes. It also aims at ensuring that any trans-boundary movement and disposal of hazardous waste, when allowed, is strictly controlled and takes place in an environmentally sound and responsible manner.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

It is expected that all chemicals and reagents that will be required on the farm will be bought locally within Zambia. Kanyenda Farming Limited will comply with this convention by not exporting any of its hazardous waste.

- g) **Convention on Migratory Species and the African –Eurasian Water Bird Agreement:** - Like other migratory species, water birds cross several international borders during their migration, facing a wide range of threats. Without international cooperation, conservation efforts of one country can be meaningless if these birds are not protected in another country.

Kanyenda Farming Limited will endeavour to protect any migratory species if any is found in the proposed project site.

- h) **The United Nations Framework Convention on Climate Change (UNFCCC):**- It was signed by Zambia in 1992. The main objective is to achieve stabilization of greenhouse gas concentrations in the atmosphere. Zambia recognizes that the largest source of one of the main greenhouse gases, carbon dioxide, is from burning wood fuel and the use of coal and oil.

Kanyenda Farming Limited will take all precautions to make sure that the contributions to green house gases from its activities are minimal. The closure phase will involve re-forestation and only areas required to be ploughed will be cleared of its vegetation. Sections of trees will be left between areas to be cultivated.

3.21 Agriculture (Fertilisers and Feed) Act 13 of 1994

The act provides for the regulation and control of the manufacture, processing, importation and sale of agricultural fertilisers and farm feed. It also provides for minimum standards of effectiveness and purity of such fertilisers and feed.

Kanyenda Farm Limited will strictly follow the requirements and provisions in this act. It shall make sure that the purity of fertilisers and feed conform to stipulated standards. It shall import and or locally buy fertilisers and feed from recommended and registered fertilisers and feed dealers/ companies.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

4.0 DESCRIPTION OF THE PROPOSED PROJECT

The proposed project will essentially require the preparation of land for farming. This will involve clearing of vegetation, tillage, planting, fertilizer application and weeding, harvesting, and temporal storage of wheat, maize and soyabeans.

Activities to be undertaken will be categorized under the following phases: Preparation, Construction, Operational and Decommissioning & Closure phase activities.

Preparation Phase

The preparation phase, prior to the commencement of this project will include but not limited to the following activities:

- Obtaining relevant authorization and documentation from regulatory bodies including ZEMA, ZESCO, Mpongwe District Council (MDC) and other relevant authorities for the project undertaking.
- Delivery of construction and farm machinery to site, borehole siting and drilling.
- Identification and liaison with local farmers for potential out grower schemes.
- Hiring of onsite local labour for the construction phase.
- Procurement and delivery of construction raw materials to site.
- Communication with relevant stakeholders on project commencement.

Construction Phases

- Site clearing to facilitate construction of Farm House, Workers Compound, chemical store, fuel storage tank and machinery workshop.
- Fencing off the area to demarcate the farm boundaries and avoid animal and human trespass into the farm area.
- Construction of a Farm House for the farm manager incorporating an office.
- Construction of Workers houses including all support infrastructure. The block of houses will comprise eight (08) by 3 roomed houses on a 6m by 24m block.
- Construction of a Sewerage Management Facility. The system will be composed of two (02) inspection manholes joining from the worker's house toilets. The manholes will then connect to a septic tank which will empty into a soak away. The system will incorporate a monitoring borehole for monitoring the likelihood of ground water contamination by the system.
- Power line extension, transformer installation and connection from Nkanga Hill to Kanyenda Farms.
- Construction and installation of one centre pivot, borehole water reservoir, piping and pump installation.
- Installation of a surface water storage tank and construction of pump house at the farm house.
- Access Roads and drainages along the main road to alleviate historical flooding problems.
- Clearing of Vegetation and stumping to prepare the land for farming.

Operational Phase Activities

Activities to be undertaken in this phase will be repetitive as the farming system will be conducted in crop rotation one crop after the other. At full operation capacity, on complete

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

centre pivot installation, the pivot will be used for crop per season basis with crop rotation done in the next season.

- Obtaining of all environmental licences relating to the operation of the farm.
- Ploughing of the fields.
- Delivery and Storage of Farming Inputs (seed, fertilizer, agro chemicals, etc).
- Pumping of water from the Boreholes to the water reservoir.
- Planting, irrigation and growing of Soya Beans, Maize and Wheat.
- Harvesting of Soya Bean, Maize and Wheat.
- Temporary Storage of Soya Beans, Wheat and Maize at the Farm.
- Transportation of the Soya Beans, Wheat and Maize to the market.
- Generation of domestic solid and hazardous waste.
- Fuel storage and use of lubricant on machinery.

Decommissioning and Closure Phase Activities

- Demolition of the Farm House, Workers Compound and all other infrastructure.
- General Cleaning, grading and levelling of areas demolished.
- Enhancement of Soil fertility in the areas graded and levelled.
- Enhancement of Soil fertility on land used for growing crops.
- Removal of the above ground fuel storage tank for alternative use.
- Rehabilitating all contaminated sites such as the workshop area and the surrounding of the fuel storage facility.
- Un-installation/Removal of the Centre Pivot, removal of Pumps and Burying of Boreholes.
- Re-vegetation of the areas which had buildings and any other infrastructure.
- Re-vegetation of the land used for growing of crops.
- Post closure sampling and analysis of borehole water (some boreholes will be left for this purpose) and soil.

During the lifecycle of the project, construction of built structures in the form of staff houses, garage, chemical store and perimeter fence will be undertaken. Other structures to be constructed include the under listed:

(i) Internal and haul roads

Internal haul roads will be constructed as pathways during the construction, operational phases of the project. This will involve grading and levelling of the proposed haul roads. Internal roads will be constructed avoiding cutting down of trees as a means of conservation. Trees near the roads will act as dust shields since the road will be gravel.

Construction of an access road to the facility will also be undertaken to ease access to the site by haul trucks bringing supplies to the farm and taking harvested crops to the end users. Haul roads will incorporate drainage systems to take care of the historical flooding problem experienced in the area.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

(ii) Sewerage management facility

Construction of a Sewerage Management Facility will be undertaken on site since Kanyenda Farming Block is not serviced by municipal sewer and effluent collection and management systems such as sewerage treatment plants. The system will be composed of two (02) inspection manholes joining from the worker's house toilets and other sources of waste water. The manholes will then connect to a septic tank which will empty into a soak away.

The system will incorporate a monitoring borehole to be drilled at approximately 56m from the system in the direction of natural water flow for monitoring the likelihood of ground water contamination by the system. The operation design of the septic tank will be based on a 36 hour retention time with daily flow assumed at 140 litres per person. The total proposed capacity of the septic tank will be 9200 litres at normal operation.

The same system will be adapted for the manager's house but will incorporate one (01) inspection manhole, septic tank and soak away. Construction will be designed to incorporate future developments that would increase the waste water output from the farming facility. The system layout is shown in appendix 20.

(iii) Power supply line

The nearest source of power from the project site is Nkanga Hill where there is an existing power supply line from Zesco. The powerline supplies the entire Mpongwe district via the national grid. Kanyenda Farms Limited will tap power from this facility which is 3km away. The Nkanga Hill power line has 11 KV supply capacity and will be stepped down to the required usage capacity at the farm through installation of step down transformers. This will be done with the permission and professional expertise of Zesco who are the custodians of power supply in Zambia. Kanyenda farms anticipates to use 300KVA to sufficiently operate the machinery to be installed on site. Construction of this power line will be done in close collaboration with Zesco and ZEMA as regards environmental considerations of the project.

(iv) Water supply borefields and connecting pipelines

A total of ten (10) boreholes will be sited and drilled on site for the supply of water for both irrigation and domestic use at the farm. The availability of water from the drilled boreholes will determine the installation of centre pivots to be used for irrigation of crops. Water pumps and pipes will be installed to complete the water supply system at the farm.

(v) Fuel storage facility

The construction of this facility will include installation of a 5000L surface fuel tank for the storage of Diesel fuel on a concrete slab and will also include a fuel dispenser. The facility will be installed under a roof covering to prevent storm water coming into contact with the storage tank. The slab for the surface fuel tank will have spoon drains leading to a water-oil interceptor which will drain into a soak away. An impermeable bund wall will be constructed around the tank with dimensions of 4m X 2.5m X 0.5m to contain any spillages (*see attached drawing*). Fire fighting equipment comprising dry chemical powder (DCP), Carbon

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

dioxide (CO₂) fire extinguishers will be installed. Others will include fire blankets, sand buckets and first aid equipment for emergency and accident response.

A lubricant store for storage of engine oils, grease and other heavy oils will also be constructed at the farm. A secure waste oil storage facility will also be put up with impermeable surface and walls to prevent ground water and soil contamination at the facility. Used oil generated from the farm equipment workshop will be stored in drums in the used oil facility and disposed of by selling to ZEMA licensed used oil dealers in the area.

(vi) Machinery Workshop and Chemical store

A workshop for repair and service of farm equipment will be constructed on site. The workshop will incorporate a used oil receptacle, storage of used batteries. Used oil will be kept in drums and sold off to ZEMA licenced dealers once it accumulates to significant levels. Repair of machinery will have high peak and low peak periods during which time generation of used oil may be minimal. Used batteries will also be sold to licenced collectors.

All chemicals (pesticides and herbicides), seeds and fertilizer will be stored in properly designed and constructed chemical store. This facility will have adequate natural and artificial lighting, adequate ventilation, emergency shower in case of chemical contamination and warning signs. Chemicals stored will be used in rotation using First In First Out (FIFO) method. Kanyenda Farming limited will obtain relevant licences for the storage of the chemicals to be used on the farm.

4.1 Agricultural Activities

Agriculture is the main economic activity of Mpongwe District. Its prominence as one of the most agricultural productive districts on the Copperbelt has even earned it the tag “The Granary of the Copperbelt” and this is not far from the truth. The district has all categories of farmers as per the Ministry of Agriculture and Cooperatives (MACO) description.

The Kanyenda farming project will involve cultivation of Soya Beans, Wheat and Maize on a 669 Ha piece of land on a commercial basis. The developer intends to initially develop 210 Ha and thereafter increase the farming capacity to 300 Ha and an additional 90 Ha in the first, second and third phases respectively in the next three years. The first phase of the project development will be conducted soon upon approval while the other two phases will be done as more resources are available. One centre pivot will be installed in the third phase of the development plan in order to irrigate the proposed crops.

4.2 Land Preparation

4.2.1 Bush Clearing

The project site had patches of already cleared land from the previous farming activities conducted by peasant farmers prior to acquisition of the land by Kanyenda Farming Limited. Vegetation clearing will be done using commercial bulldozers and excavators. Where the vegetation is very thick, two bulldozers cross cutting by chain saw will be the preferable

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

method. It is estimated that more than 60 % of the land is covered with trees and is undeveloped.

After the trees are felled, stacking will follow and this will be done on selected emplacement points. Some of these trees may be given to the locals for firewood and charcoal so as to deter them from cutting more trees, especially during this period of development.

For the purpose of protecting the environment, caution will be taken not to disturb the soils. It is also the intention of the developer to leave trees standing especially at the boundaries and between fields to provide wind breaks.

4.2.2 Tillage

Minimum tillage will be done using a rotary hoe of disc mounted on a tractor. After primary tillage, secondary operations such as harrowing and discing should be conducted to remove clods. If clods persist a second discing/harrowing operation may be necessary. All stones should be removed from the field to prevent serious damage to implements.

A good tilth is essential for most crops but it should not be too fine. These operations should give a satisfactory seed bed and at the same time, ensure that the land is free from weeds at planting time.

Good land preparation will ensure excellent yields as the plants will be offered an opportunity to germinate almost at the same time. This crucial as far as obtaining a good yield is concerned.

4.2.3 Planting

The developer intends to use a planter to do the sowing. This will render timely execution of farming activities.

A planter is an essential implement for commercial farming. It is towed behind a tractor and lay seeds down in precise manner along rows. Seeds are distributed through devices called row units. The row units are spaced evenly along the planter.

4.2.4 Tendering of the crop

Weeds in the inter-row will be effectively controlled with herbicides or mechanical weeding. This will be done at the pre- and post emergence stages. The idea is to smother weeds away so as to reduce competition with the crop. The herbicides to be recommended are those that are selective to avoid damaging the crop.

For both post and pre-emergence stages, timing is critical, windy situations should be avoided to prevent drift of chemicals. The soil regime where the chemical is being applied should be wet to ensure effective adherence to the soil particles. For runaway weeds, hand picking should be employed.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

4.2.5 Fertilizer, pesticide and herbicides application

The fertilizers to be used on the farm will be mainly basal and top dressing fertilizers. The nutrient content in these fertilizers is nitrogen, phosphorus, and potassium. In Zambia these are applied as either D-compound for basal or urea for top dressing.

In the absence of inorganic fertilizers, organic fertilizers such as cow dung, chicken manure or legumes can be applied. Organic fertilizers will be promoted on the farm so as to preserve the natural fertility of the soil. Kanyenda Farming Limited will fully utilise the chicken manure produced at Golden Lay Limited's poultry houses in order to enhance use of organic fertilizers. Kanyenda Farming proposes to utilize chicken manure at the rate of 10Mt per Ha in the fields.

A wide range of chemicals in the form of pesticides and herbicides will be utilized at the farm at various stages of growth of the crops.

Specific pesticides will be used for pest control on each crop. The control of weeds in the field will be done using herbicides with crop-specific application rates and times. Table below gives specific pesticides and herbicides that will be used for the three crops.

Table 6: Pesticide and Herbicides application

Planted crop	Pesticide to be applied	Herbicide to be applied	Application method
Soya Beans	Folicur plus	Fomesafen	Boom sprayer
	Artea	Chlorimuran	Boom sprayer
	Imidachloprid	Gramoxone	Boom sprayer
	Fumaphos(crop-phos)	Fusillade	Boom sprayer
	Treflan 45 (trifluralin)	Dual (metalachlor)	Boom sprayer
Wheat	Imidachloprid	Glyphosate	Boom sprayer
	Lambdacyhatothrin	Omerus super	Boom sprayer
	Alpha cypermetrine	propaquizafof	Boom sprayer
Maize	Imidachloprid	Glyphosate	Boom sprayer
	Folicur C	Tebutryn	Boom sprayer
	Dursban	Gesaprim super	Boom sprayer
	Lambdacyhatothrin	Gluphosate 450	Boom sprayer

Each herbicide and pesticide will be applied in their right concentrations using boom sprayers. No aerial application of chemicals will be conducted on the farm.

4.2.6 Harvesting

It is the intention of the developer to harvest the crop using combine harvesters and human labour. Soyabeans and wheat will be harvested immediately they are mature to avoid shattering which may result in high losses.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Maize may be left in the field for quite longer so as to reduce the moisture content. The recommended moisture content at which maize may be stored is about 12%.

4.2.7 Storage

Temporary storage may take place at the farm. The produce will then be hauled straight to Golden Lay upon harvest.

4.2.8 Irrigation

The full development of Kanyenda Farm will depend on the availability of adequate groundwater with a good yield for irrigation. The developer will install one centre pivot to supplement rain-fed agriculture with dry weather agriculture.

A number of boreholes have been sited and some have turned out to be dry wells. However, 3 boreholes have been found to have adequate water. The pumping test conducted revealed that these boreholes have an average flow rate of 5 l/s.

4.3 Crops

4.3.1 SOYABEANS (*Glycine max*)

Introduction

Soya bean is one of the important food legume crops grown in Zambia by both commercial and small scale farmers. Soyabeans has the highest concentration and the most balanced quality of protein amongst food legume crops. The soyabeans oil is also an important source of cooking oil and the cake, left after extraction, is a valuable animal feed. Soyabeans are an excellent rotational crop with cereals. Yield increases of up 25% have been obtained in a maize/Soya Beans rotation. Soya Beans are host plants to nematodes and are not recommended for rotations with other susceptible crops such as potatoes, tobacco, etc.

Varieties

There are a number of varieties of soyabeans. Some of these are listed in Table 4.1 below.

Table 7: Varieties of Soya Beans

Variety	Maturity (Days)	Days to shattering	Yield potential (kg/ha)	Remarks
Hernon 147*	120	10	1500	Promiscuous
Magoye*	130	7	2000	Promiscuous
Santa Rosa	110	20	2500	Needs Inoculation
Kaleya	115	18	2500	Needs Inoculation
Tunia	120	18	2500	Needs Inoculation

*These varieties mainly used by small scale farmers are particularly suitable for production when inoculums are not available.

It is important to note that there are other varieties that have come on the scene.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Climate and Soil Requirements

Provided soils are deep and well drained, soyabeans will grow well on a wide range of soils varying from loamy sands to clay loams, although the heavy textured soils are potentially higher yielding. Optimum growing temperature is 20 – 25°C. Optimum soil pH of 5.0 – 5.5 is required. Moisture, at the critical pod-fill stage (March), rather than soil type is the main limiting factor.

Recommended Management Practices

Seed Rate

Seed rate of 100 to 80kg/ha for Hernon 147 and Magoye respectively. 75 to 110 kg/ha for Santa Rosa, Kaleya and Tunia. With germination being generally poor in soyabeans higher seed rates are preferred.

Row Spacing

Optimum row spacing is 50cm (for hand weeding) or 75cm (machine powered weeding). For drilling, either by hand or by a seed planter, 30 seeds per meter should be drilled for 50cm rows. When the rows are 75cm apart, 40 seeds per meter should be drilled.

Narrow rows (50cm) give higher yields. Row widths above 75cm and below 30cm tend to decrease yields with present varieties.

Planting

Optimum planting time is between middle to end of December (all areas of the country). Soyabeans are day length sensitive and no yield advantage is gained from planting earlier than mid-December with the recommended varieties. Early planting encourage the occurrence of red leaf blotch disease. January plantings result in shorter plants and lower yields.

Weeds

Since soyabeans is usually planted in mid season most early weeds are destroyed during land preparations. Soya beans should be kept weed free especially during the first seven weeks. Usually 2 – 3 weedings is sufficient as shade from narrow (50cm) rows suppresses later weeds.

Herbicides can also be used to smother weeds and should be applied at recommended rate.

Table 8: Herbicides Application

Weeds	Chemical	Rates of application per ha
Annual weeds	Treflan 45 (trifluralin)	1.0-2.0 litres
	Dual (metalachlor)	1.5-2.2.5 litres

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Broad leaved weeds	Afalon (linuron) pre-emergence	2.0-3.0kg
	Basagram 48 (bentazon) post- emergence	1.5-4.0 litres

Fertilizer

Soya Beans are efficient at utilising residual fertility and it is becoming increasingly common practice to adopt a policy of maximizing the basal fertilizer in cereal rotations (e.g. with Wheat) and to sow Soya Beans without any direct fertilization. Soil tests are recommended for specific advice.

If the fertility of the soil is in question, application of “D” compound fertilizer at the rate of 1 bag per lima will be carried out. In acidic soils, Lime application will be conducted as a recommendation. Kanyenda Farming Limited will also utilise Chicken manure at the rate of 10Mt per Hectare.

Inoculum

Inoculum, containing suitable strains of Rhizobium, is available from suppliers on order. The use of inoculum is always recommended for commercial production.

Lime

Table 9: Lime Soil Requirements

Soil type	Critical pH (CaCl ₂)	Maintenance lime requirements* kg/ha
Sands	4.6	500 - 1 000
Sandy loams	4.8	1 000 - 1 500
Sandy clays	5.0	1 500 - 2 000

* Guide only. Specific requirements are best determined by soil tests.

Crop Protection

Insects

Soya beans can stand up to 20 – 30% foliage loss before flowering without serious yield losses. For this reason, soyabeans in Zambia do not yet have economically serious insect problems. However, they do have occasional attacks by cutworms, looper caterpillar and stink bugs.

Table 10: Insect Control Requirements for Soya Bean

Insects	Chemical control	Rate/ ha
Cutworm* (Agrotis spp)	Dursban (chlorpyrifos) 4 E**	0.8

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Looper Caterpillar*** (<i>Xanthodes graellsii</i>)	Thiodan (endosulfan) 50 W. P or Sevin (carbary) 85 W.P	liters 2.0 kg 2.0 kg
Stink Bug**** (<i>Nezara</i> sp)	Fastac 10% EC	175 ml

* Spray at first sign of damage. (Seedlings cut at ground level).

** Control variable in dry conditions.

*** Treatment only necessary for heavy infestations-uncommon, as natural biological control, by virus normally occurs. (Caterpillars cause defoliation).

****Spray when the count reaches more than two per meter length of row, or one per meter in a seed crop. (Stink Bugs pierce pods causing seed shrivel and abortion).

Diseases

Dark-reddish brown blotches caused by a fungus (*Pyrenochaeta glycine*) have had a major concern in Zambia for soyabeans for many years. They appear on the lower leaves and spread up the plant progressively. Similar lesions, which later form blotches, also appear on the petioles, stems and pods. Planting before the recommended date encourages the development of the disease. None of the present varieties offers resistance. In severe cases Brestan may be sprayed, once, at the pod-fill stage at 1.0kg/ha product.

Scerotina Stem Decay (*Screrotina sclerotiorum*).

Only recently recorded and is characterized by a wilting of the upper leaves and the appearance of water- soaked lesions on the stem covered by a white cotton growth, in which hard black bodies (*Screrotia*), resembling mouse droppings are embodied.

No variety is resistant. Physical contamination of seeds with the sclerotia is a major cause of disease spread. Prolonged periods of high soil moisture and high relative humidity are necessary for the disease to develop. To reduce the chance of development, plant only certified seed, do not use over narrow rows, and rotate with cereals.

Table 11: Disease Control for Soya Beans

Disease	Control
<i>Bacterial Pastule</i> (<i>Xanthomonas phaseoli</i>)	Varietal resistance is adequate
Bacterial Blight	Varietal resistance is adequate
<i>Red Leaf Blotch</i> (<i>Pyrenochaeta glycinis</i>)	Plant mid to end December

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Harvest

Although varieties have been selected for resistance to shattering, this still remains a major cause for yield loss. Harvesting should commence immediately the crop is mature and should be completed as soon as possible.

For larger areas it is recommended to plant varieties of different maturity ratings to extend the harvest. The harvest period can also be extended by swathing, as the cut plants do not shatter as readily as the standing crop. Areas of up to 100 hectares have been successfully harvested by hand.

Yield

Commercial soyabeans growers, who are able to provide supplementally irrigation, report yields of 4.0 t/ha and above. Average commercial/high management rain fed yields range from 1.8 – 3.0 t/ha. Marketing should be at 12% moisture.

4.3.2 MAIZE (*Zea mays*)

Introduction

Maize is one of the most widely cultivated cereals in the world and is the major cereal staple in Zambia. It belongs to the grass family, it is grown in all the regions of Zambia but it is more suited to Region I and II. In region III yields are low especially in fields which are not limed due to Aluminium toxicity because the soils are acidic. In Zambia maize is grown mainly for human consumption and animal feed.

Climate and soil requirements

Maize is sub-tropical plant and prefers hot sunny conditions with reliable and evenly distributed rainfall. It does well under frost free conditions and when mean daily temperatures are above 15°C. For germination the lowest mean daily temperature is about 10°C.

Maize can be grown successfully on a wide range of soils from loamy sands to clays provided there is sufficient depth (at least one metre) and the crop is properly fertilized. It does well under pH ranging 4.7-6.5.

Recommended Varieties:

There are many varieties available from various seed companies. The farmer is advised to select varieties suited to their region i.e. high, medium or low rainfall area or the time of planting may help decide the variety to use. The yields are determined by a number of factors among which are time of planting, soil fertility level and general management factors. The potential yield will range from three to over ten tons depending on the variety and management. The different varieties suitable for different regions with their characteristics are shown in Appendices.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Recommended Management Practices

Crop rotation

Maize does well in rotation with legumes such as soyabeans, cow peas, beans, groundnuts and even tobacco.

Land preparations

Efficient land preparation is essential if maize is to be grown successfully. The aim is to loosen the soil for free root development; ensure seed bed preparation for easy planting, good germination and emergence; increase depth in which fertilizer and residues are mixed in the soil; use methods which preserve the tilth and soil structure; conserve moisture and increase subsequent rainfall penetration; control and destroy weeds; pests and diseases; and leave soil surface resistant to erosion.

A good tilth is essential for the crop but it should not be too fine. One good discing and harrowing is usually sufficient. However, if clods persist a second discing /harrowing may be necessary. These cultivations should give a satisfactory seed bed and at the same time, ensure that the land is free from weeds at planting time.

Planting

Land must be prepared before planting so that when soil is sufficiently moist, seed planting can be done immediately. Depth of planting is generally about 5 cm but this can vary with soil moisture status. Dry planting which is done before the start of expected rains (2 – 3 weeks) depth of planting is usually 7.5 – 10 cm so that ineffective light showers will not cause incomplete germination on soils with tendency to crust large seeded.

Spacing

Rows 75-90 cm with intra row spacing of 20-30 cm is recommended to achieve the desired population.

Table 12: Land Management

Row space cm	Plants/ha '000	Row space cm	Plants/ha '000	Row Space cm	Plants/ha
70 x 20	66,6	80 x20	62,5	90 x20	55,5
75 x 25	53,3	80 x25	50,0	90 x 25	44,4
75 x 30	44,4	80 x 30	42,6	90 x 30	37,0

(Surviving stands are usually up to 10 per cent lower)

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Seed Rate

The seed rate is determined by the desired plant population and the size of seed. The table below illustrates the seed rates at different plant population densities.

Table 13: Seed Rates at Different Plant Populations

	Plant Population '000			
	30	40	50	60
	Kg/ha			
Large round thicks	21	28	35	42
Medium rounds	19	25	31	38
Large Flats	18	24	30	36
Medium thicks	17	23	29	35
Medium flats	15	20	25	30
Small round thicks	15	20	25	30
Small flats	13	17	21	26

Plant 5 cm deep, into moist soil, with first planting rains mostly from November to early December.

On soils with a tendency to crust, large seed planted shallower may assist emergence.

Weeds

Weeding is a very important cultural practice which drastically reduces yield when not carried out. This is because weeds compete with maize for nutrients. Weeds can be controlled by the use of hoes, cultivars and also the use of herbicides. The table below shows the herbicide recommended for maize.

Table 14: Herbicide Application for Maize

Weeds	Herbicides	Stage of application	Rate/ha*
Annual grasses but not Mulungwe (<i>Rotboella exalhata</i>)	Lasso (Alachlor) 48 EC	Pre-emergence	3.5 – 5.0 lt
	Dual (Metolachlor) 72 EC	Pre emergence	1.5 – 2.5 lt
Most annual weeds but not Mulungwe	Gesaprim (Atrazine 50 FW)	Pre emergence	3.2 – 5.0 lt
	Gesastop (Simazine) 80	Pre emergence	2.0 – 3.5 kg
	Bladex (Cyanazine 50 WP)	Pre emergence	2.0 – 4.0 lt
As Atrazine but with improved grass control and for dry conditions	Basagram (Bentozon) 48 EC	Post emergence	2.0 – 5.0 lt
Broad leaf weed, and	Shellamine 8 EC (2, 4 – d	Pre or Post	2.0 – 3.5 lt

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

yellow nutsedge	Amine)	emergence	
Annual grasses suppresses nutsedge	Eradicane 70 EC (E.P.T.C. + Safener)	Pre plant incorporated	3.0 – 6.0 lt
Perennial grasses and most annual weeds	SCAT (Glyphosate)	Post emergence	5 – 6 lt
Broad leaf weeds and nut grass	Blazine	Post emergence	3.0 – 4.0 lt

*Guide only. Manufacturer's recommendations are continuously being reviewed.

Fertilizer

Fertilizer may be applied before planting or at the same time as planting. However, if it is applied at the same time as planting, it will slow down the planting operation. The inefficient practice of applying compound fertilizers after crop emergence results in poor early maize growth and should be strongly discouraged.

It is important to use the “cup” method of application as it is considerably more efficient than broadcasting or even banding thus ensuring optimum benefit from an expensive input. Depending on the density of fertilizer and plant population, a fertilizer crop will contain varying amounts of fertilizer depending on the density of the fertilizer. A number of 8 cup of compound fertilizer (probably D) used under conservation farming for 22, 222 stations/ha will give 210kg/ha a No. 12 cup will give 316kg/ha. Chicken manure will be applied to enhance soil fertility at a proposed rate of 10Mt/ha. The table below shows different nutrients requirements depending on the level of soil fertility.

Table 15: Soil Nutrients Requirements

Fertility status	N	P ₂ O	K ₂ O	S
Low	160-180	70-100	30-40	20 min
Medium	120-140	40-60	10-20	20 min
High	80-100	20-30	0	15 min

Average application, on well fertilized rotated lands:

Basal: 300-400 kg/ha 'D' plus 250-300 kg/ha Urea.

On the heavier textured soils the total fertilizer application may be applied before planting. On 'sandveldt' soils a single split application (up to knee height) of approximately 75 per cent of the nitrogen is recommended. Splitting nitrogen applications further has not given any significant yield increases.

On well fertilized rotated lands the basal fertilizer is best broadcast.

Lime

Optimum pH (Cacl) range for maize is about 5.5 – 6.0, though a pH ranging from 5.0 – 6.5 is still satisfactory. In the range of 5 – 5.5 liming should be a regular operation. Based on

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

recommendations from department of Research and Specialist services lime should be thoroughly disced in after ploughing for maximum effect.

Farmers should take soil samples for analysis to the department of Research and Specialist services for analysis; the fields sampled should have a history of what crops were planted and which crops a farmer intends to plant on the same pieces of land. The laboratory results will be as good as the quality of the sample taken. If a farmer is not sure of how to collect a soil sample, a visit to the nearest agricultural extension worker would help. Lime can also be applied for maintenance of pH as shown in the table below, however before maintenance rates can be applied soil samples should be taken to determine the baseline data.

Farmers practicing conservation farming, lime can be applied directly in the planting furrows or stations.

Ideally soil samples should be taken for analysis of the nutrients and pH status in order to allow enough time to act on resulting fertilizer and lime recommendations. Samples should be taken soon after harvest in early winter. Lime should be applied before the necessary land preparations.

Table 16: Conservation Farming Lime Requirements

Critical pH (CaC12)	Maintenance lime requirement)*
Sands 4.4	500 – 1 000
Sandy loams 4.6	1 000 – 1 500
Sandy clays 4.8	1 500 – 2 000

*Guide only. Specific requirements are best determined by soil tests.

Micronutrients

Season induced (cool, overcast, wet conditions) symptoms of zinc deficiency are often observed in the early growth stages but disappear once the plant develops. So far no response to zinc applications has been obtained. (An exception is where over liming has raised the pH to above 6.5).

Crop Protection

Pests

Important pest of maize are stalk borers, leaf hoppers, earworm, cutworms and termites.

To control pests in maize it is essential to scout, this gives an early warning and helps to determine the most economical quantities and timing for chemical treatment as outlined below:-

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 17: Pest Control Guidance

Pest	Chemical	Dosage
Maize root rot	Carbofuran 10g	200g/100 metre row
Cut worm	Deltamethrine 0.5 EC	100 ml/ha
	Accis 2.5 % EC	56 – 60 ml in 100 lt water
	Samaron 600 SL	100 ml/100 lt water
Termites	Chlorpyrifos	200 ml in 100 l water
Fat Hohn	Carbofuran 10g	200 g/100 m row or 1 g/station if hand planted
Stalk borer	Endosulfan 35 EC	700 ml/ha
	Monocrotophos	0.75 – 1 lt/ha
	Deltamethrin 2.5 EC	200 ml/ha
Larger grain borer	Actellic Super	50 g/90 kg shelled maize

*Chemicals are available from various agro chemical companies, assistance can be sought from them in their various products.

Diseases

The most important maize diseases are leaf blight, maize streak virus, rusts, cob rots and grey leaf spot. The most effective control measure is the use of resistant varieties and crop rotation (see appendix 1 – 5).

Table 18: Common Diseases in Maize

Disease	Symptom	Treatment
Maize Streak Virus	Broken narrow yellow lines along leaf veins	Avoid late planting in the high rainfall areas. Choose resistant varieties. Spray Dimethoate 50 ml/455 lts of water or Imidacloprid 70 WS, 250 g/100 kg seed to control the vector
Fusarium kernel rot	Pink to light brown gain mostly at the tip of the cob in groups	Plough under or burn stover
Diplodia ear rots	Grain has grey – brown shrunken appearance, white mycelium between gran	Plough under or burn stover
Leaf Blight (Helminthosporium turcicum)	Formation of long ecliptically grayish lesions first on the lower leaves and later spreading up the plant	Varietal resistance is adequate Plough the stover under
Rust (Puccinia sorghi)	Small rusty raised spots on leaves in periods of high	Varietal resistance is adequate

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

	humidity	
Grey Leaf Spot	Elongated lesions appearing as streaks at first, then develop into dark grayish brown rectangular shapes	Varietal resistance Crop rotation Burn crop residue Chemical use:- 200 ml Benlate, Punch, Folicure), spray when 2 – 3 % of leaf area is affected and when the lesions are restricted to the basal five leaves of the maize plants.

Harvest

Physiological maturity occurs at approximately 30 percent moisture. Safe moisture storage content is 12.5 per cent.

Yield

Average commercial yield is 6.0 to 8.5 tonnes per hectare (Experimental yields have exceeded 12 tonnes). Marketing in 50 kg bags at 12.5% moisture is recommended.

Composition

Maize is a starchy food containing 70% digestible carbohydrates, 5-10% protein plus oils, minerals, sugars and fibre. It is an extremely valuable food but requires added protein to make a balanced diet. The grain can be used industrially for starch and alcohol. Edible oil can be expressed from the germ.

4.3.3 IRRIGATED WHEAT (*Triticum aestivum*)

Introduction

Wheat as a dry season irrigated crop has a high potential in most areas, but present production is mainly confined to the southern and central areas of Zambia. Wheat is mainly used in the bakery industry (bread making). Irrigated and rain fed varieties are not interchangeable. Irrigated wheat fits well into a rotation with soyabeans, potatoes, groundnuts or tobacco. Maize, cotton and sunflower are best grown after wheat as timeliness of land preparation can prove difficult.

The disease spectrum of irrigated wheat is different from that of rain fed wheat. Rusts and powdery mildew are potentially the most serious diseases of irrigated wheat. The major disease of rain fed wheat is *Helminthosporium sativum*. Rusts are common to both crops, but the risk of carry-over is minimal as present varieties have adequate resistance.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Climatic and Soil Requirements

The crop is adapted to a wide range of soils, but yields are better on the heavier soil types (sandy loams and clay loams). The yield of wheat is greater on high veldt than on low veldt (valley areas and Kafue flats).

Recommended Varieties:

There are many varieties marketed by various seed companies. The varieties differ in both disease resistance and yield. The table below shows the different varieties and their characteristics.

Table 19: Wheat Seed Variety Characteristics

Variety	Days to		Height	Disease reaction			Yield potential Base=100
	Flower	Harvest		cm	Leaf rust	Stem rust	
Loerie	80	120-130	94	R	R	MR	110
Canary*	79	120-130	98	R	R	MS	106
Emu 'S'	79	120-130	90	MS	S	MR	100

*Canary is awn less

M= moderate R= resistant S= susceptible

Recommended Management Practices

Irrigated wheat fits well into a rotation with soybeans, potatoes, groundnuts or tobacco. Maize, cotton and sunflower are best grown after wheat as timeliness of land preparation can prove difficult.

Seedbed

Wheat requires a fine tilth to ensure uniform distribution of the seed within the row. The use of typed implements is recommended in preference to discs which may have an adverse effect on soil structure and encourage pan formation. A fine, level, seedbed will encourage uniform emergence. Direct drilling in a soybean/wheat rotation is becoming popular among large-scale farmers.

Seed Rate

Approximately 100 kg/ha certified seed (minimum germination 90%) should be sown in a well prepared seedbed to give approximately 220 seeds/m².

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Seed Treatment

Certified seed is sold treated with a contact fungicide/insecticide mixture, e.g. Captasan or Thirasan at a rate of 250g/100 kg seed.

Spacing

Drill in rows approximately 20 cm apart, 2-4 cm deep, in a firm fine seedbed to ensure good germination.

Planting

Mid-April to June; the optimum on the plateau being the first three weeks of May. At lower lying altitudes (i.e. at Kafue Flats and Valley areas) April planting is preferable. The higher the altitude, the longer the time from planting to maturity.

Weeding

It is important to control weeds early, usually at 3 leaf stage. An inspection can be done to determine the level of weed infestation. A decision can be made on which method of weed control can be employed. The table below shows the recommended herbicides.

Table 20: Recommended Herbicides for Weeding

Weeds	Herbicides	Stage of application	Rate/ha
Most annual weeds but not Mulungwe	Basagram (Bentazon) 48 EC Shellamine (2,4 D) 48 EC	Any stage after emergence	2 – 5 lt

Fertilizer

Table 21: Fertilizer Application for Wheat

Fertility Status	N	P ₂ O ₅	K ₂ O	S
	Kilograms per Hectare			
Low	140-160	80-120	40-60	20 min
Medium	110-130	50-70	20-30	20 min
High	80-100	20-40	0	15 min

Average fertilizer application (when grown in rotation with soybeans which are not directly fertilizer):

Basal: 500-600 kg/ha 'C' + 250 Urea top dressed

Otherwise, on well fertilized rotated land:

Basal: 300 – 400kg/ha 'C' + 300 Urea top dressed

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Soil tests are recommended for specific requirements.

Basal fertilizer should be broadcast before planting and worked into the soil or drilled with the seed. However, when drilling it is essential to ensure that seed and fertilizer do not come into contact. Top dressings of nitrogen are best applied with the irrigation water up to 6 weeks after planting. Later top dressings tend to increase protein (within limits) rather than yield. On heavier textured soils all the nitrogen may be broadcast before planting. Where applicable, Chicken manure will be applied as a supplement to inorganic fertilizers.

Lime

Table 22: Wheat Lime Requirements

Critical pH (CaC12)	Maintenance Lime Requirement* kg per hectare
Sands 4.8	500 - 1 000
Sandy loams 5.0	1 000 - 1 500
Sandy clays 5.2	1 500 - 2 000

Depending on the quality of irrigation water. Lime is only rarely necessary for irrigated wheat. Soil and water tests are recommended.

Micronutrients

Limited trials have indicated that ear sterility is associated with boron deficiency. As a precaution 'C' mixture, which is boronated, is now recommended instead of 'D' mixture.

Pests

Insect pests are not usually a serious problem on irrigated wheat and mandatory measures are not considered necessary. Should a specific problem arise contact Mount Makulu Research Station.

Birds (e.g. Quelea) can sometimes be troublesome, especially on awn less varieties grown on small areas. At present, bird scaring is the most effective control measure.

Diseases

Diseases are usually of minor importance in the irrigated season but stem rust (*Puccinia graminis*), leaf rust (*Puccinia recondita*) and powdery mildew (*Erysiphe graminis*) are potential threats.

Stem rust (also called black rust) produces dark reddish-brown elongated pustules on stems, leaves (upper and lower surface) and sometimes also on the heads.

Leaf rust (also appears as irregular patches of white fluffy growth on the leaves coloured pustules which occur on leaves (upper surface only) and on leaf sheaths.

Powdery mildew appears as irregular patches of white fluffy growth on the leaves (upper surface only) and occurs occasionally on the heads as well.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

The best form of disease control is the use of resistant varieties. However, if severe infestations should occur early in the season chemical control may become necessary. Mount Makulu Research Station should be contacted for disease identification and advice on fungicide applications.

Irrigation

Wet the soil to field capacity prior to planting. A light irrigation after seeding will aid emergence and prevent capping.

Clay-loam soils: start irrigation 3-4 weeks after planting and use intervals of 7-10 days

Sandy-loam soils: start irrigation 2-3 weeks after planting and use intervals of 7-10 days.

Increase the amount of water per application from flowering onwards. Irrigation should continue until the crop is in the hard dough stage.

Where soyabeans loss from shattering at harvesting presents a major weed threat the pre-plant irrigation may be started earlier and the volunteer soybeans sprayed with paraquat before wheat emergence. Or the pre-plant irrigation should be withheld and the soyabeans treated with the recommended broadleaf herbicides.

Yield

Average commercial yield is at present 6 to 8 tonnes/hectare. Wheat is marketed in 50 kg bags at 12.5% moisture content.

4.4.0 Post harvest activities

Harvesting of Soya Beans, Wheat and Maize will be conducted using combine harvesters. Other post harvest activities will include handling of harvested crops, temporary storage in transit trucks and haulage to Golden Lay Limited for use in feed making as a ready market. In the window period between harvesting one crop and planting the next, farm fields will not be cleared using fire as the crop remains will be incorporated in the soil during land preparation as the remains are degradable and capable of adding nutrient value to the soil. Ploughing back the remaining biomass into the soil is a common practice in the modern farming world and kanyenda Farming Limited will not depart from this act. Therefore the biomass will be ploughed back into the soil to enhance soil fertility.

4.5.0 Project schedule and life span

The proposed project site was originally customary land converted to a 99 year leasehold title from the Zambian government under the ministry of lands. Kanyenda Farming limited will conduct farming activities on the site for the duration of the title deed and will strongly consider re-applying for another lease period once the 99 year lease expires. The project implementation schedule will be conducted as stated in table 1 and discussed in section 2.0 above.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

5.0 PROJECT ALTERNATIVES

5.1 Site Alternative

There is no alternative site for the proposed project due to limited space of processing expansion of the farm and other necessary structures.

After close analysis and inspection by the survey team, the proposed site was proven to be the most ideal for the establishment of the farming Project. Furthermore, Mpongwe district in general and the Kanyenda area in particular are designated farming blocks which are suitable for the farming of the said crops. The project undertaking will bring development to the area and create employment.

5.2 Alternative Process

There is no alternative process for the developers to use in the agricultural project such as this one. The project will be operated in a manner that will be both as organic and biodegradable-oriented especially in the use of fertilizers and chemicals.

5.3 Power, Transport and Water Supply

Alternative power supply includes the establishment of diesel generators and solar panels on site. Due to the availability of hydro electricity via ZESCO in the vicinity the other options were not considered as priority.

There being no stream near the project area, groundwater is the only feasible source of water at the project site. It is for this reason that the developer has placed significant priority on groundwater exploration and borehole drilling.

The alternate modes of transport are air and water. These are not feasible as the developer has no intention of building an airstrip and as for water transport; there is no navigable river in the area.

5.4 Crops

The developer intends to use the crops grown on the farm as a raw material for feed for chickens. These crops are the major ingredients in the formulation of chicken feed. Alternative to this is buying these ingredients from suppliers. This is what the developer had been doing until recently when the main supplying farm was taken over by a competitor company who is also using a lot of these ingredients. To that effect there is no short term solution but to produce these crops and feed them to the chickens.

5.6 Alternative Pollution Control Methods

There are no alternative pollution control measures apart from the ones that are proposed, highlighted and discussed under the impact mitigation plan.

5.7 Impacts of Alternatives

If an alternative is available at any phase or stage of farming, its impacts will be evaluated using the same criterion that has been proposed under chapter 7.0.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

For the siting of the proposed project no alternative site has been identified and as such no impacts could be evaluated as impacts would be associated with the site.

The processing of the farm products will be done using the best available technology and so far the developer has not identified any better alternative in terms of the processing of the farm products and as such no impacts could be identified.

As stated the source of power is electricity from ZESCO. Alternatives such as solar, wind, geothermal, biomass, thermal using diesel, etc have been evaluated and found not to be viable to supply power to this project. Electricity from ZESCO is viable as it will be tapped few kilometres from the proposed project site. As such impacts resulting from alternative energy sources could not be identified.

Inputs and outputs from Kanyenda farm will be transported by land. There are no intentions of transporting by air as it is not viable and there are no rivers in the vicinity to be used for water transport. Therefore impacts on alternative transport have not been evaluated.

The only sources of water supply are boreholes and rains direct into the fields. There are no rivers or streams in the proposed project site or its vicinity. Only impacts associated with water supply from boreholes and rain fed irrigation have been evaluated. No alternatives and no impacts for alternative sources.

The developer has no intentions of growing any other crops other than maize, soya beans and wheat. The reason being that the three crops are required as feed for the chickens by the sister company (Golden Lay Limited). The only alternative is to source these three products from elsewhere. The impact of this is the out grower scheme where locals in the vicinity will be growing these crops and the company will be buying from them. This in turn improves the living standards of the locals and it also has a multiplier effect on the economic activities in the area.

However in an event that an alternative site, energy source, transport, crops, water supply, sanitation and processes were available clearing of vegetation resulting into loss of fauna and flora, disturbance in the ecosystem, dust generation during construction, runoff, erosion, increase in population in that area, creation of employment, high revenue base for local authorities and other revenue collecting authorities, improved living standards, thefts, HIV and AIDS, illegal settlements, noise pollution, surface water contamination, soil contamination, improved welfare, displacement of people (if alternative site has settlements), generation of hazardous waste, generation of solid waste, contamination of soil, ground water and air by fertilisers, pesticides, herbicides and other chemicals that will be used at the alternative site.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.0 ENVIRONMENTAL BASELINE STUDY

6.1 Project overview

The developer, Kanyenda Farming Limited has acquired land in Mpongwe District. The farm is precisely located in Kanyenda Farm block in Chief Kalunkumya's area. For this reason the farm is called Kanyenda Farm.

Kanyenda Farm has a land area of 669 Ha and is held under leasehold in the name of Kanyenda Farming Limited. The developers hold a 99 year title to the land within Lot F/10848. The developers intend to turn this land into a commercial farmland where arable crops will be grown. The crops that the developers target to grow on this property are Soya Beans, Wheat and Maize. The intended project will be undertaken by growing crops both under rain fed and irrigation once sufficient ground water is established to be present on site.

6.2 Location and Physiography

6.2.1 Physical Location

Mpongwe District is one of the 10 districts of the Copperbelt Province of Zambia. It lies 67 km south of Luanshya Town. The district shares its boundaries with Kapiri Mposhi district on the south, Kasempa district to the west, Lufwanyama to the north, Masaiti to the east and Solwezi to the north-west. Figure 2 shows the location of Mpongwe District in relation to other districts.

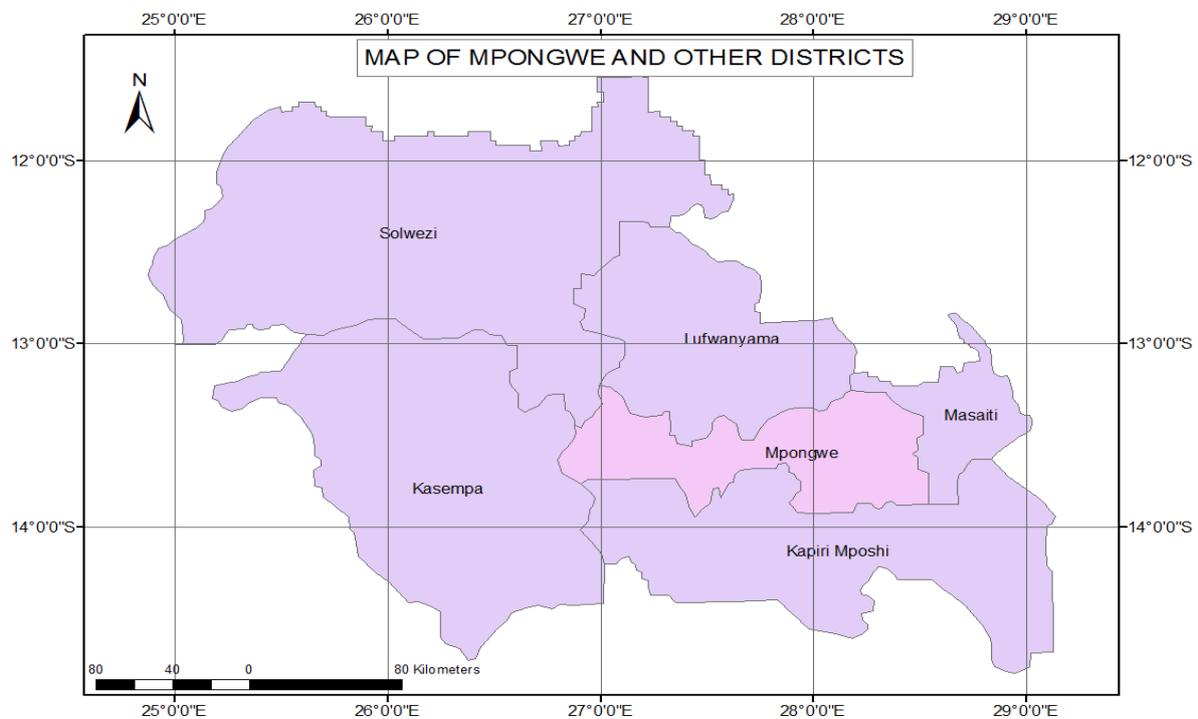


Figure 2: Location of Mpongwe District

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

The Kanyenda farming project is situated in Mpongwe district along Kasamba Road, about 4 km from the Luanshya-Masaiti/Mpongwe Road (Figure 3). The road leading to the project area is accessible throughout the year, though it is unpaved.

Geographically, the farm is situated between latitudes 13°22'15''S and 13°24'18''S and between longitudes 28°13'24''E and 28°15'05''E.

The map below (Figure 3) shows the site map for the proposed farm as surveyed by the land surveyor.

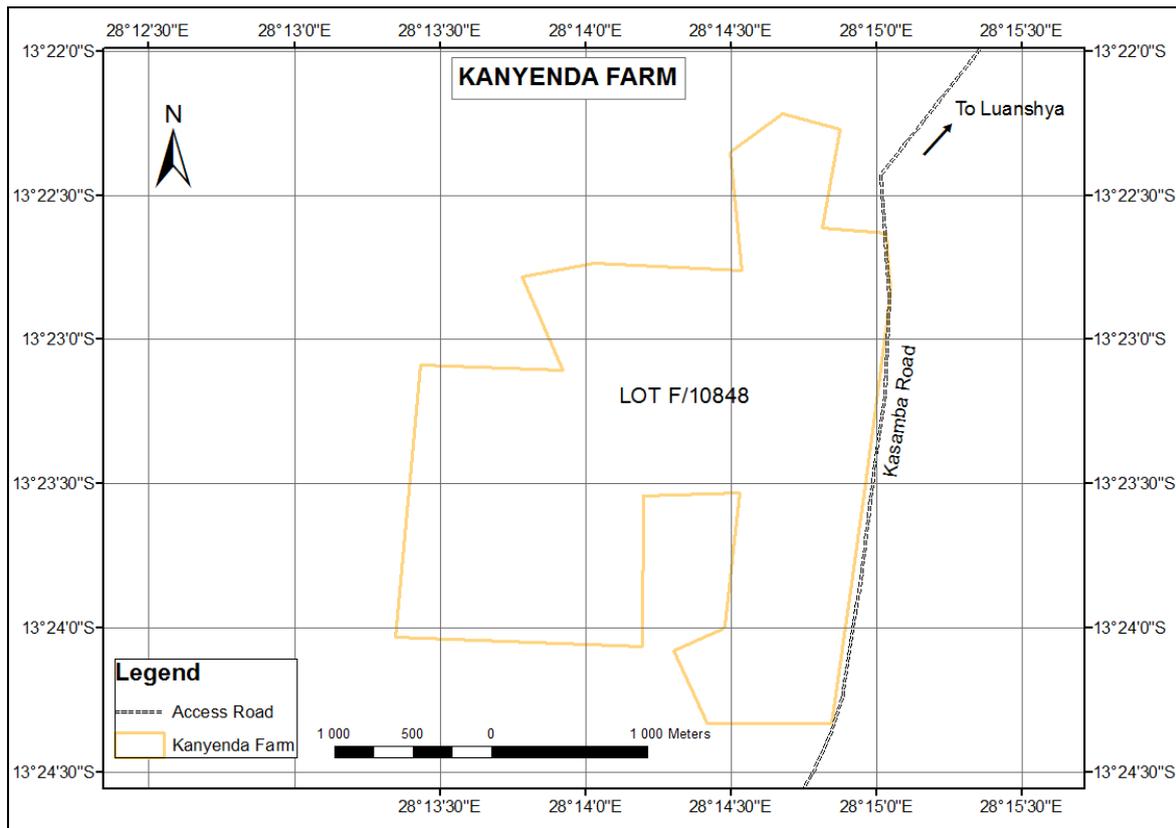


Figure 3: Site Map of Kanyenda Farm

6.2.2 Topography

According to the Topographic map (Figure 5) and the 3D map (Figure 6), Kanyenda Farm lies on a plateau-like feature occurring between approximately 1,230 to 1,260 meters above mean sea level. Prominent hills are found to the south, with Nkanga Hill rising to 1,354 m above mean sea level, approximately 1 km east of the southern farm boundary.

The farm appears to 'sit' on a local water divide with notable drainages towards the north-west and north-east (Figure 5 & 7). General surface drainage on the western part of the farm is towards the west, while the central part of the farm drains towards the northwest (Figure 5). According to the topographic information, these ephemeral streams and channels drain into the Kafue River that lies to the north of the study area.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

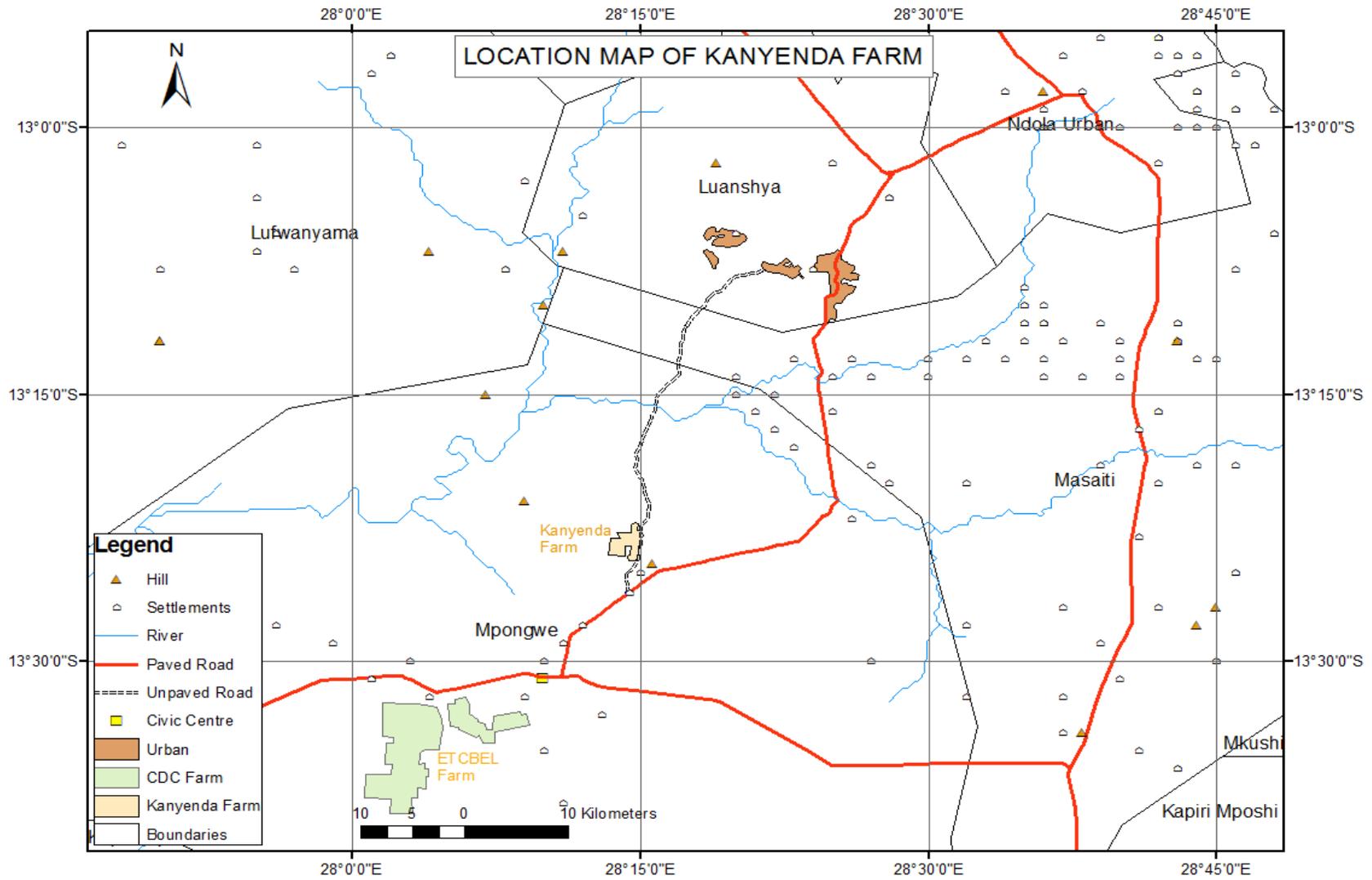


Figure 4: Location Map of Kanyenda Farming Project

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

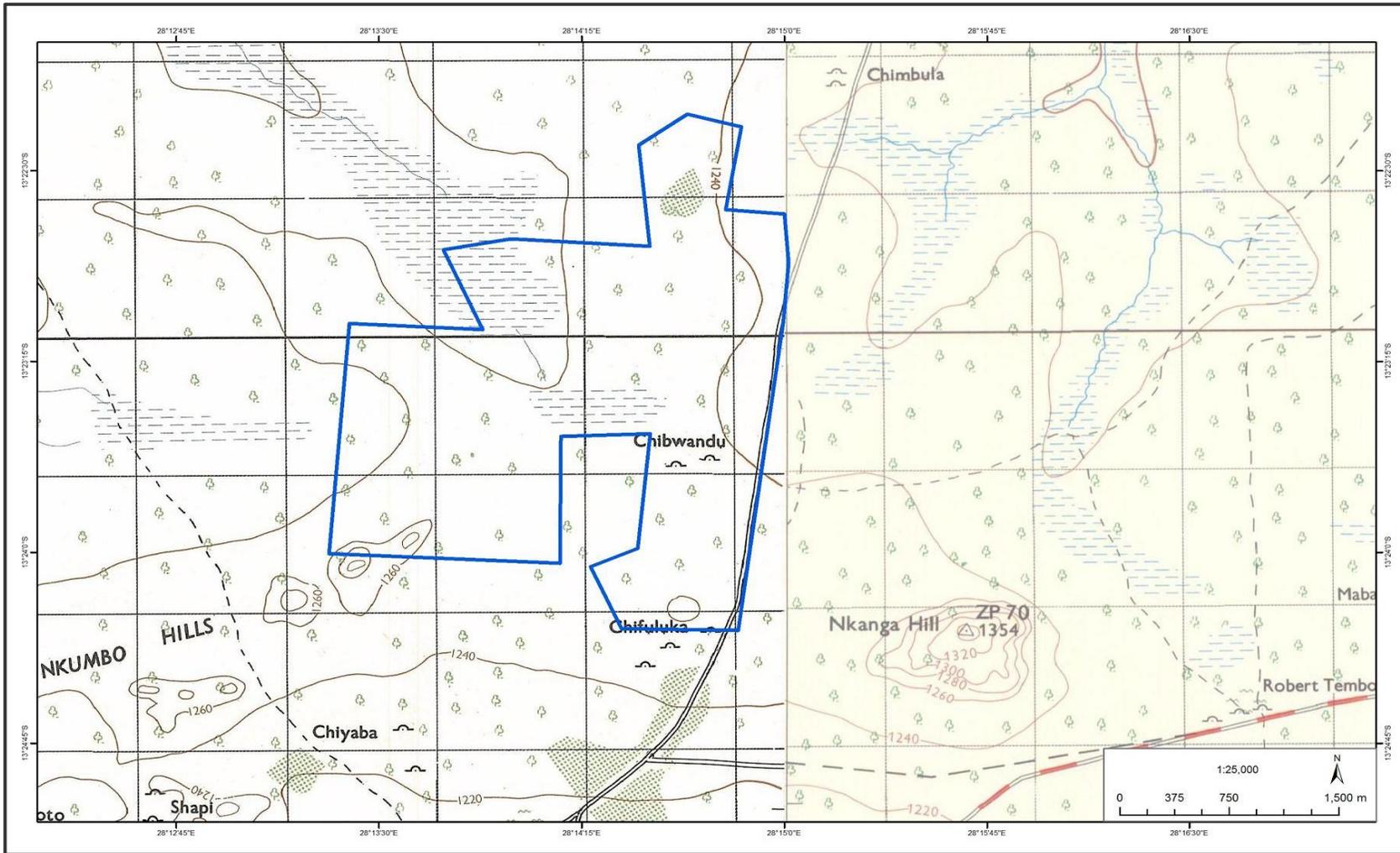


Figure 5: Topography of Kanyenda Farm

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

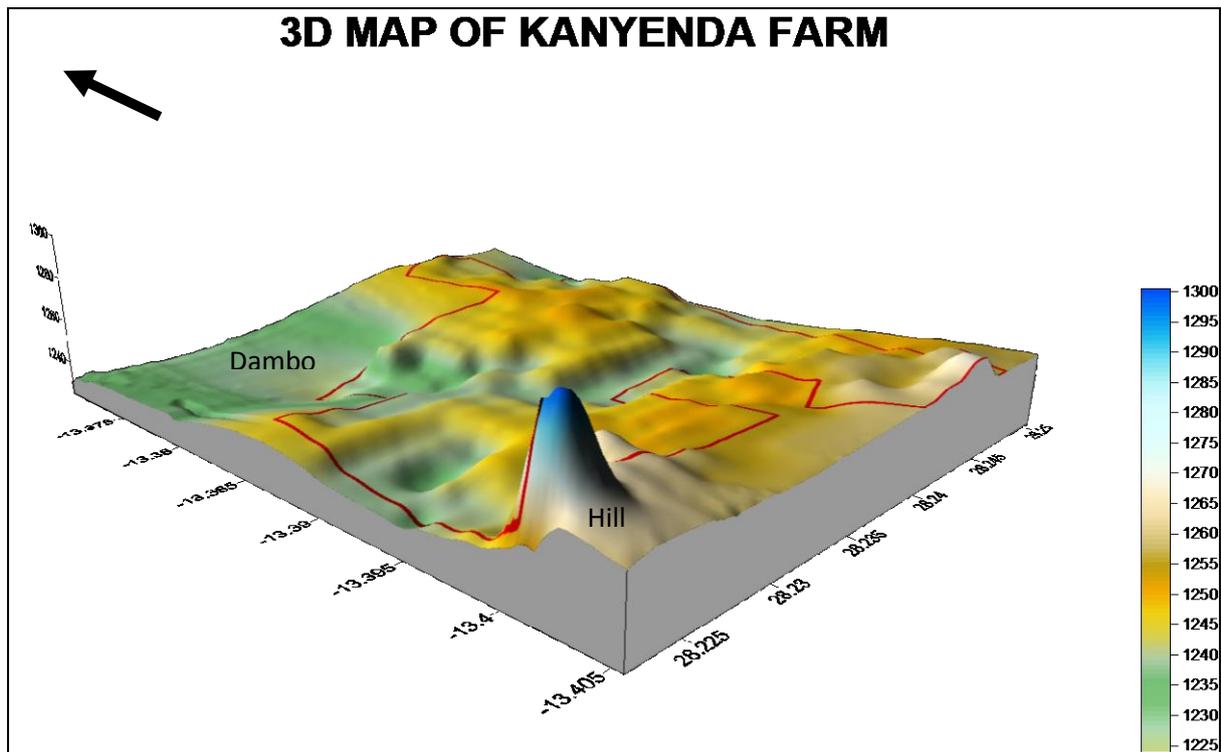


Figure 6: 3 D VISUALISATION OF KANYENDA FARM

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

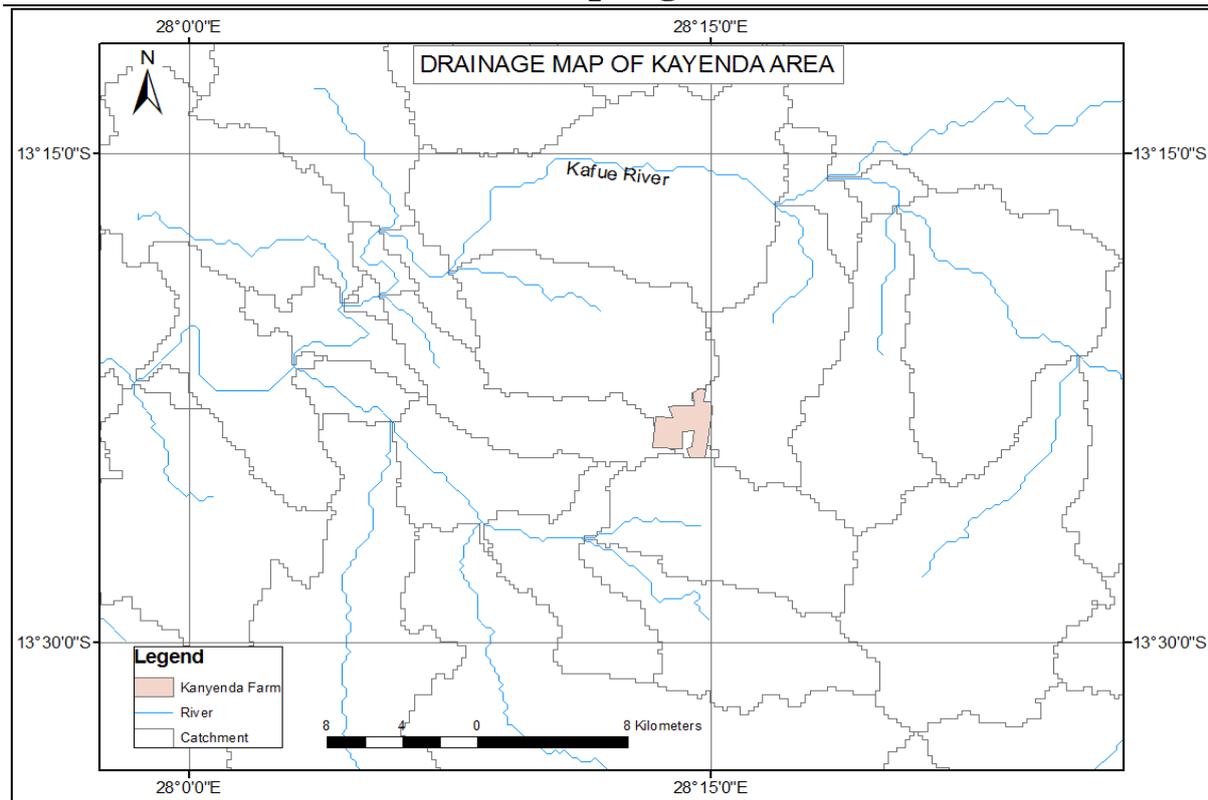


Figure 7: Drainage Map of Kanyenda Area

6.2.3 Soils

Soils in Zambia have been formed from a great diversity of parent materials. However, the characteristics and distribution of the soils are largely influenced by climate particularly rainfall. The main soil types encountered are Acrisols, Ferralsols, Lixisols, Luvisols, Alisols, Nitisols, Cambisols, Podzols and Gleysols.

The soils on Kanyenda Farm are predominantly Ferralsols. These soils are highly leached and well drained. Textures are generally sandy loam to sandy clayey loam in the top soil. However, the most predominant soils are the sandy loam. These soils are acidic and the pH levels were found to be in the range of 5.0 -5.8. The coefficient of permeability was found to be 2.5 cm/hour implying that these soils are well drained.

The soils in the area were found to be deep soils and in most locations the depth was found to be greater than 90cm (>90cm). This implies that root formation would not be hindered in any way especially that the crops being proposed are all shallow rooted.

6.2.4 Visual Features

A visual assessment of the regional and local landscape characteristics of the proposed farm was conducted.

The region currently supports mainly dry land or rainfed agriculture. Irrigation farming is being practiced on some commercial farms having river frontage. The largest commercial

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

farm in the region is Zambeef Mpongwe Farms (formerly ETC Bio-Energy). This farm has a number of centre pivots for its irrigation.

The Project area is located on a gently sloping plain. Within the proposed project area, the land elevation ranges from about 1230 m to 1260 m above mean sea level, with a slope ranging from 0.5 - 1.0%. The major topographic feature in the general vicinity of the project area include Nkanga Hill, approximately 1 km south east of the project area and Nkumbo Hills on the south-west side of the project area.

The visual catchment of the project area is presented in Figure 4 as well as the satellite image (Figure 5). Clearly, it seems the farm is a source of an ephemeral stream. This is evidenced by the lineaments at the centre of the farm. The topographic map (Figure 4) shows a wetland (dambo) that starts from the farm running in the north-west direction towards the Kafue River. However, after years of human activity in the area this dambo has become dry as can be seen on a 2005 satellite image (Figure 8).

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.3 Climate

Kanyenda Farm is located in the bounds of a tropical savannah climate that is strongly seasonal, with three distinct seasons, namely:

- A cool dry season occurring from mid April to mid August
- A hot dry season lasting from mid August to mid November
- A warm wet season from mid November to mid April

The local climate at the study area is described using an average of data from nearby meteorological stations. The Met stations in the vicinity of the area included Mpongwe Mission Hospital, Mpongwe Development Company, Ndola and Kafironda. Using the worldClim climate estimator with a resolution of 2.5m, the local averages were obtained.

The Ndola meteorological station (60 km north east of the study site) has the most complete record; at this station, the standard deviation in annual rainfall is 232 mm with an average annual rainfall of 1229 mm for a 30 year period (1961-1990 climatic data from the FAO_CLIMWAT database).

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.3.1 Rainfall

The average rainfall, at and around the project area is 1170mm with variability of 15%. The rainfall is generally of moderate intensity and is distributed between November and April, with December and January being the wettest months (Table 4.1 and Figure 4.8).

The project area has a relatively good climate for tropical crop production. The area experiences good rainfall with little risk of drought. Even in the worst season if crops are planted early and well tended, a good yield can still be expected.

Table 23: Mean Monthly Temperatures, Precipitation and Evapotranspiration

Month	Min Temp °C	Max Temp °C	Rain mm	Humidity %	Wind km/day	Sun hours	Rad MJ/m ² /day	ETo mm/day
January	17.1	26.6	278	79	268	6	19.6	4.22
February	17.1	26.9	236	79	233	4	19.5	4.17
March	16.5	27.4	163	73	285	7.5	21	4.7
April	14.4	27.5	44	71	346	9.9	22.6	5.01
May	10.8	26.6	4	57	354	10.5	21.2	5.22
June	7.9	25.1	0	53	346	10.6	20	4.87
July	7.8	25.2	0	49	415	11	21	5.45
August	10.2	27.5	1	42	518	11.1	23.3	7.1
September	13.6	30.5	2	39	493	10.9	25.2	8.2
October	16.2	31.5	30	42	441	10.3	25.9	8.26
November	17.1	29.4	140	63	354	7.9	22.5	5.98
December	17.2	27	272	78	380	6.1	19.8	4.51
Total			1170					
Average	13.8	27.6		60.4	369.4	8.8	21.8	5.6

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

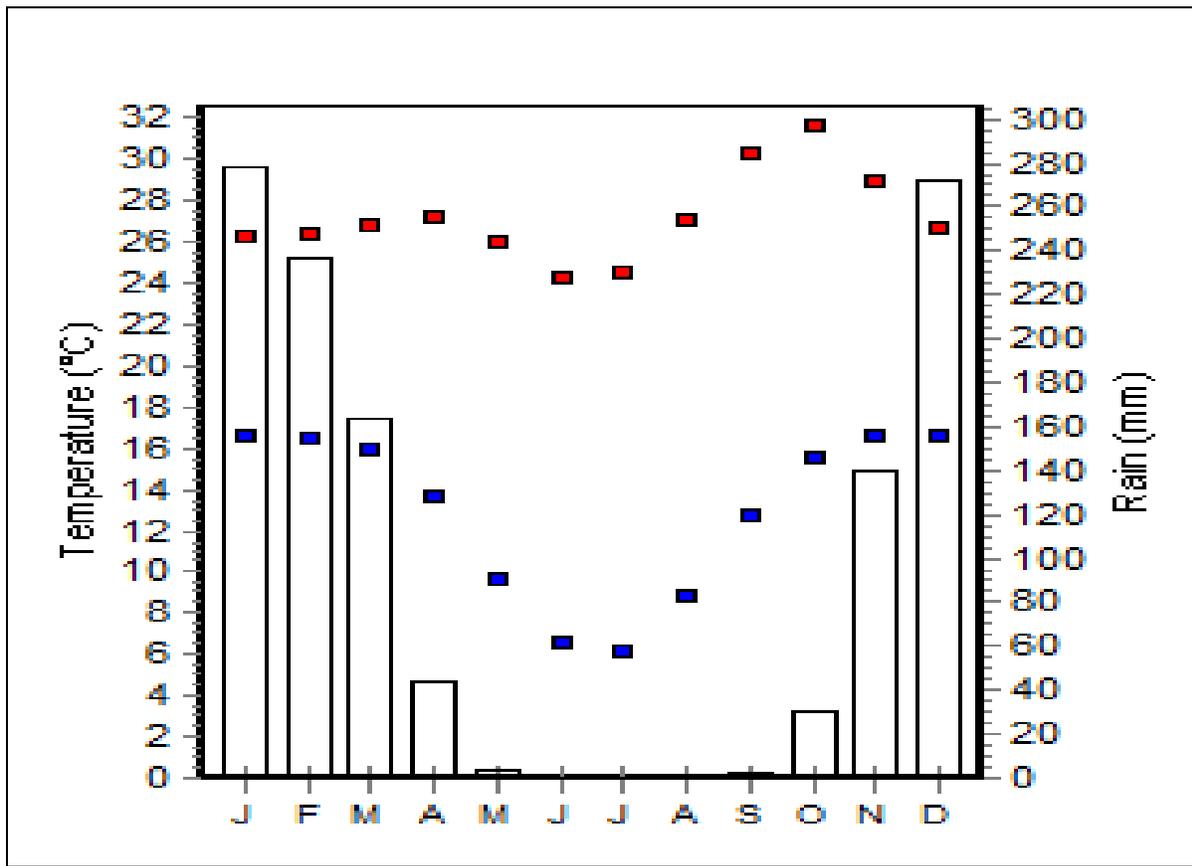


Figure 9: Rainfall Hyetograph, Minimum and maximum Temperature Variation for Kanyenda

6.3.2 Temperature

The mean monthly temperature ranges from 8°C in July to 32°C in October. Temperatures are cool enough to support optimum growing conditions for tropical crops such as maize, soya bean and wheat. Approximately 12 days of frost are recorded annually and sunshine ranges between 11 hours per day from May to August, and down to 4 hours per day in February. The frost days have, fortunately, very little impact on the growth of the above mentioned crops. Table 22 and Figure 9 show the temperature variation over a period of 12 months.

6.3.3 Evaporation

By considering average annual rainfall (Table 22), a strong moisture deficit (net difference between evaporation and rainfall) is evident for an average year. This moisture deficit is most pronounced during dry weather months, coinciding with periods of higher evaporation. This trend entails that during dry weather, irrigation agriculture should be practiced to supplement moisture to a crop grown during this period.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.3.4 Humidity

Relative humidity varies throughout the year, reaching peak in the wet season. Wet season humidity levels are almost 80%, dry season humidity levels are 38%, with mean relative humidity of the area recorded as an average of 60%.

6.3.5 Wind

The predominant wind direction around the project site is that which is generally found on the Copperbelt as a whole. The wind direction is from the north-east to south-west. The mean wind speed ranges from about 518 km/day in August to 233 km/day in February. During summer months, the moist air moves in from the Atlantic Ocean over Congo DR and westerly winds are associated with thunderstorms.

6.4 Agricultural Suitability and Land Capability

Kanyenda Farm lies in region III of the agro-ecological zones of Zambia. The region is one of the highest rainfall areas with the average annual rainfall of 1000-1500 mm. The period suitable for crop production is 120-150 days. Except for Copperbelt Province, the soil in the region is in an advanced stage of leaching and acidification, yet on applying lime it can be used as farmland. It is suitable for the production of millet, cassava, sorghum, Soya Beans, Maize, beans and groundnuts.

6.4.1 Agricultural Suitability

The agricultural suitability assessment was conducted in accordance to the FAO suitability classes. The majority of the site is S2 class implying that the area is moderately suitable with no serious limitation in terms of moisture deficiency, erosion hazards or nutrient problems. However, measures need to be taken to ensure that the soil condition is maintained or enhanced. The farm intends to use chicken manure to increase the soil nutrients and as a means of soil conditioning.

Around the hills at the south western corner of the farm, the soils are not suitable for the intended development as these soil exhibit a high level of stoniness. Thus these soils would be suitable for grazing with the adoption of intensive management practices.

6.4.2 Land Capability

The land capability assessment was conducted in accordance to the FAO land capability classes. This system is based on the assessment of biophysical characteristics, categorising land in terms of its general limitations such as erosion hazard, climate and slope. Land is classed based on the limitations to a particular type of land use.

Class C2 soil dominates the site and is defined as that with the potential to be cropped using soil conservation practices such as strip cropping, conservation tillage and adequate crop rotation. Agricultural productivity on this area is potentially high.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Soil erosion risks would arise from the structure of the soil and to a greater extent overland flow. Field inspection indicated textures and soil types on C2 land in the study area have low to moderate degree of erodibility.

6.5 Land Use

Land use surrounding the project area is dominated by charcoal burning and small scale (subsistence) farming. The farmers in the area are predominantly maize and cassava growers. Grown also though at smaller scales is finger millet, groundnuts and beans. A small number of intensive livestock operations are also located in the vicinity of the project area.

6.6 Energy and Mineral Resources

The source of energy in the district is wood fuel and charcoal. Wood fuel accounts for over 90% of the population as the local people only depend on firewood for cooking and other heating purposes. Those living in concentrated communities such as the District Township, the hospital and the settlement outside Zambeef Mpongwe Farms , use charcoal. The increased use of firewood and charcoal due to the increased population has put a lot pressure on the forest resources, and hence an ecological hazard.

Mpongwe District is served by a Zambia Electricity Supply Corporation (ZESCO) power line, which runs from the east to the west almost traversing the middle of the district. This power line supplies electricity to the commercial farms in the farming block that include Zambeef Mpongwe, Somawhe farms and SeedCo farms. Other Zesco serviced areas include Mpongwe Mission Hospital farm, Mpongwe Secondary School, Mpongwe Municipal Council, Government offices and residential housing unit at and near Kasamba.

As for mineral resources, there are no serious mineral deposits in the district except in certain areas like Chief Kalunkumya's where precious stones have been discovered. Another area is across Machiya where Anglo-American Company at one time showed interest. The only serious mining activity is that of agriculture lime at Ipumbu by Mpongwe Development Company.

6.7 Bushfire Hazard

The potential bushfire hazard within the vicinity of the project area is dependent on weather conditions, accumulation of fuel (dry vegetation matter), extent and density of remnant woodland and intensity of surrounding land uses, primarily grazing.

The developer has been advised to provide fire breaks within the site and improved access for fire fighting.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.8 Hydrology/Water Resources

6.8.1 Surface water

There are no streams in the area except a dambo that runs across the farm towards the Kafue River which is about 17.2 kilometres north of the farm.

Significant surface water inflow is most likely to be the result of rainfall events. The catchment area drains towards the dambo, almost at the centre of the farm. Due to many years of human activity in the area, this dambo has become dry as can be seen on a 2005 satellite image (Figure 8).

In case of flow away from the farm into other farms, the developer intends to construct a water control structure to divert flow to site runoff collection.

The developer intends also to install underground drains to avoid groundwater flooding the area especially that irrigation will be practiced.

Figure 10 shows the direction of flow on Kanyenda Farm. This flow will be controlled to prevent erosion and loss of property in and around the farm.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

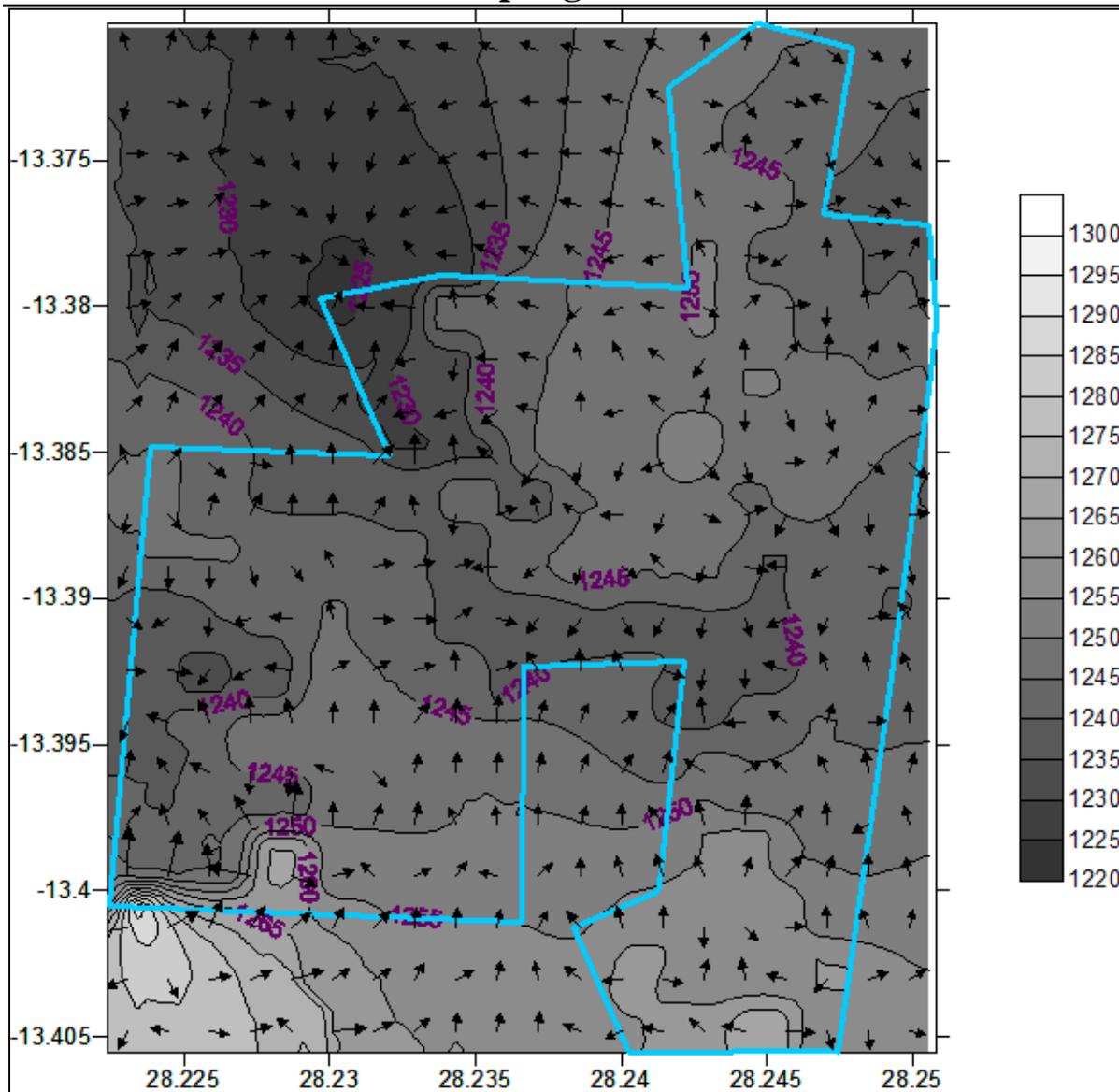


Figure 10: Surface Run Off Direction on Kanyenda Farm

6.8.2 Groundwater

There are two boreholes presently existing on the farm. Both are reported to have been constructed in 2010. There is no information on the geology encountered or logs of the well constructions. One is operating and pumping for domestic and constructional use. The client reports a yield for the borehole of around 5 l/s. The second borehole is reported to be dry; though there is no data to confirm this.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

There is also a hand pump used by the community on the eastern boundary of the Farm, both of which reportedly supply water throughout the year. Details on construction and yields are also presently not known.

There is however a farm located approximately 25 km to the south-west that operates several irrigation pivots. This farm has not been visited. It is assumed that groundwater is the source of water for the irrigation.

In terms of quality, the water was found to be safe in all aspects. Water samples were obtained and tested for a number of parameters including pH, faecal coliforms, total coliforms and heavy metals. Table 24 shows the results obtained from these tests compared to the ZABS standards.

Table 24: Ground Water Analysis Results

Parameter	Unit	Result	ZABS Limits
pH		5.05	6.0 – 8.5
Turbidity	NTU	3	5
Conductivity	µS/cm	41	1500
Total suspended solids	mg/l	3	100
Total dissolved solids	mg/l	19	800
Sulphate	mg/l	1	250
Nitrate	mg/l	0.87	45
Iron	mg/l	0.239	0.3
Copper	mg/l	0.181	1.0
Magnesium hardness	mg/l	12	-
Calcium hardness	mg/l	10	-
Lead	mg/l	0.01	0.05
Magnesium	mg/l	2.9	30
Calcium	mg/l	4	100
Manganese	mg/l	0.016	0.02
Faecal coliforms	# / 100	0	0
Total coliforms	# / 100	0	0

From these results it can be concluded that the groundwater at the project site is safe for both domestic and agricultural activities.

6.9 AIR QUALITY

There is no historical information regarding air quality in the project area. However, in view of the lack of any major industries around the project area, it is reasonable to assume that air quality is generally good. In view of having baseline data and a primary requirement for assessing the impacts on the air, the EIA team conducted Air and Dust sampling around the project site area.

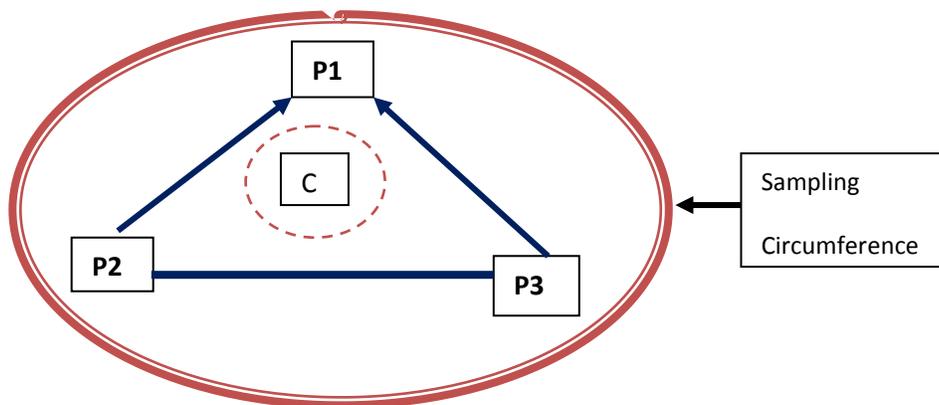
The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

A field survey on the project site was conducted to come with the Potential Areas of Concerns (PACs) for Air quality and Dust sampling points through collection of both primary and secondary data. During the field survey, three (3) PACs were identified for Air quality and Dust sampling to be conducted. The PACs were:

- (i) Sampling point P1 located southern part of the Farm.
- (ii) Sampling point P2 an area around the Workers quarters.
- (iii) Sampling point P3 located near Nyirenda's Farm.

The instrumentation used for the Air sampling was a Dragger pump and for Dust a portable Personal Area Sampler. Triangulation method was done to capture representative data, reduce the degree of error and increase precision.

Below is a sketch map showing the sampling points sited in some Potential areas of concerns for accurate readings and sampling:



Key

P = Sampling point

C = Centre of project site

6.9.1 GASEOUS EMISSIONS

The Gas sampling at the site was conducted at the three Potential Area of Concerns and the results are shown in the Table below. It was observed from the results that the Gaseous emissions sampled at the site did not pollute the area at the time of the study.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 25: Ambient Air Quality Measurements Results

PAC	DAY	DURATION OF SAMPLING (MIN)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)
Sampling Point(P1)	1	60	Not Detected	Not Detected	Not Detected
	2	60	2.5	Not Detected	Not Detected
	3	60	Not Detected	Not Detected	Not Detected
Sampling Point(P2)	1	60	1.5	Not Detected	Not Detected
	2	60	Not Detected	0.35	Not Detected
	3	60	Not Detected	Not Detected	Not Detected
Sampling Point(P3)	1	60	Not Detected	Not Detected	Not Detected
	2	60	Not Detected	Not Detected	Not Detected
	3	60	Not Detected	Not Detected	0.25

6.9.2 DUST

The project area is expected to emit very minimal dust levels or concentrations especially during ploughing of the field. A Personal area sampler for dust measurement which was placed at specified locations (sample points) and was made to run for a specified period until the scientist comes to remove it and take the readings. The pump was switched off, filter was disassembled from the cyclone/filter assembly, weighed and the weight was recorded.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 26: Dust Measurements Results

PAC	DAY	Duration of Sampling (MIN)	Dust Level (µg)	Dust Concentration (µg/m ³)	Respirable Dust (24hours) (µg/m ³)
Sampling Point(P1)	1	185	0.00345	0.00075	0.179
	2	200	0.00102	0.00020	0.016
	3	204	0.00189	0.00037	0.030
Sampling Point(P3)	1	175	0.0675	0.15429	1.234
	2	230	0.0851	0.14802	0.888
	3	186	0.0803	0.17269	1.382
Sampling Point(P2)	1	180	0.0947	0.21044	1.684
	2	191	0.0854	0.17884	1.431
	3	198	0.0386	0.07798	0.624

All the potential areas of concerns sampled at the project site emitted dust levels which were acceptable and within the Zambian guidelines limit.

The table 27 below gives the official Zambian guidelines limits for ambient air pollutants.

Table 27: Ambient Air Pollutants Guidelines

PARAMETER	REFERENCE TIME	GUIDELINE LIMIT
Sulphur (SO ₂)	1hour	350µg/m ³
Respirable Particulate Matter PM10	24hour	70 µg/m ³
Oxide of Nitrogen (NO _x) as nitrogen dioxide (NO ₂)	1hour	400 µg/m ³
Carbon Monoxide (CO)	1hour	30mg/m ³

6.9.3 Noise and vibration

Ambient noise levels were deduced from the measurements conducted on site using noise level meter at different measurement time of the day in line with the key socio-economic activities of Kanyenda Farming Block in general and the proposed project site and its surrounding in particular. Levels measured are presented in the tables of results discussed below.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Noise level readings were used to characterize the noise environment at each location or site and to distinguish the various noise levels associated with each point.

Table 28: Ambient Noise Level Results (7th April 2012)

Location	Co-ordinates	R1(dB)	R2(dB)	R3(dB)	Duration(min)	Average(dB)
GL-C	263°38'4"	39.7	39.0	40.0	15	39.6
GL-S	85°19'20"	38.4	39.2	38.8	15	38.8
GL-M	91°44'28"	45.4	44.9	45.0	15	45.1
GL-G	285°44'02"	40.2	39.8	39.2	15	39.7
GL-L	7°03'34"	39.2	39.0	40.1	15	39.4
GL-K	335°19'03"	33.9	41.0	40.7	15	38.5
GL-J	273°18'37"	33.8	34.0	34.6	15	34.1
GL-E	173°34'21"	41.9	40.2	42.0	15	41.4
FARMHOUSE	28°14'48"	44.0	37.8	42.3	15	41.3
NYIRENDA'S	175°43'12"	42.1	44.0	40.1	15	42.0

Noise level results recorded on day one according to table 27 indicate all sampled points have levels below the disruptive noise level in accordance with the IFC noise standards.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 29: Ambient Noise level Results (8th April 2012)

Location	Co-ordinates	R1(dB)	R2(dB)	R3(dB)	Duration(min)	Average(dB)
GL-C	263°38'4"	38.8	39.2	38.6	15	38.9
GL-S	85°19'20"	39.0	38.9	40.0	15	39.3
GL-M	91°44'28"	44.8	45.0	44.7	15	44.8
GL-G	285°44'02"	39.6	39.9	40.1	15	39.9
GL-L	7°03'34"	38.9	39.2	38.9	15	39.0
GL-K	335°19'03"	38.0	39.7	40.1	15	39.3
GL-J	273°18'37"	34.1	33.8	35.0	15	34.3
GL-E	173°34'21"	42.0	41.8	39.7	15	41.2
FARMHOUSE	28°14'48"	43.5	40.8	42.9	15	42.4
NYIRENDA'S	175°43'12"	45.1	39.9	42.8	15	42.6

On day two, the highest recorded level was 44.8dB at sampling point GL-M located at the main entrance gate to the proposed site.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 30: Ambient Noise Level Results (9th April, 2012)

Location	Co-ordinates	R1(dB)	R2(dB)	R3(dB)	Duration(min)	Average(dB)
GL-C	263°38'4"	38.7	38.9	39.0	15	38.9
GL-S	85°19'20"	38.8	38.6	39.0	15	38.8
GL-M	91°44'28"	44.8	45.0	44.9	15	44.9
GL-G	285°44'02"	40.0	39.0	40.8	15	39.9
GL-L	7°03'34"	38.8	39.9	40.1	15	39.8
GL-K	335°19'03"	38.9	40.1	41.0	15	40.0
GL-J	273°18'37"	34.0	33.9	34.1	15	34.0
GL-E	173°34'21"	40.8	41.0	41.1	15	40.9
FARMHOUSE	28°14'48"	43.0	42.8	40.9	15	42.2
NYIRENDA'S	175°43'12"	44.0	43.8	39.9	15	42.6

The noise levels in the area are consistent with the levels generally expected for rural Zambia especially where there are no major industrial or mining activities being undertaken.

The highest average noise level reading obtained was **45.1 dB** near the gate to the project site. The area recorded the figure due to its population and socio-economic activities especially during the day. The highest noise level recorded are below the disruptive (85 dB) noise level standard of the International Finance Corporation (IFC) which was the benchmark used in the study. From the figures recorded, it can be deduced that there is an increase in noise levels during mid day compared to morning and evening times. This is attributed to increased socio-economic activities during the day.

The project area is a designated Farm Block in Mpongwe District with no industrial activity taking place that would lead to high noise levels. No ground vibration was noticed or observed during the sampling period.

During the construction and operation phases of the project, Noise levels and vibrations are expected to increase due to construction machinery to be used on site and haulage vehicles that will deliver materials to site. In addition, during the operation phase, noise levels may increase due to farm equipment such as planters, sprayers and combine harvesters. However, the noise levels increase will only be limited to the construction phase and the planting and harvest times during the operation phase.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.10 FAUNA

Kanyenda Farming area falls under the Miombo Vegetation type. This type of vegetation sustains mainly large Mammals but due to the disturbances from the farming activities and human settlements most of the animals around Mpongwe area have migrated. The project site area has no evidence of large mammals apart from the domestic animal such as cattle and goats. Oral interviews with the local people revealed and confirmed that no large mammals have been spotted in the area and there was confirmation that none of such animals are known to exist in the area. However, the area manifests evidence of existence of the small mammals such as rodent's and moles. Reptiles such as snakes, lizards and chameleons are also known to exist in the area.

6.10.1 MAMMALS

Below is the list of small mammals frequently seen during the site survey.

- 1) *Rattus rattus* (Black Rat)
- 2) *Thryonomys swinderianus* (Cane Rat)
- 3) *Rabbits*
- 4) *Paraxereus cepapi* (Bush Squirrel)

6.10.2 REPTILES

Reptiles that were observed and seen by the local people at the project site were *Bitis arietans arietans* (African Puff adder), *Naja nigricollis nigricollis* (Black-necked Spitting Cobra), *Mabuya mabuya* (Common African Lizard) and *Dispholidus typus* (Boomslang).

6.11 FLORA

Mpongwe District in the Copperbelt province falls under the Central Zambezian Miombo vegetation. The Majority of the vegetation is Miombo woodlands with small patches of the Munga vegetation.

Kanyenda Farm which is the project site located off the main road between Mpongwe and Masaiti, 16 km away from the Mpongwe District has the Miombo woodlands vegetation type. Vegetation in this area consists of tall trees, Bushes and Shrubs and has a high rainfall pattern making Miombo and Munga vegetation to be dominant. The tree heights at the project site vary between 1-17metres and grasses were 0.1-1.5metres.

A Baseline field study on the Project site was conducted over a period of for weeks. The size of the Kanyenda farm is 669.4783 Hectares, 210 hectares of the vegetation at the project site has already been cleared from previous small scale farmers. The following were identifiable vegetation on project site boundary:

- 1) *Brachystegia*
- 2) *Parinari* (*Mupundu* (B))
- 3) *Brachystegia spiciformis* (*Musase* (B))

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

- 4) *Brachystegia longifolia* (Musamba (B))
- 5) *Julbernardia paniculata*
- 6) *Hyperhenea Imperata* (Thatching grass)
- 7) *Pericopsis angolensis* (Mubanga (B))

The population of the trees at the site was spaced, the southern part of the Project site has 10 trees of every 100m² transect while the Eastern region of the site had 5-6 trees of every 100m² transect. As a result of the project implementation about 300 hectares of natural vegetation will be removed from the site to pave way for the development of the Farm.



Figure 11: Vegetation on the proposed project site

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District



Figure 12: Vegetation on project Site

Vegetation identification was done by examining tree shape, size and foliage colour. As for species identification the following were considered; leaf composition, leaf type, leaf variation and plasticity, branch shape and stems.

Population and Density of the trees within the proposed farming site was conducted by using the Quadrant technique. A Quadrant technique is the best technique for demographic study of counting individuals. This technique of counting individual organism requires knowing the Area or volume of individual organisms that are immobile. It is a four sided figure.

Four Quadrant plots (transects) of 20metres by 20metres were made in the area near the workers quarters within the farm. Area of 400m² was established per quadrant plot and the number of trees was counted to estimate the population of the trees within the proposed farming site.

The four Quadrants plots were found to have a variety of species. The table below shows the Species and trees recorded in the four plots at the proposed site.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 31: Species and number of trees recorded.

Species	Plot 1	Plot 2	Plot 3	Plot 4
<i>Brachystegia</i>	5	1	1	2
<i>Parinari (Mupundu (B))</i>	1	-	1	1
<i>Brachystegia spiciformis (Musase (B))</i>	2	4	-	1
<i>Brachystegia longifolia (Musamba (B))</i>	1	2	3	1
<i>Julbernardia paniculata</i>	-	2	1	3
<i>Pericopsis angolensis (Mubanga (B))</i>	3	1	1	1
TOTAL NUMBER OF TREES	12	10	7	9

Average trees per plot were found to be 10.

Table 32: Summary of Vegetation structure and composition

Habitat	Growth Form	Dominant Species	Average(H) range(m)	Cover Class
Plot 1	Tree	<i>Brachystegia</i>	4.5 – 18.5	Sparse
	Ground Cover	<i>Grass species</i>		Mid - Dense
Plot 2	Tree	<i>Brachystegia spiciformis (Musase (B))</i>	4 – 16.5	Dense
	Shrub			
	Ground Cover	<i>Grass species</i>		Sparse
Plot 3	Tree	<i>Brachystegia longifolia (Musamba (B))</i>	4.5 – 17.0	Mid-Dense

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

	Ground Cover	<i>Grass species</i>		Mid- Dense
Plot 4	Tree	<i>Julbernardia paniculata</i>	2 – 17.1	Dense
	Ground Cover	<i>Grass Species</i>		Sparse

6.11.1 Species Diversity

Species diversity determination helped in understanding the variety of different species in a community, this helps in impact assessment and mitigation measures. The proportional abundance of species was calculated using the Shanon-Wiener Index.

Table 33: Species diversity estimated figures

Species	Proportional abundance	Estimated Number of species found at the project site
<i>Brachystegia</i>	0.237	29085
<i>Parinari (Mupundu (B))</i>	0.079	9695
<i>Brachystegia spiciformis (Musase (B))</i>	0.184	22622
<i>Brachystegia longifolia (Musamba (B))</i>	0.184	22622
<i>Julbernardia paniculata</i>	0.158	19390
<i>Pericopsis angolensis (Mubanga (B))</i>	0.158	19390

6.11.2 Volume of the tree

Determination of the Volume of the tree using the volumetric approach for all trees greater than 1.5m helps in calculating the quantities to be removed per hectare.

Volume of the trees for the four sites was determined by use of the volumetric method.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

The formula used was:-

$$V = \frac{\pi(\text{DBH}/2)^2 * \text{Ht}}{3}$$

Where

V = Tree volume (m³)

DBH = Diameter Breast Height

Ht = Total tree height

The Tree volume figures given in Table 33 represent the volume of wood available at each plot for merchantable heights only. The highest volume of wood that will be cleared during site clearance occurs in plot 4.

Table 34: Volume of Wood Produced During Site Clearance

Sample	Average Diameter (cm)	Average Height (m)	Bore Area (m ²)	Volume Per tree (m ³)	Volume Per Hectare (m ³)
Plot 1	31.2	11.5	0.076	0.293	96.91
Plot 2	34.5	13.2	0.093	0.409	112.73
Plot 3	30.0	12.5	0.071	0.300	57.88
Plot 4	36.8	16.0	0.106	0.565	140.16

Plot 4 and 2 had the highest volume of wood to be removed.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 35: Summary Volume of Wood to be cleared during Site Clearance

Average volume per hectare(m ³)	Volume of wood to be removed /469 hectares (m ³)
101.92	47800.48

The results in table 34 show that the average volume of wood produced to be cleared per hectare is **101.92m³**. The total wood to be removed from the 469 hectares would be **47800.48m³** and Density was found to be **0.0238**.

Some patches of Munga woodland which is Savannah woodland were identified at the project site. This type of vegetation is usually associated with flat topography, but may occur in patches or most commonly along streams. Soils are alluvial of riverine origin with high Base Exchange Capacity which are usually sandy clays. This vegetation is identified by the wide presence of *Acacia sp.* Grass cover is mostly dominated by *Hyparrhenia sp.*, *Andropogon sp.*, *Panicum sp.* and *Setaria sp.*

A Hydro census was conducted using verbal interviews and site visits within the surrounding local communities and it was found that there is no Surface water or stream located within the project site boundary, hence no Aquatic species were sited at the Project site. The project site had no rare or endangered species sited.

6.12 BIRDS

Miombo woodlands is a habitat of a mixed bird species. A number of bird species were identified at the project site. These include Dusky turtle dove (*Streptopelia lugens*), Red-faced Mousebird (*Urocolius indicus*), Swallow-tailed Bee eater (*Merops hirundineus*), Scaly-throated Honeyguide (*Indicator variegates*), Barn swallow (*Hirundo rustica*), Common Bulbul (*Pycnonotus barbatus*), Gray headed Sparrow (*Passer domesticus*), African Bush-warbler (*Bradypterus baboecala*) and White eyed slaty-Flycatcher (*Melaenornis fischeri*). Most of the birds mentioned are seed and insect eaters.

6.13 INSECTS

Insect survey at the project site was done and a number of insects were observed in the area. Insect life includes a variety of species of dragonfly, wasp, bees, crickets, grasshoppers, termites, mosquitoes, ants, red ants and moths. Some insect species provide a source of nutrition for local people either through direct consumption or via collection of insect products such as honey.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.14 Geology

The general geology of the Kanyenda farm area is shown in Figure 4, which is based on the Geological Map of the Luanshya Area by A.C.J. Hickman (Degree sheet 1328 NW quarter, scale 1:100,000, Geological Survey of Zambia, Report, 46, dated 1984)

According to the map the southern part of the farm is thought to be generally underlain by pebbly conglomerates, arkoses, quartzites and argillites of the Lower Roan Formation, while most of the central part of the farm is indicated to be underlain by highly metamorphosed micaschists. It is reported that in places these vary with minor micaceous quartzites.

The geological map appears to indicate a narrow band of southward dipping medium to coarse grained sugary and friable meta-quartzites in the northern sector of the farm. This is bound by gneisses that suggest a typical basement erosion surface. Structurally, there appears to be a major south-east north-west trending fault that offsets (estimated from the map of around 500 m) the narrow band of meta-quartzites. This feature is certainly influencing the local surface and likely groundwater drainage.

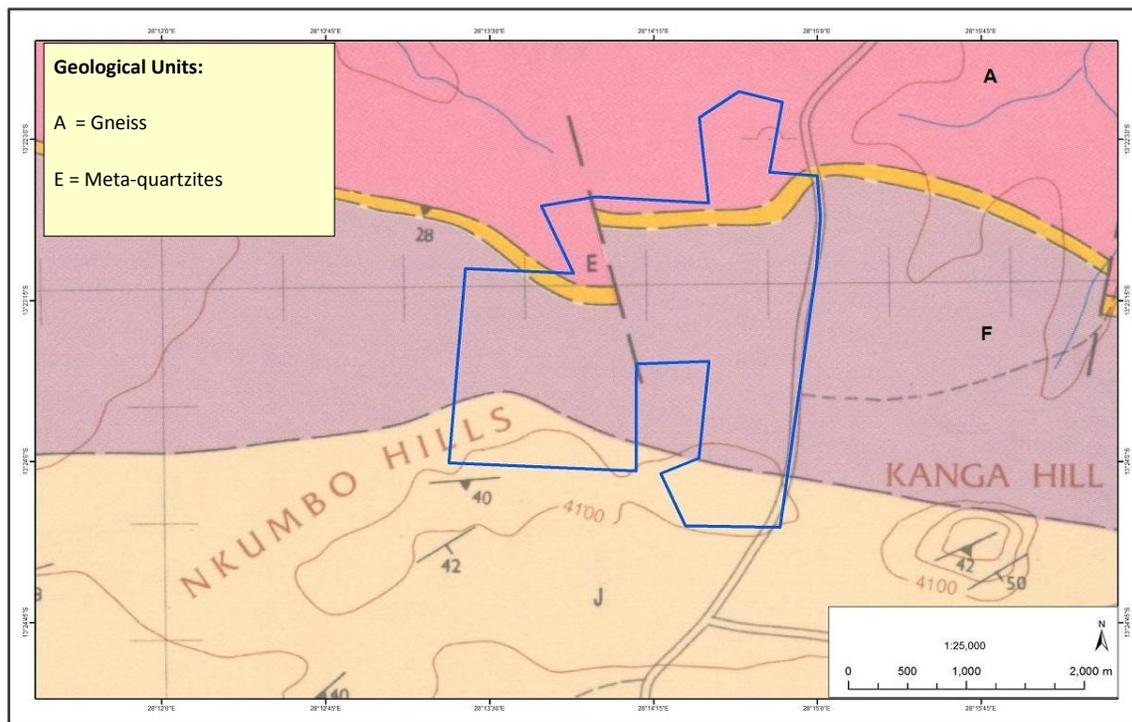


Figure 13: General Geology of Kanyenda Farming Area.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.15 Socio-Economic baseline

6.15.1 Scope of work, Assumptions, and methodology

6.15.1.1 Scope of work

The first phase of the socio-economic work was to attend and together with other team members, carry out consultative meetings with stakeholders, then interviews with the interested and affected parties (IAPS). The first part also involved a preliminary consultative meeting with Mpongwe District Council. This was to be followed by consulting the area identified community Traditional leaders as well as the Community. Limitations and challenges encountered have been discussed in section 9.14 at the end of the document.

6.15.1.2 Literature Review

Review of relevant documents related to the project undertaking was conducted by the EIA team.

6.15.1.3 Interviews

The literature review was followed by personal interviews with the community members and consultative meetings with community members and all stakeholders affected by the project and also those who have interest in the development of Kanyenda Farms. Three consultative meetings were held in respect of the project; the first district level meeting was held on 29th December, 2011 at the Council Chamber followed by a scoping held on 30th December 2011 at Kanyenda. The project disclosure meeting was held on 3rd August 2012 to obtain views, concerns and questions regarding the project as part of the requirement of the EIA process.

6.15.2 Background and Geographical Location

The project site is in Mpongwe district, which is located on the Copperbelt Province of Zambia. Mpongwe is one of the ten (10) districts of the province and is predominantly a rural district created in 1996. Mpongwe district is situated in what used to be called Ndola rural of the Copperbelt Province of Zambia. It lies 67 km south of Luanshya town. It has an altitude between 1200 and 1500 metres above the sea level.

6.15.2.1 District background and Geographical Location

Before Mpongwe became a district, it was part of Ndola Rural District. It became a district in 1996, under the Statutory Instrument No. 30 of 1997 of the Local Government Act. The other two districts that were part of the Ndola Rural District are Lufwanyama and Masaiti districts. The major tribe is Lamba. The Lamba people migrated from their ancestral land, Kola, in the now Democratic Republic of Congo (DRC) in the seventeenth century.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

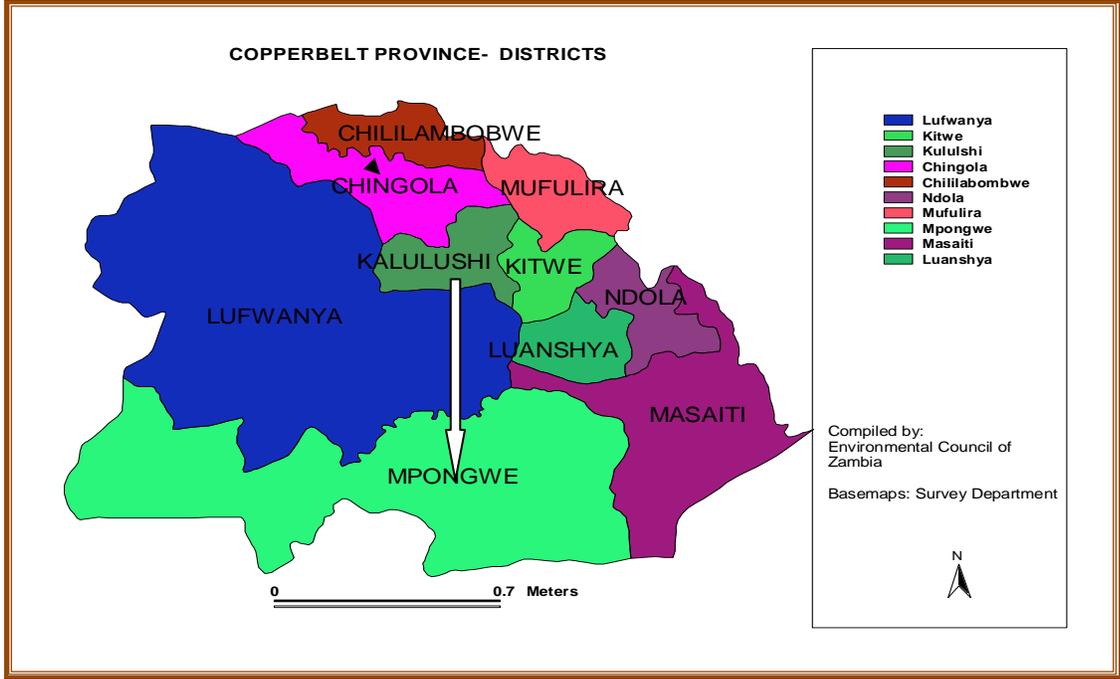


Figure 14: Copperbelt District Map (Source: Mpongwe E.S.A, 2005)

6.15.3 Government, Administration and Population characteristics

6.15.3.1 Provincial Government and Administration

Copperbelt province is found in the central part of Zambia. It covers an area of 31,328 square kilometres, representing 4.2% of the total area of Zambia. It forms boundaries with North-western province on the western side and Central province in the south. It also shares borders with DR Congo in the north.

Administratively, the province is divided into 10 districts, namely: Chililabombwe, Chingola, Luanshya, Kitwe, Kalulushi, Lufwanyama, Masaiti, Mpongwe, Mufulira and Ndola. Ndola is the administrative capital of the province. The Copperbelt province is one the most developed provinces in the country due to its rich mineral deposits. The province hosts the copper mines that have for years been the main stay of the national economy and have provided much foreign earnings. The mines have been the major employers of the Zambian population. Apart from Copper, the province is also endowed with other non ferrous metals such as cobalt, silver precious and semi-precious stones.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

The province is headed by the Provincial Minister and Permanent Secretary. These officials oversee the general political, development and administrative aspects of provincial governance. They are assisted by District Commissioners who are in charge of the administration of districts. Each district is divided into constituencies which are further divided into wards. These are headed by elected Members of Parliament (MPs) and Councillors respectively.

6.15.3.2 Traditional Government and Administration

Traditional governance is and has always been an important aspect of the way of life of people especially in the developing world where chiefs administers land and is the chief custodian of the customary land. Although it falls within Chief Kalunkumya’s Chiefdom, the project area is now on private property which is on Title Deed and as thus, does not fall and is not under customary control.

In terms of population, in 2000, Copperbelt province had a total population of 1,581,221 (799,402 males, 781,819 females). The provincial 2010 population stands at 1,958,623 people with 984,853 being female and 973,770 males. The average provincial inter censal annual growth rate stands at 2.2.

The 2010 CSO preliminary statistics indicate that Mpongwe district has a total of approximately 91,765 people of which 46,224 are females and 45,541 males.

Table 36: Mpongwe District Population 2010

Number Of Households	Population			Population Growth Rate	Population Share In The Province
	Male	Female	Total		
18,238	45,541	46224	91,765	3.6	100.0

Source: CSO, 2010 Preliminary results

The proposed project area is located in Mpongwe constituency and in Kanyenda ward which has a total of 8,375 people and 1,743 households. Of the 8,375 people, 4,238 are males and 4,137 females.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

The following chart shows the population of the ward.

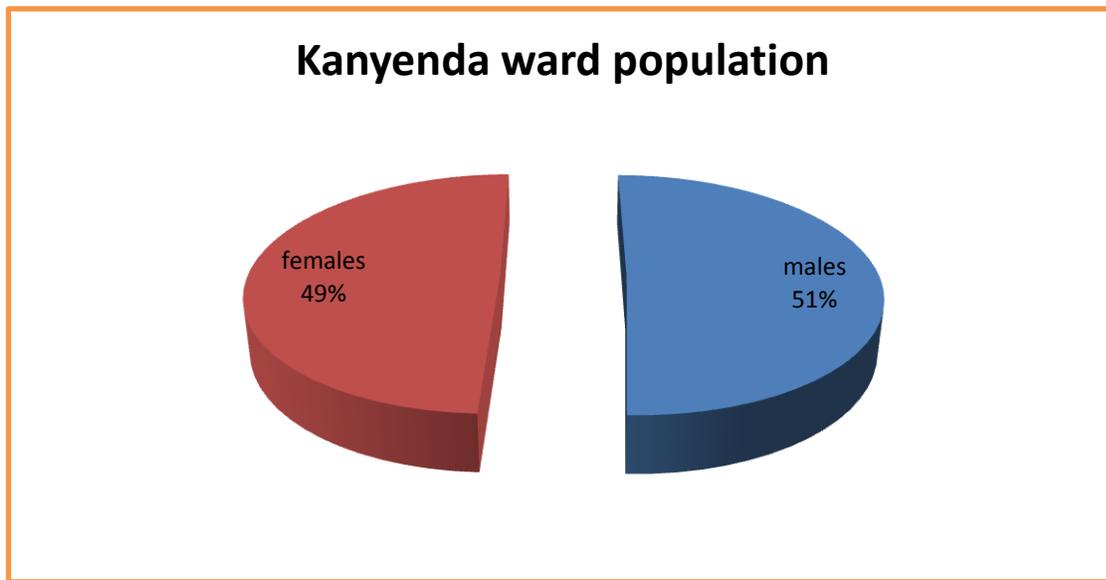


Figure 15: Kanyenda Ward Population Distribution

The number of settlements and/or families that have been relocated from within the peripherals of the farm is estimated to be 21. All these were considered in the socio-economic baseline done and fully compensated by Kanyenda Farming limited. Details of this are attached in the EIS report.

6.15.3.3 Social Fabric and Structure of Mpongwe

Although the entire Copperbelt province has a diverse mix of ethnic or tribal groupings with their corresponding Bantoid languages, the most predominant spoken language of communication in Copperbelt province is Bemba. For Mpongwe, the main tribes of the project area are Lamba and Bemba. Bemba is also taught in schools although the main language of communication which is also used in literacy campaigns, community meetings and agriculture extension services is Lamba.

6.15.3.4 Cultural Resources

Mpongwe District has a cultural shrine termed as the Nchembe Shrine. The Nchembe shrine is a parallel tunnel that was dug in the 19th century by the Plateau Chiefs as a refuge in times of war and other adversity such as slave trade. These tunnels are still visible today. They are found at Mpongwe Centre just after the Farmers Training Institute. They require protection and some investment to open them up for tourism.

In terms of the proposed farming activities at Kanyenda farms having a negative impact, the site will not be affected due to distance.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.15.4 Economic Activities

6.15.4.1 Agriculture, timber

Agriculture is the main economic activity of Mpongwe District. Its prominence as one of the most agricultural productive districts on the Copperbelt has even earned it the tag “The Granary of the Copperbelt” and this is not far from the truth. The District has all the category of farmers as per the Ministry of Agriculture and Cooperatives (MACO) description.

The forest resource is an important resource in the District. The forest resource provides firewood and charcoal for energy, honey and beeswax, timber production, wildlife and traditional medicines.

The demand for firewood, charcoal and agriculture is placing a lot of pressure on the forest resource, thus endangering the exploitation and development of the other resources such as bee keeping, timber production and wildlife. Bee keeping has a very long history among the local people in the District. The forests of Mpongwe are a source of honey for the local people who convert the honey into fermented honey beer, which is a favourite recreation and source of income for the small-scale farmers. The potential of bee keeping was even explored by Horst

Windorf (a German volunteer) in 1993 who put up a honey and beeswax factory at Mpongwe Farmers Training Centre (FTC). He even engaged in the training of the local farmers on the improved methods of bee keeping. Although he (Wendorf) left Mpongwe, the honey and beeswax factory is still in use today.

Timber production is also done by the local people albeit in a haphazard manner. Valuable Mukwa and other timber trees are cut and sawn into planks that are sold to the urban towns of Luanshya. But measures should be put in place to check the levels of indiscriminate cutting of the trees as well as issues of afforestation.

6.15.4.2 Mining

There is no known commercial mining, which is done in the District especially that which involves mining and exploiting the product to the outside of the District boundary. Rumours of the existence of some gemstones have been mentioned for certain areas, but no full exploitation report has been produced. There is, however, the mining of Agricultural lime by the Mpongwe Development Company (MDC).

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.15.4.3 Employment and Incomes

In the private sector, most of the people are employed in the agriculture sector. The major employer is Zambeef Products formerly ETC Bio-Energy Limited.

Government, through the various departments has also employed quite a significant number of people in the district especially in the Ministry of Health, Agriculture and Education, which are spread across the entire district.

6.15.4.4 Kanyenda Survey site findings

A field survey was conducted to ascertain the socio economic status of the area where the local people have been relocated to. This section presents the field findings of the affected community and therefore paints a picture of the situation in the new settlement in terms of description of socio-economic conditions obtaining in the affected Kaloko community. The conditions brought forward herewith are as a result of 14 (of the 24) household sample of a household based census survey findings. The census survey of households also determined the extent to which the affected families experienced loss of immovable assets distance to social services available and their perception of the resettlement programme.

6.15.4.5 Housing and housing characteristics

Out of the total 14 families interviewed, the survey revealed that all of them (100%) are married and most of the households (93%) are headed by males and only 7% by females, implying levels of vulnerability with regard to household heads, is insignificant.

With regard to the approximate family sizes, which is usually a function of the house size they have moved out and in, the survey revealed that the smallest family size is 2 while the biggest is 11. The average family size is therefore 6.

In trying to determine the psychological attachment to the area, the affected families were asked to state the approximate number of years they had lived in Kaloko community. The study revealed that 10 out of the 14 interviewed had spent more than 15years in Kaloko while only 4 said they had lived there for 10-15years.

When the household respondents were asked to state the estimated sizes of their previous houses, results gathered showed that they had various types of houses built using different material with the most common being those built using moulded clay with bricks followed by those built using moulded bricks and lastly those with burnt bricks. The statistics computed indicated 50% (7 houses), 43 % (6houses) and 7% (only 1 house) respectively.

In the current site where they have moved, the picture is slightly different as there are slightly more people who have built houses using burnt bricks, although those with moulded bricks are

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

less. The survey shows that 29% are now made of burnt bricks while 64% built using moulded clay and sticks and only 7% are of moulded bricks.

With regard to the roofing material used, the survey has revealed that only two types have been used both in the previous site and the current one. In both, only corrugated iron sheets and grass thatch has been used.

In the previous site, 85% of the households used grass thatch as the main roofing material on the main house while only 15% used corrugated iron sheets. In the new site, all the 14 families (100%) interviewed use corrugated iron sheets.

6.15.4.6 House sizes (previous Vs Current site)

The houses in the previous site and current site are of various sizes as shown below.

No	Name	Size Of Previous House (m²)	Size Of Current House(m²)
1.	Mateyo Stephen Lunda	12	16
2.	LastonMalikoTembo	15	15
3.	NobbyMupishi	15	15
4.	Chifita Clever	6	20
5.	Daniel Mupishi	28	18
6.	ChimbilaLafeti	20	20
7.	Martin Masauka	24	40.7
8.	John Lafeti	15	18
9.	Edson Mukuni	18	18
10.	James Lafeti	8	40
11.	FebbyMatanda	25	8.2
12.	Kelvin Matanda	24	12
13.	Raphael Chimbila	24	24
14.	Chitafu Moses	8	18

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

6.15.4.7 Lost land (Cultivated Vs Uncultivated land)

Much as the affected community still lives in the same village, area and chiefdom, in terms of land, the entire community has lost out as indicated in the table below.

No	Name	Previous Land Lost Under Cultivation	Previous Land Lost Not Under Cultivation	Current Land Under Cultivation	Current Land Not Under Cultivation
1	Mateyo Stephen Lunda	3ha	6ha	Nil	1ha
2	Laston Maliko Tembo	2.5ha	5ha	0.250	1ha
3	Nobby Mupishi	5ha	8ha	0.75ha	1ha
4	Chifita Clever	5ha	10	Nil	1ha
5	Daniel Mupishi	12ha	18ha	Nil	1ha
6	Lafeti Chimbila	1ha	20ha	0.250ha	1ha
7	Martin Masauka	13ha	15ha	Nil	8ha
8	John Lafeti Chimbila	1ha	Nil	Nil	1ha
9	Edson Mukuni	Nil	Nil	0.250ha	0.750ha
10	James Lafeti	0.750	3.5ha	Nil	1ha
11	Febby Matanda	9.5ha	15ha	0.250ha	1ha
12	Kelvin Matanda	2ha	5ha	Nil	1ha
13	Raphael Lafeti Chimbila	2ha	4ha	Nil	1ha
14	Chitafu Moses	7ha	10ha	Nil	1ha

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

The Kaloko community, like many other rural communities in Zambia is a farming community that thrives on peasant agriculture for their sustenance and therefore the 1 hectare given to all the affected has been said to be inadequate by all the respondents.

6.15.4.8 Community perception of the resettlement programme

Various views were expressed by the 14 interviewed community members and when summarised, they are as follows:

No	Perceived benefits of new site
1.	Slight improvement in terms of proximity to main market, schools,clinic
2.	Improved source of drinking water- borehole provided by Kanyenda farm
3.	Jobs created at the farm
4.	Transport cost,availability improved
No	Perceived weaknesses of new site
1.	Land in new site too small
2.	Complete loss and unpaid for of fruit trees
3.	No new clinic, as distances of minimal impact
4.	Lost a season without farming due to compensation

Much as most of the distances had improved, the community said that the impact is very minimal. The distance said to have improved include those to the palace, market clinic, grinding mill, churches and schools.

6.15.4.9 Lifestyle Disruption

Regarding changes in their lifestyle, residents cited challenges which were classified in either ‘Social Structure Disorientation’ or ‘largely referring to fruit trees to be left behind’. Among the 14 households who responded, 10 of them (account for about 71 percent) thought social structure disorientation would be the major lifestyle to be disrupted. Only 17% attributed the major disruption in their lifestyle to the fruit trees they will leave behind as they move to the new location, while about 12% of the respondents thought whatever challenges maybe they were negligible.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

In their view, residents said fruit trees play an important role in the lifestyle of most households in Kaloko area and Mango trees in particular. These serve as an alternative source of food and income, mostly during the early stages of the rainy season when most households are food insecure, a time which coincides with the ripening of Mango fruits. These fruits are either sold by the roadside, or simply eaten to alleviate food insecurity of the individual household.

Therefore, relocation to an area where there are no fruit trees will cost them this salient alternative food and income source for a period of not less than five years.

6.15.4.10 Compensation

Terms of Compensation

As earlier put, the entitlement matrix involving impact identification and to some extent mitigations, in terms of those affected had already been formulated and implemented by the time consultants moved in to do an EIA study. In consultation with the affected families/community, Local Authority and Traditional authorities, the matrix drawn proposed eligibility and payments for all kinds of losses and set standards for compensation. The following are the details on record:

i) Land for land option

It has been revealed that being a customary area, land for land was the preferred option. The chief provided land for the affected families where they have resettled the chief remains the custodian of the land on their behalf (community) by law.

ii) Cash compensation for lost /affected fields,

According to records at Council availed to the consulting team, an average of **ZMK 2,253,166.70** was paid per farmer/family with the highest getting **ZMK9,0000, 000** and the lowest **ZMK 180,000**. This was paid out on 25.01.10. See the attached payment sheet in the annex for details

iii) Other community benefits

- Provision of Improved drinking water, improved productivity.
- In commitment to provision of improved drinking water, the farm has so far drilled a borehole for the affected families in their new location.
- The farm has also already drawn up a community school construction programme with the residents in which commitment to help with roofing material has been made once the community identifies a school site and commences construction.
- The farm has been providing manure to the affected families and is in the process of registering outgrower groups. Soyabeans will be grown by these outgrower groups and

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

sold to the farm at prevailing market value. A ready market for the purchase of local maize from the farmers will be provided by Kanyenda Farming limited.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

7.0 ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

Environmental impacts of the proposed project have been discussed according to the phase in which they may occur during project implementation. These phases are:

- Preparatory/ Planning and Construction Phase
- Operational Phase
- Decommissioning and Closure Phase

While the social economic different economic impacts have been discussed and sub divided into construction and operational phases. The socio-economic impacts have been discussed in relation with the following subjects:

- Revenue
- Local Farmers
- HIV and AIDS
- Welfare
- Public Health and Safety
- Settlements
- Labour/ Employment
- Social Services/ Amenities
- Air
- Drinking Water
- Houses

The identified environmental impacts are associated with the following project activities;

- Internal roads and haul roads
- Sewage treatment facility
- Farm house
- Workers Compound
- Mini Workshop
- Power supply line

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

- Water supply boreholes and connecting pipelines
- Centre Pivots
- fuel storage facility
- Agricultural Activities

Characterisation of the impacts is the first step and it involves identifying whether the impact is positive or negative. The nature of the impact will further be described depending whether it is direct or indirect, short or long term and reversible or irreversible.

Significance of the impact will be evaluated in terms of spatial extent, duration, timing, likelihood, frequency and sensitivity.

Table 5: Impact Characterization Parameters

Item No.	Impact Criterion	Description	Criterion Classification	
			Term	Description
1.	Positive or Negative Impact	Will the impact have a positive or negative effect on the environment?	Positive	A positive impact
			Negative	A negative impact
2.	Likelihood of impact occurring.	What is the likelihood/certainty associated with a potential impact?	Unlikely	Unlikely to occur
			Possible	Possible to occur
			Likely	Likely to occur
			Certain	Certain to occur
3.	Timing of impact	At what point in time will the impact occur?	Pre-construction	Will occur during site construction phase.
			Start of operations	Will occur immediately farming operations begin.
			Near-future	Will occur within the life time of the farming period

**The Environmental Impact Statement for the Proposed Soya beans,
Wheat and Maize Growing Project by Kanyenda Farming Limited
in Mpongwe District**

			Mid-future	Will occur after farming has ceased
			Distant-future	Will occur in the distant-future.
4	Duration of impact	What is the likely duration/ time frame over which the impact will occur?	Indeterminate	Unable to be predicted with certainty.
			Short term	Will cease once activity stops.
			Medium term	Will continue for the lifetime of the farming period.
			Long term	Will continue beyond operational phase
			Permanent	Will remain permanently
5.	Spatial Extent of Impact	What is the geographical extent of the impact?	Local	Will affect areas within operational boundaries.
			Regional	Will affect areas outside farming area.
			Provincial	Will affect the whole Copperbelt.
			National	Will affect the whole Zambia.
			International	Will affect other countries.
6.	Frequency	How many times will the impact occur?	0	Non
			1	In one Phase

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

			2	In two phases
			3	In all the three phases
6.	Sensitivity of Impact	How sensitive is the impact to the environment or society?	1	Not sensitive
			2	Lowly Sensitive
			3	Sensitive
			4	Highly Sensitive
			5	Extremely Sensitive.

7.1 ENVIRONMENTAL IMPACTS

Impacts on the physical environment have been described in three categories. The impact characterisation table gives all the details of each evaluated impact according to nature of impact (positive, direct/ indirect and reversible/ irreversible), timing, duration, spatial extent, likelihood, frequency and sensitivity.

7.1.1 PREPARATION/ PLANNING AND CONSTRUCTION PHASE IMPACTS

Surface Water Quality

There are no streams or rivers within and/or in the vicinity of the proposed site. The only possibility is that of storm water flowing along roadside drains and across the farm land. This water will finally sink or percolate into the soil. It is therefore unlikely that there will be surface water pollution resulting from the any activities from the farm and any associated activities.

Ground Water Quality

Due to handling of fuels at the fuel storage tank, leakages of fuel and oil from machinery and handling of used oil at the workshop, it is likely that ground water may be contaminated by hydrocarbons. Inappropriate handling of fresh fuels and used oil may lead to leakages of fuel into the soil and in an event of rains and or storm water these hydrocarbons will end up in the soil and eventually in ground water. This impact may affect both the proposed project site and in its vicinity. Therefore, the impact will be regional.

Ambient Air Quality

Access road construction, vehicular movement, clearing of vegetation, sinking of boreholes, construction of the farm house and the workers compound, ploughing and tilling, transportation of

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

materials, etc will certainly generate appreciable amount of dust. This impact will be regional as it may affect both the proposed project site and its vicinity. This will be a nuisance.

Soil Contamination

Poor management of fresh and used oils will also certainly contaminate the soil. This impact will be regional as it may affect the proposed project site and its vicinity.

Soil Erosion

Clearing of vegetation, construction of access roads and infrastructure will result into possibilities of soil erosion. This impact will be local as it will be restricted to the proposed project site. Soil erosion will eventually result into poor soil fertility as the nutrients will be leached out.

Generation of Noise

Transportation of farm implements, use of dozers, excavators, graders, tractors and any other equipment in vegetation clearing, sinking of boreholes and construction of infrastructure will result into noise generation. This impact will be regional as it may go beyond the proposed project site.

Land Use

Construction of all the necessary farm infrastructure such as internal access roads, the farm house, workers compound, sewerage treatment facility, sinking of boreholes, installation of the centre pivots (in phases) and putting up of a power line will certainly have a positive impact on land use. Land use will change from idling, hunting and charcoal burning to commercial farming purposes.

Flora

Clearing of vegetation will certainly reduce the number of trees in the area. Some of trees that will be cleared are endangered species. It is almost impossible or very difficult to replace the endangered species at any time. This impact will be local as only affecting trees in the proposed project site.

Loss of Habitat

As a result of clearing of the flora, the local ecosystem will be disturbed. This will certainly result into loss of habitat for the birds, lizards, snakes, rabbits, moles, mice, ants and microorganisms. There are no engendered species of animals in the area. There is no game management area or a game park or reserve.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Fauna

The impact on fauna is unlikely as there are no bigger animals in the proposed project site or in the vicinity which are sensitive to such developments. The only animals present are those that are able to survive even with such developments. Examples are birds, rabbits, lizards, rodents, snakes and smaller animals.

Landscape and Visual characteristics

Clearing of vegetation and construction of different farm infrastructure will certainly have an impact on the landscape and visual characteristic of the proposed project site. This impact will be local. The landscape and visual characteristics will change drastically.

Public Safety

Vehicular movement and farm equipment may possibly cause accidents to members of the public who may illegally stray into the farm area. Open boreholes are certainly a danger to public safety.

Archaeology and cultural sites

Archaeological sites having items such as cultural relics, iron and stone age objects, old caves, artistic work and paintings, spiritual and worshiping items, churches, traditional places (Insaka) etc may be possibly be damaged during construction phase if available. At the moment there are no such areas within and outside the proposed project site. Therefore this impact is unlikely.

Hazardous Waste

Fresh and used oil are likely to be spilled into the soil during the construction phase depending on the management of these items. The impact will be local.

Solid Waste

Off cuts from steel, timber, rubble and domestic waste will be generated during construction. This impact will be local.

Sewer waste

Use of toilets whether pit latrines or advance will result into sewer waste being generated. This may possibly affected ground water quality in the vicinity of the pits. This impact is minimal and will be local.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

7.1.2 OPERATIONAL PHASE IMPACTS

Surface Water Quality

There are no streams or rivers within and or in the vicinity of the proposed site. The only possibility is that of storm water flowing along road way drains and across the farm land. This water will finally sink or percolate into the soil. It is therefore unlikely that there will be surface water pollution resulting from the any activities from the farm and any associated activities.

Ground Water Quality

Due to handling of fuels at the fuel storage tank, leakages of fuel from vehicles and handling of used oil at the workshop it is possible that ground water may be contaminated by hydrocarbons. Inappropriate handling of fresh fuels and used oil may lead to leakages of fuel into the soil and in an event of rains and or storm water these hydrocarbons will end up in the soil and eventually in ground water.

Application of fertilisers, insecticides, fungicides and herbicides will certainly result into soil contamination and with rain water and storm water these chemicals will contaminate ground water. This impact may be regional as areas in the proposed project site may be affected.

Ambient Air Quality

Vehicular movement, ploughing and tilling, transportation of materials (inputs and out puts), etc will certainly generate appreciable amount of dust. This impact will be regional as it may affect both the proposed project site and its vicinity. This will be a nuisance.

High wind velocities may also result into dust generation from the bare land that has been cleared of its vegetation.

Soil Contamination

It is possible that soil contamination may occur due to inappropriate handling of chemicals such as fertiliser, insecticides, fungicides and herbicides. Poor management of fresh and used oils will also certainly contaminate the soil. This impact will be regional as it may affect the proposed project site and its vicinity.

Soil Erosion

Poor maintenance of access roads and drainages may result into continuation of soil erosion. Soil erosion may be from storm water and or high velocity winds. This impact will be local as it will be restricted to the proposed project site. Soil erosion will eventually result into poor soil fertility as the nutrients will be leached out.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Noise

Transportation of farm implements and products, use of farm equipment in ploughing and tilling, application of fertilisers, insecticides, fungicides and pesticides, pumping of water, and any other activity associated with the operational phase will certainly result into noise generation. This impact will be regional as it may go beyond the proposed project site.

Land Use

Tilling and ploughing, transpiration of farm inputs and outputs, built infrastructure, pumping of water from boreholes, supply of electricity and any other activity that will be carried out on the farm land at operational phase will certainly have a positive impact on land use. Land use will change from idling, hunting and charcoal burning to commercial farming purposes.

Flora

During operational phase it is possible that invasive species may be introduced accidentally into the proposed project site and in the vicinity of the proposed project site. The agents of this invasive species may not be necessary the developer but may be from the out grower scheme that will be initiated and encouraged by the development.

Fauna

Operational phase activities will have no impact on fauna as there are no bigger animals in the proposed project site or in the vicinity which are sensitive to such developments. The only animals present are those that are able to survive even with such developments. Examples are birds, rabbits, lizards, rodents, snakes and smaller animals.

Landscape and Visual characteristics

Use of access roads, buildings, tilling and ploughing, irrigation system, growing of crops and use of machinery at the farm will certainly have an impact on the landscape and visual characteristic of the proposed project site. This impact will be local. The landscape and visual characteristics will change drastically.

Occupational Health and Safety

Employees in the farm may be exposed to occupational health and safety risks as a result of the use of fertilisers, herbicides, pesticides and other chemicals that will be used at the farm. In the application and use of these chemicals the company shall develop, establish and implement standard working procedures which shall comply to international and national occupational health and safety standards and guidelines. The use of proper PPE for the workers shall be implemented and enforced on the farm to safeguard the lives of the employees.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Public Safety

Vehicular movement and farm equipment may possibly cause accidents to members of the public who may illegally stray into the farm area. Open boreholes are certainly a danger to public safety.

Archaeology and cultural sites

Operational phase activities are unlikely to have any impact to archaeological and cultural sites as there are no such areas and the activities themselves cannot lead into discovery or damage of such sites. At the moment there are no such areas within and outside the proposed project site. Therefore this impact is unlikely.

Hazardous Waste

Fresh and used oil are likely to be spilled into the soil during the operational phase depending on the management of these items. The impact will be local.

Solid Waste

Domestic and Biomass waste will be generated during operational phase. This impact will be local. The domestic waste generation is negative while the biomass generation is a positive impact. The biomass may be used as an energy source with appropriate technology.

Solid waste such as chemical containers and packaging materials will certainly be generated during operational phase. This impact will be local and irreversible.

Introduction of Alien Invasive Species

This impact may occur during the operational phase. During cultivation, it is possible that alien invasive species may be deliberately or accidentally introduced at the farm.

Sewer waste

Use of toilets whether pit latrines or advance will result into sewer waste being generated. This may possibly affected ground water quality in the vicinity

7.1.3 DECOMMISSIONING AND CLOSURE

Soil Erosion

Poor maintenance of access roads and drainages may result into soil erosion. Soil erosion may be from storm water and or high velocity winds. This impact will be local as it will be restricted to the proposed project site. Soil erosion will eventually result into poor soil fertility as the nutrients will be leached out.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Land Use

Land use will certainly change after decommissioning and closure. After rehabilitation and re-vegetation land use may be restored to the original.

Public Safety

Boreholes, electricity lines and old farm equipment may pose danger to locals who may illegally enter the proposed project site after closure.

Landscape and Visual characteristics

Visual characteristics and the landscape will certainly change. Infrastructure such as the farm house, workers compound, workshop and the fuel storage tank will be demolished. There will be no growing of the three crops any more. The irrigation system will be removed. This will certainly change the landscape and visual characteristics.

Solid Waste

Biomass generation will cease as there will be no growing of crops. Closure activities will result into generation of rubble. Domestic waste generation will continue but at very minimal scale as the population at the farm will drastically reduce. Only the caretakers with his family will leave at the farm.

Sewer waste

After decommissioning and closure, use of toilets whether pit latrines will be done by the caretakers and consequently the impact will be very minimal considering the few numbers (The caretaker and his family). This may possibly affect ground water quality in the vicinity. This impact will be local.

7.2 SOCIO – ECONOMIC IMPACTS

7.2.1 Impacts of flooding of fields, houses

Construction Phase

It had been alleged (at the time of consultations) that, the opening up of the farm, growing/cultivation of the fields had resulted in increased runoff which periodically caused flooding of fields and homes located across the road, on the eastern part of the farm. In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and an annual occurrence respectively.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Operational Phase

After the completion of all construction works, full scale cultivation activities, the anticipated impact is expected to continue.

Although it is yet to be established as to whether the flooding problem is historical or caused by current farming activities at Kanyenda, scientifically, the consulting team will consider multiple factors that could be behind the flooding before establishing responsibility of the impact. As stated above, during the construction phase, in terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and an annual occurrence respectively.

7.2.2 Impacts of possible drinking water contamination

Construction Phase

Not much impact is anticipated at this stage.

Operational Phase

It was alleged that once spraying of crops with chemicals starts, residents whose water wells are located in the wind ward direction and near the farm will be affected. The EIS consultations conducted so far have revealed that majority of the people fetch their drinking water from shallow wells which could easily be contaminated. There were repeated calls for the company to consider helping the community with boreholes.

The impact would be considered negative and significant if established as it endangers human life.

In terms of magnitude, likelihood, extent and frequency, the impact is considered negligible, possible, confined to the project site surrounding and could possibly be an activity that occurs when spraying is done respectively.

7.2.3 Impacts of air pollution on residents

Construction Phase

Respiratory diseases due to air pollution

The major source of the impact will be dust from front end loaders and dozers making access roads, clearing ground for construction and trees from the farm. This would be felt by the nearby households.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Operational Phase

The impact will continue as most of the trees will have been cleared and the whole farm under full cultivation, although the other causes of this problem include actual farming activities which raise dust and the chemicals during the spraying of crops in the farm.

In terms of magnitude, likelihood, extent and frequency, the impact is considered marginal, possible, confined to the project site surrounding and a weekly activity once spraying starts respectively.

7.2.4 Pressure on existing facilities/social services

Construction Phase

Hospital

During construction and farm clearing phase, all occupational health related injuries will be referred to the nearby Kanyenda Rural Health Centre, located at the junction of the access road to Kanyenda farm and - Mpongwe road for immediate attention. This will have an impact on the capacity of the staff, available bed space and other associated clinic facilities as this entails extra load.

In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and a daily/weekly occurrence respectively.

Land for housing

An influx of workers in search of employment opportunities during the ongoing farm clearing stage is likely to result in pressure on traditional land around the farm for occupation by prospective migrant workers from the surrounding chiefdoms, villages and districts.

In terms of magnitude, likelihood, extent and frequency, the impact is considered negligible, unlikely, confined to the district and a daily occurrence respectively.

Municipal services

Not much is expected at construction stage.

Operational Phase

Health

During the operational stage, a lot of workers will be employed by the farm to assist in farm work and this will entail increased pressure on existing health facilities. The farm will also attract a number of migrant labour from other villages and districts for employment and this will put

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

pressure on existing health facilities. In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and a daily occurrence respectively. The impact is negative.

Schools

Farming is usually a labour intensive venture as workers are required at every stage- field preparation, cultivation, weeding, fertilizer and other chemical application as well as harvesting. At full scale operational stage, the company will attract, employ a lot of people from other parts of the village, chiefdom and district who will come along with their families. This is likely to create pressure on existing schools. The impact is considered negative as this will result in increased teacher – pupil ratio, a factor which militates against provision of quality education. In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and an annual occurrence (during enrolments only) respectively.

Land for housing

As stated above, the influx of people in search of employment opportunities during the ongoing farm clearing stage is likely to increase once the farm is under full scale cultivation. Migrant labour will increase especially during the peak season of farm activity.

Municipal services

If, after full scale farming operations are commissioned, the surrounding area, built up by those seeking employment, which is usually developed without regard to basic services (as it is outside Council's planning boundary) such as clean drinking water and sanitation facilities, disease outbreaks can be unavoidable. Population concentration within the project area will lead to production of solid and liquid wastes which will aid the breeding of disease vectors like mosquitoes and house flies.

Population concentration can also lead to disease when there is inadequate housing leading to overcrowding, lack of free circulation of air and poor ventilation.

Contagious diseases can also easily spread under these conditions. Transmission of an infectious disease may occur through one or more of diverse pathways including physical contact with infected individuals. These infecting agents may also be transmitted through liquids (e.g., cholera), food, body fluids, contaminated objects, airborne inhalation (e.g., respiratory diseases and meningitis), or through vector-borne spread. Disease outbreaks in such a situation can be the order of the day with a resulting loss of life.

If not properly handled, the impact may be negative.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Increase in criminal activity

Wherever there is population concentration, it is expected that some form of crime may increase. Increased population will outstrip, outpace the capacity of the local police.

This will be aggravated by the fact that the area around has no existing police post nearby.

7.2.5 Impacts on Labour situation/employment

Construction Phase

During this phase, skilled and unskilled labour will be required. The project area is characterized by high level of unemployment and low level of skills and creation of employment opportunities will therefore increase the positive benefits for the local people who are in dire need of income for sustenance. Furthermore, indirect opportunities for employment will arise from the provision of services to the construction teams/those clearing the farm, such as sale of food and beverages. In this sense the construction phase may have a positive impact on the employment situation in the nearby communities. In terms of magnitude, likelihood, extent and frequency, the impact is considered definite, possible, confined to the entire district and a mainly a seasonal occurrence especially during harvesting respectively.

Operational Phase

Socio-economic benefits provided by the project will include job provision to the locals during the whole operational phase.

7.2.6 Impact on Settlements and private farms

Construction Phase

During the construction phase heavy machinery will be employed for the clearance of access roads. Heavy machines may affect households and other privately owned farms.

In terms of magnitude, likelihood, extent and frequency, the impact is considered negligible, unlikely, confined to the project site surrounding and a once off occurrence respectively.

It is certain that the impact of displacing people who do their weeding and or have shelters within the proposed project site will be displaced. In fact this impact has already occurred when the developer just acquired the farm. The Social Management Plan and socio-economical mitigation measures have stipulated how the developer, local authorities, the chief and the affected parties resolved this issue.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Operational Phase

The impact of people being displaced can only occur at preparation and construction phase. Therefore it is unlikely that this impact may occur during the operational phase. People will not be allowed to re-settle on proposed project site. It will be illegal.

7.2.7 Impacts on public/workers safety and health

Construction Phase

During the construction phase heavy machinery like tractors, dozers etc will be employed for the clearance of access roads. Heavy machines make a lot of noise, cause carbon dioxide emissions and generate dust and may cause accidents among operators if not handled properly. In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and a daily occurrence on workers if preventive measures are not considered respectively.

Operational Phase

Access by unauthorised people into the farm, an action which merits trespassing may result in injury if found by farm security personnel. Besides, accidents with the basic cultivation tools, other machinery and farming implements that the workers will be using may occur. In terms of magnitude, likelihood, extent and frequency, the impact is considered insignificant, highly unlikely (as the farm is fenced), confined to the project site surrounding and of negligible frequency respectively.

7.2.8 Impacts of poor conditions of service

Construction Phase

The impact is anticipated at this stage. Subjection of workers to poor conditions of service is against the country's Labour Laws and is therefore considered negative and significant if established and reported.

Operational Phase

The impact may continue if not controlled. In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site and a monthly occurrence respectively.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

7.2.9 Impacts of HIV/AIDS

Construction Phase

Presence of migrant workers from other parts of the district and province will, during this phase be responsible for the spreading of HIV/AIDS as they will be interacting with local people. Casual and unprotected engagement in sexual activities may spread the infection, not only to the members of the community but also the contractors as well.

In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and a once off occurrence respectively.

Operational Phase

The practice could continue and this habit could lead to more cases of HIV/AIDS and consequently death.

In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and a daily occurrence respectively.

7.2.10 Impact of out grower scheme to local farmers

Construction Phase

Not much is expected at this stage.

Operational Phase

Engagement of local people in soya beans production as out growers will help boost productivity, enhance local farmers' incomes and subsequently improved lives and reduced poverty.

In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and an annual occurrence respectively.

7.2.11 Improved Local Authority Revenue base

Construction Phase

Not much is expected at this stage.

Operational Phase

Through payment of various levies and revenues, full operations of the farm will improve the financial standing of the council.

In terms of magnitude, likelihood, extent and frequency, the impact is considered significant, possible, confined to the project site surrounding and a monthly occurrence respectively.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

7.2.12 Loss of Land

There will be loss of land for those people who were cultivating and or had shelters within the proposed project site. These people have been identified and the developer has since compensated them. The chief has given them land where they have resettled just adjacent to the proposed project site on the eastern side. This impact will only occur during the construction stage and its local.

7.2.13 Loss of Livelihood

The people who were doing subsistence farming and /or had shelters within the proposed project site certainly lost their livelihood. This impact was local as it only affected a few who had their fields and or shelters within the proposed project site. The developer with the help of the local authorities, the chief and the affected parties (before the EIA process had started) had already compensated the affected parties. The chief has since given them land where they have resettled.

7.2.14 Loss of Customary Rights

The people who had shelters and or fields within the proposed project site had the right to their customary land. However due to the proposed project they lost that right to that particular land, however, Kalunkumya chiefdom is so vast and the chief has since resettled the affected parties to the land on the eastern side of the proposed project site. So this impact has been well mitigated.

7.2.15 Damage to Agriculture/ Fisheries

This impact is very much unlikely. There is no stream or river within and or in the vicinity of the proposed project site, as such no damage to fish is expected. This impact will not occur during any phases of the proposed project.

The developmental project is an agricultural project and it is unlikely that it will cause an agricultural damage during any of the proposed project phases. If anything it will have a positive impact on agriculture in the area. There will competition among various farms to produce more and it will introduce an out grower scheme.

7.2.16 Loss of Amenity Value

There is no any form of amenity in the proposed project site and the locals do not use the proposed land as a form of amenity at all. For this reason it is unlikely that this impact will occur throughout the project phases.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 38: Impact Characterization

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
Preparation /Planning and Construction Phase									
Surface Water Quality	1.	Storm water contamination	Negative Direct Irreversible	likely	Pre-construction to distant future	Short term	Regional	2	1
Ground Water Quality	2.	Contamination of ground water	Negative Direct Irreversible	likely	Near-future	Short term	Regional	1	5
Drawdown	3.	Reduction in drawdown levels	Negative	unlikely	Near-future	Short term	Regional	1	5
Ambient Air Quality	4.	Contamination of ambient air with dust	Negative Direct Irreversible	Certain	Pre-construction to near future	Short term	regional	3	3
Soil Contamination	5.	Contamination	Negative	likely	Pre-	Medium term	Local	2	3

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
		of soil with hazardous waste (used oil)	Reversible Direct		construction to near future				
	6.	Contamination of soil with Pesticides, fungicides and herbicides	Negative Irreversible Direct	unlikely	Start of operational to near future	Medium term	Local	1	4
Soil Erosion	7.	Lose of soil fertility as a result of soil erosion by wind and or by water.	Negative Irreversible Indirect	Likely	Pre – construction to distance future	Permanent	Local	3	4
Noise	8.	Generation of Noise	Negative Direct Irreversible	Certain	Pre-construction to near future	Medium term	Regional	2	3

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
Land Use	9.	Change of land use	Positive Direct Reversible	Certain	Start of operational to near future	Medium term	Local	2	4
Flora	10.	Clearing of vegetation	Negative Direct Reversible	Certain	Pre - construction	Permanent	Local	1	5
	11.	Introduction of Invasive Species	Negative Indirect Irreversible	Possible	Pre-construction	Permanent	Regional	2	5
	12.	Extinction of endangered species	Negative Direct Irreversible	Certain	Pre-construction	Permanent	Regional	2	5
Fauna	13.	Loss of fauna	Negative	Certain	Pre-construction	Permanent	Regional	1	5

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation							
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity	
			Direct Irreversible							
	14.	Interruption of animal corridors	Negative Direct Irreversible	unlikely	Pre-construction to operational phase	Permanent	Regional	2	5	
	15.	Loss of endangered fauna species	Negative Direct Irreversible	unlikely	Pre-construction	Permanent	Regional	1	5	
Archaeology and cultural sites	16.	Damage and removal of archaeological sites	Negative Direct Irreversible	Unlikely	Pre - Construction	Permanent	Local	1	4	
	17.	Damage and removal of	Negative	Unlikely	Pre -	Permanent	Local	1	4	

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
		Cultural Sites	Direct Irreversible		Construction				
Public Safety	18.	Danger to the community from farm equipment	Negative Indirect Reversible	Possible	Pre – construction to Near future	Medium Term	Regional	2	4
Loss of Habitat	19.	Animals likely to lose their habitat	Direct	Certain	Pre – construction to Near future	Medium Term	Local	2	4
Landscape and Visual characteristics	20.	Change to landscape and visual characteristics	Negative Direct Reversible	Certain	Pre-Construction	Medium Term	Local	1	4
Hazardous Waste	21.	Generation of hazardous waste such as	Negative Direct	Certain	Pre-Construction to	Short Term	Local	2	4

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation							
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity	
		used oil, chemical containers, batteries, florescence tubes etc.	Irreversible		Operational phase					
Solid Waste	22.	Generation of Solid Waste from plant biomass	Positive Direct Irreversible	Certain	Operational Phase	Medium Term	Local	1	4	
	23.	Generation of Domestic Waste	Negative Direct Irreversible	Certain	Pre – Construction to Mid Future	Short Term to Medium Term	Local	3	3	
Sewer waste	24.	Generation of Sewer Waste	Negative Direct Reversible	Certain	Pre – Construction to Mid Future	Short Term to Medium Term	Local	3	3	

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
Operational Phase									
Surface Water Quality	25.	Surface water contamination	Negative Direct Irreversible	unlikely	Pre-construction to distant future	Short term	Regional	3	1
Ground Water Quality	26.	Contamination of ground water	Negative Direct Irreversible	Possible	Near-future	Short term	Regional	1	5
Drawdown	27.	Reduction in drawdown levels	Negative	Certain	Near-future	Short term	Regional	1	5
Ambient Air Quality	28.	Contamination of ambient air with dust	Negative Direct Irreversible	Certain	Pre-construction to near future	Short term	regional	3	3
Soil Contamination	29.	Contamination of soil with	Negative	likely	Pre-construction	Medium term	Local	2	3

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation							
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity	
		hazardous waste (used oil)	Reversible Direct		to near future					
	30..	Contamination of soil with Pesticides, fungicides and herbicides	Negative Irreversible Direct	Certain	Start of operational to near future	Medium term	Local	1	4	
Soil Erosion	31.	Lose of soil fertility as a result of soil erosion by wind and or by water.	Negative Irreversible Indirect	Possible	Pre – construction to distance future	Permanent	Local	3	4	
Noise	32.	Generation of Noise	Negative Direct Irreversible	Certain	Pre- construction to near future	Medium term	Regional	2	3	

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
Land Use	33.	Change of land use	Positive Direct Reversible	Certain	Start of operational to near future	Medium term	Local	2	4
Flora	34.	Clearing of vegetation	Negative Direct Reversible	Certain	Pre - construction	Permanent	Local	1	5
	35.	Introduction of Invasive Species	Negative Indirect Irreversible	Possible	Pre-construction	Permanent	Regional	2	5
	36.	Extinction of endangered species	Negative Direct Irreversible	Certain	Pre-construction	Permanent	Regional	2	5
Fauna	37.	Loss of fauna	Negative	Certain	Pre-construction	Permanent	Regional	1	5

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation							
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity	
			Direct Irreversible							
	38.	Interruption of animal corridors	Negative Direct Irreversible	unlikely	Pre-construction to operational phase	Permanent	Regional	2	5	
	39.	Loss of endangered fauna species	Negative Direct Irreversible	unlikely	Pre-construction	Permanent	Regional	1	5	
Archaeology and cultural sites	40.	Damage and removal of archaeological sites	Negative Direct Irreversible	Unlikely	Pre - Construction	Permanent	Local	1	4	
	41.	Damage and removal of	Negative	Unlikely	Pre -	Permanent	Local	1	4	

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
		Cultural Sites	Direct Irreversible		Construction				
Public Safety	42.	Danger to the community from farm equipment	Negative Indirect Reversible	Possible	Pre – construction to Near future	Medium Term	Regional	2	4
Occupational Health and Safety	43.	Health and safety risk to employees on the farm due to use of herbicides, fungicides and pesticides	Negative Direct Reversible	Possible	Operational Phase	Medium Term	Local	1	4
Landscape and Visual characteristics	44.	Change to landscape and visual	Negative Direct	Certain	Pre-Construction	Medium Term	Local	1	4

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation							
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity	
		characteristics	Reversible							
Hazardous Waste	45.	Generation of hazardous waste such as used oil, chemical containers, batteries, florescence tubes etc.	Negative Direct Irreversible	Certain	Pre-Construction to Operational phase	Short Term	Local	2	4	
Solid Waste	46.	Generation of Solid Waste from plant biomass	Positive Direct Irreversible	Certain	Operational Phase	Medium Term	Local	1	4	
	47.	Generation of Domestic Waste	Negative Direct Irreversible	Certain	Pre – Construction to Mid Future	Short Term to Medium Term	Local	3	3	
	48.	Generation of	Negative	Certain	Operational	Medium	Local	3	4	

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
		Solid Waste from containers and packaging materials for fertilisers, herbicides, fungicides and pesticides.	Indirect Irreversible		Phase	Term			
Sewer waste	49.	Generation of Sewer Waste	Negative Direct Reversible	Certain	Pre – Construction to Mid Future	Short Term to Medium Term	Local	3	3
Decommissioning and Closure Phase									
Ambient Air Quality	50.	Contamination of ambient air with dust	Negative Direct	Unlikely	Pre-construction to near future	Short term	Regional	3	3

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
			Irreversible						
Soil Erosion	51.	Lose of soil fertility as a result of soil erosion by wind and or by water.	Negative Irreversible Indirect	Likely	Pre – construction to distance future	Permanent	Local	3	4
Land Use	52.	Change of land use	Positive Direct Reversible	Certain	Start of operational to near future	Medium term	Local	2	4
Public Safety	53.	Danger to the community from farm equipment	Negative Indirect Reversible	Possible	Pre – construction to Near future	Medium Term	Regional	3	4
Landscape and Visual characteristics	54.	Change to landscape and visual characteristics	Negative Direct	Certain	Pre-Construction	Medium Term	Local	1	4

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation							
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity	
			Reversible							
Solid Waste	55.	Generation of Domestic Waste	Negative Direct Irreversible	Certain	Pre – Construction to Mid Future	Short Term to Medium Term	Local	3	3	
Sewer waste	56.	Generation of Sewer Waste	Negative Direct Reversible	Certain	Pre – Construction to Mid Future	Short Term to Medium Term	Local	3	3	
SOCIO- ECONOMIC CHARACTERISATION										
Houses	57.	Flooding of houses	Negative Direct Reversible	Unlikely	Pre – Construction to Mid Future	indeterminate	Regional	3	5	
Drinking Water	58.	Contamination of drinking water	Negative Direct	Possible	Pre – Construction to Mid Future	Indeterminate	Regional	3	5	

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation							
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity	
			Irreversible							
Air	59.	Air pollution on residents near the farm	Negative Direct Irreversible	Likely	Pre – Construction to Mid Future	Short term	Regional	2	3	
Social Services/ Amenities	60.	Pressure on existing social services	Negative Indirect Reversible	Certain	Pre – Construction to Mid Future	Short to long term	Regional	2	4	
Labour/ Employment	61.	Creation of jobs	Positive Direct Reversible	Certain	Pre – Construction to Mid Future	Short to long term	Provincial	3	5	
Settlements	62.	Impact on settlements	Negative Indirect Reversible	Certain	Pre – construction to mid future	Permanent	Regional	2	4	

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
Public Health and Safety	63.	Danger and Risks to the Public	Negative Direct Reversible	Possible	Pre – construction to mid future	indeterminate	Local	3	4
Welfare	64.	Poor or good conditions of service	Positive or negative Indirect Reversible	Possible	Pre – construction to mid future	indeterminate	Regional	3	5
HIV and AIDS	65.	Transmission of HIV and AIDS through casual sex	Negative Indirect Irreversible	Certain	Pre – construction to mid future	indeterminate	Regional	3	5
Local Farmers	66.	Impact of the out grower scheme	Positive Direct Reversible	Certain	Start of operational to mid future	Short to long term	Regional	2	4
Revenue	67.	Improved	Positive	Certain	Pre – construction	Short to long	National	3	5

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Item No.	Potential Impact	Environmental Impact Characterisation						
			Nature	Likely hood	Timing	Duration	Extent	Frequency	Sensitivity
		revenue base	Indirect and direct Reversible		to mid future	term			

Source of format: The Lumwana Copper Project Environmental Impact Assessment, July 2000

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

8.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The purpose of these management plans is to make sure that all potential environmental and social impacts are mitigated against in accordance with the Environmental Management Act and its regulations and other relevant environmental laws.

8.1 Mitigation Measures for Environmental Impacts

Table 39 states in detail all the mitigation measures associated with the identified potential environmental impacts.

For each impact the following are stated;

- Environmental/ Socio-economic Aspect
- Objective
- Item Number
- Environmental/ Socio-economic Management Action
- Responsible Person
- Timing; with starting and ending time

8.2 Mitigations for the Socio-economic Impacts

Table 40 Suggests mitigation measures for the identified potential socio-economic impacts.

The mitigations are described under the following sub headings;

- Construction Phase
- Operational Phase
- Impact/ Aspect
- Mitigation Measure
- Responsible Person
- Timing: Start to End

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 39: Environmental Management Plan

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
Preparation /Planning and Construction Phase						
Surface Water Quality	To prevent contamination of storm water	1.	Construction of proper drains along access roads and drains within the farm land	Farm Manager	2012	2014
Ground Water Quality	To prevent ground water contamination from oil spills	2.	Drip trays will be used when removing used oils from equipment waiting servicing.	Environmental and Safety Officer	2012	2014
		3.	Fuel storage tanks will be placed in a banded wall and concreted surface. The bunding shall have a volume equivalent to 110% the volume of the fuel tank. A sump shall be constructed in such a way as to drain any oil that has spilled.	Environmental and Safety Officer	2012	2014
		4.	Used oil storage tank shall be lockable, concreted and bunded.	Environmental and Safety Officer	2012	2014
Drawdown	To reduce the impact of draw down.	5.	Boreholes shall be located and drilled in such a way as not to increase the impact of drawdown.	Farm Manager	2012	2014
Ambient Air Quality	Reduction of gas and fumes from borehole drilling and diesel	6.	Diesel equipment to be equipped with gas absorbers	Environmental and Safety Officer	2012	2014

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
	farm units	7.	Use of low Sulphur content fuel will be prioritised	Environmental and Safety Officer	2012	2014
	Suppression of dust from construction sites and access roads	8.	The farm shall have a water bowser which shall be used to suppress dust on access roads and construction sites where there is dust.	Environmental and Safety Officer	2012	2014
		9.	If available molasses will be sprayed on roads and construction sites to suppress dust formation.	Environmental and Safety Officer	2012	2014
Soil Contamination	To protect soil from contamination from fresh and used oil spills.	10.	Refuelling of construction equipment will be done in designated areas and periodic maintenance will be done on all equipment to avoid oil leaks getting into the soil.	Environmental and Safety Officer	2012	2014
		11.	Drip trays will be used in maintenance areas to drain used oil from equipment.	Environmental and Safety Officer	2012	2014
		12.	Fresh and used oil will be stored in separate and lockable shades whose floors shall be concreted.	Environmental and Safety Officer	2012	2014
		13.	A bioremediation farm shall be established for the purpose bioremediation of oil contaminated	Environmental and Safety	2012	2014

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
			soils.	Officer		
Soil Erosion	To protect the soil from erosion	14.	Storm water drains will be constructed around construction sites to collect storm water and there by prevent soil erosion.	Farm Manager	2012	2014
		15.	Access roads and the plant periphery will be left with trees and this will protect soil erosion.	Farm Manager	2012	2014
Noise	Minimise Noise to acceptable levels	16.	All farm equipment will be subject to a routine maintenance to ensure they are in good working order, hence minimising noise levels	Farm Manager	2012	2014
	To protect workers from noise exceeding acceptable levels	17.	Employees shall wear ear muffs or ear plugs and other necessary Personal Protective Equipment.	Farm Manager	2012	2014
		18.	Selection of low noise level equipment when purchasing farm and workshop equipment will be first priority	Farm Manager	2012	2014
		19.	Trees along access and periphery roads shall left intact to shield and reduce noise levels.	Farm Manager	2012	2014
Land Use	To rehabilitate the area	20.	The mitigations here shall only come at closure. Buildings like the farm house, workers houses, fuel storage facility, used oil storage shed and the	Farm Manager	2012	2014

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
			mini workshop will be demolished, area cleared and rehabilitated. The pivot centre shall be removed and the other irrigation equipment removed also. Pumps shall be roved and boreholes caped. The farm land shall be re-vegetated and or allowed to naturally re-vegetate.			
Flora	To protect the local flora where possible.	21.	Only vegetation located in areas where buildings, access roads and growing area will be will be cut.	Farm Manager	2012	2014
Fauna	To protect local fauna.	22.	Noticed fauna in the proposed project site will be preserved by taking it to areas that will remain undisturbed.	Farm Manager	2012	2014
Loss of habitat	To protect biodiversity	23.	Where possible vegetation will be left intact in the area will not be required for cultivation. Natural regeneration and re-vegetation of the cleared land will be encouraged in areas where cultivation will not be done.	Farm Manager	2012	2014
Archaeology and cultural sites	To protect cultural heritage from damage	24.	Any cultural heritage site discovered during construction will be preserved and the cultural heritage commission informed accordingly.	Farm Manager	2012	2014
Public Safety	To minimise health and safety risks.	25.	Pre-employment and regular medical examinations will be carried out on all farm employees.	Environmental and Safety Officer	2012	2014

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
		26.	All plant equipment will be subject to a routine maintenance programme to ensure they are in good working order, hence minimising health and safety risks.	Farm Manager	2012	2014
		27.	All workers whether contractor or not will be subject to wearing appropriate personal protective equipment (PPE) depending on the work type and place.	Environmental and Safety Officer	2012	2014
		28.	All workers to go through safety and health inductions when just employed.	Environmental and Safety Officer	2012	2014
	To protect members of the public from hazards associated with construction activities.	29.	Only authorised workers will be allowed to enter construction areas. No members of the public will be allowed to enter construction sites.	Environmental and Safety Officer	2012	2014
		30.	Danger warning signs to be placed in different points along the boundary of the farm.	Environmental and Safety Officer	2012	2014
		31.	Warning signs to be written in symbols, English and Vernacular language.	Environmental and Safety Officer	2012	2014
Landscape and Visual	To protect visual characteristics of the	32.	Where there shall be no roads and buildings, the visual characteristics of the landscape shall not	Farm Manger	2012	2014

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
characteristics	landscape.		be altered.			
Hazardous Waste	To safely keep generated hazardous waste	33.	Used oil and used batteries storage areas shall be constructed according to environmental guidelines. Lockable, concreted and bunded shed shall be constructed.	Environmental and Safety Officer	2012	2014
Sewer waste	To prevent sewer waste from contaminating the soil and or ground water	34.	A septic tank- soak way system shall be used to treat sewer waste. The tank will allow for safe disposal of naturally treated wastewater into the ground. A vacuum tanker will also be used to empty the septic tank when full and disposed off at nearest sewerage treatment plant(Luanshya). Sludge from the septic tank will be removed upon disinfection and disposed off at a designated dumpsite.	Environmental and Safety Officer	2012	2014
Solid Waste	Dispose solid waste at construction site accordingly	35.	Metallic and timber off cuts will be stored in designated areas and sold or given to authorised scrap metal dealers or given to the locals for domestic use.	Environmental and Safety Officer	2012	2014
		36.	Cement empty bags and containers will be re-used or given to employees or locals for domestic use.	Environmental and Safety Officer	2012	2014

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
OPERATIONAL PHASE						
Surface and ground Water Quality	To prevent contamination of storm water and ground water	37.	Proper maintenance of storm water drains along access roads and drains within the farm land	Farm Manager	2015	2111
		38.	The transport of hazardous materials to and from farm will be done in accordance with laid down procedures. Requirements will Include: documentation and inventory control through chain of custody; emergency response training for spills.	Environmental and Safety Officer	2015	2111
		39.	Only designated transport routes shall be used to transport chemicals such as fertiliser, fungicides, herbicides, fuel, used oil, fresh oil, lime and pesticides	Environmental and Safety Officer	2015	2111
		40.	Contracted transporters of chemicals shall be licenced with the Environmental Council of Zambia.	Environmental and Safety Officer	2015	2111
		41.	Contracted transporters of petroleum products shall be licenced with the Energy Regulation Board.	Environmental and Safety Officer	2015	2111
		42.	Application of fertilisers, fungicides, pesticides and herbicides will be in accordance will the law and guidelines.	Farm Manager	2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
Drawdown	To protect the locals from being affected by the effect of drawdown on their water supply wells.	43.	A drawdown monitoring programme will be put in place.	Environmental and Safety Officer	2015	2111
		44.	Local will be informed how far from the farm should they put their wells.	Environmental and Safety Officer	2015	2111
		45.	Boreholes in the farm to located far away from residential areas where locals are likely to put boreholes. A minimum of 300 metres away is recommended.	Environmental and Safety Officer	2015	2111
Ambient Air Quality	To prevent contamination of air due to dust emissions from vehicles and trucks operating on dirt roads.	46.	The farm shall have a water bowser which shall be used to suppress dust on access roads and construction sites where there is dust.	Farm Manager	2015	2111
		47.	If available molasses will be sprayed on roads and construction sites to suppress dust formation	Environmental and Safety Officer	2015	2111
		48.	Trees will be left along access roads and on the periphery of the proposed project site to act as a wind breaker and thereby reduce dust levels.	Farm Manager	2015	2111
	Low fume and gas emissions	49.	Diesel equipment to be equipped with gas absorbers	Environmental and Safety Officer	2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
		50.	Use of low Sulphur content fuel will be prioritised	Environmental and Safety Officer	2015	2111
Soil	Protection of soil from contamination by hazardous waste	51.	Hazardous waste shall be kept in a lockable, concreted and bunded storage facility.	Environmental and Safety Officer	2015	2111
	Protection of Soil from contamination by fertiliser, pesticides, fungicides and herbicides	52.	Pesticides. Herbicides, fertiliser and fungicides shall be kept in a properly constructed area with proper ventilation, concreted floor, bunded and lockable shed.	Environmental and Safety Officer	2015	2111
		53.	Application of these chemicals shall follow the right procedures.	Farm Manager	2015	2111
Soil Erosion	To protect the soil from erosion	54.	Storm water drains will be periodically maintained to collect storm water and there by prevent soil erosion.	Farm Manager	2015	2111
		55.	Access roads and the plant periphery will be left with trees and this will protect soil erosion.	Farm Manager	2015	2111
Noise	To minimise noise levels to acceptable levels.	56.	All farm equipment will be subject to a routine maintenance programme to ensure they are in good working order, hence minimising noise levels.	Farm Manager	2015	2111
	To protect workers from noise exceeding	57.	Employees will wear appropriate ear protection in workplaces where noise levels exceed 82 dB. An	Environmental and Safety	2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
	acceptable levels.		Environmental and Safety officer will monitor the use of ear protection on the farm.	Officer		
		58.	Trees left along access roads and the farm periphery will not only act as a wind breaker but also sound proof.	Farm Manager	2015	2111
Land Use	Protect land from being used in other ways.	59.	Kanyenda farm area will be strictly for commercial farming of soya bean, wheat and maize. Any other use will be prohibited.	Farm Manager	2015	2111
Flora	To protect the local flora where possible.	60.	All the trees left after the construction phase shall not be cut for whatever reason. A procedure for cutting of trees shall be put in place. Progressive planting of trees shall be carried out and encouraged in areas where trees had been carelessly cut.	Farm Manager	2015	2111
	Extinction of endangered plant species.	60.	Identified Endangered plant species shall be preserved and planted elsewhere at all costs if possible.	Environmental and Safety Officer	2015	2111
	Protection from introduction of invasive species.	61.	No invasive or alien species shall be introduced on this farmland in accordance with the invasive act.	Environmental and Safety Officer	2015	2111
Fauna	To protect local fauna.	62.	Noticed fauna in the proposed project site will be preserved by taking it to areas that will remain	Environmental and Safety	2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
			undisturbed.	Officer		
Archaeology and cultural sites	To protect cultural heritage from damage	63.	Any cultural heritage site discovered during operational phase will be preserved and the cultural heritage commission informed accordingly.	Farm Manager	2015	2111
Public Safety	To minimise health and safety risks.	64.	Pre-employment and regular medical examinations will be carried out on all farm employees.	Environmental and Safety Officer	2015	2111
		65.	All plant equipment will be subject to a routine maintenance programme to ensure they are in good working order, hence minimising health and safety risks.	Farm Manager	2015	2111
		66.	All workers whether contractor or not will be subject to wearing appropriate personal protective equipment (PPE) depending on the work type and place.	Environmental and Safety Officer	2015	2111
		67.	All workers to go through safety and health inductions when just employed.	Environmental and Safety Officer	2015	2111
	To protect members of the public from	68.	Only authorised workers will be allowed to enter construction areas. No members of the public	Environmental and Safety	2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
	hazards associated with construction activities.		will be allowed to enter construction sites.	Officer		
		69.	Danger warning signs to be placed in different points along the boundary of the farm.	Environmental and Safety Officer	2015	2111
		70.	Warning signs to be written in symbols, English and Vernacular language.	Environmental and Safety Officer	2015	2111
Occupational Health and Safety	Protection of workers from occupational health and safety risk arising from the use of fertilisers, pesticides, fungicides and herbicides.	71.	Develop, establish and implement working and operational procedures. Proper storage of all chemicals Use of appropriate PPE by all employees at the farm	Environmental and Safety Officer	2015	2111
Landscape and Visual characteristics	To protect visual characteristics of the landscape.	72.	Where there shall be no roads and buildings, the visual characteristics of the landscape shall not be altered.	Farm Manager	2015	2111
Hazardous Waste	To safely keep generated hazardous waste		Used oil and used batteries storage areas shall be maintained according to environmental guidelines. Lockable, concreted and bunded shed	Environmental and Safety Officer	2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
			shall be used.			
Sewer waste	To prevent sewer waste from contaminating the soil and or ground water	73.	A septic tank- soak way system shall be used to treat sewerage waste. The tank will allow for safe disposal of naturally treated wastewater into the ground. A vacuum tanker will also be used to empty the septic tank when full and disposed off at nearest sewerage treatment plant(Luanshya). Alternatively, drying pan (concreted foundation with a band wall) will be constructed and the sludge from the septic tank will be dried .Upon being dried this will be used to enhance soil fertility in areas where progressive re-vegetation and landscaping may be required. The sludge in its final stage has gone through a completed biodegradation process and it not harmful at all.	Environmental and Safety Officer	2015	2111
Solid Waste	Dispose of solid waste	74.	Biomass from the plants will be stored and energy generation options evaluated.	Farm Manager	2015	2111
		75.	Domestic solid waste will be disposed of at the Mpongwe District Council disposal site according to the waste management regulations.	Environmental and Safety Officer	2015	2111
	Disposal of waste contaminated with chemicals	76.	Disposal of empty containers and packaging materials	Environmental and Safety	2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
	(Containers and packaging materials)			Officer		
DECOMMISSIONING AND CLOSURE PHASE						
Ambient Air Quality	Contamination of ambient air with dust	77.	Progressive and natural re-vegetation shall be done and this will protect land from being blown by wind and there by producing dust.	Environmental and Safety Officer	2111	2114
Soil Erosion	To protect the soil from erosion	78.	Storm water drains will be periodically maintained to collect storm water and there by prevent soil erosion.	Environmental and Safety Officer	2111	2114
		79.	Access roads and the plant periphery will be left with trees and this will protect soil erosion.	Environmental and Safety Officer	2111	2114
Land Use	Change of land use	80.	Demolition of all surface infrastructures, grading and re-profiling of the surface and re-vegetation will be done. If possible land use will change to the original one.	Environmental and Safety Officer	2111	2114
Public Safety	Danger to the community from farm equipment	81.	All farm equipment removed and infrastructure will be demolished. Areas requiring rehabilitation rehabilitated. Bore holes shall be capped.	Environmental and Safety Officer	2111	2114
Landscape and Visual	Change to landscape and visual	82.	Demolition of all surface infrastructures, grading and re-profiling of the surface and re-vegetation will	Environmental and Safety	2111	2114

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Environmental Aspect	Objective	Item no.	Environmental Management Action	Responsible Person	Timing	
					Start	End
characteristics	characteristics		change the landscape and visual characteristics	Officer		
Solid Waste	Generation of Domestic Waste	83.	Domestic solid waste will be disposed of at the Mpongwe District Council disposal site according to the waste management regulations.	Environmental and Safety Officer	2111	2114
Sewer waste	To prevent sewer waste from contaminating the soil and or ground water	84.	A septic soak way system shall be used to treat sewer waste.	Environmental and Safety Officer	2111	2114

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 40: Socio-Economic Management Plan

Phase	Impact	Mitigation measure	Responsible Person	From	To
Construction	Impacts of flooding of fields, houses	If established that the flooding problem is caused by current farming activities at Kanyenda, the farm will take up responsibility of the impact such as diverting, burying the water channels and gullies.	Farm Manager	2012	2014
Operational				2015	2111
Construction	Impacts of possible drinking water contamination	During and once spraying of crops with chemicals starts, the farm will ensure that spraying is done during early hours or late afternoons when the weather is calm, without strong winds to avoid residents whose water wells are located in the wind ward direction and near the farm from being affected. The farm has committed to sinking of boreholes for the surrounding families.	Farm Manager	2012	2014
Operational				2015	2111
Construction	Impacts of air pollution on residents	A water bowser will be used to water down the dust and prevent respiratory diseases	Farm Manager	2012	2014
Operational		During spraying of crops with chemicals, the farm will ensure that doing it in early hours or late afternoons when the weather is calm, without strong winds.		2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Phase	Impact	Mitigation measure	Responsible Person	From	To
Construction	Pressure on existing facilities/social services	<p style="text-align: center;"><u>Hospital</u></p> <p>To minimise a lot of occupational health related injuries which may affect the operations of the nearby clinic, the company/farm will ensure that they have first aid services for mild injuries and also provide adequate Personal Protective Equipment</p> <p style="text-align: center;"><u>Land for housing</u></p> <p>All prospective migrant workers from the surrounding chiefdoms, villages and districts looking for land for building houses will have to go through the traditional leaders since the surrounding area is under customary land.</p> <p>The farm/company will not be responsible for provision of accommodation for all workers.</p>	<p style="text-align: center;">Environmental / Safety Officer</p> <p style="text-align: center;">Farm Manager</p>	2012	2014
Operational		<p style="text-align: center;"><u>Health</u></p> <p>To reduce increased pressure on existing health facilities, the farm may have to put up a health post for the workers</p> <p style="text-align: center;"><u>Schools</u></p> <p>To reduce increased pressure on existing educational facilities, the farm may have to help expand existing schools in Kanyenda.</p>	<p style="text-align: center;">Environmental / Safety Officer</p> <p style="text-align: center;">Farm Manager</p>	2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Phase	Impact	Mitigation measure	Responsible Person	From	To
		<p style="text-align: center;"><u>Land for housing</u></p> <p>As stated above, all workers from the surrounding chiefdoms, villages and districts looking for land for building houses will have to go through the traditional leaders since the surrounding area is under customary land.</p> <p>The farm/company will not be responsible for provision of accommodation for all workers</p> <p style="text-align: center;"><u>Municipal services</u></p> <p>Clean drinking water and sanitation facilities will be provided by the farm as it has committed to this already.</p> <p style="text-align: center;"><u>Increase in criminal activity</u></p> <p>We propose that a police post be opened to service the area</p>			
Construction	Impacts on Labour situation/employment	Creation of jobs should be promoted, encouraged and the impact enhanced.	Farm Manager	2012	2014
Operational				2015	2111
Construction	Impact on Settlements and private farms	So far, team members who did the assessment have confirmed that all such settlements have been fully compensated by the company. Whatever issues that	Farm Manager	2012	2014

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Phase	Impact	Mitigation measure	Responsible Person	From	To
Operational		are outstanding, the company will ensure are attended to as soon as possible and done in the presence of Local Authorities and traditional leaders.		2015	2111
Construction	Impacts on public/workers safety and health	All workers will be provided with adequate PPE.	Farm Manager Environmental/ Safety Officer	2012	2014
Operational		Only trained workers will operate farm machinery. Training of workers in First Aid in conjunction with Red Cross Mpongwe office		2015	2111
Construction	Impacts of poor conditions of service	Strict adherence to Zambian Labour Laws and specifically, sector approved minimum wage as well as provision of PPE, normal working hours etc	Director Farm Manager	2012	2014
Operational				2015	2111
Construction	Impacts of HIV/AIDS	In liaison with the National Aids Council, Mpongwe office as well as the District Health Office, sensitise the workers and encourage them to go for VCT.	Director Farm Manager	2012	2014
Operational				2015	2111
Construction	Impact of out grower scheme to local farmers	Because this will result in improved income for the local people and reduced poverty levels, the impact should be enhanced and supported.	Farm Manager	2012	2014
Operational				2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Phase	Impact	Mitigation measure	Responsible Person	From	To
Construction	Improved Local Authority Revenue base	Because this will result in improved revenue for the local Authority, improve municipal service delivery, the impact should be enhanced and supported.	Local Authority	2012	2014
Operational				2015	2111

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

8.3 Emergency preparedness and Response Plan

The emergency preparedness and response plan is presented as a guiding response to emergency situations that may arise in the process of project implementation. The plan identifies the most likely emergency situations coupled with their causative factors. It also highlights the most practical response to each arising emergency condition and the respondents to the emergency in order of priority.

Implementation of the plan in the course of the project will help minimize risks associated with project undertaking and implementation within acceptable levels. Kanyenda Farming Limited will implement the plan taking into account that changes may be made to the plan to accommodate unforeseen emergency situations and their causative factors for improved future response performance.

Emergencies will be classified under three main categories depending on the degree of damage to property, resulting injury or fatality and the extent to which the emergency affects farm operations and general project implementation.

Minor emergency- A minor emergency will be one that Kanyenda Farming Limited personnel will be able to handle satisfactorily without affecting or threatening parties beyond the operations of the farm. E.g. minor injuries that are treatable using first aid techniques within the farm premises.

Serious emergency- An emergency that will have implications beyond the control of local personnel at Kanyenda Farming Limited. It will involve generally stakeholders or parties outside farm operations such as the local chieftdom, Council and regulatory authorities in the project area. E.g. chemical spills, electrical emergency and farm machinery accidents and flooding of neighbouring houses and fields resulting from farming activities.

Major emergency- This will be an incident that will have major safety, environmental, governmental and socio-economic implications. E.g. injuries resulting into fractures, lacerations burns (near death) as a result of operation of farm machinery and chemical poisoning likely to lead to death and would involve registration with the department of occupational health and safety.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Kanyenda Farming Limited will respond to each level of emergency in accordance with the provisions of various governing local regulations. Table 41 below shows the emergency preparedness and response plan for the project.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 41: Emergency Preparedness and Response plan

S/N	Emergency situation	Likely cause	Proposed response	Respondents
1	<i>Fire Outbreak</i>	<ul style="list-style-type: none"> • Neglect of safety procedures. • Act of arson. • Sheer accident. 	<ul style="list-style-type: none"> • Sound alarm. • Alert all and assemble at fire assembly point. • Conduct roll call and evacuate area. • Identify casualties. • Fight the fire if necessary using appropriate means. • Inform Mpongwe fire brigade and Zambia police. • Document incident and provide preventive action. 	<ul style="list-style-type: none"> • SHE officer. • Farm manager • Fire service dept. • Zambia police. • Kanyenda Health centre.
2	<i>Fuel and Oil spillages</i>	<ul style="list-style-type: none"> • Leaking fuel tank. • Pump failure/leakage. • Weak, leaking oil drums and containers. • Improper handling during dispensing. • Neglect of safety procedures. • Sheer accident. 	<ul style="list-style-type: none"> • Contain material by bunding with sand to prevent material flow. • Repair source of contaminant. • Inform ZEMA. • Clean up spills using appropriate spill kit available on site. • Document incident. 	<ul style="list-style-type: none"> • SHE officer. • ZEMA emergency response team. • Farm manager
3	<i>Chemical, Seed/fertilizer spillages.</i>	<ul style="list-style-type: none"> • Neglect of chemical handling procedure. • Unsecure chemical packaging and storage. • Weak /damaged chemical containers • Sheer accident. 	<ul style="list-style-type: none"> • Contain spilt material within storage area. • Remove all damaged containers. • Inform ZEMA. • Clean up spills. • Return un-usable chemicals to supplier. • Document incident. 	<ul style="list-style-type: none"> • SHE officer. • Farm manager.
4	<i>Disease Outbreak</i>	<ul style="list-style-type: none"> • Water contamination. 	<ul style="list-style-type: none"> • Identify affected people and 	<ul style="list-style-type: none"> • SHE officer.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

		<ul style="list-style-type: none"> • Poor sanitary conditions. • Poor worker hygiene practices. • Neglect of disease outbreak control procedure. 	<ul style="list-style-type: none"> provide first aid. • Inform Kanyenda Health Centre. • Isolate and Evacuate affected people. • Provide safe potable water by chlorine treatment. • Provide proper sanitation. • Community sensitization of safe hygiene practices. • Document incident. 	<ul style="list-style-type: none"> • Farm manager. • Kanyenda health Centre.
5	<i>Workers' injury</i>	<ul style="list-style-type: none"> • Unskilled labour . • Neglect of safety procedures. • Faulty equipment and tools. • Sheer accident. 	<ul style="list-style-type: none"> • Determine extent of injury. • Provide appropriate first aid. • Evacuate to nearest health centre. • Document incident. • Take appropriate action to avoid re-occurrence. 	<ul style="list-style-type: none"> • SHE officer. • Farm manager. • Trained first aider. • Kanyenda health Centre.
6	<i>Chemical poisoning</i>	<ul style="list-style-type: none"> • Unskilled labour. • Chemical Handling negligence. • Lack of PPE. • Faulty application equipment • Sheer accident. • Water runoff to shallow wells 	<ul style="list-style-type: none"> • Classify emergency extent. • Apply appropriate first aid. • Document incident. • Evacuate to nearest health Centre. • Notify relevant stakeholders. • Provide prevent action to avoid re-occurrence. 	<ul style="list-style-type: none"> • Farm manager. • SHE officer. • Clinical staff. • Trained first aider.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

8.4 Environmental and Social Monitoring Plan

Kanyenda Farming limited will implement the project in accordance with its detailed implementation plan. Certain aspects of the project will need close monitoring during the lifecycle of the farming project. Monitoring of the project and its performance will be carried out as part of the proposed routine project implementation to observe changes taking place in the environment and assess the effectiveness of mitigation measures put in place and the unfolding of residual impacts. This would facilitate timely interventions to correct non conformities that are not consistent with the plan thereby preventing the occurrence of serious negative effects. Key environmental indicators to be monitored will include water, air and soil contamination. Social elements of the project bordering on employment, occupational health and safety and HIV/AIDS will also be monitored during implementation. Monitoring results will be reported to ZEMA , Mpongwe Municipal Council and other relevant agencies as part of the compliance and licensing requirements.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 42: Environmental and Social Monitoring Plan.

Impact/Environmental Aspect to be Monitored	Indicator to be Monitored	Details of Monitoring Activities & Methods	Responsibility, Monitoring frequency	Cost estimate (US \$)
<i>Environmental elements</i>				
Ambient Air Pollution	Dust, CO,CO ₂ , NO _x ,	Ambient air & dust sampling and analysis.	Consultant, Quarterly.	15,000.00
Soil contamination	Hydrocarbons, Chemical residues, Nitrites & Nitrates.	Soil sampling and chemical analysis on contaminated sites	Farm Manager, Monthly.	13,000.00
Water pollution	Feacal & total coliforms, Ph, micro chemical elements, turbidity, conductivity , TDS & TSS.	Borehole water sampling, chemical & biological analysis. Effluent sampling & analysis, borehole monitoring.	Farm Manager Environmental officer, Monthly.	9,000.00
Pollution from Solid waste	Accumulation rate of solid waste on site	Timely disposal of waste at dumpsite ,bulk purchase of inputs to reduce waste package handling.	Farm Manager, Monthly with increased frequency during peak times..	16,000.00
<i>Socio-Economic & Cultural elements</i>				
Occupational health and safety risks	Number of reported cases of injury, chemical poisoning and occupation related illnesses .	<input type="checkbox"/> Review reports in incidence occurrence book. <input type="checkbox"/> Carry out interviews with workers	Farm Manager, safety officer. weekly & monthly.	12000.00
Employment Creation	Number and proportion of local resident employees on establishment list and number of local contractors engaged	Review establishment and contract list Review Contractors inventory	Farm Manager, Annually.	65,000.00

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

9.0 Decommissioning and Closure Plan

This decommissioning and rehabilitation plan report has been prepared to provide information to the Zambia Environmental Management Agency ZEMA , local people of Kanyenda, the Chiefdom of Kanyenda ,Mpongwe district council and all concerned and interested parties regarding the proposed farming of soya beans, maize and wheat by Kanyenda farming limited. The report will facilitate satisfactory closure of the Kanyenda farming project to prevent adverse long term environmental impacts and restore the land for use to levels acceptable to regulators, post farming land users and the local stakeholders. Cost estimates for the decommissioning and closure plan are included in the report as indicative figures. The figures may change depending on many economic factors including time of decommissioning.

This report is a part of the long term commitment to a sustainable project which incorporates a careful plan for the end of the life of the agricultural project. It is also a component of the Environmental Impact Statement (EIS) to be submitted to ZEMA as a fulfilment of the requirement of the Environmental Management Act No. 12 of April,2011.

9.1 Project background

The genesis of the idea to acquire and develop farm F/10848 by Kanyenda Farming Limited was necessitated by the nationwide shortage for raw materials (particularly Soya Beans) used in the production of stock feed on the one hand, and the overall takeover of ETC Bio-Energy Limited by Zambeef Products plc in Mpongwe District. ETC Bio-Energy was the main supplier of the Soya Beans, maize and wheat used by Golden lay in the manufacture of feed for their poultry industry in Luanshya.

9.2 Brief project description

Kanyenda Farming limited will develop 669 Ha of land into commercial farming land to plant Soya beans, Maize and Wheat. The project will be developed in phases depending on the availability of water from the prospecting boreholes that will be used for irrigation of the crops. The project phases are outlined in below.

9.2.1 Preparation phase

The preparation phase will include but not limited to the following activities:

- Obtaining relevant authorization and documentation from regulatory bodies including ZEMA and the Mpongwe District Council (MDC) for the project undertaking.
- Delivery of construction and farm machinery to site.
- Borehole siting and drilling.
- Identification and liaison with local farmers for potential out grower schemes.
- Hiring of onsite local labour for the construction phase.
- Acquisition and delivery of construction raw materials to site.
- Communication with relevant stakeholders on project commencement.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

9.2.2 Construction phase

This phase will incorporate the following activities;

- Site clearing to facilitate construction of Farm House, Workers Compound, Security facilities and all other infrastructure.
- Fencing off the area to demarcate the farm boundaries and avoid animal and human trespass into the farm area.
- Construction of a 14 m by 12m Farm House for the farm manager incorporating an office.
- Construction of Workers houses including all support infrastructure. The block of houses will comprise eight (08) by 3 roomed houses on a 6m by 24m block.
- Construction of a Sewerage Management Facility. The system will be composed of two (02) inspection manholes joining from the worker's house toilets. The manholes will then connect to a septic tank which will empty into a soak away. The system will incorporate a monitoring borehole for monitoring the likelihood of ground water contamination by the system. The same system will be adapted for the manager's house but will incorporate one (01) inspection manhole, septic tank and soak away.
- Construction of the Fuel Storage Tank and a lubricant store.
- Construction of a Chemical Store.
- Construction of the Fertilizer Storage Shed.
- Construction of the Mini machinery/motor vehicle Workshop.
- Construction of a Used Oil Storage Area incorporating a sump and oil/water interceptor.
- Extension of the 3Km power line from Nkanga Hill to Kanyenda Farming Limited (This may require a separate EIA study depending on advice from ZEMA).
- Siting and Sinking of Irrigation/ Domestic Water Supply Boreholes.
- Installation of a surface water storage tank and pump house at the farm house.
- Access Roads and drainages along the main road to alleviate historical flooding problems.
- Clearing of Vegetation on farming land.
- Clearing of Vegetation and stumping to prepare the land for farming.
- Installation of Centre Pivots. This will be done in phases as the water availability is proven reliable through survey.

9.2.3 Operation phase

During this project phase, the activities to be undertaken are summarized below.

- Ploughing of the fields.
- Delivery and Storage of Farming Inputs (seed, fertilizer, agro chemicals, etc).
- Pumping of water from the Boreholes.
- Planting, irrigation and growing of Soya Beans, Maize and Wheat.
- Harvesting of Soya Bean, Maize and Wheat.
- Temporary Storage of Soya Beans, Wheat and Maize at the Farm.
- Transportation of the Soya Beans, Wheat and Maize to market.
- Obtaining of all environmental licences relating to the operation of the farm.
- Generation of domestic waste and hazardous waste.
- Fuel storage and use of lubricant on machinery.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

9.2.4 Decommissioning and closure phase

In the event that Kanyenda Farming Limited determines that the project undertaking be ceased due to any reason warranting cessation of operation, the following activities will be undertaken in line with the provisions of the law governing the operation of this project;

- Demolition of the Farm House, Workers Compound and all other infrastructure.
- General Cleaning, grading and levelling of areas demolished.
- Enhancement of Soil fertility in the areas graded and levelled.
- Enhancement of Soil fertility on land used for growing crops.
- Removal of the above ground fuel storage tank for alternative use.
- Rehabilitating all contaminated sites such as the workshop area and the surrounding of the fuel storage facility.
- Un-installation/Removal of the Centre Pivot.
- Removal of Pumps and Burying of Boreholes.
- Re-vegetation of the areas which had buildings and any other infrastructure.
- Re-vegetation of the land used for growing of crops.
- Post closure sampling and analysis of borehole water (some boreholes will be left for this purpose) and soil.

9.3 Closure objectives

The closure objective of Kanyenda Farming limited is to leave the area in condition which is safe, stable and minimizes environmental impacts on the flora, fauna, water, soil and air quality. Generally, closure objectives covering public health and safety, landform (soils) and vegetation will be developed as outlined in table 36 below.

Table 43: Closure Objectives

Aspect	Objective
Final land use	Maximize the beneficial use of the farm site after closure.
Safety and public health	Leave the site in a condition that reduces adverse effects on people and the environment as generally acceptable by stakeholders.
Vegetation	Re-vegetative the site to meet the agreed condition.
Ground water contamination	Achieve a condition where contaminants on site are below acceptable standards. Minimize potential of offsite pollution.
Soil contamination	Achieve a condition where contaminants on site are below acceptable standards.
Socio-economic	Enable all stakeholders to have their interests considered during the closure phase

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

9.4 Decommissioning during construction (abandonment of project)

In the event that Kanyenda Farming limited decided to abandon the project before full completion and/or during the construction phase, a decommissioning and closure plan will be instituted to ensure all the potential negative effects arising from the abandonment will be addressed in totality taking into consideration the cost attached to the undertaking.

9.4.1 Potential Effects

Positive potential effects of the project will result from the communal borehole to be drilled for residential use which will not be decommissioned as it will be used by the community.

The setting up of the satellite depot by Kanyenda Farming limited to purchase maize from local farmers will continue even in the event of project abandonment. Maize will be bought off the farmers to meet the demand for the commodity at Golden lay limited. During the operation phase of the project, an out grower scheme will be implemented by the developer in which local farmers will be empowered with agricultural inputs such as seeds, fertilizer and agrochemicals to grow soya beans and maize which they will supply to Kanyenda Farming Limited as a ready market.

During the construction phase, the road and drainage leading to the entrance of the project site will be rehabilitated periodically during the life span of the project. This will eliminate the historical flooding problems associated with settlements near the main Kasamba road.

Negative potential effects of the project abandonment can be classified into physical , environmental , ecological and social economic effects.

(a) Physical negative effects

Negative physical effects of the premature abandonment of the project will include heaps of construction materials such as sand, quarry dust, blocks, scaffolds, and cement. Dumps and foundations dug up during construction may lead to physical injuries if warning signs and security are not provided at the site during this phase. The presence of unfinished pivot construction may also pose physical danger that may result in injuries.

Unfinished structures such as farm house, workers housing units, sewerage management systems such as toilets, soak away and septic tanks may be physical hazards resulting into injury. A lack of security fencing of the area will lead to local residents trespassing in the farm land.

(b) Environmental negative effects

During the construction phase, temporary haul roads will be created for easy access to the site and this will result into dust generation that may affect the vegetation by settling on the leaves of plants. Nearby settlements will be affected by dust resulting

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

from the partially constructed gravel roads. Increased noise levels may be experienced by residents near the project site especially during the day. This exposure may extend to construction workers on site by way of dust inhalation and high noise levels.

The boreholes drilled at the project area may be contaminated due to improper management and maintenance once the developers abandon the project at the construction stage.

The diesel fuel facility used for refuelling construction vehicles and machinery may lead to underground and surface water contamination if not properly managed at project abandonment stage.

(c) Ecological negative effects

Most of the trees that will be cut down during the construction phase will completely be lost resulting into water runoff and erosion during rainy season. Once trees are lost this will change the biodiversity of the project area as the indigenous tree population will be reduced. The land that will be cleared for cultivation of the intended crops will remain bare if the project is abandoned at this stage. This may lead to soil erosion as there will be no root support for the loose soil.

(d) Social Economic negative effects

The potential employment opportunities for the local people will be lost due to the project abandonment. This may lead to increased crime rates in the area as the potential economic activity will no longer be attainable.

All these effects are deemed potentially negative during the construction phase of the project. The potential effect, its class, score in terms of extent of the effect, occurrence frequency and the responsible personnel to ensure mitigation measures are implemented are summarized in table 37 below.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 44: Project abandonment potential effects

POTENTIAL EFFECT	CLASSIFICATION	EXTENT SCORE	FREQUENCY			RESPONSIBILITY
			L	M	H	
Soil erosion/water run off	Environmental	Medium		✓		Farm manager
Solid waste generation	Environmental	Low		✓		Environmental officer/farm manager
Ground water contamination	Environmental/public health.	Low	✓			Farm manager
Air quality contamination	Environmental/occupational health.	Low	✓			Farm manager
Deforestation	Ecological.	Medium		✓		Farm manager
Employment loss	Socio-economic.	High			✓	Farm manager

9.4.2 Mitigation measures

Warning signs around the project area will be erected to warn potential trespassers of the physical danger posed by the abandoned project. The area will be fenced off during construction and fence will act as barrier to deter illegal entry into the farm area.

All the materials that will remain unused at the project site will be taken away to avoid posing as a physical hazard.

The communal borehole will be used as an ongoing monitoring point for water. Water will be continually sampled and analyzed as part of the closure plan (*see table 46 for proposed environmental closure budget*) and results presented to relevant authorities such as the local council and ZEMA. Corrective action will be taken depending on the outcome of the water sample results.

9.5 Decommissioning after ceasing operation

In the event that Kanyenda Farming Limited can no longer undertake the farming project and has decided to end the project, the Zambia Environmental Management Agency (ZEMA), Mpongwe District Council and other relevant local authorities and/or interested parties will be informed beforehand. A detailed final closure plan will be submitted for approval to ZEMA. The following sections describe the activities to be undertaken by Kanyenda Farming limited to successfully bring the project to a close taking into consideration all the Environmental, Physical and socio-economic impacts that may arise during this phase.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

9.6 Dismantling of equipment and farm machinery

All the farm machinery and equipment on site will be dismantled in a well planned manner in order to avoid contamination of soil, air and water and to eliminate the physical hazards associated with the equipment to be dismantled.

9.6.1 Un-installation/ Removal of the Centre Pivot

All the components of the centre pivot will be dismantled component by component and packed into haul trucks for transportation to another site for alternative use and/or sale.

9.6.2 Removal of Pumps and Burying of Boreholes

The submersible and surface water pumps and all electrical components associated with the pump will be disconnected from the power supply and uninstalled. A total of five (05) boreholes will be buried to restore the bore sites to their original state while the remaining boreholes will be used as monitoring boreholes for underground contamination for the next two (02) years of the post closure program. The communal borehole will not be decommissioned as it will be used by the community as a water source for domestic water consumption.

9.6.3 Movement of re-usable farm machinery

The farming equipments such as planters, ploughs, combine harvesters will be surrendered to the original owners since most of it will be hired by Kanyenda Farming.

9.7 Demolition of the Farm House, Workers Compound and related infrastructure

The farm house, workers quarters and other concrete related infrastructure will be demolished accordingly. This will be done systemically in order to recover as much reusable construction material as possible. The rubble resulting from this demolition will be used to level the ground and refill and reprofile the septic tanks and soak away system that will be utilized as a sewerage management facility during the operation phase. General Cleaning of the areas formerly occupied by the demolished structures will be conducted to be coupled with grading and levelling of the ground to pave way for tree replanting.

9.8 Enhancement of Soil fertility on land used for growing crops

After repeated cultivation in the farm land, the soil structure and fertility levels may shift from its original natural state to support indigenous growth of local species of trees and shrubs. Kanyenda Farming Limited will incorporate a soil enhancement program which will include the use of natural compost and chicken manure in the area used for the cultivation of soya beans, maize and wheat in order to restore its natural existence.

9.9 Removal of surface fuel storage tank and related structures

The surface fuel (diesel) storage tank and fuel pump will be removed for alternative use including all the piping and fire prevention and fighting equipment to be installed during the operation phase of the project. The impermeable concrete surface at the facility will be unearthed and the roofing removed for alternative use. Assessment of the soil at the facility will be conducted by the soil specialist to establish contamination. In the event that the soil is contaminated with hydrocarbons from the diesel and oil storage facilities, Soil remediation will be conducted using hydrocarbon digesters prior to re fertilization of the soils. The farm machinery

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

workshop contaminated with used oil will be rehabilitated in line with the soil remediation program to be undertaken.

9.10 Installation of warning signage and symbols

In order to maintain safety and reduce the risk of physical accidents from trespassers, the areas considered to pose accident risks will have warning signage installed to prevent injury and restrict access to the site.

9.11 Post closure sampling and analysis.

In order to ascertain that the baseline environmental conditions of the project site are maintained after ceasing operations, continuous sampling, analysis and reporting of the water, air quality, and noise and soil parameters will be conducted. Water, soil, Air and noise sampling and reporting shall be undertaken for a period of two (02) years after closure of the operation and reports submitted to ZEMA accordingly.

Post closure monitoring may continue until positive trends emerge which indicate that no further management of vegetation, water resources and landform is required than would be necessary for the similar use of land.

9.11.1 Water

Ground water samples will be collected on a scheduled time line from the five respective monitoring boreholes including the borehole to be reserved for domestic use by the local residents. Analysis of the samples will be done in accordance with the World Health Organization (WHO) portable water parameter standards. The parameters to be analyzed will include but not limited to the ones listed in the table below.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 45: Water Analysis Parameters

PARAMETER	WHO GUIDELINE
pH	6.5-8.5
Turbidity (NTU)	5.0
Conductivity(mMhos/cm)	1500
Total Dissolved Solids (mg/l)	1000
Total Suspended Solids(mg/l)	-
Total Hardness(mg CaCO3/l)	500
Calcium Hardness(mg CaCO3/l)	500
Alkalinity (mg CaCO3/l)	500
Iron (mg/l)	0.30
Ammonia (NH4-Nmg/l)	1.50
Sulphates (mg/l)	250
Chlorides (mg/l)	250
Nitrates (NO2-Nmg/l)	0.10
Nitrites (NO3-Nmg/l)	10.0
Acidity (mgCaCO3/l)	500
Total phosphates (mg/l)	5.0
Magnesium(mg/l)	-
Calcium(mg/l)	200
Fluorides (mg/l)	1.50
Potassium(mg/l)	-
Manganese(mg/l)	0.50
Total coliforms(#/100ml)	0
Feecal coliforms (#/100ml)	0

9.11.2 Soil

Contamination of the soil with hydrocarbons and other contaminants may occur especially near the workshop and fuel facility during the operation phase. Upon ceasing of operations, samples will be collected from the site as well as the crop fields to determine the nutrient levels of the soils in comparison with the baseline environmental conditions prior to commencement of the project. Samples collected will be analyzed and results reported to ZEMA periodically. Soil bioremediation measures will be taken as per laboratory analysis recommendation in the event that contamination of the soils has occurred.

9.11.3 Air and Noise

The project to be undertaken at the site will be limited to agricultural activities. However, sources of air pollution may include vehicular emissions especially from farm machinery and haulage trucks within and around the site. Others sources may be from wind gusts and occasional bush fires especially during the dry season.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Ambient air quality measurements will be conducted on site against known parameters that will include SO₂, CO, CO₂, NO_x and ambient dust. Results will be compared to initial baseline environmental conditions obtained during the EIA study.

Noise level measurements will be conducted on site and any changes noted and reported to ZEMA. Analysis of the changes in the socio-economic activities of the local people leading to changes in the noise levels will be reported on in the post closure phase.

9.12 Environmental closure plan budget

Kanyenda Farming Limited will allocate a total of **US\$ 218,020.00** for the decommissioning and rehabilitation plan for the project site. The amount will be disbursed on need basis during the period of closure and post closure monitoring. The breakdown of the budget is itemized in the table below.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

Table 46: Proposed Closure Budget Estimate

Activity	Rate/ Unit measure (US\$)	Quantity	Cost (US\$)
Equipment /infrastructure dismantling			
Un-installation of centre pivot, water pumps		01	44,200.00
Demolition of farm houses and other concrete infrastructure.			35,120.00
Burying of boreholes	3000 /borehole	05	15,000.00
Disposal of demolition waste		-	5,300.00
Grading, levelling and clearing of demolished areas		-	5,000.00
Demolition of fuel storage facility and related structures			9,200.00
Treatment of contaminated soils		-	9,300.00
Re-vegetation costs			
Supplying and planting trees	37/Ha	600 Ha	22,000.00
Vegetation care and maintenance			19,700.00
Installation of warning signage		10	2,000.00
Public sensitization & awareness activities	-	-	3,000.00
Subtotal (for pre closure activities)			169,820.00
Post closure monitoring			
Collection and analysis of ground water samples (monthly)	900/month		21,600.00
Collection and analysis of surface water samples (monthly)	-	-	-
Collection and analysis of soil sample(bi –annual)	5,000/year		10,000.00
Noise/Air quality measurements(bi annual)	1000/year		2000.00
Public consultations			1,200.00
Summary reports(bi-annual)			1,000.00
Detailed reports (annual)			1,500.00
Contingency			10,900.00
Subtotal (for a 2 year period)			48,200.00
GRAND TOTAL			218,020.00

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

9.13 Stakeholder consultation

Stakeholders have a key influence on the standards which are considered acceptable for closure of the farming project in Kanyenda area. Stakeholder consultations will be undertaken prior to the closure of the project with the aim of developing an understanding of the key environmental, socio-economic and cultural issues associated with the closure of the project. Any commitments made to the stakeholders by Kanyenda Farming Limited during this phase will be monitored in the post closure phase to ensure timely implementation of these commitments.

9.14 Limitations in this EIA Study

Like any other developmental project, the proposed project had a number of challenges and consequently limitations. One of the major challenges was how to tackle the issue of the people who had been displaced from the proposed project site. These people either had their shelters on the proposed project site and or were doing some cultivation on the proposed project site. By the time the consultant was engaged by the developer, Senior Chief Kalunkumya, the council and affected parties had already gone through the negotiations process and had already being compensated by the developer and the senior chief had also already given them(displaced and compensated people) alternative land. All these people have been given land adjacent to the farm on the eastern side of the farm. However the study team has decided all necessary mitigations considering comments and issues that came from the three public consultative meetings it held (the scoping, disclosure and a stakeholders meeting at the council chambers).

Another challenge was the level of understanding of environmental issues by the local people. The locals were only interested in discussing socio-economic issues as opposed to typical environmental aspects that may arise from the proposed project. However, the study team members explained very well the purposed of conducting an EIA and conducting pubic consultative meetings.

There has been very few such commercial farming projects in the vicinity of the proposed project site as such it was difficult to find or get sources of baseline data on the environment. However the study team, did all they could to get the data that was presented in this document. The study team carried out ambient air tests, ground water tests and noise level analyses.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

9.15 Conclusion

Kanyenda Farming limited, the project proponent is a Zambian registered company with links to Golden Lay limited, the largest producer of table eggs in Zambia.

The shortage of raw materials particularly Soya Beans used in the production of chicken feed was the genesis of this proposed project.

As expected with any other development, the establishment and operation of the farm will not only result in positive impacts but negative impacts as well. Identified Impacts manifested on both biophysical and socio-economic aspects of the environment at Kanyenda Farms. As a result of these impacts, Kanyenda Farming Limited has carefully planned to conduct the implementation of the project with a focus on the environmental, health and socio-economic concerns that could counteract the benefits expected from the development and operation of the farm. Kanyenda farming Limited will operate the project in line with the provisions of the regulations applicable to the project of this nature. All phases of the project including the decommissioning and closure plan will be implemented with the help and satisfaction of all concerned and interested stakeholders.

Management of Kanyenda Farming limited will carefully follow the plan for implementation of the Environmental Management Plan (EMP) to ensure efficient management of the environmental concerns of the project. It is management's hope that this Environmental Impact Statement covers all the concerns of the various stakeholders and regulatory institutions and is sufficient to guide this project's implementation.

The Environmental Impact Statement for the Proposed Soya beans, Wheat and Maize Growing Project by Kanyenda Farming Limited in Mpongwe District

10.0 REFERENCES

1. Government of the Republic of Zambia, Environmental Management Act (Environmental Impact Assessment) Regulations Statutory Instrument No.28 of 1997.ZEMA, Lusaka.
2. Government of the Republic of Zambia, Environmental Management Act (EMA) of April,2011.ZEMA, Lusaka.
3. Government of the Republic of Zambia The Plant, Pests and Diseases Act, Government printers, Lusaka.
4. Government of the Republic of Zambia The Noxious Weeds Act, Cap 231, Government printers, Lusaka.
5. Government of the Republic of Zambia, Agricultural Lands Act cap 187, Government printers.
6. Government of the Republic of Zambia, The Petroleum Act Cap 439 and the Energy Regulation Act Cap 436, Government printers, Lusaka.
7. Government of the Republic of Zambia, The Local Government Act cap 474 of 1991, Government printers, Lusaka.
8. Government of the Republic of Zambia Lands Act Cap 29 of 1995 Government printers, Lusaka.
9. Government of the Republic of Zambia Public Health Act Cap 295 of 1978 Government printers, Lusaka.
10. Government of the Republic of Zambia The Water Supply and Sanitation Act No. 28 of 1997 Government printers, Lusaka.
11. Ruth Weiner & Robin Matthews, Environmental Engineering, 4th Edition, Elsevier Science, 2003.
12. Joseph A. Salvato et al, Environmental Engineering, 5th Edition, John Wiley & Sons, 2003.
13. www.wikipedia.com
14. Lumwana Copper Project Environmental Impact Assessment, July 2005.
15. www.weatherbase.com
16. <http://eia.unu.edu>
17. Mount Meru EIS for edible Oil processing plant, March 2011.
18. Aqua quest ground water siting report, 2011.