

DOCUMENT: Feasibility Study

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# Eastern Cape – Cage Aquaculture Venture



## Poverty elevation, through sustainable employment

**PREPARED FOR**

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## **1. Introduction**

The purpose of this document is to highlight the potential in the introduction of a hatchery, a provincial network of cages and a processing plant in the Eastern Cape with relevance to the following Ukhahlamba, Chris Hani, and Amathole Districts.

Pisces – Aquacultural Experts have been appointed by Thina Sinako LED Programme as the independent consultants to facilitate the statutory process for the project in terms of 1) feasibility study and 2) the relevant environmental legislation (scoping report).

Aquaculture systems are subject to the provisions under the Environmental Conservation Act (Act 73 of 1989) Article 21 that lists certain activities as potentially detrimental to the environment. According to these regulations a public participation process must be followed and all major possible hazardous influences on the environment and population must be identified. Approval for the production unit must be obtained from the Environmental Conservation authorities. In the planning schedule of such a venture sufficient time must be allowed for the public participation process and for approval by the authorities. Allowance of up to a year for this statutory process is not too far-fetched.

## **2. Background Information to Fish Farming or Aquaculture**

Aquaculture, the cultivation of fish, shellfish and aquatic plants, has enormous potential to expand in Southern Africa. The region's strengths include unpolluted coastlines, productive marine and freshwater resources, a wide climatic range, a large diversity of species available for culture, and a reputation for quality seafood. With its internationally renowned research and technology institutions, effective and efficient transport, manufacture and agriculture infrastructure,

strong management expertise, and stable macro-economic climate, South Africa has enormous potential to be the leader in aquaculture in the region.

## **2. Why Aquaculture?**

There are many reasons to pursue this potential. Aquaculture is the fastest growing food producing industry in the world. It is widely acknowledged that fish supplies from traditional capture fisheries are unlikely to increase substantially in the future, and that aquaculture production will have to increase to help satisfy the growing world demand for fisheries products. According to the United Nations' Food and Agriculture Organization (FAO), 32% of seafood consumed worldwide is already produced through aquaculture. This is projected to rise to 40% by the year 2010.

When considering the general attribution of agriculture and aquaculture organisms it becomes clear that they are more ideal for production than traditionally farmed cattle, poultry or pork due to:

- i) The fact that fish are cold blooded or poikilothermic means they waste less energy on temperature regulation as compared to traditionally farmed cattle, poultry or pork. Feed energy is thus more efficiently channeled into growth.
- ii) Being suspended in water (denser than air) also means that less energy is consumed for maintaining body position as compared to traditionally farmed cattle, poultry or pork.
- iii) Fish effectively utilize low quality protein sources as feed and assimilate these at a more efficient rate than traditionally farmed cattle, poultry, or pork.
- iv) High Fecundity and rapid sexual maturity allows for easy trait selection and improvement of the viability and quality of the end products harvested from aquaculture.
- v) Fish meat is lean, superiorly healthy and in demand.

- vi) Wild caught marine fish stocks have been over-utilized, meaning that fish farming contributes to the conservation of marine fish resources and species diversity.
- vii) Aquaculture is a non-consumptive user of water, which in South Africa is important.
- viii) Production technology for fish farming is readily available.
- ix) Work creation, empowerment and the transfer of skills in fish production is highly achievable.

Aquaculture offers significant economic benefits to producing countries by increasing export income and reducing imports. At the micro-economic level aquaculture creates substantial opportunities for generating strong commercial returns. In addition, aquaculture provides diversity to a country's economic base and creates demand for technology, training, extension services, infrastructure and local goods.

The aquaculture industry is also important from a socio-economic perspective. Aquaculture contributes to food security and poverty alleviation, directly by producing food fish, and indirectly by generating employment and income for the purchase of food. The contribution of aquaculture to employment is even larger if multiplier effects are added. Ninety percent of aquaculture production and processing takes place in rural and coastal communities, providing economic stability and growth where economic development options are often limited.

### **3. Project Location**

The proposed Project, INKOM'ANZI Fish Farming Collaborative will be introduced into the Ukhahlamba, Chris Hani, and Amathole Districts. There are Four sites in the Ukhahlamba district, namely the Holo Hlahatsi dam and three smaller privately owned sites, Rob Farrington, Gary Forster and PG Bison and a smaller hatchery at Tiffindale Ski resort, these sites are situated in the Senqu

local municipality. Three sites have been identified in the Chris Hani District, namely Xonxa Dam, Lubisi Dam and Ncora Dam. Lubisi Dam and Ncora Dam fall under the Intsika Yethu Local Municipality, Xonxa Dam falls under the Emalahleni local municipality. Three sites have been identified in the Amathole District, namely Rooikranse Dam, Beanfield Dam and Upper Beanfield Dam the processing facility and main Hatchery will also be located in this district. Rooikranse Dam is located within the Buffalo City Municipality the hatchery and processing facility will be located at Rooikranse Dam, Beanfield Dam and Upper Beanfield Dam are located in Nkonkobe local municipality

#### **4.1 Target Group and Beneficiaries**

The Senqu local municipality, in the Ukhahlamba District, is over-whelmed with rural and tribal (81.12%) in respect of settlement ***Women's Economic Participation*** is limited, they face higher unemployment levels and rate of growth in unemployment than their male counterparts. However the majority of the population are under the age of 20 years.

In the Chris Hani Intsika the Yethu local municipality is home to high levels of poverty (84.44%) and unemployment (68.37%), coupled with the highest dependency ratio (5.44) in the Province and a very youthful population, with more than half (54.01%) of the population aged under 20 years. ***Women's Economic Participation*** is limited, where women form a considerable majority (54.57%) but face significantly higher unemployment (70.76%) and rate of growth in unemployment (5.64%pa) than their male counterparts. The Emalahleni local municipality has a youthful population, with around half (50.94%) of all residents aged under 20 years, and is also home to a high proportion (7.28%) of people aged over 64 years. The Municipality has higher than Provincial, but lower than District, average rates of unemployment (60.53%) and poverty (73.86%), the ***Women's Economic Participation*** is comparable to the Provincial average. The

ratio of women to men stands at 1.18, but face higher unemployment (66.89%) and rate of growth in unemployment (5.54%pa) than their male counterparts.

In the Amathole District, the Buffalo City Municipality claims lower than Provincial average rates of poverty (54.50%) and unemployment (47.26%), and the lowest dependency ratio (1.60). The BCM reflects a fairly developed age structure, with 37.48% of the population aged under 20 years. **Women's Economic Participation** is moderate, where women are in the majority (51.68%) but face higher unemployment (52.58%) and rate of growth in unemployment (6.66%pa) than men. The Nkonkobe Local municipality claims high rates of unemployment (67.61%) and poverty (71.43%) and a higher than average dependency ratio (2.56). In the District and Provincial context, the representation of people aged under 20 (41.58%) is low and the representation of people over 64 (7.90%) is high. **Women's Economic Participation** is limited, where the ratio of women to men stands at 1.05 face higher unemployment (71.39%) and rate of growth in unemployment (5.83%pa) than their male counterparts.

The High levels of unemployment that prevail in these districts can be related to the level of skills, lack of economic and business knowledge, high level of dependency, and low growth in value creation relative to labour remuneration and employment. These districts are dependent on an extremely high financial grant for Survival.

The Collaborative will target in particular unemployed women and youth, although disabled persons can also be accommodated in some levels in the collaborative. On a provincial level comparative advantage and associated opportunities do exist in the agricultural sector as a result of labour surpluses, but commercializing these activities and enhancing productivity remains a major challenge due to rural residence insecurity and ambiguous arrangements. The Project Implementation Plan developed during the Design phase of the Thina

Sinako LED Programme will give clearly defined criteria on the grounds that the stakeholders will be identified.

#### **4.2 Project Objectives**

The overall objective of the collaborative is Poverty elevation, through sustainable employment. INKOM'ANZI Fish Farming Collaborative and associated partners will establish a provincial collaborative for the fish farmers to consolidate ownership and operational efficiencies of a sustainable aquaculture business. The Collaborative is a flagship Programme in aquaculture enterprise development and support. It will include two central hatchery and processing plants and a provincial network of fish farmers which will be mobilized and developed across the Ukhahlamba, Chris Hani and Amathole districts. The Collaboration will build an institutional capability in the Eastern Cape to support and sustain the initiative by establishing linkages that will facilitate the development and transfer of production technology and essential services such as extension, training, financial, marketing and legal services to ensure effective implementation and sustainability of the fish farmer projects. The skill development and training programme is to support Partnership Groups to upgrade the skills and professional profiles of the target beneficiaries within the aquaculture sector. The hatcheries, provincial network of cages and processing plant, will improve common economic infrastructure that will encourage sustainable economic development and black empowerment. The collaborative will encourage the target beneficiaries to improve their knowledge of market demand and their ability to match supply to demand by improving market access. The specific objective that the action intended to achieve to contribute to the overall objectives is as follows:

- The socio-economic development of rural community from previously disadvantaged background. Aquaculture has the potential to contribute towards the economic empowerment and social development of

disadvantaged rural communities. The expectations of the target group will be met in terms of improvement in skills, nutritional status, per capita income and quality of life.

- Sustainable employment resulting in an improvement of the standards of living in rural communities with regard to the per capita income, the nutritional status and human resource (skills) development. At the micro-economic level aquaculture creates substantial opportunities for generating strong commercial returns. In addition, aquaculture provides diversity to a country's economic base and creates demand for technology, training, extension services, infrastructure and local goods. Ninety percent of aquaculture production and processing takes place in rural and coastal communities, providing economic stability and growth where economic development options are often limited.
- The sustainable supply of affordable high quality animal protein to rural communities. Aquaculture contributes to food security and poverty alleviation, directly by producing fish, and indirectly by generating employment and income for the purchase of food. Fish is an affordable animal protein that is supplemented into one's diet will improve the nutritional status of the individual. Individuals infected with HIV/AIDS will have a healthier life style if their anti-viral drugs are supplemented with a fish diet due to the positive nutritional values of fish.
- The sustainable utilizations of resources such as water, human and infrastructure to the benefit of these communities. A water monitoring programme will be implemented to monitor evidence of any negative impact of aquaculture systems on water quality. Human resource development through the improvement in skills, nutritional status, per capita income and quality of life. Through the sustainable development of economic infrastructure which includes two central hatcheries, provincial network of cages and processing plants, will improve common economic infrastructure that will encourage sustainable economic development and black empowerment.

The expected results of the Cooperative will be to meet the following criteria:

- Development of an effective support model
- Facilitate skills transfer between commercial and emerging farmers
- Improved Agricultural Extension Services
- Improved market access
- Accelerated land redistribution (with effective support)
- Building animal feeds industry
- Improved veld management
- Move to formal land administration in communal areas
- Upgrading access roads/farm logistics

The expected results as mentioned above form part the Competitiveness report (conducted for the Provincial LED Programme).

#### **5. INKOM'ANZI Hatchery & Tiffindall Ski Resort Hatchery**

In commercial aquaculture, eggs are typically produced at brood stock fish hatcheries that are separate from farms used for the production of fish for food or for stocking. The production of good quality, disease-free eggs, is a specialized activity requiring a high degree of skill and management. Optimal temperature for egg fertilization is 10 – 16<sup>0</sup> C. INKOM'ANZI Hatchery in the Amathole District and Tiffindell Ski Resort in the Ukhahlamba District has an optimal temperature profile therefore have been identified for the hatchery sites. Hatchery economic infrastructure is already present at these sites however this infrastructure needs to be upgraded and rehabilitated. INKOM'ANZI Hatchery will supply fingerlings to the Amathole district and Chris Hani District. Tiffindale Ski Resort will supply fingerlings to the Ukhahlamba District.

## **6. Proposed Aquaculture System**

Circular cages will be placed on the existing government and privately owned dams in these districts as follows.

### **Chris Hani District:**

- **Xonxa Dam** - 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.
- **Lubisi Dam** - 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.
- **Ncora Dam** - 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.

### **Ukhahlamba District:**

- **PG Bison Dam** - 1 community based farming unit, expected yield of 6-8 tons in a H frame cage system
- **Rob Farrington** - 1 farm based, farming unit, expected yield of 6-8 tons in a H frame cage system
- **Gary Forster** - 1 farm based, farming unit, expected yield of 6-8 tons in a H frame cage system
- **Holo Hlahatsi Dam** – 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.

### Amathole District:

- **Rooikranse Dam** – 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.
- **Beanfield Dam** – 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.
- **Upper Beanfield Dam** - 1 community based farming unit, expected yield of 25 tons per unit in a circular cage system.

The cages are made of modular sections that will float on the water. The cage design and manufacture action is to improve common economic infrastructure essential to the operation of the Venture. The cage infrastructure is to encourage sustainable economic development and black empowerment within the sector.



**Circular cage system**

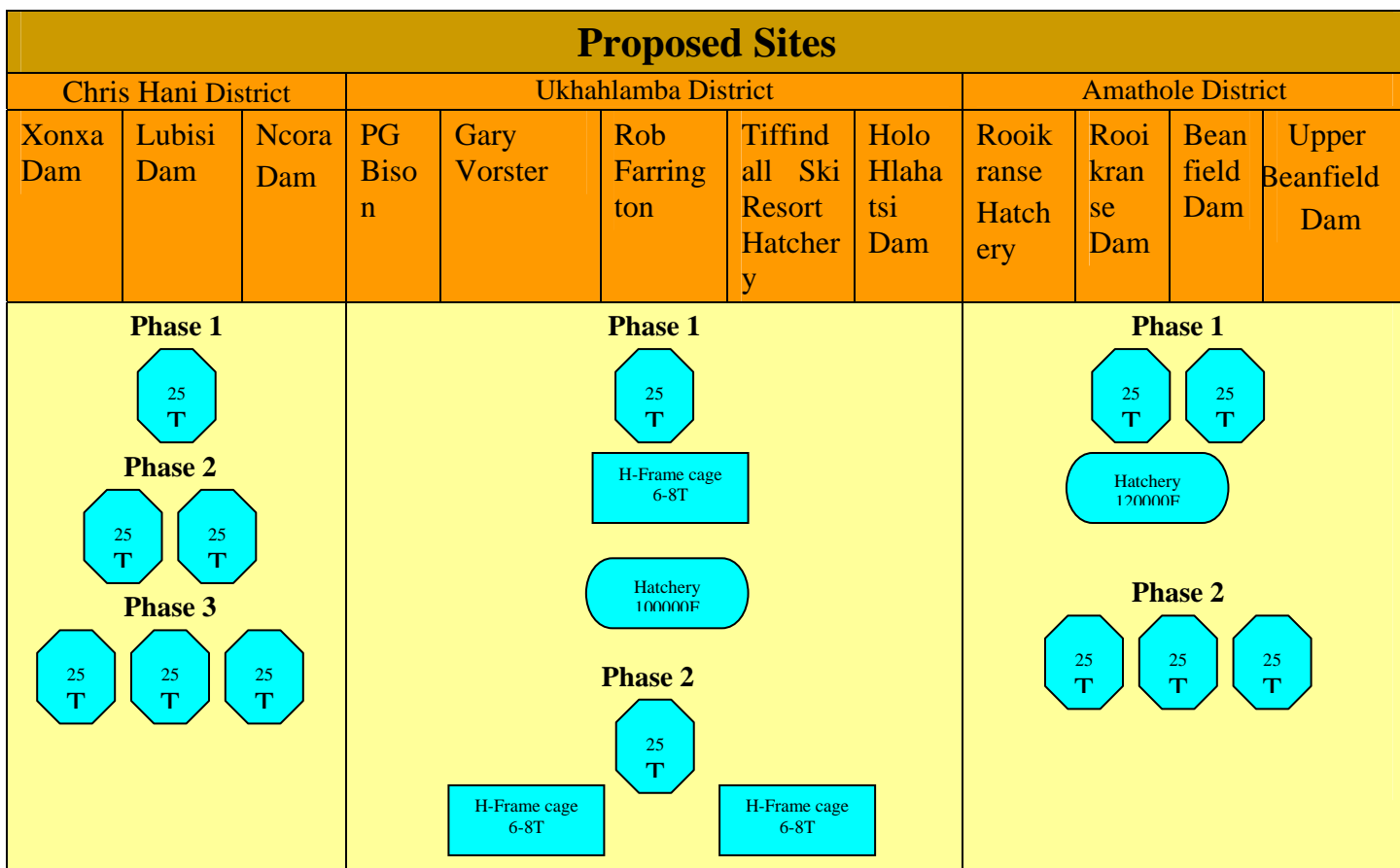
### **7. INKOM'ANZI Processing Plant**

**INKOM'ANZI processing plant** – Amathole district would be the ideal site of a processing plant due to the distribution and network potentials (Airport). During the off seasons when trout is not being processed this district's marine fishing

ports will play a key role in supplying high value marine finfish for processing to ensure sustainability of the processing plant.

**8. Proposed Fish Species and Scale of Production**

The primary species will be Rainbow Trout (*Oncorhynchus mykiss*) with Mozambique Tilapia (*Oreochromis mossambicus*) as a secondary.



The productivity is as follows: 1<sup>st</sup> year 4 x 25 ton projects (total 100 ton), 2<sup>nd</sup> year: 3x 25 ton new projects and 3x projects established in the 1<sup>st</sup> year will upgrade to 50 tons (total 250 ton), 3<sup>rd</sup> year 3x projects established in the 2<sup>nd</sup> year will upgrade to 50 ton production (total 325 ton).

## 9. Trout farming overview



Rainbow Trout (*Onchorhynchus mykiss*)

Trout is one of the most ideal aquaculture species in the world. It is widely distributed, highly productive and can be spawned under captive conditions. It can also be kept in densities of between 25 kg and 40 kg per cubic meter.

The aquaculture potential of the Rainbow trout is immense, and provided that a profitable export market is developed, it will make a significant contribution to freshwater aquaculture in South Africa and in many other parts of the world. Its current potential in South Africa is as a component of both small and large scale fish farming systems and social development programs. Initially introduced into SA for sport fishery purposes in the 1890's, commercial production started in the 1960's and rainbow trout, *Onchorhynchus mykiss*, is currently the most common grown freshwater species in SA.

South Africa produced approximately 1750 tons of trout in 2003, with a farm gate value of R 44 million and a unit value of R 25/kg. The four main areas of production are: Mpumalanga (500 tons, 14 farms), Western Cape (450 tons, 14 farms), Kwa-Zulu Natal (150 tons, 4 farms) and the Eastern Cape (20 tons, 3 farms). There has been a shift in individual producer tonnage as smaller producers have fallen away and larger producers benefit from increased economy of scale within their businesses.

Trout are sold in a variety of forms including whole fish (gilled and gutted), smoked and filleted, as well as live fish for supply of the sport fishery sector. Marketable sizes range from plate-sized (230 g – 450g) fish and upwards. Generally in SA, trout reach a market size of about 1 kg in 18 months.

#### 10. Tilapia Overview



Figure 2. Tilapia, *Oreochromis niloticus*

#### **Background**

The tilapia industry in South Africa is in an introductory phase with widespread interest from several sectors of the local economy as well as from abroad. The main tilapia species (*Oreochromis niloticus*, *O. aureus*, and *O. mossambicus*) are all indigenous to Africa indicating suitable environmental conditions and natural resources.

Various small scale and pilot phase tilapia operations have been initiated in South Africa over the past two years, with production amounting to some 263 tonnes, valued at R 3.8 million in 2003. There are approximately 15 tilapia producers in South Africa of which most (10) are operative in the warmer Northern and Eastern regions of the country. The sector also incorporates a substantial informal component of which the output is difficult to quantify.

Tilapia is marketed as live, fresh, and frozen whole fillets. In ideal grow-out conditions, market-size tilapia can be obtained within 8 – 12 months for 500 + gram fish however 2-3 growth cycles can be obtained within 8 – 12 months for 150 - 250 gram fish.

**Markets**

In Africa, tilapia is mainly produced for informal local markets. There is, however a growing demand for tilapia in international markets. Consumption of tilapia in the USA is growing at 20% annually and has stimulated the development of tilapia production throughout the Americas.

**Competition**

Annual worldwide production of tilapia increased from less than 200 000 tonnes in 1984, to 1.1 million tonnes in 2000. The FAO reports production in 85 countries, with China the leading producer having increased production from 18000 tonnes in 1984 to 550 000 tonnes in 2000. The abundant supply of tilapia from countries like China, Taiwan, Costa Rica, Indonesia, and Thailand may put domestic producers at a long-term disadvantage.

**Services**

The sector can to some extent rely on the service providers supplying other sectors, although the geographical distribution and associated logistics are presenting some problems in this regard.

**Entry Barriers and Risks**

Entry barriers include high capital requirements (especially for recirculation based grow-out), sites, regulatory matters, key technologies and trained personnel. Risks are mainly related to environmental conditions, exchange rates and competition from low cost producers.

**Outlook**

A large potential exists for future development of tilapia aquaculture in the Southern African region, both in terms of subsistence farming systems and as an export commodity. Export markets for tilapia projects provide viable opportunities and various large scale projects in the range of 1000 ton per year are currently being evaluated.

## **11. Project Sustainability**

The successful and sustainable implementation of the collaborative requires the provision of essential services in the form of business development, support and training. A network of support services that include extension, training, financial, marketing, and legal services are required to ensure effective implementation and sustainability of the aquaculture venture.

- **Extension services**

The technical nature of the program and the background (lack of experience and training) of the target group is such that specialized extension and management support services are required to ensure sustainability through the initial phase of the venture. The provision of such a service is to ensure adequate quality standards; reliable logistics/co-ordinations and control over operational risks are maintained.

- **Training**

The technical, educational and skill background of most of the prospective target farmers from historically disadvantaged rural communities are such that compulsory training skill development is required. The skill development and training programme will include:

- An initial 2 week training programme at the Sterkspruit Town Hall
- A quarterly one-day training programme at the Sterkspruit Town Hall.
- Monthly on-farm training under the supervision of the extension officers.

Training will include aspects of technical, financial, business development, market development and cage handling and maintenance. A minimum of 205 persons will receive training within the collaborative.

- **Financial**

Financial administrative services are required for both the Collaborative and the individual farming units. These services include detailed monthly reconciliation and financial analysis as well as audited year-end statements, which will provide valuable information with regards to future expansion of the collaborative. The farmers are to receive training and financial management in order to take over responsibility for financial administration as of the third year of operations.

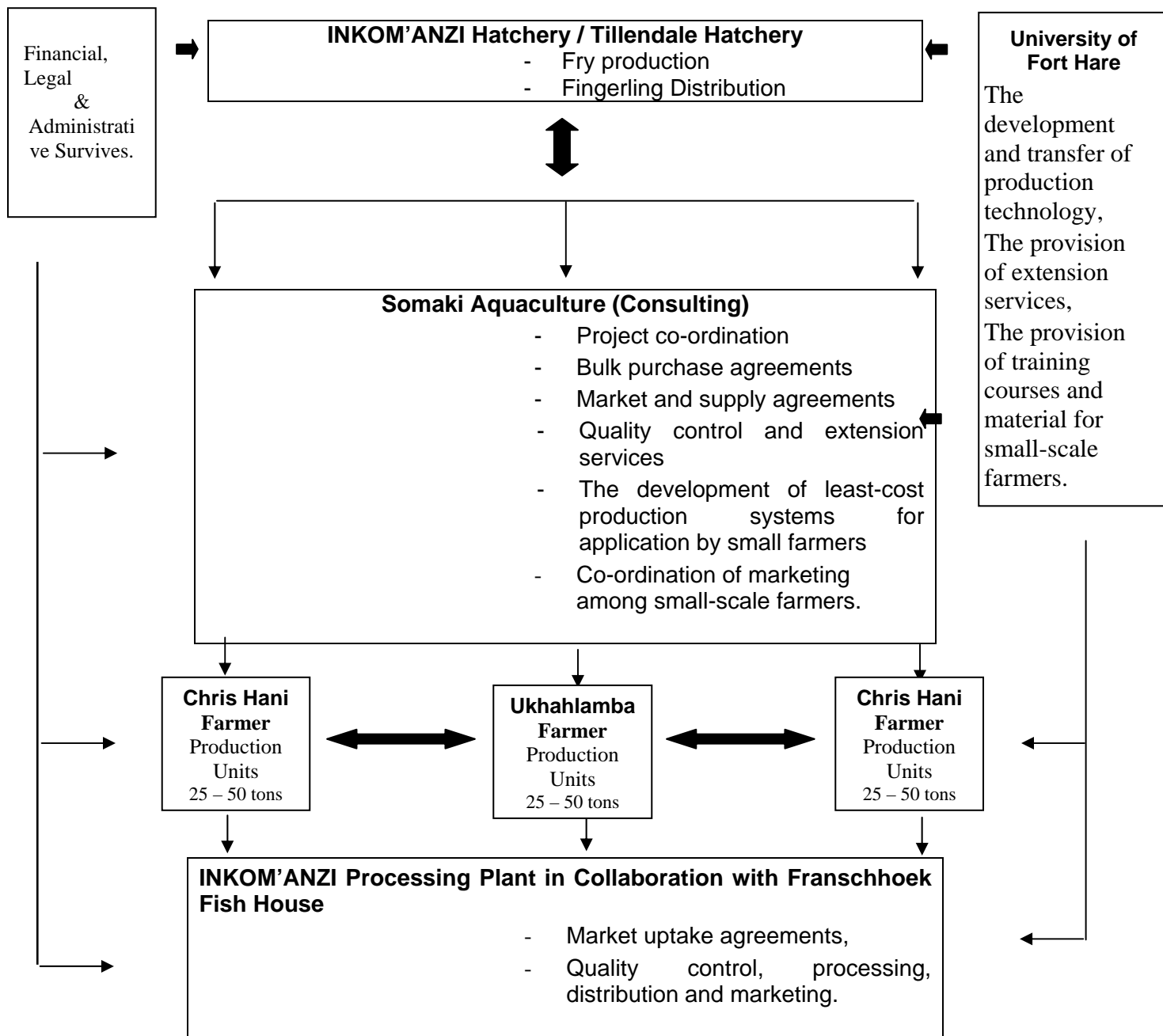
- **Marketing**

INKOM'ANZI Processing Plant will agree on a long term market uptake with the network of farmers. The processing plant will also assist in quality assessment of stock and training of farmers in terms of harvest procedure. Special branding, promotion and marketing campaigns form the network of farmer's products are envisaged.

- **Legal services**

Legal agreements are required to secure the right of the small farmer in terms of consent from the government water supply, financial, loans, registration of companies etc.

**Proposed: Operational Structure of INKOM'ANZI Fish Farm Collaborative and Role-Players**



## **11.2 Project Steering Committee**

A steering committee will be established to monitor and evaluate the activities of the aquaculture project. This committee will comprise of members from the fish farmers, individuals from political structures and forums that represent women and youth, and local authorities.

## **12. Conclusion**

INKOM'ANZI Fish Farming Collaborative will establish a provincial collaborative consisting of a two hatcheries, cages a processing plant, for the fish farmers to consolidate ownership and operational efficiencies of a sustainable aquaculture business

### **Opportunities**

- Job creation, empowerment and social development through the transfer of skills in fish production.
- Hatchery development
- Gender equality
- Potential site development including smokehouse
- Production technology transfer.
- Established support and technical networks
- Development of an effective support model
- Improved market access
- Move to formal land administration in communal areas
- Upgrading access roads/farm logistics
- Established markets with set prices per unit
- The development of economic infrastructure

The Collaboration will build an institutional capability in the Eastern Cape to support and sustain the initiative by the establish linkages that will facilitate the development and transfer of production technology and essential services such as extension, training, financial, marketing and legal services to ensure effective implementation and sustainability of the fish farmer projects.

# **Background Information Document**

## **Background Information Document for INKOM'ANZI Fish Farm Collaborative Scoping Report**

Aquaculture systems are subject to the provision under the Environmental Conservation Act (Act 73 of 1989) Article 21 that lists certain activities as potentially detrimental to the environment.

Regulation 1183 Article 3 stipulates that: The concentration of livestock, aquatic organisms, poultry and game in a confined structure for the purposes of mass commercial production, including aquaculture and mariculture. Regulation 1183 stipulates the prerequisites must be followed to obtain approval for development and must include an environmental assessment of the impact of the venture.

According to these regulations, a public participation process must be followed and all major possible influences on the environment and population must be identified. Approval for the production unit must be obtained from the Environmental Conservation authorities. The EIA involves a three way assent which includes:

**Screening** – involves basic information gathering and project orientation so that enough detail can be forwarded to the authorizing bodies (Water Affairs, Environment and Tourism, Municipalities etc) for an informed decision to be taken on the potential environmental (biophysical and social) effects of the proposed aquaculture projects.

**Scoping** – will involve further determination of environmental issues that are at stake in the proposed projects and would include tools such as public participation, authority's meetings and investigation of alternative approaches (locations or methods) that may pose a lower environmental risk.

**Environmental Impact Assessment (EIA)** – EIAs will be conducted in terms of the National Water Act (1998), water regulations and environmental laws. The EIAs will be required when the aspects that are identified in the scoping study are deemed to have a high potential environmental impact, needing full investigation towards appropriate mitigation.

By introducing this project to authorities and interest groups Pisces Aquaculture aim to achieve the following:

- To familiarize the authorities and interest groups with the project.
- To gain support for the project and the social-economic soundness and benefits.
- To introduce the insignificant environmental impacts of the proposed project.
- To gain comments and inputs so that these can assist with the approval process.
- To promote co-operative governance around the decision making and relevant legislation.

The following Authorities will be approached to provide inputs and comments on the project.

- The local municipalities of the respective Dam Sites:
  - **Chris Hani District:** Lubisi Dam and Ncora Dam - Intsika Yethu Local Municipality. Xonxa - Emalahleni local municipality
  - **Amathole District** Rooikranse - Buffalo City Municipality. Beanfield Dam and Upper Beanfield Dam - Nkonkobe local municipality
  - **Ukhahlamba District** Rob Farrington, Gary Forster and PG Bison Holo Hlahatsi - Senqu local municipality
- The Eastern Cape Nature Conservation Board
- The Department of Water and Forestry

- The Department of Agriculture and Economic Affairs

This report is to inform the authorities about the intention behind the INKOM'ANZI Fish Farming Collaborative, to establish cage aquaculture within the Chris Hani, Ukhahlamba and Amathole districts. The productivity is as follows: 1<sup>st</sup> year 4 x 25 ton projects (total 100 ton), 2<sup>nd</sup> year: 3 x 25 ton new projects and 3 x projects established in the 1<sup>st</sup> year will upgrade to 50 tons (total 274 ton), 3<sup>rd</sup> year 3 x projects established in the 2<sup>nd</sup> year will upgrade to 50 ton production (total 349 ton). During the Design Phase of the Thina Sinako LED programme a complete EIA will be introduced, this study can be viewed as a preliminary Scoping Report. At this stage the community at large have not been informed about the project, however public participation process will conclude the EIA.

## **2. Project location**

- **Chris Hani District:** Lubisi Dam, Xonxa Dam and Ncora Dam.
- **Amathole District** Rooikranse, Beanfield Dam and Upper Beanfield Dam
- **Ukhahlamba District** Rob Farrington, Gary Forster, PG Bison and Holo Hlahatsi.

## **3. Synopsis of the Project**

### **Service Support**

Somaki Aquaculture and University of Fort Hare will provide technical consultation on the design and operations of the production facilities. Furthermore they will provide services such as training, extension services, development and the transfer of production technologies. Financial and administrative services will be provided by appointed designed partners of INKOM'ANZI Fish Farming Collaborative.

### **Cage Structure**

The circular cage structure above have an approximate surface area of 176,786 square meters. The related production volume depends on the effective depth of the net as depicted in the following table:

Effective Depth (meters)	Effective Depth (meters)	Volumetric Cost (R per cubic meter, excl. VAT)
5 meters	883.93	R 143.57
6 meters	1060.72	R 119.64
7 meters	1237.50	R 102.55
8 meters	1414.29	R 89.73

Somaki Aquaculture have found the 15-meter circular HDPE cage to be well suited and economically viable to most small to medium scale cage aquaculture operations.

### **Fish Supply**

Rainbow trout (as fingerlings) will be provided from INKOM'ANZI Hatchery (Chris Hani & Amathole District) and Tiffindale Hatchery (Ukhahlamba District) and introduced into the cages at a size ranging from 50 – 200g. These fish will be harvested 6-8 months later in a size ranging from 1-1.5 kg. During the production season the fish will be fed on extruded pellet diets. Once harvested the fish will be transported off the site to be slaughtered and processed at the INKOM'ANZI Processing Plant which is in the Amathole district.

### **Processing**

INKOM'ANZI Processing Plant in Joint Venture with Franschoek Fish House will provide the essential services of processing, quality control, distribution and marketing. The processing Plant will be located in the Amathole District.

Additional information that is relevant to the project can be categorised as follows.

- Construction

The project requires the construction of a hatchery, cages, processing plant, administration offices and store rooms. The store rooms are for the storage of fish feed and are located at each site. The administrative offices should be located at the Hatchery and Processing Plant which will be at Rooikranse Dam in the Amathole District.

- Production Species

The primary species will be Rainbow Trout (*Oncorhynchus mykiss*) with Mozambique Tilapia (*Oreochromis mossambicus*) as a secondary species. Transport of the fingerlings will be under the auspices of the required provincial permits (Eastern Cape Conservation Board).

- Water Management

Water quality is of primary importance to the health and sustainability of aquaculture operations. Baseline information should be evaluated in relation to predicted changes resulting from the proposed aquaculture facility or other inputs to the receiving waters.

- Dissolved oxygen (DO) is the most important chemical parameter influencing fish productivity. In general, for Salmonids, DO levels should be above 5 ppm;
- Seasonal temperatures (water and air). Temperature affects activity levels, feeding, growth, and reproduction;
- The normal pH range is between pH 6.5 and 9.0. When the pH is outside the desirable range, fish growth will be slowed, reproduction reduced, and susceptibility to disease increased;

- High levels of suspended solids can decrease water clarity and impair invertebrate and vertebrate feeding. The proponent should ensure that applicable guidelines or objectives for turbidity and suspended solids can be met (e.g. Ontario's Provincial Water Quality Objectives require there not be a change in secchi disc readings of greater than 10%);
- Phosphorus is one of the most important nutrients in freshwater systems. Excessive nutrient releases can lead to hyper-nutrication (increase in dissolved nutrient concentration) and/or eutrophication (increase in primary production). This can contribute to the proliferation of phytoplankton blooms and subsequent die-offs that lead to depletion of DO.

Water quality maintenance will depend on keeping within the assimilative capabilities for nutrients in the production dam, the use of high quality feeds and careful feed management.

### **Scale of Production**

The productivity of is as follows: 1<sup>st</sup> year 4 x 25 ton projects (total 100 ton), 2<sup>nd</sup> year: 3 x 25 ton new projects and 3 x projects established in the 1<sup>st</sup> year will upgrade to 50 tons (total 274 ton), 3<sup>rd</sup> year 3 x projects established in the 2<sup>nd</sup> year will upgrade to 50 ton production (total 349 ton).

### **Feeding and Feed Management**

Extruded, high quality feeds, which are specially formulated for the relevant species, will be used in the project. A carefully designed feeding programme will be implemented to maximise growth, minimise feed cost and ensure environmental protection.

### **Fish Growth**

Fish growth rates depend on the species, its housing conditions, feeds, feeding rates and the production management efficiency. On average, Trout in the

collaborative will grow from 200g to a size of 1.5kg in a single production cycle. Starting from April and May and ending in November of the same year. Tilapia will grow from 150g to 800g in a production season, starting from December and ending in April of the same year.

### **Harvest Techniques**

The fish are harvested by means of lifting the cages and removing the crop.

### **Raw Product Processing (Slaughter)**

No slaughtering or processing will take place on site as all harvested fish will be transported to a suitable processing facility away from the farm.

## **4. Infrastructure Requirements**

The infrastructure requirements for the project will be the development of 2 x hatcheries (Smaller hatchery – Tiffindale (Ukhahlamba District) , Main hatchery - INKOM'ANZI hatchery (Amathole district), Cages, Processing Plant (Amathole District), administration offices and Storage facilities.

- **Hatcheries**

Tiffindale in the Ukhahlamba District will host the smaller of the two hatcheries found in the Collaborative. The main hatchery INKOM'ANZI hatchery in the Amathole Districts is located at the Rooikranse Dam.

- **Cages**

### **Chris Hani District:**

- **Xonxa Dam** - 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.

- **Lubisi Dam** - 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.
- **Ncora Dam** - 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.

#### **Ukhahlamba District:**

- **PG Bison Dam** - 1 community based farming unit, expected yield of 6-8 tons in a H frame cage system
- **Rob Farrington** - 1 farm based, farming unit, expected yield of 6-8 tons in a H frame cage system
- **Gary Forster** - 1 farm based, farming unit, expected yield of 6-8 tons in a H frame cage system
- **Holo Hlahatsi Dam** – 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.

#### **Amathole District:**

- **Rooikranse Dam** – 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.
- **Beanfield Dam** – 1 to 2 community based farming units, expected yield of 25 tons per unit in a circular cage system.
- **Upper Beanfield Dam** - 1 community based farming unit, expected yield of 25 tons per unit in a circular cage system.

- **Processing Plant**

INKOM'ANZI Processing Plant – Amathole district would be the ideal site of a processing plant due to the distribution and network potentials (Airport).

- **Administrative Offices**

The project administrative offices should be located near the hatchery and processing plant at Rooikranse Dam in the Amathole, to the technical and administrative requirements that these two facilities require.

- **Storage Facilities**

The store rooms are for the storage of fish feed and are located at each site within the District.

- **Ablution facilities**

The employees will make use of the existing ablution facilities in their respective communities.

- **Roads and Access**

No additional roads are required, however, road rehabilitation may be required at certain sites. Access to all the sites are via gravel roads.

- **Electricity supply**

No electricity is required at the Dam site (cages), however electricity is required for the processing and Hatchery site. Rooikranse has this existing infrastructure, but may need to be modified to suit the requirements of the site.

- **General Waste Removal**

General waste will consist of items such as feed bags and waste generated by the staff. This waste will be bagged and removed via integration with the existing waste removal system.

Fish mortalities in the cages are minimal. Nevertheless, any dead fish will be collected, treated with lime and buried in a hygienic process.

## 5. **The Receiving Environment – What are the impacts?**

Certain aspects of the receiving environment are examined below.

- **Water Quality Matters**

- water temperature: 12°C to 21°C, Optimum temp for feed metabolism 18°C
- water temperature range for the egg hatching: 3.9°C to 14.4°C
- optimal temperature for growth: 16°C to 18°C
- salinity: 0 to 12 ppt, 0 to 2,5 ppt is optimal
- oxygen: near saturation
- desiccation: minimum resistance
- pH: 6.5-8.5
- turbidity: wide tolerances
- un-ionised ammonia: 96 h LC50 (for a sub-adult fish) = 6,5 mg/l :  
96 h LC50 (larvae and juveniles) = 2,3 mg/l
- sibling densities:

Water quality tests need to be conducted by the designed extension officers to detect changes in the water quality caused by the fish production.

Recent improvements in the feed have contributed greatly to the maintenance of water quality. Lower feed convergence Rates (FCR) mean that the fish eats less to attain a harvest weight and less pollution metabolites are produced.

- **Security against Fish Escapes**

Through grading and harvesting processes the escape of a few fish from the cages is inevitable. This will add no additional impact on the environment, as the escaped fish will integrate with the existing population of trout and tilapia in the catchment areas.

- **Fish Predators**

Fish predators (especially otters and birds) are often problematic in such production facilities. A coarse otter net (around the cage unit) will be used to keep otters from reaching the main cage and the fish. This method is effective and does not injure the animal in any way. Under no circumstances will otters be shot, trapped, poisoned, killed or injured in any way.

The coarse outer net is also effective against birds such as cormorants. These outer net does not trap or injure such birds in any way. The cages are also covered with bird netting to prevent them from entering the unit. Under no circumstances will birds be shot, trapped, poisoned, killed or injured in any way.

- **Fish disease**

For optimal operations of the collaborative it is in the interest of the proponent to monitor fish disease in the population. Fish disease is an unseen threat in any

production system, and only because of its potential impact on production activities, but also to the threat it poses in infecting existing fish populations. Three key factors that influence the threat that disease will pose on the surrounding environment and fish communities in the collaborative.

- Generally trout and tilapia are hardy fish and not susceptible to many diseases
- Due to the use of species that already occur in the area, the surrounding environment would have been exposed to the normal suite of pathogens that characterise, and have evolved, with the species.
- A disease- monitoring program will form part of the management of the project.

A qualified fish pathologist will conduct routine scanning for fish diseases at least twice a year.

None of the known fish diseases for these species have any effect on humans and other agriculture activities.

### **Other Biological and Biophysical Aspects**

Due to the controlled nature of the collaborative the impacts on other and or regional ecological issues will be insignificant. The surrounding land is being utilised for agriculture, and the proposed project will not affect this land use in any way. No other significant ecological impacts can be envisaged.

### **6. Beneficiaries – Social and Economic Impacts**

Trout being a product of high value in the food market, will add to the agricultural economy of the area. No negative and social or economic impacts could be identified for the collaborative.

Overall the project will have positive social impact in the environment (direct and indirect) and project ownership will be created, skill will be transferred, an addition will be made to the local agricultural economy and agribusiness and facilities will be established that can serve as a stimulus for further aquaculture developments in the Eastern Cape.

## **7. Comments on the Project**

This document has provided the requirements for all the recipients to formulate their own independent opinion about the proposed project. Any opinions, comments or concerns can be directed to the contact details below.

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## **8. Conclusion**

The aim of this document is to inform the Authorities with the intention behind INKOM'ANZI Fish Farming Collaborative to establish a provincial collaborative consisting of a two hatcheries, cages and a processing plant, for the fish farmers to consolidate ownership and operational efficiencies of a sustainable aquaculture business. This document is the preliminary work (Scoping document) to the EIA which will be conducted during the design phase of the Thina Sinako LED programme.

# Budget structure

## INKOM'ANZI Fish Farming Collaborative

Table 1: Projected budget of a Farming unit, base on an annual production of 25 tons (Phase 1, year1) and 50 tons (Phase 2, year2).

	Year 1	Year 2	Year 3	Year 4	Year 5
<b>INFLOWS</b>					
Sales	625000	1250000	1250000	1250000	1250000
<b>Total (Cage Unit Sales)</b>	<b>625000</b>	<b>1250000</b>	<b>1250000</b>	<b>1250000</b>	<b>1250000</b>
Sales	900000	1800000	1800000	1800000	1800000
<b>Total (Processing Unit Sales)</b>	<b>900000</b>	<b>1800000</b>	<b>1800000</b>	<b>1800000</b>	<b>1800000</b>
<b>Total sales</b>	<b>1525000</b>	<b>3050000</b>	<b>3050000</b>	<b>3050000</b>	<b>3050000</b>
<b>OUTFLOWS</b>					
<b>Operating</b>					
Fingerling*	120000	240000	240000	240000	240000
Wages & Salaries	30000	30000	30000	30000	30000
Fish Food (R6650 per ton; FCR of 1.5:1)	249375	498750	498750	498750	498750
Maintenance	1000	1000	1000	1000	1000
Interest	0	0	0	0	0
Administration	8000	8000	8000	8000	8000
Transport & Fuel	20000	30000	30000	30000	30000
<b>Total</b>	<b>428375</b>	<b>807750</b>	<b>807750</b>	<b>807750</b>	<b>807750</b>
<b>Capital</b>					
INKOM'ANZI Processing plant	500000				
Hatchery	200000				
Cage culture units (1 unit)	75000	75000			
Store room (Wendy house)	10000				
Nets, Ropes	40000	40000			
Welding & Labour	14000	14000			
Other Equipment (scale, buckets, etc.)	12000	12000	8000	8000	8000
<b>Total</b>	<b>851000</b>	<b>141000</b>	<b>8000</b>	<b>8000</b>	<b>8000</b>
<b>NET BEFORE FINANCING</b>	245625	2101250	2234250	2234250	2234250
<b>Cumulative</b>	<b>245625</b>	<b>2346875</b>	<b>4581125</b>	<b>6815375</b>	<b>9049625</b>

Fingerlings\* Phase 1: n=25000 avg=200g, total=5000kg at R24.00/kg  
Phase 2: n=50000 avg=200g, total=10000kg at R24.00/kg

<sup>1</sup> Total (Cage Unit Sales) Phase 1 (Year 1) 25000kg at R25/Kg  
Phase 2 (Year 2+) 50000kg at R25/Kg

2 Total (Processed Unit Sales) Phase 1 (Year 1) 25000kg only utilize 30% therefore 7500 at R120/Km. Phase 2 (Year 2+) 50000kg only utilize 30% therefore 15000 at R120/Km.

The venture is however reliant on financial, administrative and technical support  
The costs of the financial, administrative and associated cost for training and extension services are reflected in the budget 2. #

### Gross Profit Percentages over - Five Years

Cages		Processing Plant		Over - All	
Sale	5625000	Sales	8100000	Sales	13725000
Less Cost of Sales	1080000	Less Cost of Sales	5625000	Less Cost of Sales	1080000
Transport	140000	Transport	140000	Transport	140000
<b>GP%</b>	<b>78.3%</b>	<b>GP%</b>	<b>41.5%</b>	<b>GP%</b>	<b>91.1%</b>

$$\frac{\text{Gross Profit}}{\text{Sale}} \times \frac{100}{1}$$

### Budget 2: budgetary Requirement for the Provision of Essential support Services

	Year1	Year2	Year3	Year4	Year5	Total
<b>Business Development</b>						
Capital Cost	851000	141000	8000	8000	8000	1016000
Operating Cost	428375	807750	807750	807750	807750	3659375
	1279375	948750	815750	815750	815750	4675375
<b>Business training</b>						
Training and skill transfer						
Course fee (R1000/person)	15000	20000	20000	20000	20000	95000
Course material (R600/person)	9000	12000	0	0	0	21000
Office administration (Telephone, fax etc)	15000	15000	15000	15000	15000	75000
	39000	47000	35000	35000	35000	191000
						0
<b>Business Support</b>						0
Marketing						0
Promotions and Branding	100000	100000	100000	100000	100000	500000
Financial and Legal Services						

Monthly admin services R2500/month	30000	30000	30000	30000	30000	150000
						0
Extension Services						0
Salaries Management Staff	300000	300000	300000	300000	300000	1500000
Vehicles (Project and Technical managers)	250000					250000
Transport (4000km per month at R2.9/km)	11600	11600	11600	11600	11600	58000
	691600	441600	441600	441600	441600	2458000
	Year 1	Year 2	Year 3	Year 4	Year 5	
<b>Total</b>	<b>2009975</b>	<b>1437350</b>	<b>1292350</b>	<b>1292350</b>	<b>1292350</b>	<b>7324375</b>

### In conclusion

<b>Total sales</b>	<b>1525000</b>	<b>3050000</b>	<b>3050000</b>	<b>3050000</b>	<b>3050000</b>
<b>Total Expense</b>	<b>2009975</b>	<b>1437350</b>	<b>1292350</b>	<b>1292350</b>	<b>1292350</b>
<b>NET BEFORE FINANCING</b>	<b>-484975</b>	<b>1612650</b>	<b>1757650</b>	<b>1757650</b>	<b>1757650</b>
<b>Cumulative</b>	<b>-484975</b>	<b>1127675</b>	<b>2885325</b>	<b>4642975</b>	<b>6400625</b>

The single farming unit becomes profitable at the end of the 2<sup>nd</sup> season.

Table 3: Projected budget of INKOM'ANZI Fish Farming Collaborative, base on an production of 100 tons (year1), 250 tons (year 2) and 325 tons (year2).

	Year 1	Year 2	Year 3	Year 4	Year 5
<b>INFLOWS</b>					
Sales	2500000	6250000	8125000	8125000	8125000
<b>Total (Cage Unit Sale)</b>	<b>2500000</b>	<b>6250000</b>	<b>8125000</b>	<b>8125000</b>	<b>8125000</b>
Sales	3600000	9000000	11520000	11520000	11520000
<b>Total (Processing Unit Sales)</b>	<b>3600000</b>	<b>9000000</b>	<b>11520000</b>	<b>11520000</b>	<b>11520000</b>
<b>Total sales</b>	<b>6100000</b>	<b>15250000</b>	<b>19645000</b>	<b>19645000</b>	<b>19645000</b>
<b>OUTFLOWS</b>					
<b>Operating</b>					
Fingerling*	480000	1200000	1560000	1560000	1560000
Wages & Salaries	120000	210000	210000	210000	210000
Fish Food (R6650 per ton; FCR of 1.5:1)	997500	2493750	3241875	3241875	3241875
Maintenance	7000	7000	7000	7000	7000
Interest	0	0	0	0	0
Administration	56000	56000	56000	56000	56000
Transport & Fuel	80000	170000	200000	200000	200000
<b>Total</b>	<b>1740500</b>	<b>4136750</b>	<b>5274875</b>	<b>5274875</b>	<b>5274875</b>

<b>Capital</b>					
INKOM' ANZI Processing plant	3500000				
Hatchery	1400000				
Cage culture units	300000	450000	225000		
Store room	200000	150000			
Nets, Ropes	160000	240000	120000		
Welding & Labour	56000	84000	42000		
Other Equipment (scale, buckets, etc.)	48000	72000	36000	56000	56000
<b>Total</b>	<b>5664000</b>	<b>996000</b>	<b>423000</b>	<b>56000</b>	<b>56000</b>
<b>NET BEFORE FINANCING</b>	-1304500	10117250	13947125	14314125	14314125
<b>Cumulative</b>	<b>-1304500</b>	<b>8812750</b>	<b>22759875</b>	<b>37074000</b>	<b>51388125</b>

Fingerlings\* Year1: n=100000 avg=200g, total=20000kg at R24.00/kg  
Year2: n=250000 avg=200g, total=50000kg at R24.00/kg  
Year3<sup>+</sup>: n=325000 avg=200g, total=65000kg at R24.00/kg

<sup>1</sup> Total (Cage Unit Sales) Year 1 100000kg at R25/Kg  
Year 2 250000kg at R25/Kg  
Year 3<sup>+</sup> 325000kg at R25/Kg

Total (Processed Unit Sales) Year 1 n=100000kg only utilize 30% therefore 30000kg at R120/Km. Year 2 n=250000kg only utilize 30% therefore 75000kg at R120/Km. Year 3<sup>+</sup> n=325000kg only utilize 30% therefore 97500kg at R120/Km.

### Gross Profit Percentages over - Five Years

Cages		Processing Plant		Over - All	
<b>Sale</b>	<b>33125000</b>	<b>Sales</b>	<b>47160000</b>	<b>Sales</b>	<b>80285000</b>
<b>Less Cost of Sales</b>	<b>6360000</b>	<b>Less Cost of Sales</b>	<b>33125000</b>	<b>Less Cost of Sales</b>	<b>6360000</b>
<b>Transport</b>	<b>850000</b>	<b>Transport</b>	<b>850000</b>	<b>Transport</b>	<b>850000</b>
<b>GP%</b>	<b>78.2%</b>	<b>GP%</b>	<b>27.9%</b>	<b>GP%</b>	<b>91%</b>

$$\frac{\text{Gross Profit}}{\text{Sale}} \times \frac{100}{1}$$

The costs of the financial, administrative and associated cost for training and extension services are reflected in the budget 4.

## Budget 4: budgetary Requirement for the Provision of Essential support Services

	Year1	Year2	Year3	Year4	Year5	Total
<b>Business Development</b>						
Capital Cost	5664000	996000	423000	56000	56000	7195000
Operating Cost	1740500	4136750	5274875	5274875	5274875	21701875
	7404500	5132750	5697875	5330875	5330875	28896875
<b>Business training</b>						
Training and skill transfer						
Course fee (R1000/person)	104000	190000	205000	205000	205000	909000
Course material (R600/person)	62400	51600	24000	24000	24000	186000
Office administration (Telephone, fax etc)	60000	105000	105000	105000	105000	480000
	226400	346600	334000	334000	334000	1575000
						0
<b>Business Support</b>						0
Marketing						0
Promotions and Branding	400000	700000	700000	700000	700000	3200000
Financial and Legal Services						
Monthly admin services R2500/month	120000	210000	210000	210000	210000	960000
						0
Extension Services						0
Salaries Management Staff	1200000	2100000	2100000	2100000	2100000	9600000
Vehicles (Project and Technical managers)	1000000	750000				1750000
Transport (4000km per month at R2.9/km)	46400	81200	81200	81200	81200	371200
	2766400	3841200	3091200	3091200	3091200	15881200
	Year 1	Year 2	Year 3	Year 4	Year 5	
<b>Total</b>	<b>10397300</b>	<b>9320550</b>	<b>9123075</b>	<b>8756075</b>	<b>8756075</b>	<b>46353075</b>

### In conclusion

<b>Total sales</b>	<b>6100000</b>	<b>15250000</b>	<b>19645000</b>	<b>19645000</b>	<b>19645000</b>
<b>Total Expense</b>	<b>10397300</b>	<b>9320550</b>	<b>9123075</b>	<b>8756075</b>	<b>8756075</b>
<b>NET BEFORE FINANCING</b>	<b>-4297300</b>	<b>5929450</b>	<b>10521925</b>	<b>10888925</b>	<b>10888925</b>
<b>Cumulative</b>	<b>-4297300</b>	<b>1632150</b>	<b>12154075</b>	<b>23043000</b>	<b>33931925</b>

The Collaborative becomes profitable at the end of the 2<sup>nd</sup> season.