ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT REPORT

PROPOSED INTEGRATED ANIMAL AND CROP FARMING & RELATED INFRASTRUCTURE AT MUBIZA VILLAGE, KATIMA MLILO, NAMIBIA

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PROPONENT	**Mwaka Integrated Farming CC** **Att:** Lutombi CHAKA P.O. 940, Katima Mlilo, Zambezi Region, NAMIBIA
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ACRONYMS AND ABBREVIATIONS

- **A&IS** — **Alien & Invasive Species**
- **ASC** — **Aquaculture Stewardship Council**
- **BA** — **Basic Assessment**
- **BAR** — **Basic Assessment Report**
- **CA** — **Competent Authority**
- **DEA** — **Department of Environmental Affairs**
- **EAP** — **Environmental Assessment Practitioner**
- **EIA** — **Environmental Impact Assessment**
- **EIR** — **Environmental Impact Report**
- **EMA** — **Environmental Management Act**
- **EMF** — **Environmental Management Framework**
- **EMPr** — **Environmental Management Programme**
- **EMP** — **Environmental Management Plan**
- **EMMP** — **Environmental Management & Monitoring Plan**
- **FAO** — **Food & Agriculture Organization**
- **FEPA** — **Freshwater Ecosystem Priority Area**
- **GAP** — **Good Agriculture Practice**
- **IFS** — **Integrated Farming Systems**
- **GMO** — **Genetically Modified Organism**
- **HACCP** — **Hazardous Analysis & Critical Control Point**
- **I&AP** — **Interested & Affected Parties**
- **ISO** — **International Standards Organization**
- **MEFT** — **Ministry of Environment, Forestry and Tourism**
- **MSDS** — **Material Safety Data System**
- **NGO** — **Non-Governmental Organization**
- **POS** — **Plan of Study**
- **PP** — **Public Participation**
- **S&EIR** — **Scoping & Environmental Impact Report**
- **SANS** — **South African National Standards**
- **SASS** — **South African Scoring System**
- **SASSI** — **Southern African Sustainable Seafood Initiative**
- **SR** — **Scoping Report**
- **TOPS** — **Threatened or Protected Species**
- **WWF** — **World Wide Fund for Nature**

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1. BY WAY OF AN INTRODUCTION

1.1 Background

The proponent is planning to embark on an Integrated Animal and Crop Farming initiative at Mubiza Village, which is some 30 km east of Katima Mlilo town, and is quite remote in the Zambezi Region of Namibia.

According to FAO (2020), mixed farming exists in many forms depending on external and internal factors. External factors are weather patterns, market prices, political stability, technological developments, etc. Internal factors relate to local soil characteristics, composition of the family and farmers' ingenuity. Farmers can decide to opt for mixed enterprises when they want to save resources by interchanging them on the farm - because these permit wider crop rotations and thus reduce dependence on chemicals, because they consider mixed systems closer to nature, or because they allow diversification for better risk management[1].

Namibia is a large, arid to semi-arid country with a population of just over 2 million. The country has the world's second-lowest population density and its natural resource endowment has enabled it to generate an average per capita income that puts it in the middle-income category, although Namibia has the highest income disparity in the world with basic health, poverty measures and unemployment worsening substantially over recent years. Articulated in 2004, Namibia's 2030 Vision will continue to promote the creation of a diversified, open market economy, with a resource-based industrial sector and commercial agriculture. (GRN 2004a:8) The resources in question are largely minerals (copper, uranium, zinc, gold, gemstones, and others) although fish, wildlife, and a unique.

- **Key Issues and Opportunities for Intervention[2]**

As Namibia continues to pursue its Vision 2030 plan for long-term national development, it will need to take all possible measures to increase equity of opportunity for its previously disadvantaged population by ensuring access to and sustainable use of its land and renewable natural resources and by sharing the incomes associated with exploitation of non-renewable resources. Systems to secure individual property ownership combined with well-managed communal tenure systems governing land and other natural resources will provide fundamental building blocks for future advances in sound resource governance. External support could be useful in several areas.

- **Support greater access for marginalized groups**

Namibia's land-reform initiatives require prospective beneficiaries to interact with various governmental and traditional entities, such as Land Boards and Traditional Authorities. Absent affirmative efforts, Namibia's most marginalized people, including the San, those affected by HIV/AIDs, and women are may be overlooked in land-reform programs because they lack awareness of the programs and their potential benefits, are more likely to be illiterate, and often have limited mobility. In addition, when marginalized groups obtain leaseholds and resettlement opportunities, they may require specifically targeted support to help them engage in productive livelihood activities. Donors could assist the government's reform efforts by developing programs that target these groups and ensuring that they have equal ability to receive leaseholds and resettlement opportunities.

1.2 Proponent: Mwaka Integrated Framing CC

Mwaka Integrated Farming CC has secured a 100-hectare piece of communal land to use for production of **crop farming (agronomic)** and **crocodile rearing.** The land of which is administered particularly by the local chiefs

[1] From www.fao.org/DOCREP/004/Y0501E/Y0501E00.HTM
[2] https://www.land-links.org/country-profile/namibia/#1529257839458-5333d70a-7bbd

whose authority is governed by the Ministry of Urban and Rural Development of Namibia. The proposed area is communal and quite remote in the Zambezi Region of Namibia. However, the main activity on the farm will be integrated animal and crop farming. Animal farming will entail crocodile farming, which falls under the auspices of aquaculture . The crocodile hatchlings will be imported from Binga Crocodile Farm in Zimbabwe. Binga Farm has agreed to supply at least 10,000 hatchlings to the Mubiza Crocodile Farm for the next ten years. Crop farming will main

1.3 Agronomy Defined

Agronomy is the application of science and technology from the fields of biology, chemistry, economics, ecology, soil science, water science, pest management and genetics to the improvement and management of the major food crops of the world[3].

Agronomy is differentiated from the plant sciences of horticulture, pomology, range science, and other applied plant sciences by the specific crops considered and the scope. Agronomic crops are those that occupy large acreage, and are the bases of the world's food and fiber production systems, often mechanized. Examples are wheat, rice, corn, soybean, alfalfa and forage crops, beans, sugar beets, canola, and cotton. Also called 'field crops', these crops typically consist of a large majority of a country's agricultural acreage and crop revenue. It is a science that looks at agriculture from an integrated, holistic perspective, informing practical decisions pertaining to food and fibre production.

1.4 Crocodile Farming Defined

Crocodiles are hunted for their skins, meat, oil and claws. Over catching of this animal has led to the decline of this species in wild populations. Although it is not a new idea, breeding this animal under captivity is a developing industry in some parts of the world. Crocodiles have been bred in farms since early 20th century. The majority of these farms were tourist attractions with wild caught alligators or crocodiles under captivity. Decline of the wild populations led to the prohibitions around the word. In crocodile farming operations, the idea is to obtain skins, meat and other products without stressing wild populations. This animal has its own characteristics and they should be learned well before any economic investment. In this review, our aim is to identify these characteristics and inform farmers about the challenges, downsides and advantages of crocodile farming with emphasis on their biology and present farming operations[4].

Initially, the project encompassed the element of paddocking wild life; however, that was dismissed by the Directorate of *Wildlife* and National *Parks* (DWNP), under the Ministry of Environment, Forestry and Tourism Namibia.

Mwaka Integrated Farming CC, the proponent, is duly registered in Namibia and wholly owned Namibians from previously disadvantaged backgrounds, who have passion in both animal and crop farming. The project seeks to contribute its share towards ensuring food security in the country as well as creating employment for Namibians. The main business activities on the farm include crocodile farming and agronomic production of cash crops such as maize, wheat albeit at a relatively small scale than the cash crops.

Growth in agricultural productivity in sub-Saharan Africa including Namibia, has been cited as vital to poverty reduction and to the achievement of the Millennium Development Goals (MDGs), as emphasized in the World

[3] http://agric.ucdavis.edu/About_Agronomy/
[4] https://www.fisheriessciences.com/fisheries-aqua/crocodile-farming-and-its-present-state-in-global-aquaculture.php?aid=549

Development Report titled Agriculture for Development (2008[5]). The company's business interests are geared towards the production of agricultural products, both agronomic and horticultural products. Its underlying vision is to contribute towards achieving food security in Namibia by utilising vast virgin and unutilised lands in the Zambezi Region.

About 80% of Namibia's agricultural products are imported[6], mainly from South Africa, which makes the country heavily dependent on imports. In order to be able to make a significant contribution towards the growth of the Namibian economy and thus wealth creation, agricultural production/output has to increase manifold. In order to address this scenario of import dependency and improve on the country's food security, the Government of the Republic of Namibia (GRN) has embarked on the Green Scheme Programme, whose objectives are to promote agricultural production and the development and implementation of a fresh produce production co-ordinating and marketing infrastructure in the country.

1.5 Green Scheme Concept

The whole concept directly falls under the Namibian "Green Scheme" initiative, which means the initiative of the Ministry of Agriculture, Water and Rural Development to encourage the development of irrigation based agronomic production within the agro-industry in Namibia with the aim of achieving various economic and socio-economic objectives[7].

The Green Scheme policy of the government offers great potential to expand and increase production of food under irrigation. The policy aims at establishing approximately 22,000 hectares under irrigation along the perennial rivers bordering Namibia. The construction of storage facilities in strategic regions will enable grain produced by small-scale farmers to be bought and stored in the silos for use during time of need. There is therefore a need to develop products stringent upon collateral conditions to access financing along this concept as long as there is a guaranteed buyer of produce.

The green scheme is designed to maximize irrigation opportunities along the maize triangle (Grootfontein, Tsumeb and Otavi) as well as in the North Central and North Eastern Regions using the Kunene, Kavango and Zambezi rivers as well as the promotion of agro projects in the South using Orange River and dams such as Naute and Hardap. This policy aims at harnessing the resources of government and other stakeholders in order to increase agriculture productivity and social development as envisaged in NDP IV and Vision 2030 and the Harambee Prosperity Plan.[8]

In order to implement its business objectives, Mwaka Integrated Farming CC intends to establish an integrated agricultural farm which entails the production of cash crops and animal husbandry / livestock. The proponent has vast wealth of expertise and experience in agricultural management and other various sectors that contribute significantly to the local and national economies.

1.6 Permitted Development

The project would be undertaken by Mwaka Integrated Farming CC, the proponent, with blessings from the Mubiza Traditional Authority, as enshrined under the Communal Land Reform Act 5 of 2002. Mubiza Village, which is some 30km east of Katima Mlilo, is in rural Zambezi Region of Namibia.

[5] https://openknowledge.worldbank.org/handle/10986/5990
[6] http://www.xinhuanet.com/english/2021-02/02/c_139716110.htm
[7] https://agribank.com.na/page/green-scheme/
[8] Bank of Namibia, 2020 Green Scheme Project Report

The Statutory or Legislative Rights allow the proponent to undertake this development. Although substantial parts of the Project are not expected to give rise to significant environmental effects in terms of the the Namibian Environmental Management Act 7 of 2007, the proponent, through Erongo Consulting Group, have undertaken to provide Environmental Assessment of the entire project. This approach has been adopted in order to provide robust and consistent supporting documentation for use with the various stakeholders or authorities including applications that will be required along the length of the project.

1.7 Purpose of the EIA Report

The purpose of the EIA Report is to describe how the EIA of the project will be undertaken, set out the topics that will be assessed and the geographic and spatial scope within which they will be considered. The report also sets out an overview of the methods that will be used to determine the potential significant environmental effects that will occur temporarily during the project implementation – digging of trenches, drilling, and vegetation clearing - and occur permanently because of its physical presence and operation.

1.8 Consultancy Terms of Reference

The Terms of Reference (TORs) for the proposed project is technically and legally based on the requirements set out by the Namibian Environmental Management Act (2007) and the accompanying EIA Regulations (2012) and Section 50 of the Local Authorities Act of 1992, Act 23 of 1992, as amended. The process covered the following steps:

- *A description of all tasks to be undertaken as part of the assessment process, including any specialist studies to be included if needed;*
- *An indication of the stages at which the Environmental Commissioner is to be consulted;*
- *A description of the proposed method of assessing the environmental issues and alternatives*
- *An identification of all legislation and guidelines that have been considered in the preparation of the scoping study;*
- *Description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity*
- *A description of environmental issues and potential impacts, including cumulative impacts that have been identified*
- *A draft Environmental Management Plan that complies with EMA and its Regulations;*
- *The nature and extent of the Public Consultation processes to be conducted during the assessment process.*

It should be noted that the ToR and scope of services required the Environmental Impact Assessment and production of EMP for the proposed development, and this included extensive and exhaustive public consultation process.

1.9 The Environmental Assessment Practitioner (EAP)[9]

Erongo Consulting Group is one of Namibia's leading Environmental, Sustainability and Management Consultancy Company founded by previously disadvantaged Namibians.

[9] See: www.erongoconsultinggroup.com

The company combines local experience with a regional and global knowledge base constantly striving to achieve inspiring and exacting solutions that make a genuine difference to our clients, the end-users, and society at large. The company works across the following markets: Buildings, Transport, Planning & Urban Design, Water, Environment & Health, Energy and Management Consulting.

We partner with our clients to create sustainable societies where people and nature flourish. With our unique combination of technical excellence and socio-economic insights we deliver enduring structures, resource-efficient solutions and socially cohesive communities for today and tomorrow.

We have a multidisciplinary approach to what we do and what we aspire to achieve. We work to create a sustainable society where improved quality of life and economic growth is enabled by innovative and durable solutions to the most pressing needs, challenges and concerns for businesses, public institutions and people.

Often these challenges are related to the physical environment in which life unfolds – natural resources, infrastructure, buildings and structures, urban spaces – and our ambition is to help drive a sustainable transition towards a more resource efficient future.

1.10 Public Consultation

Specific consultations (direct and indirect) have been undertaken to inform this EIA process. Newspapers, Facebook Pages, WhatsApp, Notice Boards and posters were used to reach out to Interested and Affected Stakeholders. The intentions for consultation during the EIA process have been included within each of the topic assessment chapters. The Newspaper articles calling for Public Consultation was utilised. This was coupled with the extensive use of the Social Media through Facebook.

The BID was shared with those who had shown some interest in the project. However, no comments were received from the IAPs who had requested for the document. The proponent engaged Erongo Consulting Group prior to the commencement of the main activities. Therefore, it should be noted that this exercise was carried out and drafted before any development has taken place on the ground.

The EIA Consultant could only identify issues observed on site as well as from discussions with and investigations from IAPs / stakeholders who were directly and indirectly affected by the whole development. General consultation process for the project included a series of high-level discussions with the **Proponent, Zambezi Regional Council, Ministry of Agriculture, Land** and **Forestry, Ministry of Environment and Tourism**, and, in some cases, Mwaka Integrated Farming Project Management Team.

The Consultation employed a triangulation of qualitative and quantitative research methods. This ensured that evidence from multiple sources will be cross-checked and searched for regularities (O'Donoghue & Punch 2003). The methodology consisted of interviews and case study. The interviews aided the EAP in learning more broadly about the proposed development and its related infrastructure.

1.11 Ownership

In terms of the Communal Land Reform Act 5 of 2002, the proposed site is under the jurisdiction of the Mubiza Traditional Authority and Permission to Occupy was recommended by the Mubiza Traditional Authority. The application for Leasehold was made to the Ministry of Land Reform (**Zambezi Communal Land Board**).

The Communal Land Reform Act 5 of 2002 seeks to "provide 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".

1.12 EIA Report and Environmental Management

This EIA Report does not provide all of the environmental management inputs that would be required for any specific project, but provides a starting point and framework for the implementation of more detailed management protocols. Likewise, the intention of the Report is not to reproduce the entire legal process of authorisation, as this is captured in various guidelines that the Department of Environmental Affairs and other departments have made available and to which Mwaka Integrated Farming CC, a prospective aquaculturist through the Environmental Assessment Practitioner (EAP), also referred during the process of authorisation or assessment.

This EIA Report depicts the outline of the authorisation process and indicates specific details that relate to aquaculture. Proper use of this Report and the accompanying Environmental Management Plan (EMP) is as a generic reference.

This Report has been compiled from the experiences of practitioners in Namibian animal and crop farming. It is further strengthened by literature on international best practice. To ensure a broad readership and usefulness the document has been compiled to assist all stakeholders ranging from government authorities at all levels, academics, future or potential farmers, new entrants and entrepreneurs, NGO's and the general public.

This EIA and Environmental Management Report have been compiled by Erongo Consulting Group on behalf of Mwaka Integrated Farming CC as a reference work that will be used by the Proponent. It provides guidance on the environmental authorisation process for the proposed development and provides a generic framework of good environmental management practices (Environmental Management Plan). The implementation of this Report through the EMP will assist with the creation of an environmentally responsible and more sustainable activity at Mubiza Village in Katima Mlilo in the Zambezi Region of Namibia.

1.13 Report Content and Structure

In arranging the content of this Report, and therefore also of the Environmental Management Plan (EMP) that will follow, the aim has been to set the chapters in a sequence that presents information to the reader in a logical order. This also facilitates cross reference between chapters with related content. It should be noted that, the information in this Report is based on the currently available baseline information provided by the Proponent and the Project Management Team, and our independent judgment as the EIA Practitioners (EAP).

Although this EIA study will not answer the question of a preferred stocking density for the proposed project (Nile crocodile), as well as crop farming, the hope is to establish a foundation for **standardization** on the proposed development. The EIA desktop study assessed commercial stocking densities for crocodilians, applied to grower-phase Nile crocodiles at a commercial crocodile farm in Gauteng, South Africa (as a **Case Study).**

2 METHODOLOGY[10] OF THE EIASTUDY

Taking into account the multi-sector project activities planned, and the vastness of the farming block, the assessment was divided into three themes namely:

- **Socio-culture:** to assess the impacts of the various project activities on the socio-cultural norms of the local community.
- **Ecological:** to assess the inputs of the various project activities on the ecological status of the area.
- **Infrastructure:** to assess the impacts of infrastructure development on the ecological and social aspects of the area.

• **Planning:**	The team reviewed the terms of reference for the team in general and for each theme group which mainly included undertaking a reconnaissance study, data collection, data analysis and report writing
• **Reconnaissance Survey:**	The team undertook a study tour to obtain a general impression of the study area, and to note the significant environmental issue that would require further investigation.
• **Scoping Exercise**	Stakeholder consultative meetings were held in the Zambezi Region and beyond.
• **Data Collection:**	Both primary and secondary data were collected.

2.1 Primary Data Collection Methods[11]

Direct Observation:	This process involved the noting of the ecological, social and economic factors as the groups walked, and drove through the area.
Aerial Observation:	This process involved the noting of ecological social and economic factors using Google Map.
Transect Walks:	The groups walked through some parts of the study area in the company of community members who provided information on the prevailing social and economic lifestyles in relation to land use.
Focus Group Discussions:	The groups facilitated focus group discussions that included local traditional leadership and select community members. This Process was to yield qualitative information on community perceptions of the proposed development.
Semi-Structured Interviews:	Semi-structures interviews were made to obtain data from institutions including the local authority, and central government agencies as well as semi-government institutions.
Consultations:	The EAP made consultations with stakeholder agencies for expert advice.

2.2 Secondary Data: The team made reference to secondary sources that included Topographic Maps, Project reports, Administrative reports, as well as text materials.

[10] Research methodology is the specific procedures or techniques used to identify, select, process, and analyze information about a topic. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability. (Wits University 2021)

[11] https://libguides.wits.ac.za/c.php?g=693518&p=4914913

2.3 Team Report and Feedback: Following data collection the term met in plenary session to review in details the data finding and discuss the possible environmental imputes and mitigation measures.

2.4 Final Report Compilation: A report-writing Team compiled the draft Environmental Impact Assessment Report. After this process, the draft report was to be subjected to Public Scrutiny.

2.5 Specialist Inputs and Specialist Studies

Specialist Inputs and Specialist Studies	Certain potential environmental impacts or complex project designs or processes may require inputs from specialised professionals in an environmental authorisation process. Such inputs may be by means of commentary or by means of specialist studies. As a relatively new field that makes use of advanced technologies at times, specialist inputs may be required in certain aquaculture environmental authorisation processes, both to provide clarity around processes and potential impacts and also to ensure that adequate information is generated for I&AP's and to enable CA's to make informed decisions. Specialist studies are usually associated with S&EIR. However, the proposed development didn't call for such studies considering its magnitude.

2.6 Environmental Management Programmes (EMPr's)

Environmental Management Programmes	An essential component of an application for environmental authorisation is the compilation of an Environmental Management Programme (EMPr). The purpose of these EMPr's is to document and plan the management approach that will best achieve the avoidance and minimisation of potential environmental impacts in phases of construction, operation and decommissioning. The following chapters contain many of the management practices that would typically be included into such management plans with regards the proposed development at Mubiza Village. An essential component of an application for environmental authorisation is the compilation of an Environmental Management Programme (EMPr) (previously called an Environmental Management Plan or EMP). The purpose of these EMPr's is to document and plan the management approach that will best achieve the avoidance and minimisation of potential environmental impacts in phases of construction, operation and decommissioning. The following chapters contain many of the management practices that would typically be included into such management plans with regards the proposed development at Mubiza Village.

2.7 Other Legislation And Authorizations

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. **Other Legislation And Authorizations**	Although this Report is focused on the EIA processes related to the proposed Crocodile Framing (aquaculture), a number of additional environmental legal frameworks and authorizations apply to the sector. Apart from constituting a legal requirement, successful completion of the EIA process itself often depends on compliance with these additional requirements.

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2.7.1

2.7.2 The Scale Of Potential Impacts the proposed development

The Scale Of Potential Impacts Of Aquaculture	As with any human development, the proposed development poses certain risks to the environment if not implemented along principles of sustainability. Although it is known that the proposed development can lead to significant environmental impacts, especially when practiced at large scale and where production takes place in environmentally "open" systems, the environmental risk profile of present-day / proposed development / integrated farming is however comparatively low. It is therefore important to recognize the relatively

	minor contribution of aquaculture impacts related to the scale and degree of impacts in global agriculture, human population growth and industrial development. Nevertheless, the proposed development can cause environmental damage in certain instances if left unchecked and unmanaged. This section looks at certain generic good practices that can be applied in the planning and operation of the proposed development to ensure greater environmental sustainability. In general, the impacts of the proposed development relate to effects on water, its direct and indirect impacts on biodiversity and ecosystems and the effects of disease. Other effects such as impacts include aesthetic disturbance and the cumulative impact of crocodile farming as an aquaculture initiative; together with other users of natural resources and water also need to be considered. Most of the potential negative impacts of aquaculture can however be mitigated effectively through planning, including inter alia proper site and technology selection and sound management. Viewing this degree of effective mitigation with the positive social and economic aspects of crocodile farming is important when evaluating environmental risks associated with the sector, especially in light of the fact that that aquaculture can play an important role in matters such as food security, economic development and alleviation of pressures.

3 PROPOSED PROJECT DESCRIPTION

The development will directly take place at Mubiza Village in Zambezi Region. Site Coordinates: Latitude: 17°36'47.3"S 24°26'11.1"E; Longitude: -17.613132, 24.436425. The location is communal in nature, and isolated from the ge5neral public and any infrastructure. It directly falls under the jurisdiction of the Mubiza Traditional Authority. The boundary of the development is clearly depicted on the Google Earth picture, ***Figure 3.1.***

About 38% of Namibia is designated communal land[12]. Communal land is land that belongs to the State and is held in trust for the benefit of the traditional communities living in those areas. Communal land cannot be bought or sold, but you can be given a customary land right or right of leasehold to a part of communal land according to the rules outlined in the Communal Land Reform Act.

Much of the remaining land is allocated for freehold farmland (44%), national parks (17%) and declared urban areas (1%). Some 1.1 million people live in communal areas. This is just over half the total population; whilst the remaining people are in urban areas (42%) and on freehold farms (6%). Matters pertaining to tenure in communal areas thus concern high proportions of Namibia's land and people.

3.1 Description of the Proposed Activity

The proponent wishes to develop an integrated animal and crop farming initiative on Mubiza Village, and the proposed development cannot take place without an Environmental Clearance Certificate as promulgated by the Environmental Management Act 7, of 2007 and its Regulations as well as the Four Cornerstone of the Earth Summit.

The proposed development, though to be developed in phases, will entail the following infrastructure:

Approx. Size	Probable activity	Scale Size	Carry / capacity	Water Requirements / Other Description	
40 ha	**INFRASTRUCTURE DEVELOPMENT**				The infrastructure will be connected to a 11kVa by Nored mains; Complementary power will be harnessed from Solar panels at 0.5 MW estimate (see Layout Plan)
	Solar plant,	**+_10**	+_ 10 solar panels	-	
	staff accommodation	**+_3**	+15 skilled & semi-skilled personnel	50,000m3 / week	
	Gardens / irrigation /	**+-25**	cash crop;	Sprinkler, drip and overhead irrigation will use reclaimed waters	
	Reservoir	**+_10**	**50,000m3 at a go**	-	
	Boreholes x 6	**+_1**	will pump almost 50,000m3 per week for domestic consumption	-	
60ha	**Crocodile Farming / rearing**				
	To be fenced and reserved for crocodiles	**60 ha**	Crocodile ponds will be constructed gradually (non-endangered species and harvesting will be done sustainably)	About 10 Water points will be constructed, clean water supplied by boreholes	

The Proposed integrated farming integrates well into the existing ecosystem or regional value chain, as well as the Government of Namibia's Green Scheme Initiative. However, if these operations were to be vertically integrated such that the end products of each operation can be directly marketed and sold to local shops in

12 https://webcache.googleusercontent.com/search?q=cache:RLQltf_iu6sJ:https://www.kas.de/documents/268877/268926/7_file_storage_file_26841_1.pdf/25878aac-5951-427a-d3dc

substantial quantities, the capital expenditure would be very high if done at a micro-level to firstly finance and secondly to manage.

Considering the available resources in terms of land and expertise in the proposed integrated farming operations, it was inferred that if the 100 ha were to be portioned into different agricultural activities, it would be more effective, manageable and beneficial to both the proponent and the Zambezi Region at large. By availing these portions of land and expertise in these proposed farming activities, there would not only be job creation, as these operations would need employees to manage them effectively, but there would also be more value addition along the economic supply chain of the country.

When considering the effect that the portioning of farm Mubiza will have on the nearby communities, the aspect of job and opportunity creation is an important one. In these communal settlements, there are many skilled artisans and labourers; however, with the current farming operations in the vicinity, employment opportunities are limited. By creating many more business opportunities through integrated farming, one would inadvertently be creating job opportunities in these communities.

3.2 Description Of The Site

The identified piece of land, Mubiza Village, is remote, isolated and regarded as communal, and lies some 30 km east of Katima Mlilo town, and the Government of Namibia or relevant Government Ministries haven't earmarked the piece of land for any future development.

This site falls under the jurisdiction of the Zambezi Communal Land Board (ZCLB) / Zambezi Regional Council, and an application for right of Leasehold was lodged with the ZCLB who consented to the development. The project has already received endorsement from the Mubiza Village Authority traditional authority.

According to the baseline information of the area, the site falls within the **agricultural** and **forest zone** in which the following activities are permitted: grazing, farming and residential activity and there is no a conservation that exists in the identified area. There are no wildlife corridors on the identified piece of land. The proposed project site falls within the settlement and cropping area of the communal lands, hence the consent by the Mubiza Village Authority to the project.

Map 1: Gazetted conservancies in Zambezi Region in relation to the Proposed Mubiza Integrated Framing project

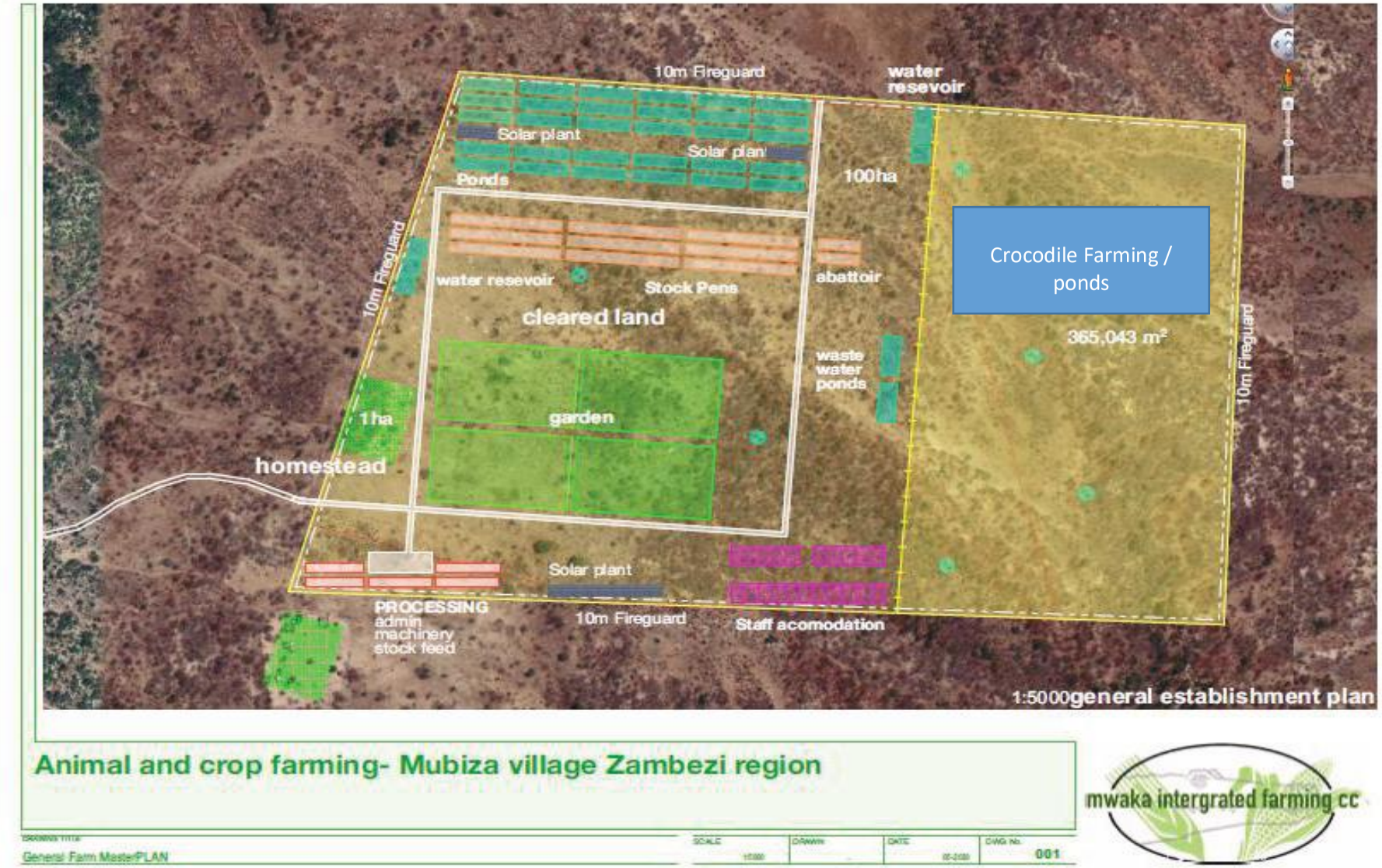

Figure 3.1: The location of the site in relations to the existing structures

4 DESCRIPTION OF THE RECEIVING ENVIRONMENT

The Chapter provides an overview of the baseline biophysical and social environmental conditions, with which the proposed project will interact. This information has been sourced from observations made during a site visit and existing literature from previous research conducted in the area. This chapter also identifies sensitivities pertaining to key environmental features as well as potential impacts resulting from the proposed project in relation to these sensitivities.

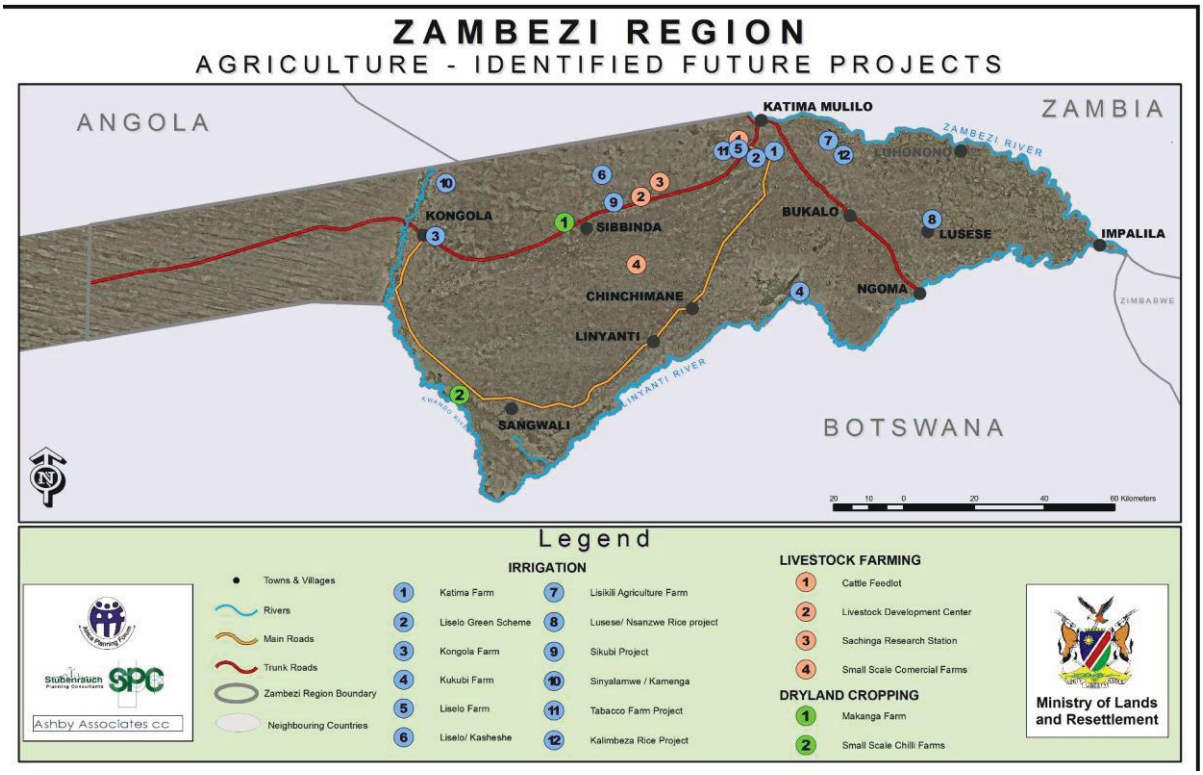

Figure 4.1: Legend of the Zambezi Region Agriculture projects Irrigation, Livestock & Dryland Cropping

4.1 Flora & Fauna

The texture of soil, the depth, the nutrient content, the concentrations of salts and the ability to hold water affect the kind of plants found in an area (Mendelsohn et al, 1997). Water drains through sand easily, washing nutrients away and leaving both the sands and many grasses low in nutrients. The six land types within the Zambezi Region form broadly six vegetation communities: open water, floodplains, riverine woodlands, Mopane woodlands, Kalahari woodlands and Impalila woodlands. Within each of the six broad vegetation communities, certain plant types exist better than in others. The Caprivi Atlas shows an assessment of the

potential values of each of these variations in terms of its potential for crop cultivation, livestock farming, conservation and other non-agricultural subsistence values of these resources (Mendelsohn et al, 1997).

4.2 Biophysical Environment

Element	Description
Climate	In contrast to the rest of Namibia, the Zambezi Region has a hot tropically humid climate with higher rainfall, lower evaporation and warmer winters.
Rainfall	Even though the Zambezi Region receives more precipitation, rainfall is highly variable from year to year and from one place to another. It also experiences periodic droughts. Average annual rainfall in the landscape is around 500 - 650 mm. Almost all rain falls in the summer months (November to April), peaking in January and February.
Temperature	The major feature of the Zambezi landscape is extensive forest, savannah sands with associated flood plains, channels and deposits which have resulted in producing six major landscapes. The site area represents two of these landscapes: Savannah forest with associated grass and Sandy soil.
Topography and soils Surface and Ground water Hydrology	The site is dominated by heavy sandy and dry savannah and there is no availability of surface water in the area. At the same time, the area is not prone to flood, hence the underground water levels is uncertain and could only be predicted and/or estimated by the hydrological expertise for water sources.

4.3 Landscape Characteristics

Element	Description
Vegetation	The Zambezi region is considered a semi-arid tropical savannah ecosystem with very distinct wet and dry seasons. Vegetation types in the Zambezi region is characterised by soils, flooding and fire. The land types in the Zambezi shows considerable variation in terms of abundance and size of plant species and communities identified to provide an overview of the dominant plant species and communities (Mendelsohn et al 1997) the two vegetation units represented at the site area: Zambezi grassland – terminalia sericea and Heavy sandy. Zambezi's natural vegetation resources provide people with many resources. Most resources are used for domestic purposes to the benefit of households. But items are also sold to earn cash income. The most important product is for grass and wood. About 88% of all the homes are constructed from wood, 78% of homes are thatched with grass or reeds and 96% of all households use firewood for cooking, Kraals and fences are constructed using timber harvested from local trees, mainly *colophospermum* Mopane and terminalia sericea (silver clustwer leaf). Other resources are used less frequently or by smaller number of people. Fruit and nuts from a large number of plant species as well as water rely bulbs are consumed domestically and also sold. Plants are also collected for medical purposes. Sleds and dug out boats are also made of wood. Palm leaves are used to make baskets, both for domestic use and for sale in the export market. The site where the project is proposed for development is characterized by some important plant species that are commonly found in the Zambezi (Caprivi) region.

4.4 Socio Economic Profile

Element	Description
Population	The population of the Zambezi Region has grown from 79,826 in 2011 to 90,596 in 2011. This is an annual growth rate of 1.3% which is slightly lower than the national average of 1.4% (NSA, 2014). The region has seen some fluctuations in its population numbers in the past two decades. There are most likely attributed to a combination of regional boundary change, political conflict / uprising, return to stability (people moving back), and out-migration towards perceived better employment opportunities elsewhere in the country. In 2011, there were a significant number of non-Namibians (10%) living in the Zambezi Region. The majority originate from Zambia (70%) while 15% were Angolans (NSA, 2014). The people from the Zambezi Region are descendants of Zambian kingdoms (Harring & Odendaal, 2012) and therefore their traditional linkages to Zambia are much stronger than to the other neighbouring countries. The population density of the region was 6.1 persons per km² in 2011, which is much higher than the national average of 2.6 persons per km², indicating possible land use pressures (NSA, 2014). Katima Mlilo Urban Constituency had the highest density amongst the constituencies with 631 persons per km². Katima Mlilo is the only major urban area and its population has increased from 22,134 people in 2001 to 28,362 in 2011; the majority of the population (69%) still lives in the rural areas. Rural to urban migration is happening across the country as people move to seek job opportunities and improved infrastructure and services. The constituencies with the next highest population densities were Katima Mulilo Rural and Kabbe North, both with 8 persons/km2, and this is largely due to their proximity to Katima Mulilo and Zambia where trade takes place. With 69% of the Zambezi Regions' population living in the rural areas, the main source of income and livelihood support is from subsistence farming. Approximately 26.3% of the rural population depends on livestock farming and 52.9% depend on crop cultivation (NSA, 2012). The long history of subsistence farming for both livestock and crop cultivation is also further enforced by the strict regulations for export of meat from the region due to the existence of foot and mouth disease. There have been recent investigations and studies to find means to improve the livestock sector and to stimulate the commercialization of the sector in the region. In the Zambezi Region, crop cultivation is dryland cropping that is dependent on the rainfall for water. Typically, households plant between one and four hectares of mostly mahangu, sorghum and maize. The Zambezi Region is a popular tourist destination, especially for wildlife viewing, trophy hunting and fishing activities. However apart from trophy hunting, the tourism sector is still very much undeveloped in spite of its vast potential. A unique selling point for the region is the ever-growing conservation efforts, the vast amount of wildlife (particularly elephants, buffalos and aquatic species that near endemic to the region) and the beautiful scenery along the river. There are about 15 tourism establishments not directly in the landscape area. The surrounding area has a number of tourism attractions including wildlife and big rivers. Even though the majority of the Zambezi population live in the rural areas (69%), the main source of household income across the region are from wages and salaries (30%), 25% from non-farming business activities, and 21% from farming activities. This varies quite significantly between constituencies, which gives the percentage of households which obtain their main income from farming.

4.5 Socio-Cultural

Cultural	Two indigenous languages are spoken by the people around this area which is Siyeyi and Silozi. Livelihood of the people in this area depends firstly on their economic dependence on ancestral land. This can be clearly seen in their sense of traditional ownership of land and unrestricted access to the use of the natural resources in the area through various traditional practices. Secondly is their strong decentralized traditional leadership hierarchy. The Chief is the head of a clan with the Mayeyi-Ngambela and Natamoyo (acting as advisors to the chief) and the Silalo Indunas at Lianshuluarea or sub-khuta (Headmen) acting at the ground level on behalf of the chief. Among other responsibilities, the senior headman's are charged with the responsibility of administering land and the local people on behalf of the chief.

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5 NAMIBIAN LEGAL REQUIREMENTS

The Policy, Legal, and Administrative framework requirements for EIA are defined by select Namibian and international relevant policies and laws which may influence or regulate certain aspects of project.

Environmental law and legislation are central in protecting us humans as well as the different plants and animals in the greater ecosystem that we exist in. Environmental law ensures that individuals, governments and cooperates do not cause harm to the environment or its ecosystems.[13]

5.1 Legislative Framework

The pursuit of sustainability, with respect to any development, is guided by a sound legislative and policy framework. This section provides a review of applicable and relevant Namibian legislation, policies and guidelines. This review serves to inform the proponent of the requirements and expectations, as laid out in terms of these instruments, to be fulfilled before the proposed project may commence. The findings of the abovementioned review are summarised below.

Table 5.1: Namibian Legislation relevant to the project

LEGISLATION/ GUIDELINE	RELEVANT PROVISIONS	IMPLICATIONS FOR THIS PROJECT
– **Namibian Constitution First Amendment Act 34 of 1998**	*"The State shall actively promote… maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future" (Article 95(l)).*	Ecological sustainability should inform and guide this EA and the proposed development.
– **Environmental Management Act EMA (No 7 of 2007)**	– Requires that projects with significant environmental impact are subject to an environmental assessment process (Section 27). – Details principles which are to guide all EAs.	The EMA and its regulations should inform and guide this EA process.
– **Environmental Impact Assessment (EIA) Regulations GN 28-30 (GG 4878)**	– Details requirements for public consultation within a given environmental assessment process (GN 30 S21). – Details the requirements for what should be included in a Scoping Report (GN 30 S8) and an Assessment Report (GN 30 S15).	
– **Forestry Act 12 of 2001** – **Nature Conservation Ordinance 4 of 1975**	– Prohibits the removal of any vegetation within 100 m from a watercourse (Forestry Act S22 (1)). – Prohibits the removal of and transport of various protected plant species.	Even though the Directorate of Forestry has no jurisdiction within Townlands, these provisions will be used as a guideline for conservation of vegetation.
– **Labour Act 11 of 2007**	Details requirements regarding minimum wage and working conditions (S39-47).	The proponent should ensure that all contractors involved during the construction, operation and maintenance of the proposed project
– **Health and Safety Regulations GN 156/1997 (GG 1617)**	Details various requirements regarding health and safety of laborers.	

[13] https://blog.ipleaders.in/need-study-environmental-law/

– **Public Health Act 36 of 1919** – **(Public and Environmental Health Act, 2015)**	Section 119 states that "no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health."	comply with the provisions of these legal instruments.
– **National Heritage Act 27 of 2004**	Section 48(1) states that "A person may apply to the [National Heritage] Council [NHC] for a permit to carry out works or activities in relation to a protected place or protected object".	Any heritage resources (e.g. human remains etc.) discovered during construction requires a permit from the NHC for relocation.
– **Burial Place Ordinance 27 of 1966**	Prohibits the desecration or disturbance of graves and regulates how bodies may be unearthed or dug up.	Regulates the exhumation of graves.
– **Water Act 54 of 1956**	The Water Resources Management Act 24 of 2004 is presently without regulations; therefore the Water Act No 54 of 1956 is still in force: – Prohibits the pollution of underground and surface water bodies (S23 (1)). – Liability of clean-up costs after closure/ abandonment of an activity (S23 (2)).	The protection of ground and surface water resources should be a priority. The main threats will most likely be concrete and hydrocarbon spills during construction and hydrocarbon spills during operation and maintenance.
– **Town Planning Ordinance 18 of 1954**	Subdivision of land situated in any area to which an approved Town Planning Scheme applies must be consistent with that scheme (S31).	The proposed use of the project site must be consistent with the Zambezi Regional Council Planning Scheme
– **Townships and Division of Land Ordinance 11 of 1963**	Details the functions of the Township Board including what they consider when receiving an application for Township Establishment (S3).	The proposed layout and land uses should be informed by environmental factors such as water supply, soil etc. as laid out in Section 3.
– **Road Ordinance 1972 (Ordinance 17 0f 1972)**	– Width of proclaimed roads and road reserve boundaries (S3.1) – Control of traffic on urban trunk and main roads (S27.1) – Rails, tracks, bridges, wires, cables, subways or culverts across or under proclaimed roads (S36.1) – Infringements and obstructions on and interference with proclaimed roads. (S37.1) – Distance from proclaimed roads at which fences are erected (S38)	The limitations applicable on RA proclaimed roads should inform the proposed layout and zonings where applicable.
– **Atmospheric Pollution Prevention Act (Act No 45 of 1965).**	– Limitations imposed on working hours, or prohibiting certain activities or methods of working	– The proponent must ensure the contractors address explosive reagent safety and best practices related to environmental management awareness. – Blast crews and engineering staff should be aware that nitrates and ammonia are generally the compounds of greatest concern for water quality
– **Explosives Act 26 of 1956 Explosives Regulations;**	– The Notices will be done according to the Act on the blasting times and use of blasting materials	
– **Communal Land Reform Act**	– List of activities that may not be undertaken without a clearance certificate: irrigation Farming development activities	Conduct a EA in terms of the Proposed land development

6 ALTERNATIVES

The proponent has been engaging the **Ministry of Agriculture, Water and Forestry**[14] to determine the best site for the proposed development. The identified piece of land came out as the most suitable considering its size and location, and "the need to have that very piece of land get developed".

An environmental impact assessment report must contain a description of the alternatives for the proposed project that were studied: the investor's proposal, the most environmentally beneficial alternative, and a reasonable alternative. The last notion raises the most doubts.

Preparing an environmental report is one stage in environmental impact assessment (EIA) proceedings under Namibia's Environmental Management Act 7 of 2007. Conducting an EIA is essential in the case of projects that are regarded as always causing a significant environmental impact, and when ordered by the competent authority in the case of projects potentially causing a significant environment impact.

6.1 Alternatives

As a rule, an environmental report must present a minimum of three methods for carrying out a proposed development project: the project as proposed by the developer, a reasonable alternative, and the alternative most beneficial to the environment. It is essentially impossible to escape the obligation to examine alternatives in the report. This obligation is intended to enable a broader selection than just carrying out the proposed project or nothing at all. For this reason, the description of the alternatives studied is essential for proper conduct of the EIA for the project.

If it appears from the assessment that it would be justified to carry out the project under an alternative other than that proposed by the developer, the competent authority will, with the investor's consent, indicate the project that can be realized, or, lacking such consent, will refuse to approve realization of the project. If the report lacks an appropriate description of the alternatives studied, it will have serious practical ramifications, because the report does not comply with the EMA Act. Consequently, the developer cannot obtain an environmental decision, or if a decision is issued despite a defective report, the developer is at risk of having the decision overturned. This will generate additional costs to supplement the defective report, and significantly delay the project.

6.2 Reasonable Alternatives

In the context of properly examining alternatives for a project, it is most problematic to describe the "reasonable alternative." The law does not define this notion in any way or provide criteria for determining a specific alternative to the project to be indicated in the environmental decision. It is clear, however, that the description of the alternatives studied must be accurate and precise, so that the authority considering the matter can examine whether the project should be carried out under the plan proposed by the developer or under an alternative plan. In each case, preparation of the description of the reasonable alternative requires an individual assessment of the environmental impact that would follow if that alternative were implemented. And it must always meet the two criteria indicated in the

[14] The mission of the Ministry of Agriculture, Water and Forestry is to realize the potential of the agricultural, water and forestry sectors towards the promotion of an efficient and sustainable socio-economic development for a prosperous Namibia.

law: it must be "reasonable" and it must be an "alternative." If it lacks either of those characteristics, the report will be defective.[15]

The "reasonableness" of an alternative means that it could actually be selected by the authority evaluating the report in place of the variant proposed by the developer. A reasonable alternative cannot be merely abstract or theoretical. Thus an alternative should not be presented that would not be actually or technically feasible or would be doomed to failure (e.g. for financial reasons).

In turn, the "alternative" aspect means that the reasonable alternative must differ from the plan proposed by the investor in terms of environmental impact. For this reason, the zero (baseline) variant—i.e. not carrying out the project at all—is not considered a reasonable alternative because it does not involve environmental impacts. Besides, apart from the requirement to describe the specific alternatives, the EIA Act requires the developer to describe in the report the anticipated consequences for the environment if the project is not carried out, meaning that the zero variant is not an "alternative."

To be "alternative," the option generally must differ from the developer's proposal in spatial terms (e.g. location, scale and dimensions) or technological terms (e.g. the type of materials used or the capacity and productivity of the equipment). Other differences can also be cited, e.g. under economic or social criteria. It is undisputed that a reasonable alternative cannot be illusory—i.e. the developer cannot propose as an alternative to carry out essentially the same project, at the same location, with only slight technical differences. However, when describing the alternative, it is also important to maintain the same type of project; suggesting an alternative must not lead to proposal of what are essentially two entirely different projects.

6.3 No-Go Alternative (Do Nothing Alternative)

Should the proposed development not take place, serious consequences can be expected, as there will be slow pace of development in line with the Harambee Prosperity Plan and other developmental initiatives as anticipated by the Central Government of Namibia and the UN. This might indirectly affect socio-economic development and may lead to service protests by the local communities.

The site is idle and not being utilised for any economic purposes and it is far away from the residential structures / infrastructure or activities. It should be noted that the identified piece of land is currently not developed, and the proposed development is the only suitable infrastructure to be accommodated on the site.

6.4 Site Alternative

Due to land availability and service connections, the proposed site, Alternative 1, is the only site that has been identified for the proposed development during the consultation process with the Proponent. Therefore, no alternative sites have been identified or considered during this study.

6.5 Technology Alternative

Due to the type of project, no alternative technology can be considered.

[15] http://www.codozasady.pl/en/what-is-a-reasonable-alternative-for-a-development-project/

6.6 Selection Process:

Consultation meetings have been held with the Proponent and relevant role-players to determine the most suitable area available for the proposed development. Economic restraints, existing infrastructure and available land were major constraints on the selection process.

6.7 Location alternatives

The Site was chosen on it merit of due to suitably and also to as result of the currently land use. The Area is currently undeveloped and is the perfect area for the proposed development considering its strategic location. Besides, there is no such area in the Zambezi Region that can accommodate such a development.

7 DESCRIPTION OF PROPOSED ACTIVITIES

This chapter seeks to describe the proposed main activities on Mubiza Farm, namely animal and crop farming. The development will directly take place at Mubiza Village in Zambezi Region, and the site measures 100 hectares. Animal farming will mainly constitute crocodile rearing, as well as animal husbandry. Hatchlings will be imported from Binga Crocodile Farm in Zimbabwe.

The Proposed integrated farming activities integrate well into the existing ecosystem or regional value chain. Considering the available resources in terms of land and expertise in the proposed activity, it was inferred that if the 100 ha were to be portioned into different activities with 60 hectares dedicated to crocodile rearing, it would be more effective, manageable and beneficial to both the proponent and the Zambezi Region at large. By availing these portions of land and expertise in the proposed activities, there would not only be job creation, as these operations would need employees to manage them effectively, but there would also be more value addition along the economic supply chain of the country.

When considering the effect that the proposed development will have on the nearby communities, the aspect of job and opportunity creation is an important one. In these communal settlements, there are many skilled artisans and laborers; however, with the current farming operations in the vicinity, employment opportunities are limited. By creating many more business opportunities through aquaculture, one would inadvertently be creating job opportunities in these communities.

The identified piece of land, Mubiza Village, is remote, isolated and regarded as communal, and lies some 30 km east of Katima Mlilo town, and the Government of Namibia or relevant Government Ministries haven't earmarked the piece of land for any future development.

This site falls under the jurisdiction of the Zambezi Communal Land Board (ZCLB) / Zambezi Regional Council, and an application for right of Leasehold was lodged with the ZCLB who consented to the development. The project has already received endorsement from the Mubiza Village traditional authority.

According to the baseline information of the area, the site falls within the agricultural and forest zone in which the following activities are permitted: grazing, farming and residential activity and there is no a conservation that exists in the identified area. There are no wildlife corridors on the identified piece of land. The proposed project site falls within the settlement and cropping area of the communal lands, hence the consent by the Mubiza Village Authority to the project.

Site Coordinates: Latitude: 17°36'47.3"S 24°26'11.1"E; Longitude: -17.613132, 24.436425.

7.1 Project Construction and Operational Phases

The 100 hectares meant for the whole project if not fully blanketed by forests or shrubs, It is communal in nature, meaning its bareness and open woodlands characterized by some savannah trees and some indigenous trees and shrubs. The Contractor will not remove or clear any vegetation or trees where crocodile ponds and livestock will be kept, but where housing infrastructure will be constructed. The animals to be kept at the farm will make use of the farm vegetation and thereby fertilize through dung and allow revegetation of the grassland.

7.2 Water Agreements, Abstraction Permits and Licenses

The proponent will install water boreholes feed water to the whole farm. In Namibia, applications for Water Abstraction Permits will be made to the Ministry of Agriculture, Water and Forestry (MAWF).

Currently water allocations exist for urban, mining and irrigation applications[16]. For urban and mining applications, the volumes are based on the predicted water demands of each development and the permits are issued accordingly. The permit allocations for irrigation are based on the area to be irrigated as well as on the water available and considerations for sharing with other users.

The permits issued to applicants specify the different types of monitoring data that must be collected, as well as the frequency at which it must be collected and submitted to the Department of Water Affairs and Forestry (DWAF). The norm is that data must be collected monthly and submitted to DWA quarterly. It is also a standard condition that every borehole used for irrigation water abstraction must be equipped with a flow meter to measure the volumes abstracted.

7.3 Crocodile Import & Export Permits

According to Nature Conservation Ordinance 4 of 1975, the Nile crocodile is protected and therefore may only be hunted with a permit from the Ministry of Environment and Tourism, or alternatively in defense of human life or protection of livestock (wi reporting within 10 days to MET).

7.3.1 Control measures and International trade

Namibia only allows a minimal trade in wild-taken skins of the Nile crocodile, hunted as trophies. Since the Namibian crocodile population is listed on Appendix I, all crocodile products are traded in accordance of Article III of the Convention. Despite the conservative approach followed, and the ability to export Appendix I specimens for noncommercial purposes, Namibia has nonetheless experienced difficulties with the export of even a minimal number of hunting trophies due to stricter domestic measures in importing countries.

7.4 Employment Creation

An estimate 100 plus unskilled workforce drawn from the local communities will be engaged by the project during the setting up and construction phases of the project. The activities will include Debushing, removal of shrubs and creation of access roads.

7.5 Waste Management

Waste Management	**General Farm Waste** **Storage** • Locate farm waste storage areas away from food handling, input storage and livestock housing areas to prevent cross-contamination and avoid attracting pests. • Make sure farm waste storage areas and containers are adequate for the amount of waste generated between disposal times. • Clean farm waste storage areas often enough to avoid creating conditions that can cause cross-contamination or attract pests. • Where possible, use containers with lids for the storage of farm waste until removal **Note:** Crops grown on-farm can be fed to livestock housed on the same farm. Follow pesticide label instructions regarding grazing and feeding crops to livestock.

[16] http://www.kunene.riverawarenesskit.com/KUNENERAK_COM/EN/MANAGEMENT/WATER_DEMAND

Disposal

- Remove farm waste often enough and in a manner to prevent cross-contamination and avoid attracting pests.
- Dispose of all materials according to municipal by-laws and provincial regulations.
- If farm waste can be used by other sectors, store and ship them so as not to pose a food safety hazard. Unless properly sanitized, vehicles used for transporting farm waste should not be used to transport food products and farm inputs.

Medical Waste

Storage

- Store used needles, empty medicine containers and unwanted or expired animal health products in rigid, leak-proof containers and labelled NON-HAZARDOUS WASTE (medicine bottles) or BIOMEDICAL WASTE (needles, scalpels and other "sharp" equipment).

Disposal

- Follow suppliers' or manufacturers' instructions for disposal of syringes, medications and other items as well as outdated medical supplies.
- Another viable disposal option may be your veterinarian. Disposal on your property or in burn barrels are not desirable disposal options.
- Contact Ministry of Environment at 1-800-663-3456 when disposal quantities are in excess of 5 kg or 5 litres.
- Make sure medicated feed and water are disposed in a manner that does not contaminate the environment.

Used Pesticide Containers

Storage

Triple-rinse all empty pesticide containers by following these steps:

1. Fill empty containers with water to a minimum of one-tenth of the container size.
2. Rinse by recapping the container and shaking or rolling.
3. Empty pesticide container contents into sprayer tank.
4. Repeat steps 1 to 3 two times.

Do not reuse pesticide containers for storage of other items.

Disposal

Take rinsed containers to a pesticide container collection site for recycling.

There are four options to dispose of unwanted pesticides:

1. Return unopened pesticide container to the dealer before winter.
2. Apply pesticide to another crop specified on the label.
3. Pay a Hazardous Waste Disposal Company to dispose of the pesticide.

Deadstock

	Storage Remove compost or bury all regulated dead animals according to provincial regulations. Locate deadstock burial pit and composting site away from: • Animal housing, • Fruit or vegetable production areas, • Areas of high livestock or human traffic, and • Any sources of water. • Protect all stored deadstock from other livestock, poultry and predators and away from public view. **Disposal** Choose a method of regulated dead animal disposal that is currently approved. These include: • Pick up by a provincially licensed Deadstock Pick-Up Service; • Composting at least 15 m from any watercourse and 30 m from any source of water used for domestic purposes; • Burial at least 30 m from any source of water used for domestic purposes and pits constructed to prevent pollution. **If You Need an Audit** Be prepared for the auditor to observe or inquire about storage activities to ensure that: • Adequate and proper waste storage areas and/or containers are clearly designated on the farm, • Farm waste storage containers and areas are well kept and maintained, • Farm waste is removed on a regular basis, • Medical waste containers are clearly marked, • Empty pesticide containers and unwanted pesticides are stored in a designated area labelled for disposal, and • Deadstock is stored and/or disposed of according to provincial regulations. **General Farm Waste** Ensure that wastes are stored appropriately prior to reuse, recycling or disposal to avoid contamination of the environment or harm to people, animals or produce. Green wastes can be composted and reused as a fertilizer and soil conditioner. Composting green wastes will assist in destroying weed seeds

7.6 Development Activities Around The Project

Integrated farming	The current state of the proposed project area for the farm shows that there are few subsistence small farm holds about three that are situated about 3 kilometers on the southern part from the project site. The proposed project will have slightly impact on the activities of wildlife as the project area will be fenced off as a security measure

7.7 Electricity

Electricity supply	The proposed project will draw 90 percent of its energy from the solar, with 10 drawn from NORED. The proponent plans to procure a power transformer which is to be provided by NORED Namibia. The proponent has allocated budget for the installation of these services. Plans are underway to apply for an extension of a power line to the development property, which shall be used when the project starts operating. This power connection is connected from the main town centre of Katima Mlilo.

7.8 Sewage Treatment and Disposal

Sewage Treatment and Disposal

Another development that will be undertaken at the site under the construction phase of the farming project will be development and/or the construction of strategic infrastructure. As a result, a 100, 000 L septic tank will be installed to absorb the liquid waste produced from the development.

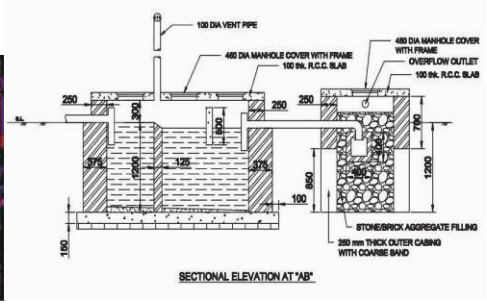
The 100,000l septic tank will be installed about 4 meters underground, it is estimated that the capacity of the septic tank can take about to 30 years for it to reach its fullest capacity.

Staff housing &solid waste

Temporal staff housing for workers and security services (guards) will be constructed. Corrugated and wooden materials will be used to construct these structures. The temporal housing will accommodate up to 20 workers (30) and workers will be accommodated on a rotational or shift basis. Household Waste will be collected through Wheelie Bins

The solid wastes disposal will be conducted as follows:

– Solid wastes (such as plastic bags, cement bags, water bottles, building rubbles) generated from the development site will be disposed to designated dumping sites (located five kilometres) from the project site, permission to construct and operate this dumping will be acquired from the Zambezi regional council in Katima Mlilo. However, precaution measures such as wheel bins and black waste plastic bags will be placed on the farm where such material will be disposed or collected before being transported to the dumping site.



100,000 L septic tank to be installed / Proposed septic tank layout designed

7.9 Access road and transportation of goods

The area is currently accessed through makeshift roads.

7.10 Settlements and displacement of people

Settlements and displacement of local people	The area proposed aquaculture development is situated a distance from human settlement and human activities. The human settlement area situated about 3 kilometres from the project. This means, the project will not disturb and/or displace any human, livestock or grazing activities during the construction and operational stages.

7.11 Water supplies

Water supplies / Boreholes	**Why Mubiza Farm should install a borehole on the farm?** Considering all the environmental impacts that influence our water supply, farmers need to plan ahead for water alternatives that can support their farming needs. Apart from well points and greywater systems, a borehole is the ideal groundwater system for farming because it reduces the usage of potable water[17]. A 'borehole' can be described as a deep hole intended to tap water. It is used in place of municipal water (Katima Mlilo or Zambezi River), and the most common use of boreholes is a self-sufficient water source for businesses. In extreme drought conditions, currently experienced throughout South Africa, without a good quality water solution, the lack thereof will become detrimental to your farming businesses. Although the quality of borehole water is drinkable after being tested, and should not be used for high-quality food products (unless filtered), it works exceptionally well for plant irrigation and other sanitation requirements on the farm. Here are two main benefits of drilling a borehole on the farm: • Helps the proposed development to become more self-sufficient with its business • A borehole is a resource that the project can rely on, whenever the municipality has water problems. It allows you to be more self-sufficient with your business, because you have total control over your water supply and will not be inconvenienced by any restrictions, unless vital. • A borehole requires very little to maintain, in terms of ongoing costs, besides an electrical pump to power the water. This makes it a financial asset that will bring the proposed development years of production. **Economic advantages** Over the years, water prices have risen and the more you use, the more you pay. With borehole water, you are not spending massive amounts on water bills, as it accesses an existing supply of groundwater which is accumulated over the years. For watering purposes, this water can be used as is, but if you require filtered, clean water, you can insert a filtration method that makes it ideal for drinking too. Along with an economic advantage, having a borehole on the property will help to add value to the property.

[17] https://www.sa-green-info.co.za/portal/article/1632/why-you-should-install-a-borehole-on-your-farm

8. INTEGRATED FARMING

8.1 Introduction

All over the world, farmers work hard to earn a living. However, not all farmers make money, especially small family farmers. There is very little leftover after they pay for all their inputs (seeds, livestock breeds, fertilizers, pesticides, energy, feed, labor, etc.). The emergence of Integrated Farming Systems (IFS) has enabled farmers to develop a framework for an alternative development model to improve the feasibility of small sized farming operations. In the last few decades, "modern" technologies have been widely used to enhance the productivity per acre of land to ensure that there is enough food for the increased global population. Due to the indiscriminate and erratic use of chemical pesticides and fertilizers, our food and ecosystems have been poisoned[18].

Integrated farming is defined as a biologically integrated system, which integrates natural resources in a regulated mechanism into farming activities to achieve maximum replacement of off-farm inputs and sustain farm income. The productivity of a diversified cropping system always tends to increase when it is integrated with dairy, poultry or fishery components. An integrated farming system (IFS) helps farmers, especially small and marginal, to achieve maximum returns and income from different integrated components, thereby improving their standard of living.

The IFS also acts as a means for providing nutritional security to a farmer's family as the farmer is able to provide various IFS components such as vegetables, fruits, egg, milk, fish, etc. to his family and get the income from the surplus amount of these components. The higher returns with the farming system were not only due to higher productivity of the system but also due to lower cost of production and recycling of by-products of crop components. There is an increase in the value for labour absorption in IFS farms due to additional components brought into integration within the farm. The IFS is feasible with respect to socio-economic imperatives, but actual adoption rates of integrated farming are limited and unevenly spread among farmers. Thus, in order to develop a nation, farmers should be properly made aware of the use and management of IFS (Walia et al., 2019).

In the last few decades, "modern" technologies have been widely used to enhance the productivity per acre of land to ensure that there is enough food for the increased global population. Due to the indiscriminate and erratic use of chemical pesticides and fertilizers, our food and ecosystems have been poisoned[19].

The integrated farming system is a commonly used term to explain a more integrated approach to farming compared to monoculture approaches. It refers to agricultural systems that integrate livestock and crop production or integrate fish and livestock and may sometimes be known as integrated biosystems. In this system, an inter-related set of enterprises is used so that the "waste" from one component becomes an input for another part of the system. This reduces costs and improves production and/or income. Since it utilizes waste as a resource, farmers not only eliminate waste but they also ensure an overall increase in productivity for the whole farming system.

[18] https://blog.agrivi.com/post/integrated-farming-an-approach-to-boost-family-farming
[19] Ibd.

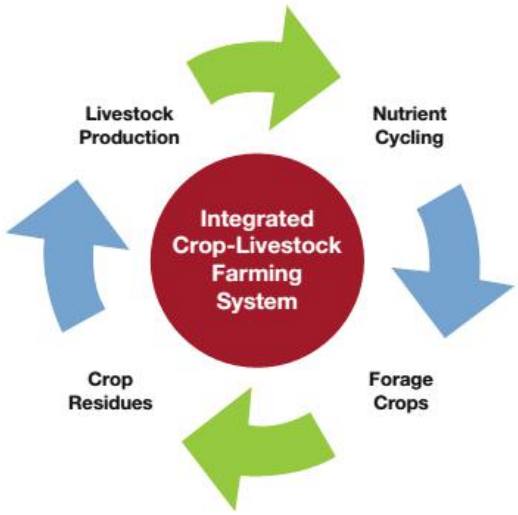


Figure 8.1: Integrated Crop-Livestock Farming System (Courtesy, FAO 2020)

Integrated crop – livestock farming system – key aspects (integrated farming includes combined growing of crop, livestock, poultry, fish, tree crops, plantation crops or other systems).

Integrated farming tries to imitate nature's principle, where not only crops but also varied types of plants, animals, birds, fish, and other aquatic flora and fauna are utilized for production. The Mubiza Village will concentrate on a limited fishponds, crocodile ponds, crops and some domesticated livestock like goats and sheep. The basic principle is to enhance the ecological diversity:

- By choosing the appropriate cropping methodology with mixed cropping, crop rotation, crop combination and inter-cropping so that there is less competition for water, nutrition and space and by adopting eco-friendly practices
- By utilizing a multi-story arrangement so that the total available area is used effectively and there is a high level of interaction between biotic and abiotic components
- By integrating subsystems by which the various components interact positively, so that the overall farm productivity is increased.

The integrated farming system is also a sustainable system which focuses on increasing farm productivity by increasing diversification, resource integration and creating market linkages[20]. Thousands of small and marginal family farmers in resource-poor regions in Asia and Africa have converted their farming to this sustainable farming system to diversify farm production, increase cash income, improve the quality and quantity of food produced and the exploitation of unutilized resources. It usually takes three to four years to establish a well-integrated farm with market linkages to ensure nutrition and the livelihood of a family. Benefits provided by using an integrated farming system are:

- The integrated farming system approach introduces a change in farming techniques for maximum production in the cropping patterns and ensures the optimal utilization of resources
- The farm waste is recycled for productive purposes in the integrated system

[20] https://doi.org/10.1007/978-3-319-99768-1_5

- A judicious mix of agricultural enterprises like dairy, poultry, piggery, fishery, sericulture etc. suited to the given agro-climatic conditions and socio-economic status of the farmers can bring prosperity to the farming operations.

Mubiza Village, just like many farmers and even entire countries throughout the world, has adopted the integrated farming system which use practices that consider the present and future climatic conditions, soil characteristics, the food habits of the population and estimates the future food requirements of the ever increasing human and animal population.

The new integrated practices include improved farming technologies like integrated nutrient management, site-specific nutrient management, conservation technology, use of bio-fertilizers, crop rotation, zero tillage, and the use of farm management systems like Agrivi[21] which helps farmers track their activities on fields, as well as the whole farm productivity and profitability. Agrivi also supports farmers with integrated farming by providing them with a knowledge base of the best practice processes in the form of required tasks that allow them to plan the season in advance.

Through the conversion to an integrated farming system and the adoption of modern farming practices, the problems of food security and global warming mitigation should definitely be solved.

The most impressive aspect of the Mubiza Village initiative is that it will integrate crocodile farming with livestock production and farming of agricultural crops, including vegetable farming. Integrated farming is a traditional. practice and, as mentioned earlier, has in recent years been further supported by the concept of an all-round 'development of agriculture, animal husbandry, fisheries and other sideline occupations. Although integrated farming is economically and environmentally sound, the motivation for integration would appear to be the national policy of diversification of production (Chand & Singh 2011).

8.2 Nature of Integration

The crocodile farming, general farming and crop production practices are amenable to easy integration. The fish feeds on grass and other vegetable matter which can be grown on the dikes and adjacent agricultural land. They also feed on aquatic plants, which can be raised in canals and other adjacent water bodies. Aquatic plants such as Pistia stratiotes, Eichhornia crassipes, Alternanthera phyloxorides and duck weeds, will be considered in the future for feeding fish or pigs and poultry on land (Chand & Singh 2011).

The leaves, stalks or other waste products are chopped or crushed and fed directly to the fish or composted to be used as fertilizer. Silver carp and big head feed on plankton which can be grown by the application of organic manures provided by pigs, cattle, and chicken raised by the side of fish farms. As mentioned, pigsties are often built on pond dikes, facilitating the application of manure, either directly or after fermentation. Duck farming in association with fish, is also reported to be practised in a few places. In areas where silk production is prevalent, mulberries are planted on the pond dikes. The silkworm pupae and other wastes are used to feed the fish. Fish pond silt is an excellent fertilizer for land crops and is commonly used by farmers. In areas without adequate irrigation like the proposed

[21] AGRIVI is a knowledge-based farm management software that helps farmers in data-driven decision making for improving productivity and profitability. It is Built on top of a powerful agricultural knowledge base, AGRIVI's automated pest and disease detection alert farmers to protect crops timely

Mubiza Village, pond water may also be used for irrigating crops, when necessary. The commune or production brigade members can also be considered as an element in this type of integration and recycling, as they eat fish and other farm products are used to fertilize ponds and crop land. (Tipraqsa 2006).

The experiences gained over several years of integrated farming of this type, when critically analysed and rationalized, could be of considerable value to Mubiza Village, which is interested in integrated rural development.

8.3 Advantages of Integration

The advantages of integration are obvious. As far as fish and crocodile production is concerned, it serves the major purpose of providing cheap feedstuffs and organic manure for the fish ponds, thereby reducing the cost and need for providing compounded fish feeds and chemical fertilizers. By reducing the cost of fertilizers and feedstuffs, the overall cost of fish production is reduced and profits increased. Secondly, the overall income is increased by adding pig and/or poultry raising, grain and vegetable farming, etc., which supplement the income from fish and crocodile farming. Thirdly, by producing grain, vegetables, fish and livestock products, the community becomes self-sufficient in regard to food and this contributes to a high degree of self-reliance. Fourthly, the silt from the ponds which is used to fertilize crops, increases the yield of crops at a lower cost and the need to buy chemical fertilizer is greatly reduced. It is estimated that about one third of all the fertilizer required for farming in the country comes from fishponds. The production of freshwater pearls in fishponds provides one more additional source of income[22].

8.4 Management of Mubiza Village Integrated Farming

Integrated farming calls for skill in different types of activity such as raising crocodiles, pigs and poultry, crop and vegetable farming, growing grass and aquatic plants and farming of fish. One person can take care of 6-8 ponds of 5-7 mu each; or 30-50 pigs or 500-1 000 chickens, but many of the activities, including harvesting, will need a large number of people. Obviously, if integrated farming has to be done on a large scale, a sufficient number of people with the required skills have to work together (Birthal, et al., 2011).

As pointed out earlier, the main motivation for integrated farming at Mubiza Village in Katima Mlilo is the accepted national policy of all-round development (Green Scheme), where the economic benefits of individual operations do not figure very prominently. The social and political setting of Namibia is highly favourable for such development. From the limited experience in some other countries also, it appears that the introduction of integrated farming can play a major role in rural development in developing countries.

[22] https://doi.org/10.1007/978-3-319-99768-1_5

9. PUBLIC PARTICIPATION [AT A GLANCE]

9.1 Introduction

The term participation typically refers to some aspect of local community involvement in the design, implementation and evaluation of a project or plan (Brown & Wyckoff-Baird, 1992). According to Smith (1983), public participation encompasses a range of procedures and methods designed to consult, involve, and inform the public to allow those that would be potentially affected by a decision or policy to have input into the process. The latter are also known as stakeholders, which include (IFC 2007):

"...persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organizations and groups with special interests, the academic community, or other businesses"

Table 9.1: Public Participation 5 Elements (Courtesy: International Association for Public Participation 2007)

Element	Description
(a) Inform	Provided the general public with balanced and objective information to assist them in understanding the problem (housing shortage), alternatives, opportunities and/or solutions, which is the servicing of land.
(b) Consult	Obtained public feedback on analysis, alternatives and/or decisions.
(c) Involve	to work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered
(d) Collaborate	Partnered with the public in each aspect of the decision, including the development of alternatives and the identification of the preferred solution.
(e) Empower	Placed final decision making in the hands of the public.

9.2 Call for Public Participation

The initial period for Public Participation ran between 1 July to 31 July 2020. No issues or comments were raised by potential I& APs despite extensive communication to engage them.

9.3 Newspaper & Facebook Advertising

The Consultant advertised using the targeted approach by using the locally and nationally read and accepted Newspaper, New Era, to reach out to I&APs. See Adverts on next page, Figures 8.1 – 8.2

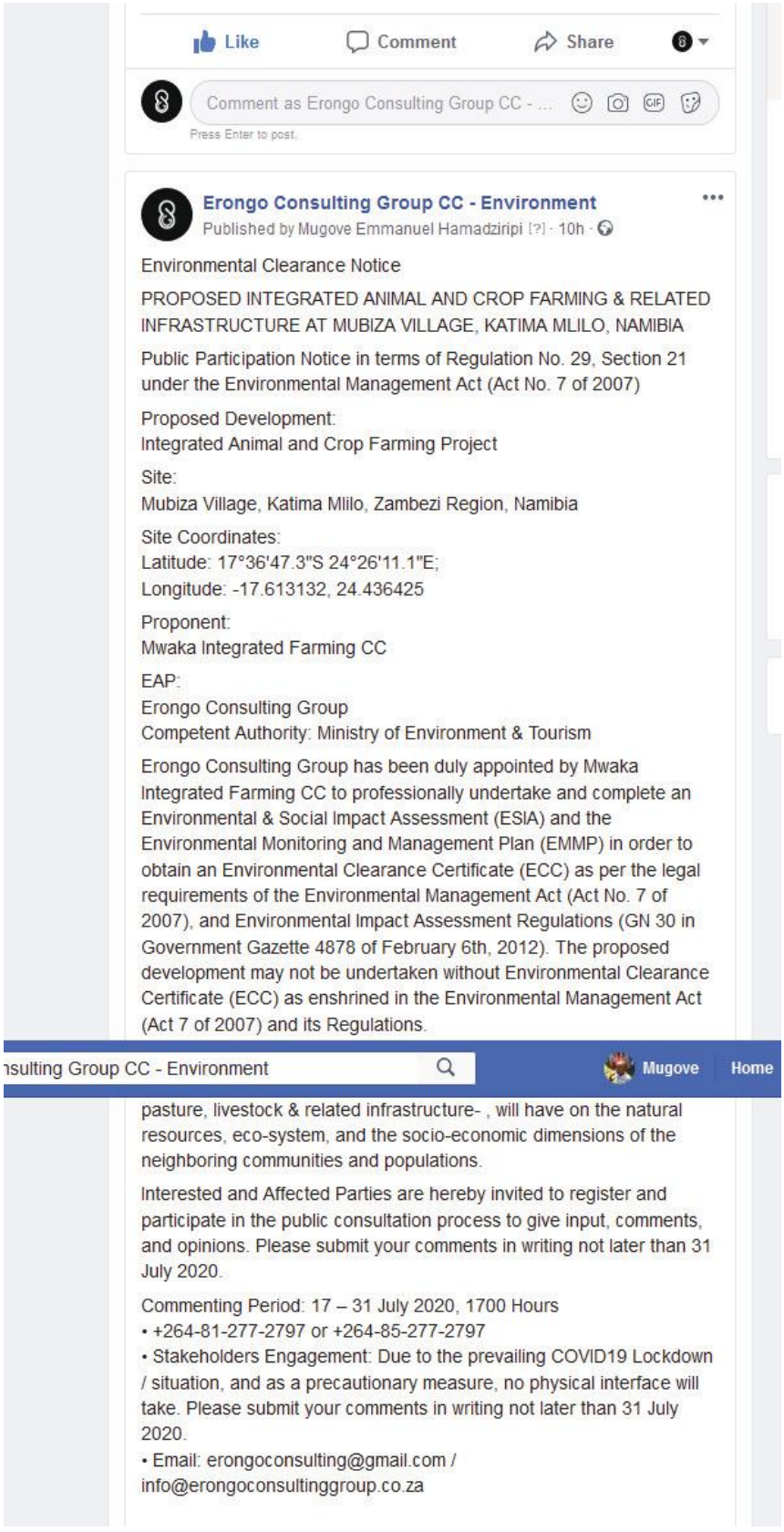
9.4 Site Notice

Given the dispersed nature of the identified piece of land, and its isolation, and the means of communication outlined above, it was deemed NOT necessary and to display a makeshift Notice Board near the identified site.

Table 9.2: List of I&APs - Mubiza Mixed Farming Project

NAME	ORGANIZATION / INSTITUTION	CONTACT DETAILS
Emmanuel Murenje	Project Management	0812345216
Induna Richard Mutenda	Mubiza Traditional Authority	0813410317
Lister Chaka (land owner)	Mubiza Project (Kalombwana Villages)	0817504032
Julia Chaka	Neighbouring Villages	0813674882
Paulina Iipinge	SAIPA	0818786676
Bekithemba Sithole	Self	0812401261
Clara Lisho	Self	0817176642
Nelson Mbeha	Self	0816642911
Misheck Marandu	Bingwa Loop Farm, Zambezi Valley	+263 772 428 808
Maria Amakali **Dir: Directorate of Water Resource Management**	Ministry of Agriculture, Water and Land Reform	+264 61 2087161
Rikka Shikongo	Ministry of Environment, Forestry & Tourism	rikka.shikongo@meft.gov.na
Rauna Kalola, **Public Relations Officer**	Ministry of Fisheries and Marine Resources	Tel: 061 205 3084 Rauna.Kalola@mfmr.gov.na
Executive Director **Annely Haiphene**	Ministry of Fisheries and Marine Resources	Annely.Haiphene@mfmr.gov.na
Secretary to the ED **Thomas Shapaka**	Ministry of Fisheries and Marine Resources	Thomas.Shapaka@mfmr.gov.na 061 205 3007

Figure 9.1: Facebook Advert



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Comment as Erongo Consulting Group CC - ...

Press Enter to post.

Erongo Consulting Group CC - Environment

Published by Mugove Emmanuel Hamadziripi · 10h ·

Environmental Clearance Notice

PROPOSED INTEGRATED ANIMAL AND CROP FARMING & RELATED INFRASTRUCTURE AT MUBIZA VILLAGE, KATIMA MLILO, NAMIBIA

Public Participation Notice in terms of Regulation No. 29, Section 21 under the Environmental Management Act (Act No. 7 of 2007)

Proposed Development:
Integrated Animal and Crop Farming Project

Site:
Mubiza Village, Katima Mlilo, Zambezi Region, Namibia

Site Coordinates:
Latitude: 17°36'47.3"S 24°26'11.1"E;
Longitude: -17.613132, 24.436425

Proponent:
Mwaka Integrated Farming CC

EAP:
Erongo Consulting Group
Competent Authority: Ministry of Environment & Tourism

Erongo Consulting Group has been duly appointed by Mwaka Integrated Farming CC to professionally undertake and complete an Environmental & Social Impact Assessment (ESIA) and the Environmental Monitoring and Management Plan (EMMP) in order to obtain an Environmental Clearance Certificate (ECC) as per the legal requirements of the Environmental Management Act (Act No. 7 of 2007), and Environmental Impact Assessment Regulations (GN 30 in Government Gazette 4878 of February 6th, 2012). The proposed development may not be undertaken without Environmental Clearance Certificate (ECC) as enshrined in the Environmental Management Act (Act 7 of 2007) and its Regulations.

nsulting Group CC - Environment Mugove Home

pasture, livestock & related infrastructure- , will have on the natural resources, eco-system, and the socio-economic dimensions of the neighboring communities and populations.

Interested and Affected Parties are hereby invited to register and participate in the public consultation process to give input, comments, and opinions. Please submit your comments in writing not later than 31 July 2020.

Commenting Period: 17 – 31 July 2020, 1700 Hours
• +264-81-277-2797 or +264-85-277-2797
• Stakeholders Engagement: Due to the prevailing COVID19 Lockdown / situation, and as a precautionary measure, no physical interface will take. Please submit your comments in writing not later than 31 July 2020.
• Email: erongoconsulting@gmail.com / info@erongoconsultinggroup.co.za

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SPERTYE: 13:00 TWEE WERKSDAE VOOR PLASING
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INHOUDSOPGAWE / CONTENTS

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To avoid disappointment of an advertisement not appearing on the date you wish, please book timeously. Classified smalls, notices and display smalls: 13:00, two working days prior to placing. A handling fee of 15% is payable on cancellations received in writing by 13:00 two days before scheduled publication. No cancellation will be accepted if received after this deadline.

RATES:
(Monday - Wednesday)
- Classified smalls: N$90.85 for the first 20 words and N$2.40 (15% VAT included) for every word thereafter.

(Thursday -Friday)
N$90.85 for the first 20 words and N$2.40 (15% VAT included) for every word thereafter.
- Display smalls: (Monday - Wednesday) N$90.85 per col. cm.
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- Churches: N$63.25 per col cm.
- Sport Clubs: N$63.25 per col. cm.
- Births, engagements, marriages, deaths, in memoriam: N$63.25 per col. cm. (VAT included)

THURSDAY - FRIDAY RATES:
- Display smalls: N$102.35 per col. cm. (VAT included)
- Legal Notices: N$603.75

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Republikein reserves the right to withhold or cancel any advertisement order that has been accepted. Republikein accepts no liability for failure to publish an advertisement received by telephone.

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Please report errors immediately. Republikein accepts no responsibility for more than one incorrect insertion of any advertisement of any cost beyond the cost of the space occupied by the faulty advertisement. No re-publication will be given due to small typographical errors which do not lessen the effectiveness of the advertisement. Republikein does not accept responsibility for mispresentation in advertisements.

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There's just something amazing about unwrapping a gift, wondering what's inside. Underneath the wrapping paper could be anything, a CD from your favorite band, a new headset from Best Buy, any one of a million things from a million stores. But what's really special is when you open up that paper and what's found inside is a tangible representation of the love and adoration the person giving the gift felt you. Nothing says that like a hand-made gift, and on Make a Gift Day, you get to be the one to share that love with the people you care about.

005 Kennisgewings / Notices

AANDAG ALLE KAPANA en [illegible] vir Kersfees. Beskikbaar 26 November 2020. Windhoek Agra Auction Pens 10:00, 3 Desember 2020, Klein Aub C26, WLA Auction Pens 10:00.
DM0202000372232

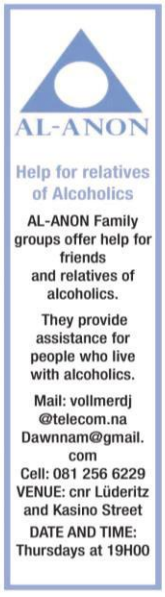
ESIA CLEARANCE NOTICE: Interested and affected parties (IAPs) are hereby invited to register and participate in the public consultation process in terms of Regulation No. 29, Section 21 under the Environmental Management Act (Act No, 7 of 2007):
1. APP1428: Township establishment on farm Volmoed, South-East of Windhoek.
2. APP1621: Integrated Animal & crop farming, Katima Mulilo.
3. APP1638:Creation of a public road on portions 180 and 181, Swakopmund.
4. APP1649: Construction of potable water reservoir, Swakopmund smallholdings
5. APP2040: Closure & Rezoning of Erven 379, 402, 403, 404 & 410 from POS to private open spaces. Swakopmund.
BID are available upon request. Commenting deadline: 25 November 2020
Email: erongoconsulting@gmail.com
DM0202000373574

008 Betrekkings gevra / Employment Wanted

HELLEN is op soek na huiswerk vir 5 dae per week. Het [illegible] en kan oppas. Skakel 081-6606580.
DM0202000373735

NDAPANDULA is looking for domestic work in Windhoek. Has 2 years experience. Call 081-4492425.
DM0202000373736

AINA (32) is looking for domestic/ office cleaning work for 3 to 5 days per week. Can start immediately. Call 081-6555638.
DM0202000373749



009 Vakatures / Vacancies

VACANCY

COMMISSIONING ENGINEER / ELECTRICAL ENGINEER

Company in PV Solar projects looking for an energetic person to join their team in Namibia to provide vital support for construction and engineering of PV Solar projects. Position will be responsible for commissioning and overseeing the installation of equipment, reviewing design plans and operationally monitoring for running plant of multiple PV Projects.

REQUIREMENTS:
- National Diploma Electrical Engineering Technology or Bachelors' Degree in Electrical;
- 5 - 10 years' experience supporting the construction and commissioning of electric power generation facilities;
- Minimum 5 years' experience solar PV specific with a minimum power scale of 5MW;
- Must have suitable references

THE COMPANY OFFERS:
- Opportunity for growth and personal development
- Mainly based in Namibia

CLOSING DATE:
This is normally 14 days from date of advertisement

PLEASE EMAIL ALL APPLICATIONS TO:
louise.dupreez@emesco.com.na
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010 Spesiale dienste / Services

VERWYDERING VAN BOUROMMEL, tuinvullis en afsaag asook snoei van bome. Huis- en kantoortrekke. Skakel Wimpie by 081-4665860.
DM0202000373618

LEAKING ROOFS? Sealing of all types of roofs, 16 years experience. Best prices. 5 Years guarantee on all roofs. Tommy 081-6186088.
DM0202000373641

UNIQUE TRANSPORT: Residential/ Office moves & goods transport (Countrywide) 5-ton truck. Also removal of garden and building rubble in Windhoek. Call: 081-2812048, 081-1293148.
DM0202000373183

010 Spesiale dienste / Services

014 Akkommodasie / Accommodation

016 Te huur / To Let

IHS PROPERTY MANAGEMENT DEVELOPMENT NAMIBIA: Brand new 2 bedroom apartments from N$5 200 pm available to rent at Otjomuise Community Lifestyle Estate, Windhoek! Do not miss out! Apply now and get your first month's rent for free! Call Lesley: 081-8151764.
DM0202000372228

IHS PROPERTY MANAGEMENT DEVELOPMENT NAMIBIA: Brand new 2 bedroom apartments from N$3 700 pm available to rent at Bridge Park Security Estate, Okahandja! Do not miss out! Apply now and get your first month's rent for free! Call Gift: 081-4169369.
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EON REAL ESTATE: KHOMASDAL,GLADIATOR COURT: Spacious 2 bedroom duplex flat. Small courtyard, close to Augustineum school. Available January 2021. N$6 500. EROS: THE OAKS. 2 Bedroom flat on second floor. Balcony with built-in BBQ. Under roof parking. Available January. N$7 000.
DORADOPARK, ISMAELCOURT: 2 Bedroom flat.N$6 000. Available February. Annelize: 081-1285451.
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IHS PROPERTY MANAGEMENT NAMIBIA: Brand new 2 bedroom apartments from N$5 800 pm available to rent at Khomas Hills Security Estate, Windhoek! Do not miss out! Apply now and get your first month's rent for free! Call: Sameer 081-2899031.
DM0202000372364

CENTRALLY LOCATED lower unit on large erf of 1 316 m² near German School. Unit consists of 1 bedroom, 1 living room, 1 kitchen, 1 bathroom & toilet. N$6 000 pm. Has enough parking. WhatsApp 0027823748275 or e-mail: worman@iafrica.com
DM0202000373335

016 Te huur / To Let

LUDWIGSDORF - NORTH FACING. Three bedrooms, study, two full bathrooms, open-plan kitchen, living room with granite tops, guest toilet, gym room with sauna, jacuzzi and shower, swimming pool and entertainment area, one bedroom flat, electric fencing, air-conditioned rooms. Call owner 085-5905577.
DM0202000373291

CBD, FREEDOM PLAZA: Next to Hilton. N$6 500. Beautiful views, 1 bedroom. To view call 081-7170177.
DM0202000373631

KHOMASDAL, PENEYAMBEKO COURT: 2 Bedroom townhouse with 1 bathroom, extra guest toilet. Open-plan kitchen and living area. Study nook. Bic, shade net for vehicles. Private courtyard with washing line. N$6 500 per month. Call Retha at 081-1221465.
DM0202000373571

EROSPARK: One bedroom flat for single person with parking, full bathroom and DStv connection. Available immediately. N$4 750 pm. Deposit required. Call Ansie 081-2729905.
DM0202000373733

KHOMASDAL: 3x 1 Bedroom bachelor backyard flat with en-suite bathroom + parking. Available immediately. N$3 800 plus N$2 000 deposit, including W+E. Call André 081-6154066.
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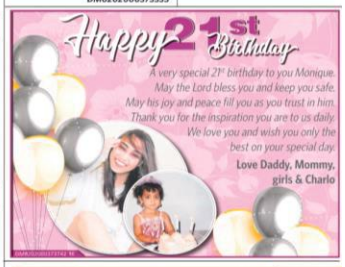

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- Cancellations and alterations: 16.00, two days before date of publication in writing only

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Liquor License N$402.50
Name Change N$402.50
Birthdays from N$200.00
Death Notices from N$200.00
Tombstone Unveiling from N$200.00
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Employment Wanted

Looking for employment

35 Years lady looking for domestic work or any kind of job in Windhoek. Have 3 years' experience. Please help me my people. I want to support my 3 kids. **Contact me: 0812061429**

I am MPINGANA NGAMBUE in Windhoek looking for a job as a pre-school teacher.

I have Grade 10 and 5 years' experience and went through training and workshop.

Please contact me on 0814147056 for Grade 1 to 3 extra class teaching.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OSHIKOTO

1. Name and postal address of applicant:
LEEVI KAULI SHEEON
P.O.BOX 12089, ONYAANYA
2. Name of business or proposed Business to which applicant relates
NEW TOWN BAR
3. Address/Location of premises to which Application relates:
OKATHIYA, OKATOPE, ONYAANYA
4. Nature and details of application:
BAR SPECIAL LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
ONDANGWA
6. Date on which application will be Lodged: **31 JULY 2020**
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
KAVANGO EAST

1. Name and postal address of applicant:
ELIZABETH MATEUS N.
P O BOX 289, RUNDU
2. Name of business or proposed Business to which applicant relates
OMUPANDA SHEBEEN
3. Address/Location of premises to which Application relates:
SIKANDUKO LOCATION - RUNDU
4. Nature and details of application:
SHEBEEN LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
RUNDU
6. Date on which application will be Lodged:
27 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
FELICIANA NDAPEWA HAINDUWA
P.O.BOX 868 OUTAPI
2. Name of business or proposed Business to which applicant relates
OKAPYA MINI MARKET
3. Address/Location of premises to which Application relates:
OKEEKE LOCATION ONYALUMLI VILLAGE, ONAMULENGE CONSTITUENCY
4. Nature and details of application:
GROCERY LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
SHEEHAMA PETRUS
P.O. BOX 31 OUTAPI
2. Name of business or proposed Business to which applicant relates
PEFIMBO MINI MARKET CC
3. Address/Location of premises to which Application relates:
OSHAMBOMBA LOCATION, OKAPANDA VILLAGE IN OMBALANTU AREA
4. Nature and details of application:
GROCERY LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OSHIKOTO

1. Name and postal address of applicant:
MOSES SIMANEKA NATANGWE MBEELI, P.O. BOX 971
2. Name of business or proposed Business to which applicant relates
ENGABALA BAR
3. Address/Location of premises to which Application relates:
ONIIMBWELE, ONEPANDANGOLO
4. Nature and details of application:
SPECIAL LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
ONDANGWA
6. Date on which application will be Lodged:
31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
KAVANGO EAST

1. Name and postal address of applicant:
AIPUTA TITUS T.N
P.O. BOX 201 RUNDU
2. Name of business or proposed Business to which applicant relates
WISDOM SHEBEEN
3. Address/Location of premises to which Application relates:
KEHENHU LOCATION
4. Nature and details of application:
RENUEVAL OF LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
RUNDU
6. Date on which application will be Lodged:
27 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
ASHIMBANGA HILKKA
P.O.BOX 143 OSHIKOLE
2. Name of business or proposed Business to which applicant relates
EPANDULO SHEBEEN
3. Address/Location of premises to which Application relates:
EHONGO CUCA SHOPS IN ONTOKO VILLAGE OF UUKOLONKADHI
4. Nature and details of application:
SHEBEEN LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged: **20-31 JULY 2020**
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

TO LET

BRIDGE PARK SECURITY ESTATE OKAHANDJA

Brand New 2 Bed & 1 Bath apartments from N$3700 pm available for rental at **Bridge Park Security Estate, Okahandja!**

Do not miss out!

Apply now and get your First month's rent for Free!

Contact: Wilbard 081 416 9359

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
JOHN IIPINGE
P.O BOX 16010 ONESI UUKOLONKADHI
2. Name of business or proposed Business to which applicant relates
TUYENI SHEBEEN
3. Address/Location of premises to which Application relates:
ONUUKUTI LOCATION, ELAMBO VILLAGE IN UUKOLONKANDHI
4. Nature and details of application:
SHEBEEN LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
ELIZABETH NAUTA
P.O.BOX 466 OUTAPI
2. Name of business or proposed Business to which applicant relates
DIVUNDU SHEBEEN
3. Address/Location of premises to which Application relates:
OUPOPO LOCATION IN OUNWALA VILLAGE - OMBALANTU
4. Nature and details of application:
SHEBEEN LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
KAVANGO EAST

1. Name and postal address of applicant:
MR JOSEP THEMBO
P.O. BOX3214, DIVUNDU, SHAMARAGHO VILLAGE
2. Name of business or proposed Business to which applicant relates
TJITJU MUTWI INVESTMENT CC
3. Address/Location of premises to which Application relates:
SHAMARAGHO VILLAGE, ANDARA DISTRICT, MUKWE CONSTITUENCY
4. Nature and details of application:
LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged: **RUNDU**
6. Date on which application will be Lodged: **27 JULY 2020**
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
MICHAEL EKANJO
ONAWA VILLAGE
2. Name of business or proposed Business to which applicant relates
M/E TRADING CC
3. Address/Location of premises to which Application relates:
ONAWA VILLAGE
4. Nature and details of application:
SHEBEEN LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
LYDIA NDATILA AMUTENYA
P.O.BOX 514 OUTAPI
2. Name of business or proposed Business to which applicant relates
VILLAGE STYLE SHEBEEN
3. Address/Location of premises to which Application relates:
EENAWA B ETUNDA – UUKOLONKADHI
4. Nature and details of application:
SHEBEEN LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
GELGINA DUMENI NDAIRIE
P.O.BOX 1136, OUTAPI
2. Name of business or proposed Business to which applicant relates
FARM HORIZON FOOD
3. Address/Location of premises to which Application relates:
OUTAPI – OMBALANTU
4. Nature and details of application:
LIGHT LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

ERONGO CONSULTING GROUP

"Balancing Growth with Resilience"

ENVIRONMENTAL CLEARANCE NOTICE

Public Participation Notice in terms of Regulation No.29, Section 21 under the Environmental Management Act (Act No. 7 of 2007)

Proposed Development: Integrated Animal and Crop Farming Project
Site: Mubiza Village, Katima Mulilo, Zambezi Region, Namibia
Site Coordinates: **Latitude:** 17°39'47.3"S 24°26'11.1"E;
Longitude: -17.613132, 24.436425
Proponent: Mwaka Integrated Farming CC
EAP: Erongo Consulting Group
Competent Authority: Ministry of Environment & Tourism

Erongo Consulting Group has been duly appointed by Mwaka Integrated Farming CC to professionally undertake and complete an Environmental & Social Impact Assessment (ESIA) and the Environmental Monitoring and Management Plan (EMMP) in order to obtain an Environmental Clearance Certificate (ECC) as per the legal requirements of the Environmental Management Act (Act No. 7 of 2007), and Environmental Impact Assessment Regulations (GN 30 in Government Gazette 4878 of February 6th, 2012). The proposed development may not be undertaken without Environmental Clearance Certificate (ECC) as enshrined in the Environmental Management Act (Act 7 of 2007) and its Regulations.

The EIA Process and the purpose of this EIA study is to identify the direct and indirect impacts that the development - **Integration of crop, pasture, livestock & related infrastructure-** , will have on the natural resources, eco-system, and the socio-economic dimensions of the neighbouring communities and populations.

Interested and Affected Parties are hereby invited to register and participate in the public consultation process to give input, comments, and opinions. Please submit your comments in writing not later than 31 July 2020.

Commenting Period: 17 – 31 July 2020, 1700 Hours

- **+264-81-277-2767 or +264-85-277-2767**
- **Stakeholders Engagement:** *Due to the pre vailing COVID19 Lockdown / situation, and as a precautionary measure, no physical interface will take. Please submit your comment s in writing not later than 31 July 2020.*
- **Email: erongoconsulting@gmail.com / info@erongoconsultinggroup.co.**

Commissioning & Operations | Project Delivery | Energy | Research | Environmental Sciences | Sustainability & Resilience | DRR | Planning | Consulting | Trainings | SHEQ | Waste Management | Advisory Services | Management Consulting

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
IIKUTI JONAS
P.O.BOX 868 OUTAPI
2. Name of business or proposed Business to which applicant relates
OHAMA MINI MARKET
3. Address/Location of premises to which Application relates:
OKAPYA – KAMBIDHI VILLAGE
OGONGO CONSTITUENCY
4. Nature and details of application:
GROCERY LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
IIKUTI JONAS
P.O.BOX 868 OUTAPI
2. Name of business or proposed Business to which applicant relates
ONHUGO SHEBEEN
3. Address/Location of premises to which Application relates:
OKAPYA – KAMBIDHI VILLAGE
OGONGO CONSTITUENCY
4. Nature and details of application:
SHEBEEN LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
IIKUTI JONAS
P.O.BOX 868 OUTAPI
2. Name of business or proposed Business to which applicant relates
OHAMA BAR
3. Address/Location of premises to which Application relates:
OKAPYA – KAMBIDHI VILLAGE
OGONGO CONSTITUENCY
4. Nature and details of application:
SHEBEEN LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998 NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14, 26 & 33)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Regional Liquor Licensing Committee, Region:
OMUSATI

1. Name and postal address of applicant:
MOSES ANDRENE KAKELO
P.O.BOX 51169 WINDHOEK NORTH
2. Name of business or proposed Business to which applicant relates
CALL ME SORRY SHEBEEN
3. Address/Location of premises to which Application relates:
OSHIKUSHASHIPYA VILLAGE, OMATANDO LOCATION, ETAYI CONSTITUENCY
4. Nature and details of application:
GROCERY LIQUOR LICENCE
5. Clerk of the court with whom Application will be lodged:
OUTAPI MAGISTRATE COURT
6. Date on which application will be Lodged:
20-31 JULY 2020
7 Date of meeting of Committee at Which application will be heard:
09 SEPTEMBER 2020
Any objection or written submission in terms of section 28 of the Act in relation to the applicant must be sent or delivered to the Secretary of the Committee to reach the Secretary not less than 21 days before the date of the meeting of the Committee at which the application will be heard.

Notice Notices

Legal Notice Legal Notice

ERONGO CONSULTING GROUP

"Balancing Growth with Resilience"

ENVIRONMENTAL CLEARANCE NOTICE

Public Participation Notice in terms of Regulation No. 29, Section 21 under the Environmental Management Act (Act No. 7 of 2007)

Proposed Development:	Integrated Animal and Crop Farming Project
Site:	Mubaza Village, Katima Mulilo, Zambezi Region, Namibia
Site Coordinates:	**Latitude:** 17°36'47.3"S 24°26'11.1"E **Longitude:** -17.613132 ; 24.436425
Proponent:	Mwaka Integrated Farming CC
EAP:	Erongo Consulting Group
Competent Authority:	Ministry of Environment & Tourism

Erongo Consulting Group has been duly appointed by Mwaka Integrated Farming CC to professional undertake and complete an Environmental & Social Impact Assessment (ESIA) and the Environmental Monitoring and Management Plan (EMMP) in order to obtain an Environmental Clearance Certificate (ECC) as per the legal requirements of the Environmental Management Act (Act No. 7 of 2007), and Environmental Impact Assessment Regulations (GN 30 in Government Gazette 4878 of February 6th, 2012). The proposed development may not be undertaken without Environmental Clearance Certificate (ECC) as enshrined in the Environmental Management Act (Act 7 of 2007) and its Regulations.

The EIA Process and the purpose of this EIA study is to identify the direct and indirect impacts that the development - **Integration of crop, pasture, livestock & related infrastructure-** , will have on the natural resources, eco-system, and the socio-economic dimensions of the neighbouring communities and populations.

Interested and Affected Parties are hereby invited to register and participate in the public consultation process to give input, comments and opinions. Please submit your comments in writing not later than 31 July 2020.

Commenting Period: 17 – 31 July 2020, 1700 Hours

- +264-81-277-2797 or +264-85-277-2797
- **Stakeholders Engagement:** *Due to the prevailing COVID19 Lockdown situation and as a precautionary measure, no physical interface will take. Please submit your comments in writing not later than 31 July 2020.*
- Email: erongoconsulting@gmail.com / info@erongoconsultinggroup.co.

Commissioning & Operations | Project Delivery | Energy | Research | Environmental Sciences | Sustainability & Resilience | DRR | Planning | Consulting | Trainings | SHEQ | Waste Management | Advisory Services | Management Consulting

REPUBLIC OF NAMIBIA
MINISTRY OF TRADE & INDUSTRY
LIQUOR ACT, 1998
NOTICE OF APPLICATION TO A COMMITTEE IN TERMS OF THE LIQUOR ACT, 1998
(regulations 14 and 15)

Notice is given that an application in terms of the Liquor Act, 1998, particulars of which appear below, will be made to the Magistrate of the District of: KHARAS

1. Name and postal address of applicant:
BOX 80, KEETMANSHOOP
2. Name of licensed business to which applicant relates
FREYERS REST KEETMANSHOOP
3. Address/Location of licensed premises to which application relates
ERF 1927, SOUTH STREET, KRONLEIN
4. Nature and details of application
RESTAURANT LIQUOR LICENCE
5. Where application will be lodged:KEETMANSHOOP
05 AUGUST 2020
6. Date on which application will be Lodged
05 AUGUST 2020

Any objection or written submission in terms of section 28 in relation to The application must be sent or delivered To the magistrate of the district, to reach The magistrate not later than 7 days after the date on which the application is lodged.

HOW TO GET YOUR LIQUOR LICENSE PUBLISHED WITH US

Send us the completed Form 2 and proof of payment (POP) once you have deposited your payment at:

Bank Windhoek
Acc no: 1179904901, Branch code: 481972

IMPORTANT

- Complete Form 2 clearly in block letters
- Make sure the application lodgement and hearing dates are still valid before you send us the application
- Indicate your business name as reference on the deposit slip

You can either fax to:
061-220584
or email to:
Lmcroro@nepc.com.na

REPUBLIC OF NAMIBIA

MINISTRY OF HEALTH AND SOCIAL SERVICES

Global Fund Grant

VACANCIES

The Ministry of Health and Social Services (MoHSS) with support from Global Fund Grant is looking for Dynamic, Suitably Qualified and Experienced Candidates to fill the following Vacancies:

Position	X 3 Pharmacist Grade 7
Total Cost to Company (TCT)	Total Remuneration N$30,847.75 Monthly (N$370,173 Annually) Basic Salary N$22786.29 Monthly Housing Allowance N$7,403.46 Monthly Transport Allowance N$658.00 Monthly
Fixed Term Contract	August 2020 until 31 Dec 2020
Duty Stations	• Zambezi Region- Katima Hospital ART • Omaheke region – Epako ART clinic • Hardap Region – Mariental ART clinic
Primary Roles and Responsibilities	Overall coordination/supervision of day to day of ART/HIV pharmacy operations. Providing clinical support and medicines information to ART patients, Providing pharmaceutical HIV Care Continuum services, Support ART management at district /regional and facility level, Support the roll out and use of ART Electronic Dispensing Tool (EDT), Community Adherence Groups and Community Based ART services (CBART), Ensure availability of ARVs and other pharmaceutical commodities, etc. **The Full Job Descriptions Will Be Provided Upon Request**
Appointment Requirements	• Registration as Pharmacist
Enquiries: Mr Stanslaus Madende @ 061-203 2858 OR Ms. Elise Jele @ 061-2032894	

Position	X 11 Senior Registered Nurses Grade 7
Total Cost to Company (TCT)	Total Remuneration N$30,847.75 Monthly (N$370,173 Annually) Basic Salary N$22786.29 Monthly Housing Allowance N$7,403.46 Monthly Transport Allowance N$658.00 Monthly
Fixed Term Contract	August until 31 December 2020
Duty Stations	• Khomas Region: Windhoek Central Hospital • Khomas Region: Okuryangava ART • Kunene Region: Kamanjab H/C • Zambezi Region: Katima ART Clic • Kavango Region: Ndama Clinic • Erongo Region: Walvis Bay (Kuisebmund ART Clinic) • Otjozondjupa Region: Mangeti Health Centre • Oshana Region: Oshakati ART Clinic • Oshikoto Region: Onandjokwe ART • Omaheke Region: Gobabis ART Clinic • Karas Region : Keetmanshoop, ART Clinic
Primary Roles and Responsibilities	Provides HIV clinical care and ART to eligible patients according to the MoHSS national guidelines. Provides nursing care and support services to inpatients as well as outpatients presenting for HIV treatment, care and support services, Participate in HIV testing Services (HTS), Evaluate patients for ART eligibility and initiate those who are eligible for ART as per the national guidelines, Maintain medical records and files in a thorough and professional manner, Provide follow-up care for treatment outcomes, Provided PHDP including STI, PAP smear, disclosure and adherence support services, Screen patients for OI's and other co-morbidities (TB, meningitis etc.), Conduct alcohol and nutrition screening and refer when indicated, Provide PEP and PrEP to those who are eligible, Requests appropriate laboratory and clinical investigations, interprets results, and provides appropriate medical care, etc. **The Full Job Descriptions Will Be Provided Upon Request**
Appointment Requirements	• Registration as Registered Nurse at the Nursing Council plus minimum three (3) years working experience in the treatment and management of HIV/AIDS OR • Registration as Midwife at the Nursing Council plus minimum three (3) years working experience in the treatment and management of HIV/AIDS
Inquiries: Mr. Salom Natanael 061-203 2858 .OR Ms. Elise Jele 061 2032894	

NB: DIRECTIVES FOR SUBMITTING OF APPLICATIONS:

Interested applicants who meet the above requirements should submit their: **(1)** Application cover letter **(2).** Resume/Curriculum Vitae (CV), **(3)** Certified Copies of Identity Documents/Passport **(4)** Certified Copies of Qualifications and **(5)** Certified copies of Certificate of Services and (6) Other Credentials if any, to:

The Human Resources Manager
MoHSS Global Fund, Private Bag 13198,
Directorate of Special Programmes,
Ministry of Health and Social Services, **WINDHOEK**
OR
Hand delivers to the Global Fund Grant Human Resource Office, Room No 26, Directorate of Special Programmes (DSP); Florence Nightingale Street, Ministry of Health and Social Services, Windhoek.

Applicants are requested to **clearly indicate** duty stations and submit separate application for each position applied for
All **Foreign qualifications** must be submitted with **their evaluation by the Namibian Qualification Authority (NQA)** and failure to do so will **lead to disqualification**
Preference will be given to Namibians
No emailed and faxed applications' will be accepted.
The Successful candidate to assume duty as soon as possible

CLOSING DATE FOR APPLICATIONS: 24 July 2020

10. PROJECT FINDINGS/IMPACTS

10.1: Analysis of Project findings / impacts

The assessment considered the major components of the project & how they would impact upon the environment. The components considered include infrastructure development, road and electricity solar panels / grid, and agro-processing industry, human settlement, service centre, irrigation and agriculture production.

Table 10.1: Impacts of Infrastructure Development

Impacts Of Infrastructure Development	The impacts associated with Infrastructure Development are: • ***Loss of potential agricultural land***: Inundation will reduce some of the planned farm portions (Neutral). • ***Environmental Degradation***: This will arise from increased pressure caused by human activities.
	The road infrastructure development will comprise the expansion of the existing primary feeder roads and the construction of a network of internal access roads as described below. • **Extension of the Road width:** The extension of the road width, which is expected to be carried out on the three primary feeder roads (described below), should upgrade their capacity from largely on-way to two-way traffic flow. • **Opening up of Access Roads:** The proposed agricultural development extension will require the opening of the largely virgin land for Access Road construction. Intensive construction of these roads (about 6m wide) will take place in the virgin pieces of land. This scale of agricultural production requires road accessibility. The development of the above road infrastructure is likely to have significant impacts both in the short- and long-term. Table 6.1 summarizes these impacts (both during and after construction) and the suggested mitigation measures. • **Ecological Impacts**: Vegetation clearing and mechanized material excavation will result in soil erosion and increased runoff into river drainages. The short-term consequence of this is the sedimentation of riverbeds and disruption of aquatic life. More intensive Access Road development is, in the long-term, likely to cause disruptions to wildlife habitats and the migratory bird routes due to the project taking place in a virgin and communal piece of land. • **Social Impacts:** The development of the primary roads is likely to attract a proliferation of unplanned roadside settlements both within and outside the project area for commercial and social

	benefits. Areas with a considerable density of settlements along these routes are likely to experience growth.

Table 10.2: Analysis of Short-Term and Long-Term Road Construction Impacts

POTENTIAL IMPACTS	HOT SPOT	MITIGATION MEASURES
Soil erosion as a result of vegetation removal:	All sloppy areas where the roads pass	Construction of leadoff and storm drains and culverts.
Population increase along the road resulting in poor land use.	Areas along the roads	○ Systematic farm allocation along the roads to reduce haphazard settlement ○ Establishment and maintenance of road reserves
Accident risks associated with vehicular traffic and transport.	Populated areas along the roads	• Establishment of speed controls and placement of road signs. • Public awareness of road safety
Creation of new pathways for disease vectors affecting humans and animals	All livestock rearing portions and human settlements on the Farm	○ Establishment of veterinary checkpoints and provision of veterinary extension services. ○ Sensitization of people on all health risk and prevention measures.
Disruption/destruction of wildlife though interruption of migratory routs, disturbance of wildlife habitats and noise related problem.	Mubiza Village Farm (site)	Establishment of a Mubiza Village Fam Conservation Plan, through which the general design of infrastructure
Opening up of avenues for poaching activities	Mubiza Village Farm (site)	▪ Formulation of a Community based Management plan. ▪ Establishment of the whole farm as buffer zone. ▪ Capacity building of Mubiza Village Farm personnel including anti-poaching units / rangers

Table 10.3: Impacts on Construction and Operation of Electricity / Solar Grids

Construction and Operation of Electricity / Solar Grids	The proposed development will make use of solar energy to power boreholes, irrigation, and general usage. • Solar energy is considered a sustainable energy supply technology. Solar energy systems/power plants do not produce air pollution, water pollution, or greenhouse gases. • Using solar energy can have a positive, indirect effect on the environment when solar energy replaces or reduces the use of other energy sources that have larger effects on the environment. • The benefits of solar energy are clear. Not only can you save money on your electric bills – you can also reduce your carbon footprint and improve the health of those around you.

Table 10.4: Way Leave Development Impacts

Way Leave Development Impacts	The ways leave clearance will more likely have similar impact as the road network, given the closely related routing. • **Ecological impacts:** The way leave traverses through the forests to aggravate the effects of soil erosion. Further still, there is likely to be a significant disruption of the water retention capacity of the soils, hence affecting the groundwater systems. Way leave clearance is likely to cause disruptions of wildlife habitats. • **Social Disruptions:** No social disruptions are expected since the way leave will not interfere with any human settlement or dwellings. **Impact:** **Soil erosion as a result of vegetation removal along the way-leaves.** **Hotspot:** Sloping ground on Mubiza Village Farm, **Mitigations:** • Vegetation clearing and early burning just after the rainy seasons. • Clearing to be limited to allocated and specified areas of the way-lakes. (Way-leave traverses to be carefully set). **Dislocation of settlements along the way-leave. N/A** **Physical Disruption of wildlife habitats** **Hotspot:** Mubiza Farm / Village **Mitigations:** • Grid layout should be discussed with MET, local Communities, Zambezi Regional Council • No Grid should be constructed in the Mubiza Village Farm

Table 10.5: Other Identified Impacts

Social-Economic Impact	The proposed activities are likely to impart both negative & positive impacts in the area. From infrastructure point of view, socio-economic impacts will arise from social amenities that will be provided will include services such as job creation, schools, health centres, etc.
Employment Creation	One of the expected most positive impacts is the creation of employment for the local community members. It is envisaged that more than 90% of the unskilled labour will be recruited from within the catchment area. For skilled labour, priority will be given to Namibians with suitable qualifications before engaging expatriates. It is also anticipated that more jobs are expected to be created as the project progresses. Project members of staff will also plough salaries and wages into the local economy directly through purchases of various goods and services.

National Economy	The project is expected to attract many potential investors (both local & foreign) who will bring substantial capital in the area. The injection of such capital investment will have far-reaching multiplier effects on the national economy. Similarly, the export of various agro-products will significantly improve the foreign exchange status of the country.
Education Services	The positive impacts on education will arise from improved education infrastructure for local schools. There will be need to open at least two basic schools in the area. Improvement in educational services will encourage pupils to attend classes and will also attract teachers to work in the area. Further, job creation for parents will improve their household income base. As a result of improved household income base, parents will be encourage their children to attend school and dissuade them from opting for caterpillar collection during school days. The perceived increase in population in the area would result in shortage of educational services in the area
Health Services	As investors implement their activities on the Farm, it is envisaged that there will also be some improvement in the provision of health services in the project area. This will be achieved through rehabilitating existing health centres and construction of a **new clinic at the Farm.** Expected impacts on health in the area will be positive & negative. The positive aspects of the impact will be improved health services as a result of rehabilitation & construction of old and new clinics respectively. On the other hand, negative impacts could arise from increased interaction between project workers (who may come from outside) and locals. This could lead to increase in transmission of communicable diseases such as COVID19, STDs, HIV/AIDS, TB, etc. in the area. Perceived increase in population will result in stretching of the few health services in certain areas of the farm.

Table 10.6: Impacts of siting of agro-processing and crocodile ponds facilities

IMPACT	HOT SPOTS	MITIGATION
Aggravation of solid waste problems in the area.	Mubiza Village Farm – Area planned for an Agro-processing industry and crocodile farming.	○ **Subject the industrial developments to specific EIA**
Aggravation of effluent discharge	**As above**	○ **Subject the Industrial development to specific EIA.**

- **Human Settlement**

The assessment of the human settlement considered the potential social changes that would result from human settlement and their subsequent impact on the environment. Population increase as a result of the influx of employment seekers and service providers would result into impacts that are related to the use of the limited natural resources, sanitation and public health facilities. Change in land tenure status from customary to state land is another social change with serious social and ecological impacts on the environment. The other social change is the tribal and ethnic interaction that would result from coming in of investors and farmers of different tribes and races in the area. This may result in cultural, tribal, religious, ethnic and traditional conflicts. The potential social and ecological impacts of the mentioned social changes and their proposed mitigation measures are analyzed in the table below.

Table 10.7: Impact of Human Settlements

IMPACT	HOT SPOTS	MITIGATION
Tendency to expand and encroach onto Protected Forests Areas, Catchments & Wetlands due to	Areas close to Mubiza Village Farm	○ Formation of Village Natural Resource Management Committee

uncontrolled increase in population immigration as a result of employment and trading opportunities		as a local control mechanism
Encroachment on planned but not occupied farmlands	All numbered farmlands that may not be quickly taken	○ Establishment of buffer zones to protected areas ○ Preparation of area land use plan
Land ownership conflicts as a result of unclear tenure procedures on unnumbered plots	All unnumbered plots which in the past fell under customary tenure	○ Establishment of Project Area Management Committee to monitor and oversee distribution and occupation of both numbered and unnumbered farms.
Disruption of social linkages and cohesion as a result of destruction of local solidarity	Inter village system and its socio-cultural practices in the area	Develop social amenities which bring people together to preserve their culture and heritage
Disruption of traditional institutions	Village Headmen Chiefdom	Develop funding mechanisms that will enhance the new roles.
Increase in communicable diseases	○ Villages ○ Farms ○ Service Centre	○ Strengthen Basic Health care provision ○ Sensitization in COVID19, HIV/AIDS and establishment of Mubiza Vocational Training Centre
Loss of use rights to various natural resources (forest, rivers, land, forest products)	Local communities in the project area	Provision of alternative sources of incomes and livelihoods/local empowerment
Racial, religious and ethnic conflicts	Local communities & immigrants	Develop social facilities & promote cultural integration
Increase in crime due to new investment and population increase	Commercial farms and other business centres	Establishment of Police Station & community policing in the area
Loss of political influence in matters affecting the area	○ Local Traditional and Civic leaders ○ Local communities	Promote cultural integration through civic education, social functions

Table 10.8: Impacts of Irrigation (a)

Irrigation will be utilized on the farm, and the water will be for both livestock & crop production. Irrigation will thus ensure efficient, increased and sustained crop production. Apart from the reticulated water, other sources of water for irrigation are the rivers, streams, and underground water, which are readily available within the Farm.

Irrigation can basically be defined as "the artificial watering of plants." Awareness of negative impacts likely to arise from irrigation is very crucial in ensuring sustainable development in the Farm. Impacts of immediate importance include soil erosion, salination of irrigation land and water bodies, water logging, and leaching of soil nutrients, proliferation of weeds, pollution & contamination of local groundwater.

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 ○ Loss of cultivable land ○ Deterioration of water resources on cultivable land ○ Loss of soil fertility as a result of washing away of humus and natural nutrients ○ Flooding of valley bottoms and silting of dams, rivers and ponds.
Salination of Water & Irrigation Land	The Farm in its current state has not been subjected to reckless land use which can escalate salinity beyond natural levels. Salinity may be defined as "the concentration of salts dissolved in water." Salinity may occur due to the presence of a particular salt. A special kind of salinity is that caused by the pollution of land & water in various ways, especially by substances, which are not naturally found in the environment (e.g. emptying of domestic and industrial waste of all kinds into rivers and refuse dumps), fertilizers. It must be noted that groundwater also contains some salts because the water tables are formed of water which has infiltrated the soil and has leached some of its salts. The saltiness of the soluble salts present in the soil and subsoil (Hugues & De Leer, 1990). The three reasons why irrigation escalates salination are: ○ The soils of the farm tend to naturally leach. Once irrigation is introduced, it will bring other mineral salts which will combine with existing salts leached in the soils. These salts will be gradually exposed on the irrigated land as the water is evaporated. The increase in the concentration of these salts will harm the crops through plasmosis or phyto-toxication. This may also affect natural regeneration where fallow is envisaged. ○ Salination of the soils may also increase through the application & spreading of other mineral salts such as chemical fertilizers. Irrigation will dissolve these fertilizers and further infiltrate them into the soils.
Leaching of Nutrients	Where the soils are porous, as is the case with sandy soils, leaching of soil nutrients, agro-chemicals and chemical fertilizers increases. It must be noted that the parent rock of the Farm is sandstone.
Pollution & Contamination Of Local Ground Water	Irrigation in itself will further enhance the infiltration of chemical fertilizers & other agro-chemicals into the groundwater. It must be noted that boreholes have been largely recommended as sources of safe drinking water. If, therefore, these chemicals infiltrate the water, then both shallow wells and boreholes will be unsafe as sources of water for human use.
Proliferation of weeds	Weed seed and plant material is generally transported by water. When irrigation occurs, this weed seed and plant material is easily drawn out of the watercourse and deposited on arable land. Some of the weed will also grow profusely along water furrows creating a bridge for insects and disease vectors for the intended crops. A good example is the water hyacinth or Kariba weed[23], which has been a headache to deal with in many rivers and dams along the Zambezi Valley or Escarpment.

All the above impacts have a very negative effect on the environment. It is therefore incumbent upon all the developers to ensure that they develop the conservation buffers and put in place erosion control measures in order to minimize factors that may lead to land degradation irrigation.

[23] Kariba weed (Salvinia molesta), has become an important aquatic weed in inland water impoundments in Zimbabwe, and is detrimental to irrigation, both domestic livestock water supply, fisheries and the environment in general (Chikwenhere & Keswani 2010)

Table 10.9: Impact of irrigation **(b)**

IMPACTS	HOT SPOTS	MITIGATION MEASURES
Soil erosion especially on sloppy grounds	Irrigated lands round water bodies	○ Putting up of level-bunds on irrigated lands to ensure infiltration and reduction of run-off ○ Regulation of water application to avoid over watering ○ Create buffers of about 20 – 40 m width between cultivated land and the rivers, streams.
Water logging of soils	Irrigated lands round water bodies	Installation of and maintenance of adequate drainage system for removal of excess water
Salination of soils	Irrigated lands	○ Application of appropriate cultivation method ○ Ensure that irrigated lands are not over water logged. ○ Cultivation of crops with salinity tolerance especially fruits
Leaching of soil nutrients	Irrigated lands round water reservoirs	Avoid over watering and replace nutrients through crop rotation organic fertilizer application
Proliferation of weeds	Mainly drainage lines	○ Maintenance of drainage lines through weed removal ○ Construct drainage line with brick linings (this also applies furrow irrigation) ○ Monitor presence of prolific weeds such as Water Hyacinth
Deterioration of water quality in the rivers & contamination of local ground water	Downstream areas and local water tables	○ Improved water, management, agriculture practices and control of inputs (Biocides & chemical fertilizers) ○ Frequent checking & control of the parameters for water quality and quantity

Table 10.10: Impacts of Agriculture Production

Loss of Habitat & decreased Biodiversity	A large percent of the Farm is forests will be opened up to pave way for commercial cultivation of agricultural crops and animal husbandry. When new land for agricultural and animal husbandry purposes is opened up, this will lead to loss of existing habitat and decreased biological diversity in these areas.
Loss of Soil Fertility	The expected causes of soil fertility losses are heavy machinery utilization during land preparation, stresses induced by clearing the natural vegetation and natural land slopes.
Heavy Machinery Utilization during Land Preparation	
	Creation of hard pan Ploughing is the most common method of preparing land for planting. The soil pores under the plough get closed and eventually get compacted as the process of ploughing continues. The compacted areas become thicker 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 (in this case accelerating runoff and erosion of nutrient-rich topsoil. **Introduction of new weed population** Weed infestation increases with the use of ploughs. Each time the soils are inverted, new weed seeds are exposed to the top layer

	which is favourable for germination. These weeds will continuously compete for nutrients with the desired crop. **Surface sealing formation** Heavy machinery tends to destroy the crumby structure of the soil causing the soil particles to be compact, with low organic and moisture content. In this state, infiltration of water is hampered; splash and runoff increase soil erosion. **Stresses Induced by Clearing the Natural Vegetation** Mubiza Farm will be a major integrated commercial farming project 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 and desiccation. **Natural Land Slopes** Slope is particularly important with arable land. The slopes of the farm are not so steep exceeding 12% restriction for arable lands.

10.2: Proposed Mitigation Measures

This section summarizes the soil conservation techniques which are thought to be appropriate for the proposed development.

Mitigation on Heavy machinery Utilization	Conservation tillage implements include rippers and sub-soilers. While utilizing conservation tillage implements, it is important that contour tillage or ridging and ridge tying is appropriately followed.
Mitigation Natural Land slopes	Biological and physical conservation measures are of considerable importance for water and soil conservation. The appropriate measure is construction of level bunds along contour lines. Plant productive grasses on the contour bund for firmness. Yet grass is suitable for this purpose.
Contamination & Pollution of Soils, Groundwater & Surface Water	The agricultural commercialization of the farm is expected to consume a lot of fertilizers and pesticides per ha. Overuse of fertilizers and pesticides may result in soil acidity and pollution of water bodies such as rivers and streams in the farm. Moreover, pesticides have serious effects on the health of users, too.
Overgrazing & Soil Compaction by Livestock	Overstocked pastures are often overgrazed and the result is that land degradation becomes more serious and usually accompanied by the disappearance of valuable pasture species
Increased Sedimentation of Local Streams & Rivers	Sedimentation of streams and rivers occur when the soil is washed down into the rivers due to erosion from upland cultivated and grazing land.

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Table 10.11: Impacts of Agriculture and Animal Production and Mitigation Measures

IMPACTS	HOT SPOTS	MITIGATION MEASURES
Loss of habitat and decreased biological diversity by replacement of natural forest with agricultural crops	Farm Mubiza	○ Create on farm biological diversity conservation areas, on each farm ○ Leave natural vegetation strips between cleared farm components
Loss of soil fertility, exposure of infertile sub soils and accelerated soil erosion due to use of heavy machinery	Mubiza Farm where heavy	○ Biomass retention and compensation to the soils by applying Agro forestry systems suitable for commercial farm.

for land preparation and creation construction of crocodile ponds, etc	equipment will be used.	○ Introduction of biological and physical structures to minimize run-offs and improve infiltration.
Introduction of noxious weeds and pests in the area	Mubiza Farm	○ Phytosanitary certification of all plants materials that come into the area. ○ Constant monitoring of weed and pest control ○ Provision of extension services on crop management.
Contamination and pollution of soils, ground water and surface water with agric chemicals	Mubiza Farm	Provision of extension services in integrated pest and disease management using both conventional and traditional control measures.
Contamination and pollution of soils, groundwater and surface water with agriculture Chemicals	All farm lands under crop production, and river systems	Creation of enough buffer zones between crop fields and rivers. ○ - Choice of chemicals with least residual impacts on, humans, animals and environment.
Increased Sedimentation of local streams and rivers	All rivers and streams in the farm block.	○ Plough across contours ○ Apply both physical and biological soil erosion control measures ○ Apply undisturbed buffer zone of vegetation cover of 20 to 40 meters, between streams and crop fields.
Overgrazing and soil compaction by livestock	grazing upland areas	○ Ensure livestock population does not exceed optimum carrying capacity of the grazing area.
Loss of plant bio-diversity due to convention of natural woodlands into pastural lands.	Mubiza Farm	Avoid clearing of natural woodlands for livestock production and promote supplementary fodder production.

11. ASSUMPTIONS, LIMITATIONS & CONCLUSION

11.1 Introduction

Environmental Impact Assessment is a process that aims to identify and anticipate possible impacts based on past and present baseline information. There is, inevitably, always some uncertainty about what will actually happen in reality. Impact predictions have been made based on field surveys and with the best data, methods and scientific knowledge available at this time. However, some uncertainties could not be entirely resolved. Where significant uncertainty remains in the impact assessment, this is acknowledged and the level of uncertainty is provided.

In line with best practice, this ESIA has adopted a precautionary approach to the identification and assessment of impacts. Where it has not been possible to make direct predictions of the likely level of impact, limits on the maximum likely impact have been reported and the design and implementation of the project (including the use of appropriate mitigation measures) will ensure that these are not exceeded. Where the magnitude of impacts cannot be predicted with certainty, the team of specialists have used professional experience and available scientific research from solar facilities worldwide to judge whether a significant impact is likely to occur or not. Throughout the assessment, this conservative approach has been adopted to the allocation of significance.

11.2 Gaps and Uncertainties

Inevitably knowledge gaps remain. For instance, there is an incomplete understanding of cumulative impacts as it is not known how the project will be consolidated onto the Greater Zambezi Valley Green Belt Master Plan.

11.3 Gaps in Project Description

Regarding the location of the site, the assessment is based on a refined layout derived from revisions of earlier layouts, to accommodate environmental sensitivities.

11.4 Gaps in Baseline Information

Ecological limitations; a limitation associated with the sampling approach was the narrow temporal window of sampling. Ideally, a site should be visited several times during all the different annual seasons to ensure that the full complement of plant and animal species present are captured.

However, this is rarely possible due to time and cost constraints and therefore, the data captured is representative of the species at the site. The vegetation at the time of the site was in a reasonable condition for sampling. This represents a sufficiently conservative and cautious approach which takes account of the study limitations.

11.5 Conclusion

It can be concluded that, an **Environmental Clearance Certificate** be issued by the Environmental Commissioner / Government of the Republic of Namibia.

Such farming system increases production to meet the demands of Namibians. Proper processing of waste and related substances increases the profit of farmers. Intensification of crops growth maximizes **income** in relation to area, time and efforts.

Conventional agriculture has caused economic problems associated with over production of crops, increased costs of energy-based inputs and decreased farm incomes. It has also produced ecological problems such as poor ecological diversity, soil and water pollution and soil erosion. The adoption of **integrated systems of agricultural** production involving lower inputs of fertilizer, pesticides and cultivations can alleviate these economic and ecological problems.

Such systems are dependent upon a good understanding of the nature of interactions between the four main components of such systems, which are fertilizers, pesticides, cultivations and rotations, and how these interactions influence crop yields and farm income. Alternatives to energy-based inputs include: legume rotations; use of waste organic matter as well as that from animals and crops; integrated pest management; pest and disease forecasting; biological and cultural pest control; living mulches and mechanical weed control; conservation tillage; specialized innovative cultural techniques, including intercropping, strip cropping, under sowing, trap crops, and double-row cropping. It is essential to integrate the components of agricultural systems fully so that their impact of other inputs is taken into account.

The applicant trusts that the above motivation meets the MEFT's expectations and criteria to grant consent for proposed development and thereby help in the revival of the economy in the post-Pandemic era.

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"Balancing Growth with Resilience"

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT REPORT

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PROPOSED STOCKING DENSITY ON PRODUCTION OF FARMED GROWER NILE CROCODILES (CROCODYLUS NILOTICUS)

MUBIZA VILLAGE, KATIMA MLILO, NAMIBIA

Proponent

Mwaka Integrated Farming CC

P.O. 940, Katima Mlilo, Zambezi Region, NAMIBIA

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1. INTRODUCTION

Crocodile farming is a relatively new industry with multiple areas for improvement and production standardization (Brien *et al.*, 2007). A study in 2000 indicated that crocodile farming in Southern Africa (at the time) was a 25-year-old practise, which began in Zimbabwe (Hoffman *et al.*, 2000). Interestingly there are no standardized recommendations regarding space per animal, but rather guidelines that should be considered broad indicators (Bothma & Van Rooyen, 2005; Manolis & Webb, 2016). Farming-based practises in South Africa, Zimbabwe and Namibia utilise closed systems where no animals are harvested from or returned to the wild. Hatchlings and growers are produced from already farm-owned stock for skin and sometimes meat production. Farming for crocodile skins has allowed the demands of international markets to be met, whilst simultaneously alleviating the pressure on wild populations (Brien *et al.*, 2007; www.fao.org; www.iucncsg.org).

Captive and farmed crocodiles do not have the same roaming and territory formation opportunities as their wild counterparts for the duration of their lives, they are stocked at higher densities than would occur naturally (Verdade *et al.*, 2006; Isberg *et al.*, 2003). Managing this husbandry aspect is one of the most important when farming crocodiles commercially. There have been multiple studies suggesting negative relationships between stocking density and growth, reproduction, health and skin quality (Brien, 2015). Intensive communal ponds are the standard in the crocodile farming industry in South Africa. Although standardized guidelines regarding stocking density within the industry are lacking, there are general requirements that need to be met. Some of the requirements are: sufficient space to rest or move, sufficient space to feed and compete for feed, and sufficient space to escape pen mates (Bothma & Van Rooyen, 2005).

Some examples of minimum areas required according to FAO are: **0.1m2 per hatchling alligator and 0.3m2 per 1-3-year-old alligator**. According to SANS (SANS 631:2009 Edition 1), the national standards for Nile crocodiles in captivity are as follows: **crocodiles older than one year (approximately 750-2000mm in length) require 0.75-2m2 per animal, whereas adult crocodiles require a minimum of 10m2 each.** In terms of stocking densities, the following studies have made their own recommendations based on their findings: according to Crocodile Farmers Association of Zimbabwe (CFAZ): Codes of Practice (CFAZ, 2012) for *Crocodylus niloticus* in Zimbabwe are as follows: **no more than 15 individuals/m2 for hatchling crocodiles (greater than 0.07m$_2$ area per individual), 2-4 individuals/m$_2$ for 1-1.5 metres long raising stock (between 0.25 and 0.5m$_2$ area per individual), and 1-2 individuals/m$_2$ for 1.5-2 metres long rearing stock (between 0.5 and 1m$_2$ area per individual)**.

Hatchlings in this case are categorized as being between **0 and 9-11 months of age,** rearing stock refers to **yearlings (one year of age)** and **grower stock** thereafter (CFAZ, 2012).

Ponds are a substantial capital investment and should be designed for the optimization of growth of young crocodiles (Bothma & Van Rooyen, 2005; Isberg *et al.*, 2003).

2. LITERATURE REVIEW

2.1 Crocodile farming

2.1.1 The origin of crocodile farming

The Nile crocodile specifically is listed under both appendices (population dependent), based on their

2.1.2 Current crocodile farming practices

There are two broad types of captive crocodile keeping, namely farming and ranching. Ranching originated in Zimbabwe in 1965 and involves the harvest of crocodilian eggs or hatchlings from wild populations, the crocodiles are hatched and/or reared on farm until slaughter. Ranching practices can include incentives for conservation of the wild species through breeding, tourism or education initiatives as envisioned by the proposed Mubiza Farm project.

Mubiza project will utilize the Farming-based practices, also known as **"captive breeding"** and utilize closed systems, where no animals are harvested from or returned to the wild. Stocks are produced from the already farm-owned stock **(Binga Crocodile Farm)** for skin and meat production. Captive breeding practices can also utilize a tourism-based initiative to supplement their income and encourage local education and job-creations. It should be noted that, the proposed commercial crocodile farming systems also contribute indirectly to the conservation of crocodilian species via alleviation of the demand for wild crocodile products.

The shift towards captive breeding has had an important effect on skin quality; with fewer injuries the quality is greater than that of wild crocodiles. The resulting increase in first grade skins has led to the shrinking of the market for second and third grade skins (MacGregor, 2006). The aim of the proposed Mubiza project as wildlife farming enterprise is the satisfaction of local and international demand without compromising the stock left in the wild. This will be achieved without compromising the product quality or animals' welfare for the duration of captivity.

2.1.3 Runtism in commercially farmed crocodiles

Captive survival rates are greater than those of wild crocodile populations and this is highly management dependent (Brien1 *et al.*, 2014). A growth abnormality seen in all captive crocodile species (on all commercial farms) is runting, also known as the failure to thrive syndrome (FTT). This syndrome is the primary cause of death in captive hatchlings (Brien, 2015). Afflicted individuals at Mubiza Crocodile Farm will be / can be identified within the first 24 days of life by exceptionally poor growth rates.

2.2 Crocodiles in the wild and in captivity

2.2.1 Crocodiles in the wild vs. crocodiles in captivity

There are 24 species of crocodile recognised throughout the world; only 15 of these species are traded in commercially for their skins. The Nile crocodile (*Crocodylus niloticus*) is the only one of these species' endemic to southern Africa (Mpofu *et al.*, 2016).

Nile crocodile farming was originally extensive (eggs sourced from the wild), but there has been a recent shift towards intensive production (eggs are sourced from already owned breeding stock in this case from Binga Crocodile Farm in Zimbabwe) (Bothma & Van Rooyen, 2005). A reality faced by crocodiles raised in captivity is an environment of extreme social challenges and reduced space compared to their wild counterparts, enduring stress challenges which reduce production and reproduction, and therefore

survivorship. Adaption capability of the crocodiles, and the ability to tolerate these captive-stresses, determines the success of production.

The following welfare requirements must be met at Mubiza Farm since a wild species is farmed in captivity:

the supply of appropriate and balanced diets, fresh water at all times, sufficient space for natural behaviours, protection from predation, disease preventative measures and timely treatments (Tosun, 2013).

Crocodiles have a natural fear of humans from the time they hatch, in captive breeding situations the larger animals over-come their fear (Brien, 2015; Bothma & Van Rooyen, 2005). This does present safety issues during feeding and nest-protecting stages.

All workers engaging with these animals will be sufficiently educated in interpretation of crocodilian behaviours and follow a strict system of rules for their own safety.

2.2.2 Crocodile products driving captive crocodile rearing

Skins have long been the primary product of the commercial crocodile farming industry, with crocodile meat becoming popular in recent years as a secondary source of income to supplement the increasing production costs associated with stricter market requirements.

- The majority of produced crocodile meat will be exported and sold for human consumption.
- Alternatively, any excess meat or off-cuts can be fed back into the production system as crocodiles are naturally cannibalistic in the wild
- **The proposed Mubiza Project takes advantage of the excitement surrounding such an unusual meat by selling to surrounding game park restaurants for tourist consumption**
- Some other uses of crocodile products will include parts for decorative purposes, and finally oil and claws

2.3 Growth of Crocodiles

2.3.1 Captive crocodile growth

As in any farming situation, production in terms of growth is dependent on an animal's genetics, and living-environment.

- The management of the crocodile's environment is the current factor determining the growth of farmed crocodiles; the farmer and the technologies available to Mubiza Team will determine the success of the enterprise.
- Crocodiles in ranching or farming situations grow better than their wild counterparts; where temperature is controlled, food is supplied, and predation is completely avoided
- There are factors of production that the Mubiza Project will consider and control to ensure optimal growth rates, such as: confinement at greater densities than would be encountered in the wild, social hierarchies, competition and dominance within groupings of animals, and finally human disturbances.
- Crocodiles in their first year of life experience stress, and its unavoidable due to inappropriate temperatures, stocking densities, handling, inadequate nutrition, human disturbances and poor management.
- Mubiza Project aims to minimize such stresses through proper management, thereby conserving immunocompetency and growth rates, and minimizing hatchling mortality.
- Stress is not to be underestimated in crocodile farming practices, with the causes varying from poor housing to poor feeding regimes and/or poorly trained staff members.

Table 1 Some standard characteristics of the Nile crocodile in the wild, adapted from Intensive wildlife production in southern Africa (Bothma & van Rooyen, 2005).

Growth rate (length)	*300mm/year (optimal conditions!)*
Mean length at maturity	*3m females and 4m males*
Mean mass at maturity	*150kg female and 400kg male*
Feeding spectrum	*Mainly fish, mammals and insects*
Preferential hunting time	*Night*
Mean number of eggs per clutch	*45 (30-90)*
Incubation period	*90 days*
Nest temperature	*30-32 degrees*
Egg mass	*100-120g*
Age at sexual maturity	*10-12 years*
Age at first mating	*10-12 years female & 15-20 years male*
Time between successive clutches	*12 months*
Life expectancy	*70 years*
Females per male in wild	*1.6*
Recommended females per male in captivity	*8*
Survival rate in wild	*2%*
Territoriality	*Generally only the males*

2.3.2 Measuring crocodile growth

Crocodile growth is measured in various ways, each has its own advantages or disadvantages. The easiest way to weigh crocodiles, when they are still of a size where they can be handled, is suspondsion from a box or sack over a spring balance (www.fao.org). The two main length measures are total length (TBL) and snout vent length (SVL). Total length is advantageous as the animal can be quickly captured and measured whilst on its belly. The disadvantage of this measure is the occasional loss of the ends of tails due to fighting and dominance behaviours (www.fao.org).

2.3.3 Manipulation of growth in commercially farmed crocodiles

The improvement of growth through the manipulation of hormones will be widely practiced as the case with Mubiza Project.

2.4 Reproduction in Crocodiles

2.4.1 Reproductive husbandry on commercial crocodile farms

- Husbandry practices for commercially farmed crocodilians at Mubiza Farm will encompass breeding, incubation of eggs, and hatchling management. Crocodiles reach sexual maturity between 4-15 years of age depending on breed, general management, and quality of feed supplied. If faster growth can be encouraged at a young age, sexual maturity can be reached at a younger age. As age and maturity progress, the number of eggs and fertility of embryos will improve (Lance *et al.*, 2015).
- Successful captive breeding relies on multiple factors including the size of the male, male to female ratios, and optimal stocking rates. Sex ratios of approximately eight females to one male are recommended, ideally in their own breeding pen to maximise fertility rates and prevent conflict between males, but this is not always economically viable. Male crocodiles should be larger than the females, but of a similar size with other breeding males to ensure dominance interactions do not prevent certain males from mating
- Stocking densities in breeding camps can be maximised via alterations in pool and enclosure shapes, more bends and barriers within a pond allow greater stocking densities
- The Mubiza Project will initially source their breeding stock from Zimbabwe. However, with time, this won't be the case or an option, as they will buy from one another in the hopes of keeping their on-farm genetics viable and gaining new animals which will produce well.

- Adults and juveniles are sold to this purpose; adults are generally preferred as they are immediately useful in the system. In future when making such purchases, juveniles of known-producers may be purchased and raised to the producer's standards to become a viable mating female between 10 and 12 years of age.
- Keeping records of breeding and hatchability successes can give farmers an idea of how well their stocks are producing (Tosun, 2013)

2.4.2 Mating in commercial crocodile farming systems

Mating is generally seasonal in wild crocodilian species and will depend on climate and environmental conditions of the habitat in which the animals are found, commercially kept crocodilians mimic this seasonal breeding (Davis *et al.*, 2001; www.fao.org).

- Grouping of crocodiles is an important factor to consider for successful captive breeding. In the wild male Nile crocodiles become territorial during the mating season - this holds true in farmed populations too and therefore sufficient space per breeding male is an important requirement. Territorial males will chase other competing males from the females and snap their jaws or roar loudly (Tosun, 2013).
- Mating itself occurs in the water (preferably 2m deep for full submersion); a single pair can mate multiple times, occasionally resurfacing for air.
- Repetitive matings are necessary as each mating only fertilizes a portion of the eggs; in the wild females seek out multiple males yielding clutches of varying paternal origin (Tosun, 2013).
- Captive crocodiles have fewer territoriality options on commercial farms, simplifying paternal traceability to an extent. Even in captive breeding instances, it can never be assumed that only one male in a breeding pen fertilized an entire clutch (Bothma & Van Rooyen, 2005).

2.4.3 Nesting in commercial crocodile farming systems

Nesting behaviours usually begin 2-3 weeks after mating activities, crocodilian species vary in their nesting behaviours (Tosun, 2013; www.iucncsg.org).

Nile crocodiles lay one clutch per female per year in the wild; this is similarly mimicked in captive Nile crocodiles. Egg laying periods differ in varying regions of Africa, in most of South Africa eggs are laid in September and October (Bothma & Van Rooyen, 2005; www.fao.org).

The provision of sufficient nesting area influences nesting success and therefore reproductive success; as well as reducing fighting over nesting sites.
These nest-sites should be easy to access and far from deep water for worker safety during collections (Brien et al., 2007). Stress caused by both nest defence and abandonment can be detrimental to the reproductive capabilities of commercial breeding animals.
Nile crocodile females are nest guarders and must be kept at bay by one handler, whilst another collects the clutch contents (Bothma & Van Rooyen, 2005).
Recordings of collections should be concise, with records such as: the number of nests collected from, the number of eggs per nest, egg weights, egg measurements, the number of deformed or damaged eggs (these eggs will be removed and not allowed to proceed to incubation), and finally the number of eggs that actually hatch

2.4.4 Incubation of eggs on commercial crocodile farms

Incubation involves the collection of eggs as soon as possible after they are laid, removing excess sand from the eggshell, marking of position laid (the eggs should be placed in the incubator in the same orientation in which they were collected from the nest site) and placing the eggs in an incubator.

Humidity plays a role in moisture maintenance in the incubator, which is important for embryo health (Bothma & Van Rooyen, 2005; www.fao.org). Vermiculate is the preferred insulating material for artificial nesting in incubators to date. Insulation supplies the eggs with both the moisture and aeration required, whilst also

insulating the eggs from swift temperature changes. In the wild hatchlings cannot escape their nest alone and must signal the adult female crocodile to dig them out by chirping (Tosun, 2013).
human-induced noises and disturbances should be minimized during hatching

2.4.5 Gender classification in commercial crocodile farming systems

Gender classification in crocodiles is important for breeding procedures on farms and for ethological research with wild crocodilians.

Crocodiles can be manually sexed via the palpation and/or protrusion of the male penis from within the cloaca (usually accomplished using a finger), which can thereafter be compared to the smaller female clitoris.
Sexing can be complicated in juvenile (difficulty distinguishing male from female genitalia) and mature (in terms of handling) crocodiles due to their size.
Another consideration is that of the morphological variations between species and individuals. Expertise is required in procedures of sexing young crocodiles as the organs are only vaguely different to the untrained eye at an early age

2.5 Ponds and densities

2.5.1 Stocking density in current commercial production systems

When reviewing stocking density, Mubiza Project will consider whether the information pertains to hatchlings, growers (also called rearing stock) or breeders.

In captivity, crocodiles are stocked at greater densities, and numerous studies in crocodilians have found multiple negative effects between stocking density and growth, reproduction, health and skin quality
Although there is no scientific based evidence for a specific surface area (land and water) per animal; sufficient space to move, feed, and escape pen mates is a general requirement
Ponds are a substantial financial cost and will be designed for the optimization of production and reproduction activities
Stocking density is one of the most important aspects of raising crocodiles in captivity; in the wild crocodiles have space to move around and form territories
Communal ponds have been the standard for a number of years in the crocodile farming industry (Isberg et al., 2003; Bothma & Van Rooyen, 2005).

Hatchlings in this case are categorised as being between 0 and 9-11 months of age, rearing stock refers to yearlings (one year of age), and grower stock would be over one year of age (CFAZ, 2012).

When considering breeder crocodiles: reproduction is significantly affected by poor housing and pen designs; with minimal egg fertility and increased embryonic mortality encountered in poorly housed females. Few farms achieve first year survival rates over 95% due to housing and management inaccuracies (Isberg *et al.*, 2003).

Species	Growth phase	Density recommendation	Reference
Saltwater crocodile	Hatchling	0.07- 0.1m2/crocodile	Manolis & Webb, 2016 (referencing CFAZ, 2012)
Raising stock (1 m in length)	0.25- 0.5m2/crocodile	"	
Raising stock (2 m in length)	1-2 m2/crocodile	"	
Nile crocodile	Hatchling	>0.07m2/crocodile	"
Raising stock (1- 1.5m in length)	0.25- 0.5 m2/crocodile	"	
Raising stock (1.5- 2m in length)	0.5- 1m2/crocodile	"	
American alligator	Raising stock (<0.6m in length)	>0.09 m2/alligator	"
Raising stock (0.6- 1.2m in length)	0.27 m2/alligator	"	
Raising stock (>1.2- 1.35m in length)	0.36 m2/alligator	"	
Raising stock (>1.35- 1.5m in length)	0.45 m2/alligator	"	

Raising stock (>1.5m in length)	Add 0.09 m2/alligator for every 0.15m above 1.5m total length	"	
American alligator	Hatchling	0.1m2/alligator (minimum)	www.fao.org
Grower (1-3 year)	≥0.3m2/alligator	"	
Nile crocodile	Grower (>1 year)	0.75- 2m2/crocodile	SANS 631:2009 Edition 1
Adult	≥10m2/crocodile	"	
American alligator	Juvenile	≥1.8m2/alligator	Elsey *et al.*, 1990
Broad snouted caiman	Hatchling	0.1m2/caiman	Poletta *et al.*, 2008
American alligator	Hatchling (<1 year)	0.3m2/alligator	Davis, 2001
American alligator	Juvenile (1-2 years)	0.6m2/alligator	"

2.6 Stress

2.6.1 Stress in commercially farmed crocodilians

Stress can be broadly defined as any factor that displaces homeostasis. Stress is important to a livestock producer due to its influence on animal health, production and reproduction (Moleon *et al.*, 2018). Any stimulus inducing a stress response in an organism is known as a stressor. Stress is unavoidable in crocodile farming situations, and can be the result of social stressors, management and housing stressors, and environmental stressors.

- It is therefore essential to monitor and, if possible, correct for potential stressors and their effects
- Chronic stress can occur in crocodiles housed at inappropriate stocking densities, where fleeing from one another is complicated by a lack of space. Stress on a continual basis can yield multiple negative effects on an animal's production, reproduction and immune system

2.6.2 Assessing stress in crocodilians

- Hormone analyses (sampled from blood, hair, urine, faeces, or saliva) are widely used for monitoring reproductive activity, metabolic activity, and stress responses in many species.
- Sampling activities can induce stress due to the need for capture, immobilization, handling and the methods of sampling. Non-invasive techniques have been gaining popularity as they avoid the potential alteration of stress levels induced by excessive handling

Stress, and potentially chronic stress, is faced in most crocodile farming systems.

The FGM approach allows minimal disturbance and handling of the animals, and collections can be easily incorporated into a farming schedule, i.e.: sample collections coinciding with cleaning or feeding schedules

2.7 Housing and Management

2.7.1 General housing requirements of farmed crocodilians

Crocodiles are large predatory reptiles, and farming of the species does not mean that they are domesticated. Crocodiles are stress prone animals therefore inappropriate management, housing, feeding, and care of these animals' leads to chronic stress reactions. The negative effects of this are extensive and, if not managed, lead to significant production and reproductive losses (Brien *et al.*, 2007). Stressed crocodiles do not grow efficiently, have poorer survival rates, become disease prone, endure reproductive failures, and have inferior skin quality.

Pen design is only one aspect of managing the farming environment. There are multiple housing related factors involved in adequately housing these large reptiles, including: water quality, feeding practices,

temperature regulation, shelter availability, training of on-farm personnel, and hygiene maintenance (Brien *et al.*, 2007; www.fao.org).
Location is the first vital factor in successful captive crocodile rearing, environments with climates as close to those which wild crocodiles inhabit are ideal (Bothma & Van Rooyen, 2005, www.fao.org).
Feed management will be discussed later, but on that note, keepers and caretakers should be knowledgeable when feeding crocodiles of feeding behaviours and social hierarchies

2.7.2 Pen design

Floors and walls of crocodile ponds are generally smooth concrete; however, plastics have been recommended for minimal skin damage (Shilton *et al.*, 2014).

Concrete flooring will be used frequently when housing crocodilians; in warmer climates this material conserves heat, assisting crocodilian appetite stimulation and subsequent growth (Blessing *et al.*, 2014; Brien *et al.*, 2007)
An important aspect of smooth concrete flooring; although it is easily cleaned and yields minimal skin damage compared to many other flooring types; in colder environments there is potential for heat loss via conduction from the crocodiles bodies (www.fao.org).
In such cases it has been recommended that insulation be provided under the concrete flooring of ponds, or copper piping run through the concrete floor to heat up water bodies at night , this is especially important in hatchlings
Walls in rearing ponds should be a metre tall with smooth polyurethane sealing, and of a neutral colour such as a light grey to mimic a natural environment
Safety for both animals and handlers/feeders is a primary concern in the crocodile farming industry.
It is recommended that walls be not only of a sufficient height but also curved inward, especially in breeding ponds, so that animals cannot climb out.
A sufficient number of gates, far from the water, with easy dual-sided locking mechanisms are also recommended (Brien *et al.*, 2007; www.fao.org).
Barriers or hiding boards placed within large ponds allow both visual and physical separation of crocodiles, reducing stress and therefore ensuring proper growth

2.7.3 Pond design and cleanliness

It is generally recommended for water-bodies/ponds to cover approximately 50-70% of an enclosure.

The water should not be too deep; crocodiles should be able to stand comfortably with tails resting on the bottom of the pond (30-50cm deep for juveniles, and at least 1m for adults), and a gradual ascent between water and land allows the animals to easily exit the water ("hauling out") Crocodiles unable to exit the water without slipping and sliding could cause damage to the skin of their bellies and feet
An angled cement extension of 1m around the pool allows easier haul out and reduces food and faecal debris entering the pool
Fresh water is ideal, especially for young crocodiles in the hatchling and rearing stages.
Water is often drawn from locally pitched, this is an important distinction as there is a high risk for disease contamination if water is sourced from areas accommodating wild crocodilians (like the Zambezi River or any water bodies within the vicinity) (Brien *et al.*, 2007). Water temperature is an essential growth-determining factor, this is important in farming situations where the air temperatures cannot be precisely controlled. In such instances maintaining the water temperatures at optimums allows the crocodiles seek out warmth when needed
Another important requirement for ponds is that they are spacious enough for all crocodiles to submerge simultaneously (Brien *et al.*, 2007; Bothma & Van Rooyen, 2005).
Water cleanliness is a major hygiene factor for both crocodile and handler, and the clarity of the water enhances handler safety
Natural ponds are advised against due to their cleaning requirements and propondsity for hygiene, disease and treatment related issues

Cleaning and pond-drainage are other water-related housing factors considered important for ideal crocodilian management.
Farming and ranching facilities will differ in their frequency of water-drainage depending on the environment, number of crocodiles housed, water-restrictions, and available resources
Outlets should ideally be located at the bottom of the pond with valves located outside of the ponds; this allows maximal drainage and cleaning away of faeces and excess food, without disrupting the animals
Cleaning frequency should be as often as possible, even daily if this can be managed. Cleaning at times such as feeding can be beneficial in minimizing the frequency of human-related disruptions
Daily removal of uneaten food is necessary to maintain hygiene and ensure minimal bacterial levels within the ponds. The occasional scrub out of ponds with disinfectants is also recommended, the ponds are to be thoroughly rinsed down before refilling and allowing crocodiles back into the area
During cleaning and feeding times it is important for the staff to avoid disturbing the crocodiles, especially younger animals due to their keen fear of humans (www.fao.org).

2.7.4 Temperature regulation in commercial crocodile houses

Crocodiles are poikilothermic, meaning they have an inability to thermoregulate by physiological means; this is where the term 'cold-blooded' originated (Tosun, 2013). The crocodile's external environment is the determinant of its temperature (Bothma & Van Rooyen, 2005). The ideal temperature range is approximately 24-32$_{o}$C, this is maintained through exercises such as basking, mouth-gaping and moving between sunny and shaded areas (Brien, 2015; Shilton *et al*., 2014; Tosun, 2013). The mouth-gaping action mentioned above as a temperature-balancing mechanism, has also been determined to be a behavioural response indicating a warning to leave the crocodile alone (www.iucncsg.org [4]).

Temperature maintenance is important for both health and growth of crocodiles; fluctuations could lead to reduced growth, survival and disease resistance (Brien, 2015; Brien *et al.*, 2007). Indoor temperatures and water temperature maintenance is essential; technological advancements in the form of heating elements have been useful in perfecting the control of these factors (Brien, 2015; Brien *et al.*, 2007).
Optimal growth rates are achieved at approximately 31oC; digestion and therefore growth is reduced when temperatures fall below 29oC.
With recent technological advances, constant temperature regulations are attainable and essential to maximizing early growth in crocodiles (Brien, 2015). Temperatures must be maintained for optimal digestion, crocodiles will even seek out heat post-feeding; this is called thermophily (Bothma & Van Rooyen, 2005). If there are unregulated temperature drops, young crocodiles will have a greater affinity for fat deposition as opposed to growth.
Sufficient heat is an important aspect but so is sufficient cooling and shade options should be provided (Brien, 2015; Brien *et al.*, 2007; Davis, 2001; www.iucncsg.org [4]). Vegetation and shade netting are both viable forms of cover when crocodiles need to lower their body temperatures (Tosun, 2013; www.fao.org). If temperatures fall below an approximate 15oC, Nile crocodiles show disinterest in feeding. Temperatures as low as 7oC (or lower) can cause reduced movement capabilities and crocodiles have drowned in cases where temperatures were not properly controlled (www.fao.org).
Maintenance of body temperatures is more difficult for a small crocodile; whereas the larger animals are able to store some heat during the day to last into the night; small animals require stricter temperature control. Roofs of enclosures that slope northwards are better (in the Southern hemisphere) for capturing maximal sunlight during the day (Bothma & Van Rooyen, 2005).
The material of the roof will also impact the amount of heat retained; aluminium, glass and fibreglass have all been used as roofing materials. Insulation within the roof materials is also a recommendation.
With all the heat-retaining technology, extractor fans will be needed to induce the required air movement during the day so as not to over-heat the crocodiles. All doors into the building should be airtight, and nearby washing facilities are recommended.

2.8 Digestion, Nutrition and Feeding

2.8.1 Crocodilian diets

Wild crocodilian diets are indiscriminate, opportunistic and tend to change as they mature. Young animals feed near the shore on small crustaceans and insects, with maturity crocodilian diets expand to include fish and varying sizes of mammals as well as these smaller prey items (Blessing *et al.*, 2014; www.fao.org).

Fresh meat is also recommended for health reasons, to minimize potential bacterial infections. Refrozen meats should preferably not be fed to commercially farmed crocodilians, and some meats require cooking before being fed
Meats that have been thawed, or that were not frozen when fresh are susceptible to bacterial contamination. With chicken forming the primary feed protein for commercially farmed crocodilians in Africa, *Salmonella* is a concern. Refreezing thawed meat would be doubly dangerous in this case.
Farmers should constantly re-assess the feed requirements of their stock to avoid thawing of more feed than is needed, and therefore avoiding the prospect of post-thaw re-freezing.
Although cooking some meats before feeding is possible to avoid certain bacterial contaminations, fresh meat is the preferred choice. This has led to one of the chief conundrums faced by the industry to date: the availability of fresh meat

2.8.2 Commercial crocodile feeding and nutrition

Feeding and nutrition can account for 45-60% of commercial crocodilian production operating costs; this varies between operations depending on available protein sources and environmental differences (Blessing *et al.*, 2014; Beyeler, 2011).

Crocodiles require high protein diets usually composed of low-fat red meats or chicken; along with supplementary amino acids, minerals and vitamins often presented in the form of premixes; www.fao.org). Crocodile stress levels, skin quality, bone quality and immune capability are dependent on a balanced diet with well formulated premixes (Blessing *et al.*, 2014).
Calcium is particularly important, and dietary levels should be monitored and adjusted according to the crocodile's requirements (Brien, 2015; www.fao.org).
Farmers in Africa have relied on chicken meat as their main protein source, with supplementary meats from stables/stockyards/supermarkets when available or if required. Often only one type of meat is fed, vitamin and mineral premixes are essential in such cases.
Another option is the purchase of fresh fish as an extra source of vitamins and minerals if the crocodiles eat it (Bothma & Van Rooyen, 2005; www.fao.org). Variation of proteins within the initial diets fed to young crocodiles (hatchlings) can be the determinants of survival rates and fitness (www.fao.org).

2.8.3 Protein in the commercially farmed crocodilian diet

Differences in feed protein availability and affordability (which vary with location) are the primary determinants of costs of feeding (Brien, 2015; Isberg, 2007; www.fao.org). Feed conversion efficiency should be optimized so as to minimize feed costs (Blessing *et al.*, 2014; Isberg *et al.*, 2003). There have been multiple studies delving into the ideal types and inclusion percentages of protein that should be fed to commercially farmed crocodilians for their optimal growth and production (Blessing *et al.*, 2014; Beyeler, 2011; Isberg, 2007).

Ideally, Mubiza Crocodile Framing should prioritize perfecting crocodile diets. Poor nutrition combined with the stress of captive farming may lead to reduced growth, fertility, and immunity; as well as increased incidences of bone and teeth disorders, and poorer skin quality (Brien *et al.*, 2007).

2.8.4 The suitability of plant-based diets in commercial crocodile farming

The development of an artificial diet would be beneficial for crocodile farming systems worldwide in terms of availability of ingredients, as well as affordability (Isberg, 2007; Bothma & Van Rooyen, 2005; Davis, 2001). Although multiple studies have been conducted in Australia for the saltwater crocodile; ranging from formulated feed pastes to pellets of varying carbohydrate/fat /protein levels, and when to initiate the feeding

of such diets; no "ideal" standardized diet has been created or approved (Isberg, 2007). Extensive research into the diet of the American alligator and Nile crocodile has yielded a pelleted artificial diet (Beyeler, 2011).

	The advantages of artificial feeds include reduced capital requirements and maintenance costs (more readily available protein sources, no need for refrigeration, and extended storage capabilities), as well as reduced labour costs (cleaning requirements) and potential for contamination
	With crocodile farms feeding chicken as the primary protein source for crocodiles, an artificial alternative could benefit both crocodiles and humans as it could reduce the competition for this protein between humans and commercially kept crocodiles
	It is fairly apparent that the advantages that artificial-based diets would afford producers in terms of affordability would come at a major production cost. A study by Beyeler (2011) confirms this for the Nile crocodile specifically: the 5-6-month-old Nile crocodiles from this study showed a feeding preference for animal-based proteins, as well as a greater efficiency if digestion when such proteins were maximised in the young crocodile diets.

2.8.5 Feeding crocodiles in the grower production stage

The first year of life is the most important in terms of growth and feeding during this period should ideally be on a daily basis and approximately 15-20% of live body weight. Only once crocodiles have reached sub-adult size (only require an intake of 10% of their body weight) should feed frequency be reduced (Brien, 2015; Blessing *et al.*, 2014; Brien *et al.*, 2007). These are only guidelines of course; individual requirements will vary according to age, production stage, stress factors, and quality of nutrition (Blessing *et al.*, 2014; Brien *et al.*, 2007; www.fao.org).

	Hatchlings in captivity can be offered food from the day of hatch; this minimizes the chances of stunting (due to early food competition) or runting (Bothma & Van Rooyen, 2005; www.fao.org). There are producers that delay feeding for the first week or two when yolks are still visible after hatch, this ensures that the egg yolks are fully utilized. Technically this should not be necessary if incubation was performed properly, in which case the majority if the yolk would have been utilized for in-egg growth pre-hatch.
	Keeping hatchlings dry, warm (34oC ideal) and protected from flies and other insects should speed up yolk absorption and prevent infections of the yolk or umbilical cord (www.fao.org).
	Once feeding begins, an initial feeding of 20g/hatchling/day should be sufficient, once the young crocodiles are eating more routinely the feed amounts can be adjusted weekly according to feed residues and increases in the size and appetites of the young animals (Bothma & Van Rooyen, 2005; www.fao.org).
	It is recommended that food be chopped or minced for juveniles to reduce fighting and messing during feeding (Bothma & Van Rooyen, 2005; www.fao.org). Brien (2015) recommended chopping the feed into bite sized pieces, making it easier for the youngsters to grab and hold onto the food, thereby reducing the amount of feed wasted or thrown into the water during feeding scuffles.
	Feed intake and growth are positively correlated, with underfeeding leading to reduced growth, and overfeeding leading to obesity and the associated health issues (as well as poor egg development). Growth rates decrease as crocodiles increase in age and are especially slow as the animals approach maturity (www.fao.org).
	Body temperature regulation determines a crocodile's rate of metabolism and digestion is impaired if an animals' temperature drops. If the temperature cannot eventually be raised food will rot inside the stomach, resultantly the body is poisoned (Bothma & Van Rooyen, 2005; www.fao.org).

2.8.6 Feeding practices on commercial crocodile farms

	Feeding on-farm is recommended towards the end of the day, when external temperatures are dropping and there is less chance of food wastage due to the feed baking in the sun throughout the day (Bothma & Van Rooyen, 2005; www.fao.org).
	Feeding needs to follow a calm routine so as not to cause unnecessary stress and the crocodiles racing around the enclosures, causing damage to themselves and their pen mates (Bothma & Van Rooyen, 2005).

2.9 Crocodile farming in Namibia and other developing countries

2.9.1 The viability of commercial crocodile farming in developing countries

Crocodile farming is a relatively new industry with multiple areas for potential improvement and production standardization. There are production difficulties as with many animal husbandry practices, these are compounded in developing countries where some simple requirements are unavailable or cannot reliably be met. Some such issues faced include a lack of electricity, clean water availability, land area requirements, animal feed requirements, and varied or available breeding stock. The reality of crocodile farming is that it is not a quick or uncomplicated way to make money and the perception of crocodile farming as an easy system where a large number of crocodiles are thrown in a pen together is incorrect. As discussed previously, recent research has suggested that inappropriately high stocking densities reduce production, and a substantial investment must be made into appropriate housing facilities (Bothma & Van Rooyen, 2005).

2.9.2 Genetic variation in commercially farmed crocodiles

Genetic improvement, although not widely utilized, could be used to make improvements by selecting from the stock already available.

2.9.3 The value of farming crocodiles commercially

There are no reliable estimates of the monetary value of crocodilian farming worldwide, prices and values differ with species, type of skin, and quality of skin. Classic skins (like that of the Nile crocodile or saltwater crocodile) fetch a greater price than those of the caiman for example.

When crocodile farming was new to Namibia, the meat was seen as worthless and was fed back to crocodiles, but recent years have seen a growing interest in the meat both locally and internationally. Tail meat is sold for NAD25-NAD50/kg, and trunk meat at NAD8-35/kg. Selling the meat internationally yields even higher prices than this; for this to be viable however, on-farm abattoirs are required that must meet the strict requirements of the meat export market. Sick or infertile adult crocodiles are not to be sold to other crocodile farmers or butcheries, such animals are usually sold to tourism-agencies or humanely discarded of (Bothma & Van Rooyen, 2005).

2.10 Injuries, diseases and other conditions

With the advent of crocodile farming, came a brand-new veterinary field of dealing with crocodilian diseases and parasites. Means of control have been established for commonly encountered issues in captive crocodile populations (Beyeler, 2011). The majority of diseases encountered in such populations are opportunistic and come about as a result of poor hygiene, improper feeding, poor temperature control and the resultant stress reactions which lower the animals' immunity (Beyeler, 2011; Bothma & Van Rooyen, 2005; Huchzermeyer, 2002).

	Illness and injury monitoring should occur as regularly as possible, especially in ponds with adult crocodiles. Strains on health are known to negatively affect feeding and reproductive activities (Verdade *et al.*, 2006; Bothma & Van Rooyen, 2005).
	Injured crocodiles are to be treated as soon as possible, when this occurs the animals should be blind-folded, and their jaws taped shut. Stress and disease susceptibility are greatest in the first year of life, survival rates are approximately 70%.
	Farmers themselves may not see this as economically ideal, but it is a substantial achievement when one considers the wild survival rates can be as low as 1% (Brien *et al.*, 2007; Bothma & Van Rooyen, 2005).
	Inappropriate stocking rates, loud noises, excessive handling, and early dietary changes should be avoided if young crocodiles are to thrive (Beyeler, 2011;
	Fungal diseases are the most commonly encountered issues in hatchling crocodiles (Davis, 2001). Disease monitoring via the noting of behavioural changes or an increased number of deaths in young crocodiles is an

important production factor. Staff working daily with crocodiles should be trained to notice and record such occurrences (Beyeler, 2011; Bothma & Van Rooyen, 2005; Huchzermeyer, 2002).
Salmonella is the most commonly encountered issue, these bacteria are known to thrive in crocodilian systems without any harm to the animal; but if the animals' immunity is challenged in some way (and therefore weakened) these bacteria become problematic and potentially life threatening (Bothma & Van Rooyen, 2005). Some diseases known to affect units in Zimbabwe and South Africa are: viral and bacterial hepatitis, viral enteritis, pox virus, septicaemia of a bacterial nature, ophthalmia, chlamydiosis, and fungal infections. Parasites such as leeches, worms and nematodes have also been encountered in farming operations. Although many of these issues have formulated-treatments in the market, there are issues where prophylaxis and maintenance of strict hygiene protocols is the only solution (Bothma & Van Rooyen, 2005).
Social hierarchies, poor housing or feeding, poorly maintained hygiene, and inappropriate temperature regulations all cause reduced immune function and therefore increased disease susceptibility; especially where opportunistic diseases are concerned.
Proper housing and management, along with strict biosecurity monitoring systems will be the best approach to minimizing disease issues in farmed crocodile populations

2.11 Crocodile Skin

2.11.1 Skins: the primary product of commercial crocodile farming

Skin is the primary product of crocodile farming, different crocodilian species yield different skins, and these are of varying value (MacGregor, 2006). Crocodiles are usually of an ideal size for slaughter at the age of 2-3 years. This can vary depending on farm location, management and diet (Beyeler, 2011). First grade skins supply luxury markets internationally and are used by many popular brands for leather shoes, bags, belts and watch straps for some well-known brands like Gucci, Hermes, Louis Vuitton and Rolex (Tosun, 2013). Nile crocodile skins are classified as "classic leather" on the international market and fetch a reasonable price (Bothma & Van Rooyen, 2005).

Skins are processed in the following steps: skinning, skin preparation via flaying, measuring and grading (usually on a light table), salting, folded and packaged into woven plastic bags, transported, tanned, coloured, and finally worked into marketable products (Bothma & Van Rooyen, 2005).
The skill level of the skinner will determine the quantity of wastage, and therefore the sizes of the skins presented to the next stage of processing (Mpofu *et al.*, 2015).
Salting is an equally crucial step and is essential for the prevention of bacterial or fungal infections of the skin, and scale decay or slipping. Substandard salting practices cause shrinking of skins by up to 16% (Mpofu *et al.*, 2015).

Crocodile skin consists of a network of scales, or scutes, in multiple shapes and sizes depending on body location (Beyeler, 2011). Belly scales are square and flat, flank and neck scales are round with raised bony centres, and finally the back and tail has pronounced raising in the scales (Bothma & Van Rooyen, 2005;). The bony deposits in scales are called osteoderms, they have rich blood and nerve supply and assist the transfer of heat to and from the body (Bothma & Van Rooyen, 2005). The soft and malleable belly scales on the other hand have no osteoderms, making this area of the skin the most highly valued (Beyeler, 2011). Skin quality can be defined as the hide properties of shape, thickness, and scale pattern uniformity

2.11.2 Grading of crocodile skins

The grading systems for crocodile skins have become stricter in recent years with the growth of the market. The skins of the Nile crocodile and American Alligator are of particular popularity (Mpofu *et al.*, 2015). Developing countries tend to struggle with the production of near-perfect skins. Issues such as physical damage, nutritional defects, and poor skill of skinners and tanners are typically encountered at a greater frequency in such countries (Mpofu *et al.*, 2015).

	Crocodilian skins are graded according to both extent and severity of physical damage to the skin. Defects of the skin can range from simple blemishes, bite or scratch marks, abrasions, deformities in the scale patterns, and knife holes
	Skins will be graded from 1 (being the best quality skins) till 4 (worst quality skins),
	First grade skins are those devoid of imperfections, the grade is diminished down to fourth grade by the extent of imperfection occurrences

2.12 Crocodile Meat

Crocodile meat is the main by-product of crocodile farming; the CSG estimates the production of meat from 1990-2005 to be approximately 400 tons/year primarily from three species: the Nile crocodile, the Siamese crocodile, and American alligators (Tosun, 2013).

	The primary focuses of Mubiza Crocodile Farm are skin quality, and the newly introduced meat quality and growth characteristics.
	Crocodile meat will be easily marketed as a healthy meat, with a low sodium and high unsaturated fatty acid content

2.12.1 Ideal crocodile killing methods

Crocodiles are ideally killed by electrical stunning of the brain and severance of the spinal cord; spinal severance is not permitted prior to stunning. The stun permits a final opportunity to check that the animal is of size and quality for slaughter, with minimal or at least partially healed skin irregularities (Beyeler, 2011).

	Feed is restricted for the week leading up to slaughter so as to prevent regurgitation during the culling, or at the time of skinning.
	During the harvest for slaughter, prolonged handling can lead to a build-up of lactic acid in the muscle, reducing meat quality
	Capturing techniques will also affect stress felt by the other crocodiles in the pen, this can cause running over one another and biting, resulting injuries reduce skin quality.
	Mubiza Croc Farm will make use of an **electric stunner**, immobilising the animals for 2-3 minutes and therefore reducing issues such as mentioned above
	Within ten minutes of death, the carcass should be hanging for bleeding out. This is accomplished by hanging the crocodiles by the tail. The carcasses should be washed of any faecal matter, blood, or mucus remaining on the body including inside of the mouth.

2.12.2 Crocodile meat quality-regulations

Crocodile meat as a product is seen as a delicacy in many countries, but the reality is that there are minimal regulations in place compared to other meat producing farming systems.

	Spirometra and *Trichinella* can be inactivated by freezing reptilian meats (Of the listed issues, *Salmonella* is the major issue faced).
	Particularly in farming situations where chicken is the primary feed available, or crocodile meat infected with *Salmonella* could potentially be transferred back into the population when they are fed back into the system
	Testing procedures as an essential implementation for the future of crocodile meat production and sale into the meat-market. This is especially important should the Mubiza project settle for feeding crocodiles chicken as their primary protein

2.13 Crocodile Behaviour

Crocodilian behaviour is complex, and there are aspects of their behaviours and social interactions that are not fully understood; with much of the information available based on studies involving wild populations.

Studies emphasize the relationship between behaviour and management, highlighting comprehension of how management affects behaviour, and behaviour affects management as essential for successful stocking programs.

- Behaviour involves both physical and chemical actions in the body, i.e.: growth and reproduction are hormonally controlled, inciting the related responses of feeding and competing for feed, or mating and seeking out mates.
- Crocodiles are ectothermic, requiring heat sources external to their bodies to maintain their body temperatures, appetites and metabolic rates.
- Temperature maintenance is therefore essential for the health, growth and reproduction of crocodiles.

2.13.1 Crocodile behaviour in the wild vs. in captivity

Social interactions are an important behavioural activity, and studies involving captive crocodilians have highlighted the differences in social behaviours encountered in these captive animals when compared to their wild counterparts (Lang, 1987). Behaviours mature with age, size and gender of crocodilians. Wild, juvenile crocodiles have been recorded banding together and forming living-groups; then a disbanding of such groups when competition and dominance behaviours begin to arise due to size divergences; and finally, the formation of territories and mating behaviours when the animals mature

2.13.2 Forms of communication in crocodiles

Crocodilians utilize various vocalisations/acoustics as a form of communication. Vocalisations include bellowing, roaring, hissing and screaming. The intentions of such vocalisations can vary from warning/threatening another animal, to signalling for a parent crocodile, to signalling distress. Crocodilian postures are of interest as they can spend most of their time being very still, with short energy bursts attributed to anaerobic metabolism, after which a significant recuperation time is required. Although crocodiles can remain still for hours at a time, research suggests they are still aware of their surroundings. Posturing, snout-lifting, head slaps, jaw snaps and tail thrashing are some other communicative tools; usually used to express warnings or aggressive intentions. The basking pose of holding the mouth open and head slightly elevated has been suggested as “lookout” or warning pose, or a bluffing attempt in the face of an opponent; as well as a temperature regulation posture.

2.13.3 The importance of behavioural monitoring in crocodile farming

In captive crocodile farming situations, it is especially important to monitor behaviours and utilize the information gathered to improve management for the sake of encouraging more natural behaviours. Monitoring of feed activities, aggression, spatial distributions or tendencies, temperature-maintenance activities and potential stress-indicating behaviours allows for the identification and rectification of factors negatively affecting crocodiles in captive rearing situations.

	In the case of more in-depth monitoring requirements than farm-handlers can provide, automated camera and video surveillance has become an essential tool for behavioural research.
	Some advantages of this type of recording are: the time over which recordings can be captured and potential for numerous sites of sampling
	It would be inefficient to have handlers posted continuously around farmed crocodiles, not to mention the stress this could potentially cause the crocodiles, which would also impact their behaviours
	The technology requirements of such monitoring are readily available and there are multiple models boasting various features and specifications according to the users’ needs

2.14 Crocodile Welfare

Animal welfare standards are continuously evolving and being updated over the years as the understanding of the welfare needs of farmed animals’ advances (Mellor, 2016; CFAZ, 2012). Husbandry practices are continually advancing to match the acceptable standards of animal welfare as set out in the national codes

of practice for crocodilian farming. South Africa and Zimbabwe's (Nile crocodile) standards are detailed in the South African Bureau of Standards Division (SABS, 2014) and Crocodile Farmers Association of Zimbabwe (CFAZ, 2012) respectively.

The ***Best Management Practices for Crocodilian Farming*** outlines four major approaches to be utilized at Mubiza Crocodile Farm to practically assess animal welfare in a scientific manner.	Anatomical and physiological assumptions make up the first approach; i.e.: the widely accepted (and scientifically backed) assumption that stunning achieves a more humane culling practice due to pain reduction.
	The second approach is the evaluation of health correlations; i.e.: measures of body condition, growth rates, survival rates, reproductive success, injuries and disease/parasite incidences are indicative of animal health.
	The third approach involves biochemical indicators; i.e.: the comparison of corticosterone levels to assess stress.
	The fourth approach encompasses behavioural surveillance and stimulus response (behavioural outputs towards a certain stimulus); i.e.: activities such as piling, distress calls or dehydration could be considered behavioural responses to impaired health or comfort in an environment. These four approaches can be applied on-farm for a practical assessment of animal welfare, allowing improvement and updating of management practices.

3. MATERIALS AND METHODS

3.1 Animals, Housing and Climate

3.1.1 Animals and housing

The layout of the house assigned to the trial was such that the 261 crocodiles were randomly allocated to eight ponds of comparable size (approximately 26m_2 each), all in the same house.

- **Space allowances from highest to lowest stocking density, are as follows: 2.60m2 per crocodile.** It should be noted that the **crocodiles will not be not be moved from their assigned ponds throughout the 6 -month period,** the aforementioned space allowances will be designed not only for densities but also to be sufficient in allowing the crocodiles to remain in the ponds for the full 6 months when considering the young crocodiles would likely grow during this trial period.
- The ponds will be treated with **potassium permanganate** for the first week after placement in the trial house. The water treatment will be a **standard procedure** used on the farm. The potassium permanganate will act as a disinfectant; simultaneously allowing the crocodiles a convenient, if fleeting, opportunity to hide in the water (which took on a dark purple-brown colour) where they could not be easily seen when submerged for the first week in their new surroundings.
- **The pen floors will consist of a smooth concrete, with tiling on the inner pen walls**. A water body will run through the centre of each pen, the water depth at the centre of the pond will be 0.16m. The dome shaped roof will be covered by a sturdy, white (non-translucent) weather proof plastic. The house will contain a walkway situated along the house-midline overlooking the ponds to allow easy access to each pen.
- **Human presence will be minimized so as not to influence the crocodiles stress responses any more than was necessary.** Access to the ponds will be granted for the activities of f**eeding, cleaning, faecal collections (coincided with feeding or cleaning times to minimize human presence in the house), and weekly time-lapse data collections (which consisted of a switch of the memory card for each camera placed in the house, and a check for battery levels).**

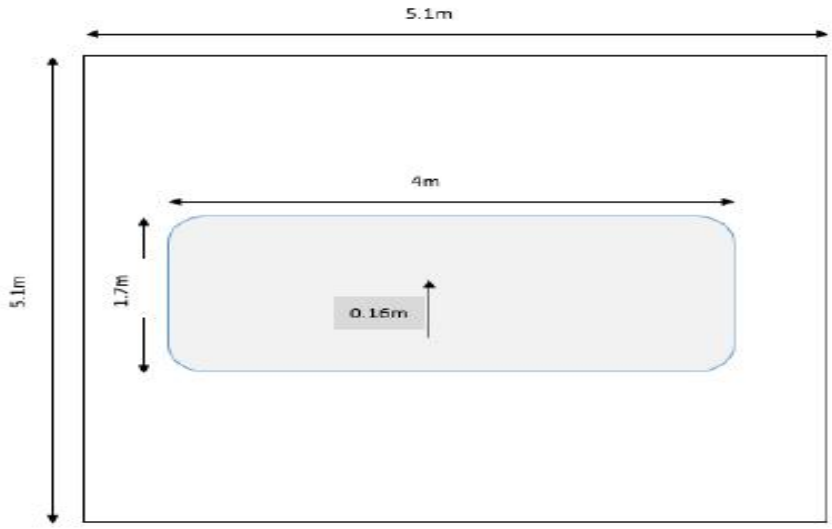

Figure 3.1: schematic pen layout with lengths and widths of the pen and pond, as well as the pond depth. **NOT TO SCALE.**

3.1.2 Processing and handling

- **Processing** will consist of the **capture and securing shut of each crocodiles' jaw with a thick elastic band**. The crocodiles will be of an easily manageable size at the beginning of the whole project, and stunning will not be required at this stage.
- Each crocodile will be **microchipped** with an Allflex®-brand microchip, and tissue samples will be attained using a sampling gun supplied by Allflex®.
- **The tissue samples** will be collected from the first single scute of the tail, creating a hole in the scute which doubled as a tagging hole.
- These tissue samples will be consigned to Allflex® for future use by Mubiza Crocodile Farm in unrelated **genetics-based studies.**

3.1.3 Daily recordings

- **Daily data collection forms** will be renewed on a **weekly basis,** each pen had a clipboard assigned to it with the forms to be filled out daily.
- These daily recordings included: **feeding and cleaning schedules; feed measures (kg feed fed, and kg feed waste collected); the confirmation of faecal samples by way of recording the weight in grams of each sample and the time of day it was collected (either the morning or the afternoon collection); various temperature measures; and time fluctuations should the farms schedule occasionally not allow the recordings at the usual specified time of day.**

- A **thermo-hygrometer** will monitor temperatures and humidity, and daily recordings of floor and water temperature will be collected for each pen using a handheld thermometer gun.
- The **feeding and cleaning schedules** will follow that of **current systems and standards**.
- To maintain the comfort and socialization activities of the crocodiles, **the personnel attending the farm will be kept as consistent as possible.**
- This will allow the animals to **adapt not only to their surroundings but to the personnel they encounter daily.**

3.1.4 Climate recordings

- **Two weather-data recording products** will be utilized for the measurement of temperatures and humidity in in each pen: a Kistock miniature thermo-hygro datalogger (Kimo instruments: KH120), and a standard hand-held **IR (infrared) thermometer (ST653)**, ordered through **ASSTech Process Electronics and Instrumentation.**
- The **temperature and humidity datalogger** will be housed in a protective casing with a magnet for easy mounting; and capable of measuring temperatures from -20 to 70oC, and humidity of 5-95% RH.
- The handheld IR thermometer is capable of measuring temperatures ranging from -35 to 535oC (resolution 0.1 oC).
- An **adjustable emissivity range** allows recording from multiple surface types.
- **The handheld recorder will be used daily, at midday (warmest time of the day), in every pen to measure temperatures attained by the cement floors and water bodies and emissivity adjustments had to be made between each change of material measured.**

3.2 Feed Intake

- Feeding will be carried out on every **Sunday, Tuesday, and Thursday; and cleaning on every Monday, Wednesday, and Friday.**
- This system will be developed by **Mwaka Integrated Farming CC,** the farm owner, to ensure that every feeding day will be followed by a cleaning day, thereby ensuring the maintenance of hygiene in the ponds (and ponds in particular).
- All crocodiles will be fed the **same diet**.
- The diet will initially be the **grower diet** that the farm will feed crocodiles with, and will consist of a **mix of ground up chicken and nutritional premixes.**
- **Continuous assessments** of the amount of **feed fed and the feed waste collected for each pen will allow weekly adjustments of the feeding quantities**, ensuring there is sufficient feed available to satisfy the requirements of the crocodiles.
- This feed adjustment will also be a **typical practice on the commercial farm**, and so will not diverge from their usual regime.

3.3 Growth

- **Morphometric measures will be recorded for each crocodile:** total body length (TBL: from the tip of the snout to the tip of the tail), snout vent length (SVL: from the tip of the snout to the caudal margin of the cloaca), and finally belly width (BelW: the width of the belly from the third button-scale of the belly on each side of the crocodile).
- After recording these morphometric measures, **Fulton's formula** will be used to calculate a body condition index/score for each crocodile ($K = W/L_3 \times 10_3$; where K is the condition score, W indicates weight, and L indicates length) (Manolis & Webb, 2016).

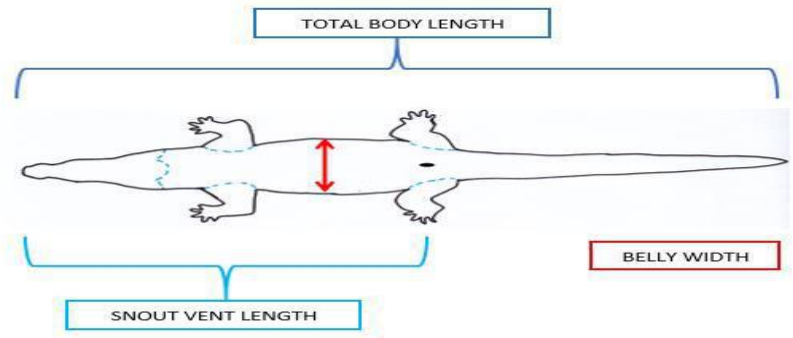

Figure 3.2: Illustration of the various morphometric measures used to assess crocodile growth

3.5 Stress

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- In addition to daily feeding and cleaning, faecal samples will be collected twice daily from all ponds to ensure the collections are fresh at the time of freezing.
- Each sample will be weighed (on a kitchen scale) and the weight in grams recorded on both the bag containing the sample itself, and the daily-logs (Annex A) kept on the farm throughout the trial.
- It should be noted that not every pen produced daily faecal samples, with the lower density ponds producing only a fraction compared to the higher density ponds.
- Ziploc bags will be used for the faecal collections, and a label on every bag noted the "pen number", "date", "sample weight" and "time" of the collection.

CONCLUSIONS

The results of this EIA study and Literature Review suggests that the proposed Mubiza Crocodile farming practices will employ an acceptable range of densities for farming of grower Nile crocodiles. Of the densities assessed in this particular study, there was no definitive "ideal" density that maximised growth and skin qualities, whilst minimizing stress endured.

The current EIA study assessed what seemed to be obvious factors for quantification of the effects of stocking density on commercial crocodile production. However, when considering the results, it is clear there were possible factors of importance external to the analysis.

Overall, the impression gained from EIA studies was that the medium density pen crocodiles are the best for the proposed development.

It is therefore envisioned that the proposed development will get the **Environmental Clearance Certificate.**