BUSINESS SUCCESS CONSULTING
Environmental Sustainability

Environmental Impact Assessment Report for the Proposed Establishment of an Agricultural Project at Onanke Village, Oshikoto Region, Namibia

Proponent:

PORAD Association Incorporated (Reg. No. 21/2018/2757)

P. O. Box 284 Ondangwa

Fax: 088648264 Cell: 0812286604

Email: poradassociation@gmail.com

Prepared By:

Business Success Consulting Cc
Cell: 0813097475/0811622154
P.O. Box 3382 Ongwediva,
Office 1, No. 5059, Omatando Street – Ongwediva, Namibia

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

MAWF DAPEES	Ministry of Agriculture, Water and Forestry Directorate of Agricultural Production, Extension and Engineering Services
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MME	Ministry of Mine and Energy
NamWater	Namibia Water Corporation
NBRI	National Botanical Research Institute
NORED	Northern Regional Electricity Distributors
OEC	Office of the Environmental Commissioner
PPE	Personal Protective Equipment
BSC	Business Success Consulting
DEA	Directorate of Environmental Affairs
DSR	Draft Scoping Report
DWA	Directorate of Water Affair
EA	Environmental Assessment
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act

EMP	Environmental Management Plan
F	Forestry Protected
GPS	Global Position Systems
Ha	Hectares
I & APs	Interested and Affected Parties

1. PREFACE

Business Success Consulting (BSC) is commissioned by PORAD Association Incorporated to conduct an EIA for the establishment of an agricultural project at Onanke Village, Omulondo District in Oshikoto Region.

The importance of environmental protection and conservation measures has been increasingly recognized during the past two decades. It is now generally accepted that economic development strategies must be compatible with environmental goals. This requires the incorporation of environmental dimensions into the process of development.

It is important to make choices and decisions that will eventually promote sound development by understanding the environment functions. In this agricultural project context, the Namibian laws through the Ministry of Environment and Tourism, and the Ministry of Agriculture, Water and Forestry regulates the protection of the quality and supply of freshwater, underscored the importance of environmental protection and conservation of the natural resource base in the context of water resources development for agriculture and rural development.

Wise management of the environment requires an ability to forecast, monitor, measure and analyze environmental trends and assess the capabilities of land and water at different levels, ranging from a small irrigated plot to a catchment. Therefore, the adoption of Environmental Impact Assessments (EIAs) will enable Porad Association to plan water and land use in an integrated manner, avoiding irreversible environmental damage. This would lead to higher economic benefits and sustainable resource use.

The Ministry of Environment and Tourism advocates for protection of the environment and enhancing habitation for native plants and animals; they cover the entire range of environmental components, such as soil, water, air, energy, and the socio-economic system.

1.0 PROJECT BACKGROUND

PORAD Association Incorporated is in the process of establishing an agricultural project in Onanke village, Omulondo District of Oshikoto Region. The project intends to contribute to local food production through crop farming and animal husbandry. The project also aims to provide training to smallholder farmers within Omulondo District where it will be operating.

The proposed agricultural project is earmarked to be established on a 200 ha piece of land in Onanke village, Omulondo District, in Omuntele Constituency of Oshikoto Region. The benefits of increased agricultural production are detailed in this report. The projects will produce healthy vegetables such as cabbages, carrots, tomatoes and onions just to mention but a few.

According to the Environmental Management Act, Act 7 of 2007, such a project requires an Environmental Clearance Certificate (ECC). Therefore, the proposed establishment of an agricultural project for PORAD Association Incorporated will not occur without an ECC. The Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 as gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007), requires that a Draft Scoping, EIA and Environmental Management Plan (EMP) for the proposed project should be undertaken in order to apply for ECC from the Ministry of Environment and Tourism.

1.2. Purpose of this Scoping Study

This scoping report is prepared for the Environmental Impact Assessment (EIA) in respect of the establishment of PORAD Association Incorporated Agricultural Project. The objective of the scoping study is to identify a range of potential problems that will be associated with this project; which will be key issues of concern that should be addressed by an EIA.

Scoping also assist in the identification of information sources and data gaps that may require to be filled by specialists studies. Therefore, this phase of assessment determines the key elements of the Environmental Management Plan (EMP) for PORAD Agricultural Project and to anticipate, prevent, minimize and manage potential negative impacts that the development may have. Such as;

- Cost too much money to rectify in future
- Pose risk to lives, livelihood or health or current and future generations
- Help to seek opportunities to optimize potential benefits of proposed development.

1.3. Project location

The proposed Omulondo Agricultural Project for PORAD Association will be established within a communal area in Onanke village, Omulondo District in Oshikoto region. The 200 ha piece of land was allocated to PORAD Association by the Ondonga Traditional Authority.

The proposed project land is currently not occupied. The land is located 34 km from Omuthiya Town. Below are the GPS coordinates and site layout of the allocated land for the proposed establishment of PORAD agricultural project:

TABLE 1.1 GPS COORDINATES PROPOSED LAND

Points	Latitude	Longitude
1	-18.48492	16.36763
2	-18.48946	16.36745
3	-18.49086	16.37426
4	-18.49298	16.38046
5	-18.49372	16.38398
6	-18.48938	16.38695
7	-18.48589	16.38885
8	-18.48065	16.37272

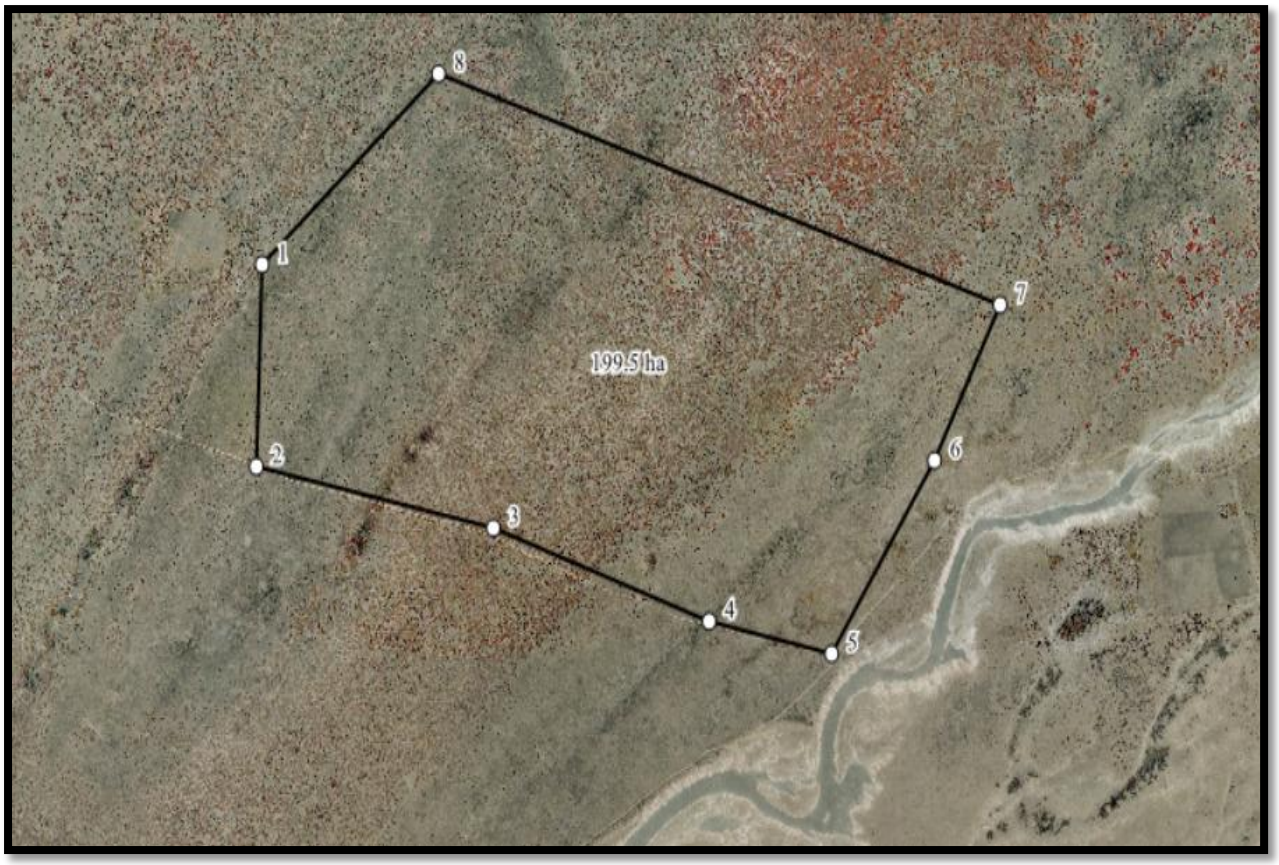

FIGURE 1: PROJECT LAND LAYOUT (GOOGLE EARTH)

2.0 DESCRIPTION OF THE PROPOSED PROJECT

2.1 Locality

2.1.1 Settlements and displacement of Households

The area proposed for this irrigation farming project is situated a distance from human settlement and human activities. The human settlement area situated about 2 kilometers from the project. This basically means, the project will not disturb and/or displace any household/ existing improvements during the construction (fencing) and operation stage.

2.2 Land Preparation

Ploughing will be done using tractors. The land will further be designed to fit the specific needs of each crop planted.

2.3.1 Tillage equipment

Tractors are basic equipment used to loosen the soil and sometimes incorporate it with the objective of improving the structure and countering compaction. These equipment include moldboard ploughs, disc ploughs, chisel ploughs and rippers.
However, in the first 3-5 years of farming it will be advisable that PORAD Association Incorporated, use the moldboard ploughs because the soil is virgin and still hard therefore would need to be broken down.

FIGURE 2: MOOULDBOARD PROUGH

After about 3 years of ploughing using the moldboard plough, the proponent may shift to the disc ploughs. This is because the disc plough has a slicing action with the main advantage that ensures that better water penetration is obtained. It is also very effective on land with large amounts of plant residues, because it promotes rapid breakdown of soil structure.

FIGURE 3: DISC PLOUGH

2.4 Watering

2.4.1 Drip Irrigation

Drip irrigation is currently the most advanced irrigation method. Several different systems are available on the market. They are made up of various thin plastic pipes with extremely small holes, spaced at prescribed distances from each other over the length of the pipe. These holes can be 30 cm to 1 m apart. Water drips from each hole at pre-calculated rates to irrigate one or two individual plants at a time. There are many advantages to for using the drip irrigation system.

1. **Water conservation**: Since drip irrigation systems control water flow efficiently and use 30 to 50 percent less water than sprinkler systems.

2. **Adaptability**: Drip irrigation systems are useful in a variety of settings—from small vegetable gardens to large farms—and for all soil types. You can easily move or expand the reach of drip emitters and drip lines to irrigate additional plants.

3. **Consistent water flow:** You can use water emitters that are pressure compensated, meaning they provide a consistent flow rate even when the water has to flow uphill.

4. **Improved plant growth**: The slow, consistent flow rate of a drip system provides ideal plant growing conditions. It allows water to soak deeply into the soil and more easily reach plant roots.

5. **Weed control**: The precision of a localized water delivery system means less water is available for weeds to grow between plants.

6. **Minimized pollution and territorial damage**: Since there's no water runoff with a drip irrigation system, fertilizer pollution is less likely to be washed into natural water sources. And unlike lawn sprinklers, drip systems don’t cause the deterioration of surrounding fences, house siding, and pavement.

7. **Time efficiency**: You can automate drip systems with a programmable timer so they stick to a hands-off watering schedule.

8. **Minimized risk of plant fungus**: Fungal diseases often occur when plants have wet leaves. Drip irrigation reduces the chance of fungal infection by delivering water directly into the soil without spraying water onto the leaves.

Even though it has many great benefit the tubes can still get plugged, become damaged by, plant roots, farm equipment and even animals. They are also cumbersome to deal with during harvest and planting seasons.

3.0 REGULATORY FRAMEWORK

3.1 Important Legislation and Regulatory Agencies

3.1.1. Constitution of the Republic of Namibia (1990)

The Constitution commits the Government of Namibia to sustainable utilization of Namibia's natural resources for the benefit of all Namibians. Article 95 of the Namibian Constitution states that "the State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of natural resources on a sustainable basis for the benefit of all Namibians both present and future"

3.1.2. Environmental Management Act, 2007 (Act No.7 of 2007)

The issuance of the Environmental Clearance Certificate (ECC) is based on the review of the Environmental Assessments (EA) reports prepared in accordance with the Environmental Management Act (2007) and the Environmental Impact Assessment Regulations, 2012.

3.1.3. Water Act, 1956 (Act No 54 of 1956)

The Water Act, Act No. 54 of 1956 inherited from South Africa is still in force because the National Water Resource Management Act, Act No. 11 of 2013 is not yet enforced. The Act makes provision for a number of functions pertaining to control and use of water resources, water supply and protection of water resources.

The Directorate of Resource Management within the Department of Water Affairs (DWA) at the Ministry of Agriculture Water and Forestry is currently the lead agency responsible for the management of surface and groundwater utilization through the issuing of abstraction permits and waste water disposal permits.
DWA is also the Government agency responsible for water quality monitoring and reporting.

3.1.4. Labour Act (Act No 11 of 2007)

The purpose of the Act is to "consolidate and amend the labor law; to establish a comprehensive labor law for all employers and employees; to entrench fundamental labor rights and protections; to regulate basic terms and conditions of employment; to ensure the health, safety and welfare of employees; to protect employees from unfair labor practices; to regulate the registration of trade unions and employers' organizations; to regulate collective labor relations; to provide for the systematic prevention and resolution of labor disputes; to establish the Labour Advisory Council, the Labour Court, the Wages Commission and the labor inspectorate; to provide for the appointment of the Labour Commissioner and the Deputy Labour Commissioner; and to provide for incidental matters.

3.1.5. Occupational Health and Safety Regulations

The construction safety is also regulated under the Health and Safety Regulations under the Labour Act. In Namibia, the Health and Safety framework regulates the following aspects:

- ✓ Rights and duties of employees
- ✓ Construction safety
- ✓ Electrical Safety
- ✓ Hazardous Safety
- ✓ Machinery Safety
- ✓ Physical hazards and general provisions
- ✓ Medical Examinations and emergency arrangements

3.1.6. National Waste Management Policy (2010)

The essence of the National Waste Management Policy, 2010 is to prevent and reduce health risks associated with exposure to healthcare substances, household, radiation and other waste from healthcare workers, waste handlers and public by promoting sound environmental waste management practices.

In addition, to design appropriate means of safe and sustainable waste management. In order to achieve lasting positive impact on health and environment, any new program should be subjected to sustainability assessment before implementation.

3.1.7. Communal Land Reform Act 5 of 2002

According to the Communal Land Reform Act, the ownership of communal land is vested in the State (Government of the Republic of Namibia) and two (2) types of rights of Customary Land Right and Leasehold Land Right are given to those who want to occupy the communal land (Legal Assistance Centre, 2003).

The communal Land Reform Act No. 5 of 2002 as amended provides for the allocation of rights in respect of communal land; to establish Communal Land Boards; to provide for the powers of Chiefs and Traditional Authorities and boards in relation to communal land; and to make provision for incidental matters.

The Traditional Authorities Chiefs and Senior Traditional Councilors administering land at district levels have the power to allocate any size of land within their jurisdiction but the power of **the village headman is only limited to less than 50 ha. The required 200 ha for PORAD Association Incorporated has already been allocated at all traditional levels of the Ondonga Traditional Authority, the Omulondo Traditional District and Onanke Village.**

3.1.8. Government Compensation Policy Guidelines of 2009

The Government Compensation Policy Guidelines of 2009 provides for fair compensation of homesteads, properties and fruits bearing trees affected by the development in communal areas. The main objective of compensation is to maintain, restore and sustain the livelihoods of the people whose homesteads and properties have been affected by the development.

The 200 ha land for PORAD Association Incorporated is neither occupied nor developed. It also doesn't have forestry protected or fruit bearing trees to be compensated.

3.2 Important Permit Requirements

TABLE 2: IMPORTANT PERMIT REQUIREMENTS

Activity	Applicable Legislation	Permitting Authority	Current Status
1. Issue of Environmental Clearance Certificate	Environmental Impact Assessment Regulations, 2012, Environmental Management Act (2007),	Environmental Commissioner, MET	ECC still to be issued
2. Fencing –off communal land	Communal Land Reform Act, 2002	Oshikoto Communal Land Board, Ministry of Land Reform	Approval and Leasehold certificate still to be issued
3. Removal, disturbance or destruction of bird eggs	Nature Conservation Ordinance 4, 1975	Ministry of Environment and Tourism	Permit to remove protected tree species to be obtained from Forestry, MAWF
4. Removal, disturbances of protected plants			
5. Abstraction of water other than that provided by NAMWATER	Water Management Act 284, 2004	Ministry of Agriculture, Water and Forestry	No permit required but to meet requirements
6. Scheduled processes in controlled area	Atmospheric Pollution Prevention ordinance 11, 1976	Ministry of Health and Social Services	No permits required but to meet provisions

7. Removal, destruction of indigenous trees, bushes or plants within 100 yards of stream or watercourse	Forestry Act 12, 2001	Ministry of Agriculture, Water and Forestry	No fruit bearing trees to be compensated

4. BASELINE ENVIRONMENT

4.0 Introduction

In the following sections the current biological, physical and socio-economic conditions of the study area are discussed and their sensitivities to change are considered.

4.1 Physical Environment

4.1.1 Climate of the Oshikoto region

The climate of the area is fundamental; in determining the availability of water and also reveals much about its ecological sensitivity and resilience to change. The climate data below is typical for Omuthiya town which is located ±34 km from Onanke and is expected to occur at the farming site.

4.1.2 Temperature, Evaporation, Wind and Solar

The average temperature for the year in Omuthiya is ± 20 °C. The warmest month, on average, is November with an average temperature of ± 26.4°C. The coolest month on average is July, with an average temperature of ± 17.2°C.

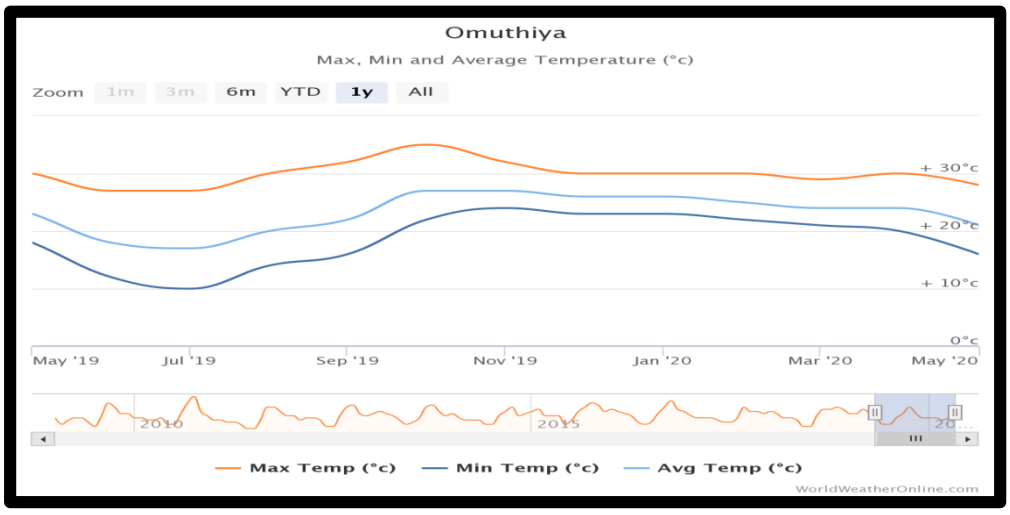

FIGURE 4: AVERAGE TEMPERATURE

The wind experienced at any given location is highly dependent on local topography and other factors. The average hourly wind speed in Omuthiya experiences mild seasonal variation over the course of the year.

Omuthiya experience the highest winds speed in the months of May to October, with average wind speeds of more than ± 8.2 km per hour while October to May experience the lowest winds. The calmest day of the year is February, with an average hourly wind speed of ± 6.8 km per hour.

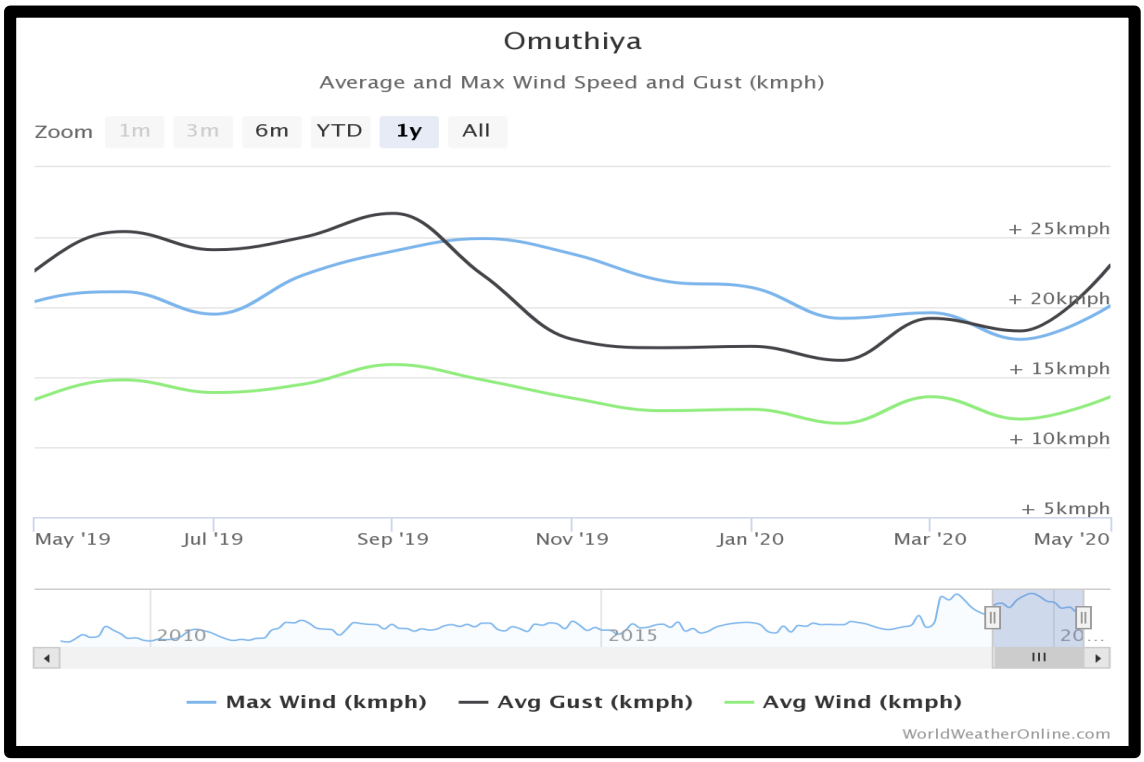

FIGURE 5: AVERAGE AND MAXIMUM SPEED

4.1.3 Rainfall

The average amount of precipitation for the year in Omuthiya is ± 500.4 mm. The month with the most precipitation on average is December to February with ± 119.4 mm of precipitation. The month with the least precipitation on average is June with an average of 0 mm.

There is an average of ± 57.3 days of precipitation, with the most precipitation occurring in February with ± 12.8 days and the least precipitation occurring in July with 0.0 days.

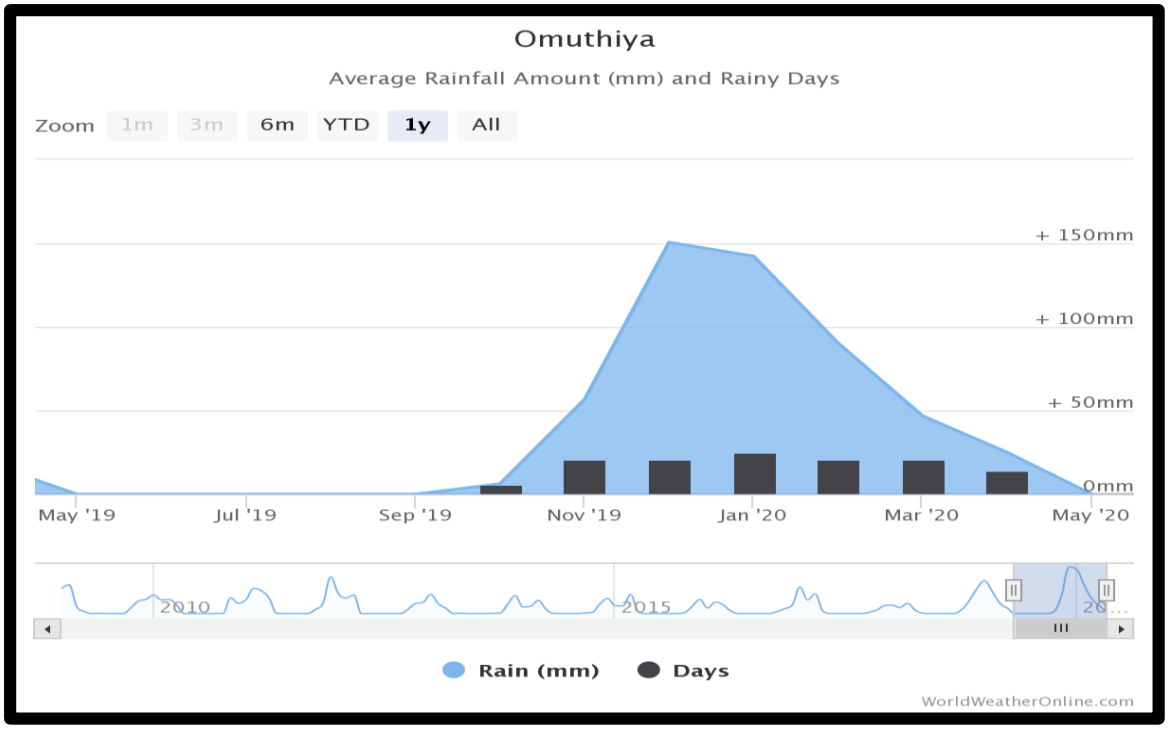

FIGURE 6: AVERAGE RAINFALL

4.1.4 Water source and supply

For many years, people in the region depended on surface water for their needs during the rainy season and on hand dug wells during the dry season. However, as the population grew this source could no longer meet demands.

The new agricultural project will be connected to a bulk water pipeline for NamWater/ Rural water supply which is supplying water at Onanke School (less than 2 km from the project site). This is the water source currently preferred by the proponent for irrigating the crops (drip irrigation)

4.1.5 Soils

The project is characterized by loamy-textured soils. Loamy textured soils are commonly described as medium textured with functionally-equal contributions of sand, silt, and clay. These medium-textured soils are often considered ideal for agriculture as they are easily cultivated by farmers and can be highly productive for crop growth.

4.1.6 Electricity Connection

The proponent has no plan to connect the project site to the grit at this point in time. The project in question is a community projects with limited resources and implementation will be done in phases as the resources allows. The proponent will be required to develop a separate Environmental Management Plan for electrification when resources become available.

4.1.7 Geology

Namibia has a unique and ancient geological history with great rock formation. The region lies on old continental base of graphite, gniesses, and volcanic rock however most of this rock lies thousands of meters below the current land scape (Mendelsohn, Obeid, & Roberts, 2000).
The proposed project will be situated in the Cuvelai –Etosha basin, which is located in Central, southern Angola and central, northern Namibia. The Namibian portion of the basin covers 92 250 square kilometers (km^2) in extent which is 64% of the basin. The total size of the Cuvelai –Etosha basin is about 145 000 km^2 in extent and has water resources that are shared between Angola and Namibia.

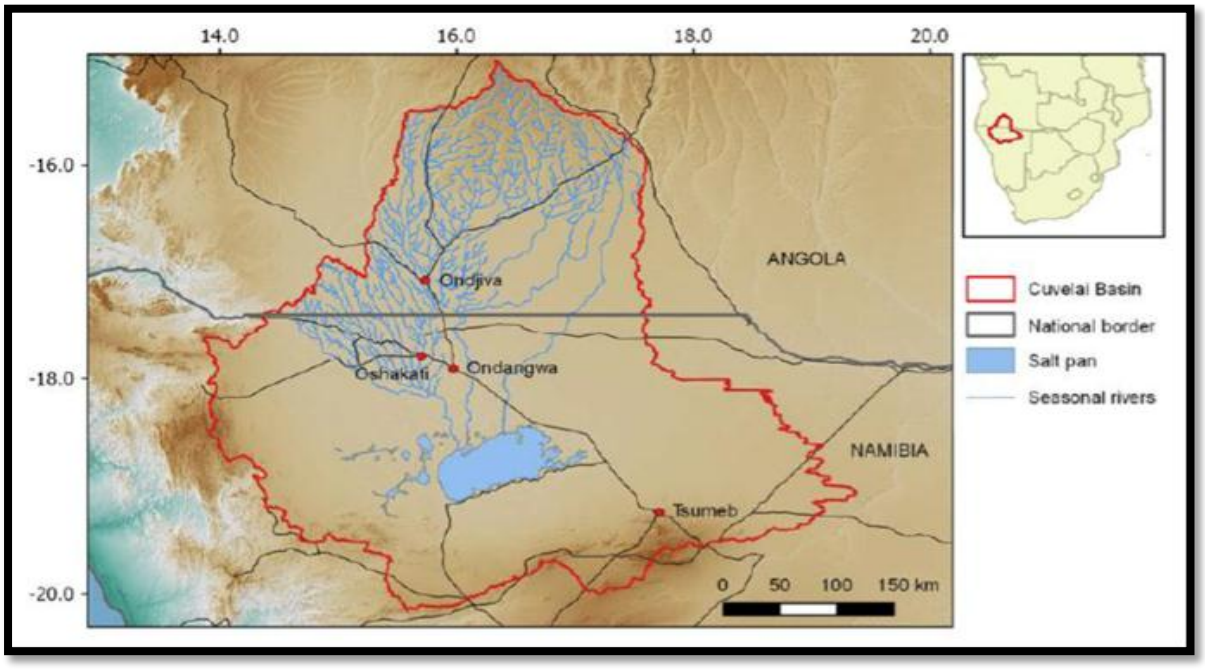

FIGURE 7: SHOW A MAP OF THE CUVELAI-ETOSHA BASIN. (SOURCE: HTTPS://WWW.CUVECOM.ORG/THE-RIVER-BASIN/)

4.2 Biophysical Environment

4.2.1 Flora and fauna

4.2.1.1 Flora observed

The vegetation in the Oshikoto Region varies greatly from the north to the south and from the east to the west. According to (Strohbach, 2014) the north and north-east (towards Okankolo), this *Colophospermum mopane* shrubveld is gradually replaced by broad-leafed savannas, whilst to the south-west, the vegetation is replaced by the *Terminalia pruinoides* woodlands. This transition is very patchy in nature. To the south, some *Odyssea paucinervis* occurs, whilst to the east *Terminalia pruinoides* and *Albizia anthelmintica* become prominent.

The project area is located in the south- west and the vegetation in the proposed area is sparsely distributed and characterized by shrubs species and grasses. The project area is dominated by *Terminalia pruinoides* and *Colophospermum mopane* with a few other shurbs like *Catophractes alexandri, Grewia flavescens* and *Grewia. Bicolor.* This was observed by a site visit and comparing picture Field Guide to the Trees & Shrubs of Namibia using by Le Roux & Müller's. The area is also covered by thick grasses and were identified using the "Grasses of Namibia, by Müller"

FIGURE 8: TERMINALIA PRUINOIDES

FIGURE 9: ONE OF THE FEW NOTABLE LARGE TERMINALIA PRUINOIDES

FIGURE 10: SHOWS VEGETATION OF COLOPHOSPERMUM MOPANNE

There are no forestry protected trees within the proposed project area. The table below shows both expected and encountered plant species within the proposed project area.

TABLE 3: EXPECTED & OBSERVED TREES

Species	Present	Absent	Occurrences
Hyphaene petersiana	X		
Colophospermum mopanne (local name: Omusati)	X		Common
Colophospermum mopanne		X	
Terminalia pruinoides (Local name: Omihama)	X		Common
Eragrostis trichophora	X		Common
Aristida stipoides	X		Common
Odyssea paucinervis		X	
Cleome gynadra		X	
Cyperus compressus	X		Occasional
Cynodon dactylon		X	
Crotalaria podocarpa		X	
Sesamum triphyllum	X		Occasional
Dichrostachys cinerea		X	
Hirpicium gorterioides		X	
Kohautia virgate		X	
Terminalia sericea		X	
Solanum delagoense		X	
Tephrosia burchellii		X	
Berchemia discolor		X	
Tribulus zeyheri		X	
pechuel-loeschea leubnitziae (local name: iizimba)	X		Occasional
Sclerocarya birrea subsp. caffra		X	
Acacia karroo	X		Occasional

4.2.1.2 Fauna observed

The portion of the land which is characterized by *Colophospermum mopanne* has thick vegetation that provides suitable environment for lager animals. While the remainder of the project land is befitting for small animals like mouse, reptiles and snakes and are commonly observed in the area. This area is mostly used by the local farmers for grazing their domestic animals like: cattle, goats, donkeys and sheep.

4.2.1.3.1 Animals and birds observed in the area

During the field visit, the team has observed birds in the project area. According to Newman's birds by colour, commonality in Southern Africa (Keneth Newman, 2000), the following birds are to be found in the area. However this list is not exhaustive because birds have no boundaries;

TABLE 4: BIRDS IN THE PROJECT AREA

Item No.	Birds
1.	Laughing dove
2.	Grey backed finchlark
3.	Palm swift
4.	Yellow canary
5.	Streaky headed canary
6.	Monteiro Hornbill
7.	Red eyed bulbul
8.	Black chested prinia
9.	Namaqua sandrouse
10.	Social Weaver
11.	Pied Crow

Besides birds, on the day of the screening only beetles, locusts (*Acrotylus diana*), spiders and freshly dug mouse burrows (an indication that there are small mammals in the area) were observed.


FIGURE 11: SHOW BURROWS OF MOUSE AN INDICATION OF THE PRESENTS OF SMALL MAMMALS.

5. ENVIROMENTAL IMPACTS

The main purpose of this section is to identify and assess the most significant environmental impacts by describing the measurable aspects of these impacts. The mitigation measures of these possible impacts will be provided in order to minimize the extent of the impacts resulting from various activities during the construction phases and beyond.

5.1. Method of Assessment

The assessment is carried out in tabular form (Table 5) to facilitate the evaluation, followed by mitigation measures. In order to determine significance, each potential impact was subjected to a range of assessment criteria listed below.

TABLE 5: CRITERIA USED TO DETERMINE THE SIGNIFICANCE OF IMPACTS AND THEIR DEFINITIONS.

Nature	Reviews the type of effect that the proposed activity will have on the relevant component of the environment and includes "what will be affected and how?"
Extent: How far in terms of area will the impact reach. Indicates whether the impact will be within a limited area	
Local	limited to within 25km of the area
Regional	limited to ~200km radius
National	limited to the borders of Namibia
International	extending beyond Namibia's borders
Duration: How long will the a particular impact least once in has occurred	
Short term	1-5 years
Medium term	5-10 years
Long term	longer than 10 years, but will cease after operation
Permanent	irreversible
Intensity: Determine whether the magnitude of the impact is destructive or innocuous and whether or not it exceeds set standards.	
Low	Where natural/ social environmental functions and processes are negligibly affected.
Medium	Where the environment continues to function but in a noticeably modified manner.

High	Where environmental functions and processes are altered such that they temporarily or permanently.
Probability: Determine the likelihood of the impact occurring	
Uncertain Improbable Probable Highly probable Definite	 Low likelihood Distinct possibility Most likely Impact will occur regardless of prevention measures
Status of the Impact: A statement of whether the impact is;	
Positive Negative Neutral.	a benefit to the environment, society or the economy a cost to the environment, society or the economy

TABLE 6: DEFINITION OF THE VARIOUS SIGNIFICANCE RATINGS

Significance Rating	Criteria
Low	Where the impact will have a negligible influence on the environment and no mitigations are required.
Medium	Where the impact could have an influence on the environment, which require some modifications on the proposed project design and/or alternative mitigation.
High	Where the impact could have a significant influence on the environment and, in the case of a negative impact, the activity causing it, should not be permitted.

5.3 IMPACTS

The following potential impacts on the environment have been identified: **Dust, Water & Soil Pollution, Soil Erosion, Animal Husbandry, Health and Safety, Noise, Health and Safety, Biodiversity Loss, Solid Waste, Socio-economic and Human Wildlife Conflict.**

These identified potential impacts have been assessed. There have been no threats to the birds that have been identified in this study. Mitigation measures are proposed for each identified impacts in the subsequent section of Environmental Management Plan.

5.3.1 Positive Impacts

The proposed activities for crop farming at the 200 ha piece of land in Onanke are likely to have both negative & positive impacts. Below is a list of positive social impacts that will be associated to the project:

1. Enhancing of Agricultural Productivity through provision of training to smallholder farmers.
2. Reducing of importation of basic essential food
3. Facilitating and contributing to government efforts of jobs creation
4. Promoting of food security, self-sufficiency in food production and quality improvement of food / nutritional value within the Omulondo district and beyond
5. Increasing household incomes that in return enhance the peoples' lives
6. Ensuring project's sustainability by:

    a) Guaranteeing that there is a commercial component through which vigorous marketing and establishment of value chain is maintained

    b) Ensuring that there is an Institutional Support, i.e. Capacity Building Project Management to safeguard continuity and sustenance of the project.

5.3.2 Negative Impacts

5.3.2.1 Crop Farming Impacts

The assessment considered the major components of the project and how they would impact the environment. These components considered include social economic impact, erosion, leaching of Nutrients and heavy machinery utilization during land preparation.

5.3.2.2 Soil Erosion

Soil erosion is the displacement of soil materials on the ground surface by action of moving water or air. Water movement on the ground surface causes water erosion, which is our area of concern. This impact can be exhibited by:

i. *Loss of cultivable land*
ii. *Loss of soil fertility as a result of washing away of organic component and natural nutrients*

5.3.2.3 Loss of Habitat & decreased Biodiversity

The removal of flora is required for commercial cultivation of agricultural cash crops and horticulture crops. When new land for crop purposes is opened up, this will lead to loss of existing habitat and decreased biological diversity in these areas.

5.3.2.4 Loss of Soil Fertility

The project is characterized by loamy-textured soils which are often considered ideal for agriculture as they are easily cultivated by farmers and can be highly productive for crop growth.

The use of heavy machinery utilization during land preparation can cause the soil to loose it's fertility. Leaching of nutrients where the soils are porous due to land preparation, as is the case with sandy soils, leaching of soil nutrients, agro-chemicals and chemical fertilizers increases.

5.3.2.5 Stresses Induced by Clearing the Natural Vegetation

The cash crops & horticulture vegetables will be a light-major commercial farming region and hence, it is expected that there will be massive clearing of the existing natural vegetation. Much of the bare land will be exposed to direct raindrop and winds' impact resulting in water, wind erosion.

5.3.2.6 Heavy Machinery Utilization during Land Preparation

a) Creation of hard pan

Ploughing using heavy machinery is the most common method of preparing land for large commercial crop farming. The spaces between soil pores under the plough decrease over time and eventually get compacted as the process of ploughing continues year by year. The compacted areas become compact and harder after each ploughing

operation, thus creating a hard pan. The created hard pan reduces the infiltration of water into the soil thus allowing the lateral movement of water, this case accelerating runoff and erosion of nutrient-rich topsoil.

b) Introduction of new weed population

With the clearing of land it open up the land and as a result encourage new less desired species move in due to the ploughs. Each time the soils are inverted, seeds of new less desired species are exposed to the top layer which is favorable for germination. These plant species will continuously compete for nutrients with the desired crop.

c) Surface sealing formation

Heavy machinery tends to destroy the structure of the soil causing the soil particles to become compact, with low organic and moisture content. In this state, infiltration of water is hampered; splash and runoff increase soil erosion.

5.3.2.7 Animal husbandry impacts

Livestock production has been an important branch of farming since the start of agricultural practices and even today is a substantial part of the modern agriculture system. The people throughout the world usually raise livestock as a major means to produce food, directly as the meat and dairy products, and indirectly as draught power and manure for crop production. Foods of animal origin i.e. meat and dairy products are a rich source of essential nutrients and usually added in the meals in reasonable amounts to have a balanced diet.
There are several environmental problems such as air and water pollution, deforestation and loss of biodiversity observed in the world, which are directly connected with livestock farming

6. ANALYSIS OF ALTERNATIVES

6.1 Land

The 200 ha piece of land was allocated to PORAD Association Incorporated by the Ondonga Traditional Authority to utilize for the project and no alternative site has been considered. The land is also very low in biodiversity and therefor very little environmental impact will occur.

6.2 Tillage implements

6.2.1 Ripper plough

For PORAD Association Incorporated, to maximize the land and prevent hand pan from developing, the use of rippers plough is recommend because they are ideal for deep cultivation of up to 400 mm. This is necessary because if soils are tilled annually to the same depth, a plough-sole develops. This compacted layer prevents infiltration and root development. To ensure better drainage and utilization of water, it is essential to break this layer regularly using a ripper.

6.2.2 Sprinklers

This type of irrigation system requires a lot of water due to evaporation and it is very expensive to run. Sprinkler irrigation is a method of applying irrigation water which is similar to natural rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air through sprinklers so that it breaks up into small water drops which fall to the ground. The pump supply system, sprinklers and operating conditions must be designed to enable a uniform application of water.