

# **INSECT FARMING INVESTMENT OPPORTUNITY IN SOUTHERN AFRICA**

## **Subject**

**Investing in a practically proven commercial Insect Farming operation in Southern Africa.**

## **Objective**

**Producing the most biologically sustainable form of “Animal Protein” of its kind in the world, in one of the most symbiotically holistic relationships between man and the environment, on a continent where Entomophagy has been around for centuries, and where quantities of insects consumed, are measured in the thousands of tons...**

## **250 Million People In Africa Include Insects In Their Diet**

**Upwards of 250 million people throughout sub Saharan Africa include a wide variety of insects in their diet, with each region having its preferences in terms of the species consumed.**

## **9.5 Billion Mopane Worms Are Harvested From The Wild Every Year, Putting A Severe Strain On Both The Environment And The Wild Colonies**

**9.5 billion Mopane Worms, each weighing an average of 9 grams (live weight) equating to +/- 85 000 tons, with a 51% Protein content...are harvested from the wild every year, and consumed by millions of people throughout Southern Africa, making this the most sort after edible insect on the continent, and if we combine all 39 Gonimbrasia species it puts it at the top of the global charts, in terms of the overall quantities consumed.**

## **Excessive Over-Harvesting Has Led To Localised Extinction**

**Unfortunately, excessive over-harvesting of this species has led to localised extinction across thousands of square kilometres of Mopane Woodlands, forcing those people living within these areas to revert to an alternative revenue stream, which unfortunately in this case is the much sort after and highly lucrative Mopane Tree itself, for its timber. This is leading to illegal logging, deforestation and everything else that comes with it...this is why it is imperative that we address these problems before it is too late. Our aim is to release between 5% and 10% of our captive bred Mopane Worm stock, in egg form, back into the affected areas.**

## **The Exponential Growth Rate Of Insects Is The Reason Behind Their Successful Transition To Being Bred Commercially In Captivity On A Large Scale**

**One of the most positive attributes associated with the farming of Insects, is their exponential growth rate, where life cycles are measured in days and weeks, and not in months and years, as is the case with traditional livestock such as cattle and sheep. For example, with Crickets and Locusts they each lay +/- 150 eggs and their life cycle is +/- 59 days from hatch to harvest, depending on the species. If an Out Grower was to start with say 250 000 eggs, within 3 or 4 generations they'd be up into the hundreds of millions of insects.**

## **An Absolute Worst Case Scenario...If All Your Insects Died**

**If, for any reason the insects all died, it wouldn't be the end of the world, the Investor/s can still sleep at night and the farmer won't go broke. If it happens to an Out Grower, they would have to start again with another batch of eggs from the Central Breeding Farm. If it happens to us on the CBF we'd buy more eggs from our UK supplier at an affordable price. Within 3 or 4 generations (+/- 200**

days) you are back to where you were, in terms of numbers. The same cannot be said for any other form of livestock farming due to gestation periods etc.

### **Positive Factors Associated With This Insect Farming Operation**

Like any intensive mixed farming operation we will begin by farming three edible insect species - Mopane Worms, Crickets and Locusts, and will add other edible species in due course. We will also be growing and processing their Feed source on the farm...

We will be farming them...

- without the use of antibiotics, herbicides, insecticides and fertilizers
- with 85% of those involved in this project being women
- without the need for vast acreages of land
- without requiring large volumes of water
- with near zero Greenhouse Gas Emissions from insects compared to other livestock
- with a conversion ratio of 1.8 Kgs of feed to produce 1 Kg of insect Protein
- where 80% of the insect is edible compared to 40% for beef & 55% for Pigs or Poultry
- they pose a low risk of transmitting zoonotic infection to humans
- they have few, if any, animal welfare issues
- producing upwards of 50 tons of Animal Protein per Hectare per annum, unheard of in any other form of crop or livestock farming around the world
- where the processed sustainable feed source for the insects is grown on site and originates from the leaves of two nutrient-rich tree species - Moringa and Mopane, as well as Cassava leaves, thus reducing our dependency on grain crops such as Maize or Soy Beans in the form of Chicken Mash which other insect farmers around the world are feeding their livestock.

### **Insects - The Most Sustainable Form Of Protein Compared To Soybeans And Cattle**

It makes this the most sustainable form of farming in the world, considering an irrigated Soy Bean crop only yields 700 Kgs of digestible “Plant Protein” per Hectare per annum, not forgetting the chemicals, fertiliser, land prep, soil erosion, siltation and deforestation that comes with it. A Beef herd only yields 80kgs of animal protein per hectare. The farming of Insects is a practically proven approach for the use of agriculturally poor land within a 550,000 km<sup>2</sup> region of Southern Africa, known as the “Mopane Woodland belt”, where edible insects can provide, economic, nutritional and ecological advantages to the indigenous populations who consume them.

### **Disease Transmission To Humans...An Important Topic Worth Remembering**

Because insects are taxonomically much more distant from humans than conventional livestock, the risk of transferring zoonotic infections is low. In recent years, the emergence of severe acute respiratory syndrome coronavirus (known as SARS) and influenza A viruses (H5N1 and H7N7) has caused global concern about the potential for pandemics. Many past zoonoses have remained within confined populations; however, in a globalised world the likelihood of such pandemics is increasing. A number of examples exist from various parts of the world, including cutaneous zoonotic leishmaniasis in Manaus, Brazil; ebola, monkeypox and Rift Valley fever in Africa and the Arabic Peninsula; Crimea Congo haemorrhagic fever in the Middle East; bovine spongiform encephalopathy (BSE) in Europe and elsewhere; West Nile fever in Canada and the United States; and paramyxoviruses in Australasia. These demonstrate that a wide variety of animal species, both domesticated and wild, act as reservoirs for pathogens, which may take the form of viruses, bacteria or parasites (Meslin and Formenty, 2004), whereas we aren't faced with the same problems with Insects.

### **How It All Started, And Why**

It all began a little over twenty years ago on our farm in Zimbabwe, culminating in 3 years of intensive field trials and research, focusing on the Mopane Worm (*Gonimbrasia belina*). Our objective at the time was to prove sustainable scalability of this species in a large scale captive breeding programme, with the aim of feeding our 400 employees and their families, all of whom lived

on the farm. Other than proving scalability and the fact that our trials were 100% successful, ROI played a fundamental role in determining whether or not insect farming was worth pursuing commercially in the long term...which it no doubt was. Unfortunately, shortly after completing the trials we had to place the project in “dormancy mode” due to the much publicised political situation in Zimbabwe at the time.

## **My Background**

I'm a third generation Zimbabwean...I was born and raised on our farm in the Mazowe Valley, North of Harare, as were my parents before me, including our three sons. I have 25 years' practical experience running our family's intensive mixed farming operation which included 1500 acres of Row Crops, namely Maize, Cotton, Soybeans, Ground Nuts and a winter Wheat crop. We also grew 25 acres of Roses and were exporting a million stems a fortnight to Europe. On the livestock side we ran an 800 strong Brangus beef herd, 1200 head of Blackhead Persian cross Dorper sheep and a 3000 per month Broiler unit for our employees.

## **The Team**

Establishing a commercial farming operation in Africa is always done in stages, especially when it comes down to your Staff compliment, as to when they'll be joining your team...apart from trying to keep your initial costs down, it would be pointless paying for a Vet or an Entomologist when you're still building your facilities and have no livestock on the farm. With 25 years of practical farming experience behind me I'll be responsible for the day to day running of the farm. Our 3 Sons, each of whom has chosen to specialize in a specific field relevant to this project, will be joining me on the farm as will a number of our ex farm employees from our farm in Zimbabwe, and who now reside in South Africa. The initial 5 Hectare Net House will be erected by a company specializing in Net and Greenhouse construction. We will second several of our own employees to their team in order for us to erect our own Net Houses in the future, using our own employees. We've had several offers from established Cricket and Locust Farmers around the world who'd be willing to assist us during the initial design and build stages. We've also received a number of requests, both local and from abroad, from Entomologists, Biologists, Food Nutritionists and Researchers, to name a few, who would be interested in working with us on the project. A Senior Entomologist who I've known for many years and who is based in the UK, with many years experience working on projects around the world, will be part of our team. We will keep the Investors posted as to who joins our team, in what role, and when.

## **Funding Requirements**

Amounting to just over one million Pounds, these funds will be used to establish Phase 1 of the project, which includes 5 Hectares of Insects being bred and reared under Net, as well as an intensive R&D programme.. My objective...to encourage 50 Investors to come on board, each investing £20 000 in Phase 1, doing so in monthly tranches of £4000 over a 5 month period, and linking it to a performance related initiative whereby they'd receive a brief but informative monthly update over an 18 month period, re our progress. ROI – 15% per annum over a 3 or 5 year period, with the option of taking an equity stake in Phase 2 of this project. This is a practically proven farming initiative, so the majority of the risk factor has been eliminated.

The Farming side will be linked to an intensive R&D programme focusing on all aspects associated with Insect Protein. Our aim during Phase 1 is to prove sustainable scalability and ROI to the International Investor community, prior to implementing Phases 2 and 3, which involves scaling the CBF up to 50 Hectares, and more importantly, the implementation of the Out Grower Programme, while also taking a closer look at the by-products such as Chitosan and Frass. Our OGP will be modelled along similar lines to the BAT Tobacco Out Grower Programme or the Illovo Sugarcane Out Grower scheme, both of which have been in existence for decades, employ tens of thousands of Small Holder farmers, and are extremely successful.

## **Income Generation**

We will begin generating an income from the sale of insects, within 6 to 7 months of starting this project, allowing us sufficient time to build up our Insect numbers into their hundreds of millions before we do. Via our R&D programme we will also focus on value addition for Human consumption, the Animal Feed industry and the Pet Food industry.

## **Funds Will Be Used To**

- establish the initial 5 Hectares of Net Housing...1 Ha for Crickets, 1 Ha for Locusts, 2.5 Ha's for Mopane Worms and 0.5 Ha's for R & D
- the design and construction of Net Bins for the Crickets and Locusts
- an assortment of equipment with which to design build and maintain this project
- establishing 20 Hectares of Moringa and Cassava as the feed source for the insects
- 4 x 40 foot shipping containers converted for egg incubation and nursery units
- 2.5 Ha's of Drip Irrigation in the Mopane Worm Nursery unit
- R & D...Feeding Trials for the Crocodile, Tilapia and Free Range Poultry Industries
- R & D...Nutritional Trials relating to different options for: human consumption, the Animal Feed and Pet Food Industries
- R & D...relating to Mopane Leaves being incorporated into the feed along with Moringa and Cassava leaves as our sustainable feed source for our Crickets and other Insect species. It also includes continuous research on the use of Micro-Greens as our sustainable feed source for our Locusts
- R & D on other Insect species, namely: Black Soldier Flies, Meal Worms, Cockroaches and Palm Weevils in the remaining 0.5 Ha's of Net House
- R & D of a vacuum suction system to harvest and transport the insects from the bins to the processing plant
- basic processing facilities for the insect feed
- processing facilities for Feed and Food Nutritional research
- farm lease
- labour

## **I Will Discuss The Project With The Interested Party In Person**

I am prepared to discuss the investment requirements and financials with the interested party / parties by phone or email, prior to meeting with them in person. A 3 year projected cash flow will be made available to genuine investors, once we meet.

## **There Are Unprecedented Commercial Opportunities For Processed Insects As Food And Feed Throughout Sub Saharan Africa**

Consumer acceptance in domestic, industrial, and agricultural fields are established and growing in Europe, SE Asia and North America, although scope for profitable marketing and large-scale production of high quality human food and livestock feed are indefinite in Africa, where we can produce large tonnages of nutritious staple foods routinely, in various forms, at a fraction of the price of what the European Insect Farmers can do. By being uncommitted to any single insect species we avoid problems of limited markets and seasonal conditions. We'll begin with the three species mentioned, with others being introduced once we are fully established.

## **The Project In Phases**

Phase 1...The project begins by first establishing 5 Hectares of Insects on the Central Breeding Farm in the Mopane Woodland Belt of Southern Africa, where we will be farming different edible insect species of proven commercial value, starting with Mopane Worms, Crickets & Locusts. Our aim during phase 1 is to prove scalability and ROI to the investors over a 12 to 18 month period, prior to moving on to phase 2. Assuming they are satisfied with the results from Phase 1 we can then negotiate

whether or not they'd be interested in taking up an equity stake in Phase 2. R & D, in terms of: sustainable feed types for the insects; processing techniques; the inclusion of various other edible insect species into the programme; marketing and the use of insects as a feed source for Tilapia, Poultry, Crocodiles and other livestock, will all play an important role during Phase 1. My aim is to have 50 Hectares under Net, producing a minimum of 50 tons of digestible Animal Protein per Hectare per annum, within 18 to 24 months of this project commencing. Although we could expand our acreage and double our annual output in terms of tonnage per hectare by "going up", which involves placing one row of bins on top of the other as they do in Europe, there is no need to in Africa as land is plentiful, plus it is easier to feed, maintain and harvest the Insects in a single row bin system. We will also establish the Out Grower Programme with eggs from the CBF.

As previously mentioned, due to the exponential growth rate of Crickets and Locusts (+/- 200 eggs laid, depending on the species) coupled to their short life cycle (+/- 59 days) producing 6 generations of livestock per year. Assuming we start the CBF with 500 000 Cricket eggs and 500 000 Locust eggs, purchased from a reputable breeder in the UK, having already secured all the relevant import documentation into South Africa, we will be up into the billions of insects within 4 or 5 generations (+/-255 days). Although processed Locust Powder is a lot more expensive on the world market due to scarcity of the product, Cricket Powder averages +/- \$20.00 per Kg, with demand far outweighing supply. +/- 12 000 Crickets and a few thousand less Locusts, make up 1Kg of Insect powder, with a protein content hovering around 55%, depending on the species and processing techniques. When discussing insect life cycles we talk in days and weeks, whereas with conventional livestock farming such as cattle we talk years, before seeing a return on our investment.

Phase 2...involves increasing the initial 5 Hectares to 50 Hectares and more importantly, to establish the "Out Grower Programme". My long term goal is to establish 10 000 Out Grower's over a period of seven to ten years, all of whom will be directly linked to the Central Breeding Farm. Each OG will eventually be farming one Hectare of insects under Net. We estimate +/- 100 people working with each Out Grower, bringing to a million, the total number of people involved in this project, 85% of whom will be women, in a region where unemployment runs at close to 90%. Their involvement will include: growing and harvesting of the feed crops such as Mopane, Moringa and Cassava for the insects; collecting the Frass from the OG and processing it; harvesting of the feed source; harvesting and processing the insects into various foods such as bread, biscuits, protein bars and cereals. The list of down stream services associated with this project is endless...

Phase 3...will focus primarily on increasing our variety of livestock by introducing additional species such as Black Soldier Flies, Meal Worms, Cockroaches and Palm Weevils, to name a few, in order to spread the range of production across the seasons, to consume waste material, and to permit the rotation of lines, as insurance against difficult circumstances. We will also begin focusing our attention on the extraction of Chitin / Chitosan, a by-product found in the exoskeletons of insects and one of the key ingredients used in Biodegradable Plastics. We will also be focussing our attention on value addition to our range of products.

### **The Social Significance In The Growing Regions Has Great Potential**

Severe unemployment and even frequent famine are rife in areas where our OG programmes will be located. Participants will be able to feed their families, improve their family income and reduce their vulnerability to drought and famine. Income derived from sales would ensure that their wealth creation is not a zero-sum game. Wastes as feed for say, poultry and fish, should improve their domestic economy and health.

### **The Scheme Takes Advantage Of The Cultural And Natural Environment**

Apart from our social benefits, we can offer quality products at a fraction of the costs of the European and American Insect Farmers and Processors. We work on indigenous stock, indigenous ecology, and indigenous experience, and would soon dwarf our European and American rivals. In Africa all our

feed for our insects is grown where it is consumed and not of value elsewhere; there is no need to bid for costly soya or maize in competition with human or stock demands. Pests and poor harvests are not major threats.

## **Our Choice Of Mini-Livestock And Technology Suits African Conditions And Local Markets**

The existing local demand for Mopane Worms, Crickets and Locusts throughout sub Saharan Africa is practically insatiable, and we know from experience that we could run an insect farming operation very profitably to serve that demand alone. At first, processing and milling of the insects by the Out Growers will be done using hand operated equipment, but, as annual output rises to hundreds or thousands of tonnes, processing on an industrial scale will be necessary by way of a centralized processing plant. By that time we should be exporting to countries in Europe for use in the Aquaculture Industry, and which do not share our local advantages. Such large-scale opportunities are part of the reason to support our Out Growers Programme

### **Markets**

Other than for human consumption, international aquaculture and livestock-feed markets alone could absorb our entire output indefinitely. Both primary products and scrap material would be valuable in animal feed, locally and internationally. The products are equal to the finest fish meal, exactly suited to raising either marine or freshwater fish, poultry, crocodiles, pigs and cattle to name a few. It is also an excellent option for use in pet food and is free from antibiotics, parasites and toxic wastes such as lead or mercury. Similarly, marketers would compete for products that would also be valuable for human consumption. Our aim, once we are producing a large tonnage of insects, is to supply various UN organizations such as the WFP, for use in their humanitarian feeding schemes throughout Africa, doing so in the form of Protein Biscuits and Bars as well as a dry Porridge.

### **Nutritional Value Of Insects**

The nutritional value of all our products is exceptional; they are well balanced, rich in energy and in complete proteins with all essential amino acids, including those that are under-represented in most vegetables and grains. They are good sources of nutrient minerals, essential fatty acids, and most vitamins. Details vary, some are rich in vitamin B<sub>12</sub>, and others can be tuned according to demand. Local communities relish them in various forms, one of which is a processed powder for use in biscuits, bread, bars and cereals.

### **Local Versus Export**

How much output to consume locally and how much to export are open questions; local production costs, including labour, housing, and insect feed / forage, are far lower, and output much higher in Africa, than in Europe, North America, SE Asia and Australia. This favours export, but we can adapt according to circumstances. Note that other high-value crops from Africa, such as vegetables and flowers, are extremely competitive in Europe. As with any intensive mixed farming operation we'll initially focus our attention on Mopane Worms (*Gonimbrasia belina*), the Migratory Locust (*Schistocerca gregaria*), and two Cricket species (*Gryllobates sigillatus* and *Gryllus assimilis*), We have other prospects in mind already, especially for higher value export, but do not wish to divide our initial effort too early.

## **Starting With The Poorest, Semi-Arid, Grazing Savanna Of The Mopane Woodland Belt**

...but can combine with agriculture on high-quality land, whether bought or leased, and can expand throughout sub Saharan Africa. In output terms per hectare, food efficiency and drought sensitivity, insect husbandry efficiently out-produces all other forms of livestock and crop farming; the production cycle is measured in weeks rather than months or years, and the waste, processing costs, and demand for space, water and food are significantly lower. Note that one of the merits of Mopane

Worms is that they feed on Mopane leaves, which few other animals can digest in their green form other than elephants, due to the high concentration of Tannins and Phenols.

### **Equipment And Installation Requirements Are Exceptionally Modest**

...for intensive Insect Farming in Africa; we take advantage of the ideal African climate, resources and species without expensive technology, by opting to use Net, as opposed to farming them indoors with heating, air extraction/ventilation systems, and artificial lighting. Most of the costs involved relate to the Net Houses and Net Bins.

### **Sustainable Feed Source For The Insects**

...will combine selected indigenous and established plant species according to their respective value. Moringa, Cassava, and Mopane are three already identified, among others. Details will depend on the livestock. Mixing processed Mopane leaf with Cassava or Moringa leaf powder has proved to be a successful diet for Crickets and one or two other species to date. Apart from our unique Housing and Bin system our various feed options set us apart from all the other insect farmers around the world, in terms of sustainability, nutritional value and cost. Unfortunately the European and American Insect Farmers are all forced into having to use Soy Bean and Maize meal in the form of Chicken Mash as their feed source, which is far from being sustainable! We could eventually supply them with our Feed product.

Insect farming has the capacity to achieve for Africa, what Cricket farming has done for countries throughout SE Asia, albeit we could get there in a quarter of the time they did.

If this project interests you, please contact me via email at.... [info@africaninsectprotein.com](mailto:info@africaninsectprotein.com)

Iain Foulds  
+44 77380 20351

Below are links covering various topics relating to the Insect Farming Industry in general...there is no arguing the fact that Africa is being left way behind, whereas we should be at the forefront of this industry due to the number of people on the continent who consume insects...

French Insect Protein producer gets an additional 40 million Euro cash injection...

<https://www.feednavigator.com/Article/2018/11/29/French-insect-feed-protein-producer-gets-40m-cash-injection>

World's biggest insect farm raises an additional 110 million Euros...

<https://salmonbusiness.com/worlds-biggest-insect-farm-project-raises-e110-million-investment-and-will-be-managed-by-robots/>

The world's leading insect farming start-ups...

<https://agfundernews.com/funding-insect-startups-slow-start-despite-demand.html>

Chinese in-door hi-tech Cockroach Farm breeding 6 billion Cockroaches a year

<https://www.scmp.com/news/china/society/article/2142316/giant-indoor-farm-china-breeding-six-billion-cockroaches-year>

<https://www.nanalyze.com/2018/04/8-startups-edible-insects-bugs/>

The ecology and sustainable utilization of the Mopane Worm...

[https://www.sanparks.org/assets/docs/parks\\_kruger/conservation/scientific/noticeboard/science\\_network\\_meeting\\_2012/8-15-gardiner.pdf](https://www.sanparks.org/assets/docs/parks_kruger/conservation/scientific/noticeboard/science_network_meeting_2012/8-15-gardiner.pdf)

Chitosan which is found in the exoskeletons of insects and used in Biodegradable Plastics...the “sleeping giant waiting to be awoken” <https://www.biobasedpress.eu/2017/08/chitosan-a-sleeping-giant-waiting-to-be-woken/>

Nutritional value of Mopane Worms... <http://aaun.edu.au/wp-content/uploads/2018/02/Compositional-analyses-of-traditionally-smoked-and-dried-Mopane.pdf>

Nutritional value of Locusts... <http://khartoumspace.uofk.edu/bitstream/handle/123456789/20995/Determination%20of%20Nutritive%20Value%20of%20the%20Edible.pdf?sequence=1>

Nutritional value of Crickets... <https://www.cricketflours.com/cricket-nutrition/>

White paper on Mopane Worms... <https://thescipub.com/PDF/ojbsci.2009.93.104.pdf>

PROteINSECT on insect protein... [http://www.proteinsect.eu/fileadmin/user\\_upload/press/proteinsect-whitepaper-2016.pdf](http://www.proteinsect.eu/fileadmin/user_upload/press/proteinsect-whitepaper-2016.pdf)

Research on the use of Mopane Worms in cereals... <https://onlinelibrary.wiley.com/doi/pdf/10.1111/mcn.12037>

Insect farming...the way to go <https://www.cleantech.com/feeding-fish-to-fish-how-insect-farming-fixes-fishmeal/>

A list of all the insect farms and processors... <https://www.bugburger.se/foretag/the-eating-insects-startups-here-is-the-list-of-entpreneurs-around-the-world/>

9.5 billion Mopane Worms, each weighing 9.5 grams (live weight) equating to +/- 85 000 tons, are harvested each year from the wild...

<http://www.au-ibar.org/component/jdownloads/finish/129/3080>

Suppose that 5% of broiler feed in the Netherlands would be replaced by insect protein, then you would need up to 72 kilotons (72 000 tons) of Insects <https://www.poultryworld.net/Nutrition/Articles/2018/5/Insects-could-help-boost-the-immune-system-287219E/>

Research doc on feeding Insects to Tilapia in Africa... <https://www.wageningenacademic.com/doi/pdf/10.3920/JIFF2017.0007>