UNITED NATIONS UNIVERSITY
Fisheries Training Programme

unuftp.is Final Project 2012

A FRESHWATER AQUACULTURE DEMONSTRATIONS AND TRAINING CENTRE IN CHOKWE, MOZAMBIQUE: A BUSINESS PLAN

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ABSTRACT

The aim of this study was to write a business plan for the operations for a Freshwater Aquaculture Demonstration and Training Centre that will be built in the Chokwe district in Mozambique. This will provide managers of the centre, donor organisations and possible investors with a tool to determine the profitability of the investment, its operational feasibility and to monitor the centre's performance. The study anticipates the operational needs of the centre, the basic operating requirements, its marketing possibilities and the possibility of further cooperation with donor organizations. Only the feasibility of the aquaculture operations is considered in the study but neither the training courses nor the research lab operations. The data used was based on values and estimates from Mozambique or deduced from information from similar operations in other countries. In order to achieve the study objectives a profitability model was built to analyse the data. Two scenarios were considered, model A where the profitability of the operations was assessed over 10 years of operations, and model B, where the operations were assessed over the same period but a three year donor financed subsidy of fingerlings was assumed. The result obtained from the profitability assessment of the business models shows thatit is possible to make the operations of the centre economically sustainable, reduce inadequate return on the investment and can help the leading institutions better assess the viability of future aquaculture projects.

This paper should be cited as:
Quim, J. R. 2013. *A freshwater aquaculture demonstrations and training cetre in Chokwe, Mozambique: A buisness plan*. United Nations University Fisheries Training Programme, Iceland [final project].
http://www.unuftp.is/static/fellows/document/quim12prf.pdf

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1 INTRODUCTION

Mozambique is situated on the east coast of Africa between latitude, 10°27´S and 26°52´S has a coastline that extends for 2,700 km along the south east of Africa and the surface area is 799,380 km2 (Figure 1). The Mozambican maritime coast area is divided into three distinct sections in which fishing activities are also different. In land there are important bodies of water and about 25 large, permanently flowing rivers, a number of coastal and inland lakes and flood plains, which provide fish for the local population during a great deal of the year (Ministry of Fisheries, 2009). The bordering countries are Tanzania, Malawi, Zambia, Zimbabwe, South Africa and Swaziland. In 2009 It was estimated that the population are about 23.9 million and more than 70% of the population reside in rural areas where they practice subsistence agriculture and are considered to be below the poverty line (IHDI, 2011).

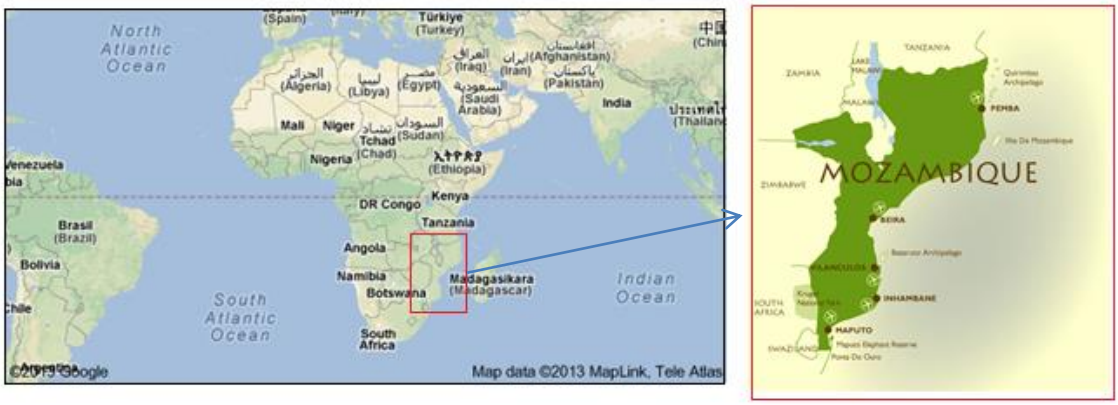

Figure 1: Map of Mozambique (Resource: Imagine Africa, n.d.).

In 2009 the fisheries sector contributed at least 3% to Mozambique's GDP. The country's marine catch was around 130,000 tonnes, of which about 91% come from artisanal fishing, 2% from semi-industrial and 7% from industrial fishing. However, in terms of value, the industrial catch, consisting almost exclusively of crustaceans and high value demersal fish species intended for export, represented slightly more than half the total value (about 52%) and artisanal fishing not more than 42%, with the remaining 6% coming from semi-industrial fishing. There are no estimates for the inland catches (Ministry of Fisheries, 2009)

Aquatic resources are important to the economy, food and nutritional security, employment generation and earnings of foreign exchange. In 2000, the government decided to separate the Ministry of Fisheries (MOF) from the Ministry of Agriculture and Rural Development (MOARD) (Omar *et al.*, 2005).

In 2009, the average fish consumption per capita in Mozambique was estimated in 5.0 kg/year (FAO, 2011). However, it was much higher among the coastal communities and estimated in 2007 to be at 10-12kg/person/year (FID/CP/MOZ, 2007). Demand in fish products is higher than the domestic supply.

The Fisheries administration system consists of three integrated sub-systems; 1. Policy making (Ministry of Fisheries -MOF); 2. Fisheries management (Fisheries Research Institute –IIP National Administration of Fisheries –ADNAP and National Institute of Fisheries Inspection-INIP) and 3. Promotion of development (Institute of Promotion of Small Scale Fisheries-IDPPE, National Institute for aquaculture Development - INAQUA, Fisheries Schoo-EP and Promotion Fisheries Fund FFP). The Fisheries administration has a local presence, in prov-

inces and districts. Despite the creation of a separate Ministry of Fisheries, subsistence small-scale freshwater fish farming is under the promotion and assistance of the provincial agriculture departments (MOF, 2009).

The Government of Mozambique places high priority on poverty alleviation through implementation of a number of policies and programmes. Such policies as fisheries policy, fisheries master plan and the fisheries development plan envision the creation of favourable environment for investment in marine aquaculture, promotion of freshwater fish culture development initiatives in the country's inland zones and regulation of the general conditions where the fresh water aquaculture activity may be developed (INAQUA, 2008).

In 2005 Omar *et al.* 2008 estimated 258,000 ha suitable for inland aquaculture and 33,000 ha for marine aquaculture in Mozambique. Less than 10% of this potential is exploited. As in 2005 there are still many opportunities to advance a rapid development of freshwater aquaculture. However, this work can only be undertaken when the existing key constraints are successfully addressed. Most crucial constraints are the lack of research support, infrastructure, the lack of good quality seed and the absence of good quality brood stock and fish feed.

The site in Chokwe (200km north from Maputo) has been identified as suitable place for a Freshwater Aquaculture Demonstration and Training Centre with good water supply through out the year and water does not heve to be pumped. The site is about 9.5ha, sufficient for the main facilitiese.g. office building, laboratories, hatcheries, library, classrooms, brood stock & rearing ponds, water supply & drainage system and road system (Nguyen and Dinh, 2009). The Norwegian/Icelandic developmental programme has already agreed to finance the infrastructure (ICEIDA, 2012).

According to the developmental objectives of the project proposal (Nguyen and Dinh, 2009) the centre will specially be designed for;

Quality Seed Production

Taken from the draft of establishment of Freshwater Aquaculture Demonstration and Training Center

- To maintain the qualified brood stock of grass carp; common carp and tilapia at the centre in order to produce the good quality fry and fingerlings to supply the seed for aquaculture demonstration centre and over the country.

- To produce (1million fingerlings per year of each species of grass carp, common carp and tilapia); for formulation of aquaculture models at the Centre and small-scale aquaculture trials of the provinces where the potential can be exploited;

Training capacity

- Annually organize 2-3 training courses for farmers (20-30 farmers/a training course) during 7-10 days in nursery and grow-out techniques.

- Annually organize about 1-2 training courses for 1-2 months to the district and provincial technicians in seed production and aquaculture management.

- Develop the research and training capacity to organize the vocational training programs in the near future.

Research capacity

- To implement the National programs on genetic improvement for important fish species;
- To carry out the collaborative research program with other institutions in the country and oversees countries in the aquaculture field;
- To organize the international conference for technological and informative exchange
- To develop the suitable aquaculture technologies applied for the country through the pilots and farming demonstration.

Strategic development for aquaculture

- To help the Government to formulate the strategic plan and policies for aquaculture development;
- To control the seed quality for seed supply network through over the country;
- To provide the technical support and education in aquaculture field for country;
- To formulate the collaborative training program in aquaculture science for southern African Region.

The Centre will in that way fulfil all the needs regarding the developing requirements for activities in aquaculture in Mozambique.

For a quality seed production a high quality brood stock of grass carp, common carp and tilapia has to be maintained at the centre to supply the seed for both the aquaculture demonstration centre and farmers all over the country.

A business plan will be developed for the operations of the Centre. Starting activities without a business plan can result in mistakes, which could have been anticipated and solved at the planning stage. A written business plan exposes thoughts, assumptions and findings, and evaluates rationality. It gives answers to questions like: Can it really work? What resources are needed now or in the future? Such answers can minimize the risks involved. Moreover, without a business plan, financial resources will only be inverted by those few who have an unquestioning faith in the project. Investors, public or private, will insist on evaluating exactly why they should support the investment (Dan and Stewart, 1992).

The overall goal of this study is to design a business model that can help to ensure the economically sustainable operations of the centre by producing fry and fingerlings to sell to fish farmers in Mozambique and for growing Carp and Tilapia at the centre for marketing in the local markets. The profits generated from the fingerling and fish production are supposed to create sustainable operations for the centre so that it can then offer training programs and research counselling.

Main tasks of the study were to:

- design two alternative business plans for fry, fingerling and fish farming of the Freshwater Aquaculture Demonstration and Training Centre of Chokwe in Mozambique;
- analyse the cost and revenues of fry, fingerling and fish production at the centre using a profitability model;
- open up the possibility of further cooperation with donor organisations, regarding the start-up of the fry and fingerling production of the Centre

The design of the business plans was guided by the above tasks in order to ensure that the overall objectives are achieved. Assumptions regarding marketing data and operating data are made from aquaculture studies, information given in in interviews with specialists from the National Institute of Aquaculture and the intuition of the author. The reliability of the data used needs to be assessed further before a final decision is taken based on the output of the profitability model used.

2 MOZAMBICAN AQUACULTURE

The development of aquaculture can become an important contribution to household food security and general welfare by supplying food and providing income.

2.1 History of fish farming in Mozambique

In general, aquaculture in Mozambique is still a relatively new activity even if the culture of artisanal production of freshwater tilapia (*Tilapia.spp*) has existed since the 1950s. The Marine aquaculture emerged in 2003 and consisted then of commercial farm producing marine shrimp (*Penaeus. spp*) and seaweed (*Kappaphycus. spp*) (FAO, 2006).

At the beginning of the 1960s, the governor of Mozambique built hatcheries and demonstration farms in Umbeluzi (0,5ha), Sussundenga (2ha) and Chokwe (1,6ha). In 1978-1979 the government expressed renewed interest on freshwater aquaculture particularly as a means of supplying fish in the rural communities, which were undersupplied in animal protein (FAO, 2006).

Until the 1990s, aquaculture was limited to inland waters, associated with agricultural activities. This situation changed in the 1990s, with the emergence of the first commercial undertakings. The Aquaculture Program for Local Communities project (ALCOM) funded by SIDA and executed by FAO, assisted Mozambique in developing freshwater fish farming and extension methods and approximately 230 fish ponds were constructed (FAO, 2006).

Mozambique has both, native and exotic species with potential for aquaculture development such as Mozambique tilapia (*Oreochromis mossambicus*), Nile tilapia (*Oreochromis niloticus*), red breasted tilapia (*Tilapia rendalli*) and common carp (*Cyprinus carpio*). In addition, other candidates for aquaculture available in the country include the African catfish (*Clarias gariepinus*), grass carp (*Cterophryngodon idella*), silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*Aristichthys nobilis*) (MOF, 2005).

The main cultured species is tilapia in a mixed-sex culture, which is done all over the country. It is raised in earthen ponds, ranging in size from small backyard ponds (200-400 m^2) to larger ponds (1.5 ha). Pond culture of freshwater fish is done by poorly technique in Mozambique. The culture system is extensive. Seeds are either collected from the wild or from other farmers' ponds and stocking density is 2-5 fish/m^2. Fish are fed on agriculture by-products such as rice, maize, millet and sorghum bran and cassava leaves. As a fertilizer farmers use cow-, goat-, chicken- and other livestock manure depending on availability. The fish grow to maximum of 150g over a period of six months. Yields are relatively low, estimated at 0.8 tonnes/ha/year. Cropping time is from six months to a year, depending on the feeding regime (FAO, 2006).

A cage culture operation in the Manica province began commercial production in 2004 and produced 1 tonne of Nile tilapia (150g) per month. Production was sold on site. The facilities included raceways for both fingerling production and on- growing. Cages were constructed of the cheapest locally available construction materials using empty oil barrels as float devices (FAO, 2006).

In 2006 FAO (2006) observed that the seed supply for cage culture depended on the farm production. Feed was produced on the farm from locally available ingredients. The cage farm and other farms faced problems such as lack of inputs, fish seed, feed technology, feed formulation and feeding management, and lack of capital to operate the harvest and increase productivity. The situation is mostly the same today.

The marine aquaculture in 2005 was represented by an industry that produced on average 1,000 tonnes a year of marine prawns. It was exploiting 2,500 ha of land in a semi-intensive system and was providing direct employment to about 2,000 workers (INAQUA, 2008).

That year the Government of Mozambique adopted an aquaculture strategy which aims was to set up the sustainable development of aquaculture; to increase the current production levels of marine prawns and aquatic species intended for export and local consumption and establish a legal, normative and institutional framework for appropriate and effective management of aquaculture (INAQUA, 2008).

The freshwater aquaculture development is still under consideration by Government of Mozambique as a top priority, for the reason of its vast potential of water resources, land and the native species suitable for aquaculture practices (INFOSA, 2009).

In 2008, the government of Mozambique established the National Institute for Aquaculture Development (INAQUA) by Cabinet decree No. 29 of June 2008. INAQUA is responsible for the promotion, extension, administration, and coordination and monitoring for the aquaculture development. It is also responsible for experimental research and provision of incentives to promote aquaculture in Mozambique (INFOSA, 2009)

2.2 Economics and sustainability of aquaculture in Mozambique

At the global level aquaculture development has been viewed as a measure of improving food security and as a means of supplementing income for rural families. In Africa, economic analysis in aquaculture is a relatively recent practice and not much work has been reported on its social and economic impacts. In Mozambique, aquaculture was just before the turn of the century almost entirely for subsistence, with little surplus production being sold in the rural market (Egna & Boyd, 1997) and still is.

Economic considerations in the selection of an appropriate aquaculture production system include its potential for economic returns, its economic efficiency and, ultimately, the farmer's access to operating capital (Hebicha, Gamal, & Green, 1994). There are not many reports on the economic evaluation of aquaculture production systems in Mozambique, other than the few case studies on Economic Analysis of Small Scale tilapia production (Salia, 2008).

It is against this background that the present study was undertaken to assess the business plan for the operations for Freshwater aquaculture Demonstration and Training Centre of Chokwe in Mozambique. Carp and tilapia fingerlings and fish production is used as a case study to provide managers of the Centre and investors with a tool to use in determining the investment, feasibility and monitoring performances of both the operations and the managers.

3 METHODOLOGY

The study focuses on the development of business models and a plan for the operations of the Freshwater Aquaculture Demonstration and Training Centre that will be built in Chokwe district in Mozambique as a part of a Norwegian/Icelandic developmental donor Programme. It will contain analyses of anticipated operations of the centre, include further possible cooperation with donor organizations, describe the Centres marketing possibilities and its basic operating requirements. Then a possible business model will be evaluated based on financial analysis using a profitability model.

Literature was reviewed from Internet and library sources in order to gather baseline data. Particular attention is paid to business plan data resources, hatchery operations and economical basis for Fingerlings production and fish farming.

As benchmarking idea for the Centre´s financial structure information was gathered on the split of earnings from sales of products and the running of the, Marine Laboratory and fish farm in Grindavik that is a part of the Marine Research Institute.

The profitability of the two different business models will be evaluated assigning data and running an Excel profitability assessment model designed by Professor Pall Jensen. A description of the elements of the model is shown in a flow chart in Figure 2.

Below a short explanation of both the flow and each of the elements is given:

Assumptions summary

In the assumptions summary the start-up investment costs are presented along with financing information regarding equity and loans, sales price and sales quantity, variable and fixed costs and all the inputs (Appendix 1) Information from the summary is then used in the other elements.

Investment and Financing

The investment cost shows in details how the costs related to the project will be covered. It shows the book value and the depreciation of equipment (Appendix 2).

Operating Statement

This component has the purpose of calculating the revenue and costs year by year, the income tax, other taxes and the appropriation of the profit (Appendix 3)

Cash flow

The cash flow calculation begins with the operating surplus from the operating statement it includes cash flow before and after taxes, net cash flow and cash movement. Its indicate losses or gains over the time of the project (Appendix4).

Model Components

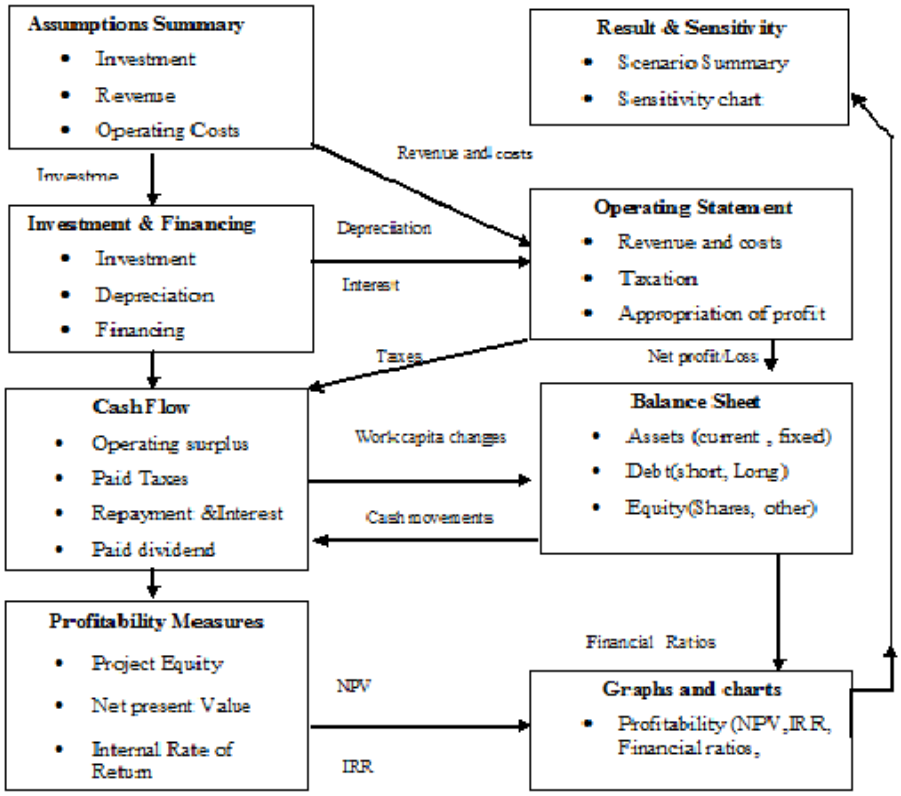

Figure 2: Profitability model and its components.

Balance sheet

The balance sheet gives a more complete figure to be able to follow the forecasted development. The balance sheet is used in the model as a verification tool as many logical errors may result in a difference between total assets on the one hand and total debt and capital on other hand (Appendix 5).

Profitability Calculations

This component of the model calculates the profitability of the investment. Two measures are used in the model: the Net Present Value (NPV) with a discounting factor, and the Internal Rate of Return (IRR) (Appendix 6).

Sensitivity Analysis

Sensitivity analysis for exploring and understanding the effects of uncertainties and can be done in many different ways. Impact analysis deals with only one uncertain item at the time, for example sales price, sales quantity, or cost of brood stock. Scenario analysis deal with simultaneous changes in more than one uncertain item used.

The flow chart describes that by using the assumptions for investment, revenues and both variable and fixed operating costs, an investment and financing table is built. This will then be used, along with information from the assumtions part , for building the operating and balance sheet part of the profitability model. Information then flows to the cash flow part and to the profitability measurement part. From that graphs and charts are made and the sensitivity of the internal rate of return of the equity of the proect is assessed by changing the main financial factors one by one.

4 BUSINESS PLAN AND OPERATIONS ANALYSIS

Two different business models, A and B, will be described. Both will then be assessed using the profitability model.

Below (Figure 3) is a process chart for both business models:

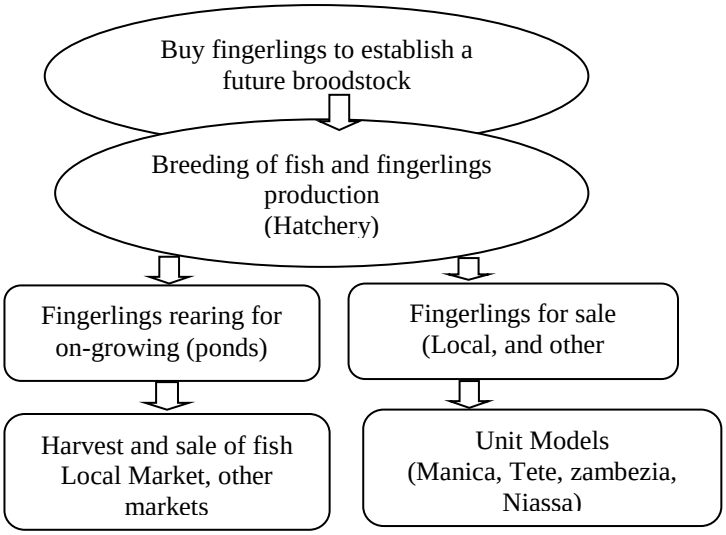

Figure 3: Process chart of Business Models.

The buying of the fingerlings only happens in the first year. After that the fry and fingerlings are producedat the centre.

4.1 The Business models

The Model "A" assumes that the facility and equipment is fully funded by donors. That way the government looks upon this as it's the investments equity at the start of the investment period. All revenues and costs from the operation of the aquaculture are reflected, but the training- and research programs are not a part of the analysis. Instead a cost for necessary research is assumed. The total profits of the Centre are expected to be reinvested by government or be used for operations of the training and research programs.This model is used to evaluate if the operations of the aquaculture part is sustainable. It is also assumed,

although unrealistic, that the acquisition and installation of equipment purchased has already been finished before the first year of operations in 2015.

In this first year, the activity will focus on the acquisition, selection and rearing of fingerlings for the establishment of a future brood stock and tuning the operation up for an efficient fingerling production. The fish growing will in the first year be secondary to this. In this model, the production of fingerlings is in progress since the fish have already reached sufficient maturity for reproduction as early as after the first six months. Both activities will happen simultaneously, production of fingerlings and on-growing. Some fingerlings will be used for raising fish in the ponds of the Centre but mostly fingerlings will be sold directly from the Centre. Fingerlings will also be sent to aquaculture units' already created by the INAQUA in the provinces of Manica, Tete, Zambezia and Niassa, were then will be sold on credit to fish farmers.

The whole fish is sold at the average size of 500 gr. at three different marketing locations; through middlemen in the Capital city, also through middlemen local markets in the province and directly to customers at the centre. The price to both the middlemen and local customers is estimated at $ 6.4. That gives the middlemen a 25% margin on cost of sales if the end price is $8 and the local customers bying directly from the centre can afford the sales price.

The Model "B" is based on the same assumptions as Business model "A" but adding an assumptions of a temporary three-year financial assistance from donors for the operations of fingerling production and subsidising the price for small scale farmers.

4.2 Assumptions and analysis common for both Business Models

Needs of the customers and their ability to purchase is the first step that must be analysed by the managers in order to determine key success factor of the business (Ssebisubi, 2010). This assessment will build up knowledge, can provide good relations with customers and strengthen the Centres bargaining power.

In this study it is imperative to know what is required for the Freshwater Aquaculture Demonstration and Training Centre of Chokwe to survive during the operation time of the investment period. This is a combination of how and what will have to be the Strategy in order to satisfy and to capture a growing number of customers of fingerlings (Grant, 2005).

4.2.1 Customers and potential markets for fingerlings

For the Freshwater Aquaculture Demonstration and Training Centre three customer groups were identified:

1. Aquaculture for self-consumption ("family" based);
2. Small Aquaculture Associations ;
3. Aquaculture, producing for the market at a small-scale.

The most aquaculture operations in Mozambique fall into the first category. Fish farming is a marginal activity, poorly integrated into the rest of their farming activities undertaken it in earthen ponds. this kind of culture system has overall had negative results. For the fish farmers, the satisfaction gained from small-scale fish farming is not sufficiently attractive to outweigh the effort and degree of technical expertise required. For the future, it is suggested that aid to this kind of aquaculture should concentrate on support to those farmers who show signs and capabilities of adopting more intensive methods. (Harrison, 1996).

Farmers Associations who make aquaculture as an alternative source of income to finance other livelihood activities characterize the second group of customers of aquaculture in Mozambique. They sell a big part of production at agricultural fairs and asmall portion is then divided between the members. For this type of Aquaculture it is easy to provide technical assistance and credit and thus increase the quantity and quality of their production.

The last group are Small-scale market-oriented aquaculture farmers: According to Harrison, (1996) only a few hundred people in Africa. Belong to this group. In Mozambique, they are very few and generally have a good knowledge of fish farming. For them, fish farming is not their only activity, but it may be a main or significant part of their business operations. In the rural setting, this form of aquaculture tends to be integrated with other agricultural activities, and is an important extra source of income.

With improvement in seed quality, feed formulation and distribution, can be expected the creation of small, medium and large-scale companies for aquaculture production can be expected.

A potential problem is that fish farmers only purchase a small numbers of fingerlings and thus the hatchery must hold the fingerlings for long periods. This is not recommendable. In this respect, the timing and marketing of fish production must be well established before investment in a hatchery (Guttmann, 2000).

In Business plan A a full average unit price of $0.78 is estimated for the sale of 3,760,000 fingerlings each year. As the characteristics above point to the majority of the potential customers of fingerlings, both those that use aquaculture for self-consumption (family based), and the associations, can hardly be expected to pay full price for fingerlings at least in the first three years of operations. Thus a Business plan B is designed where donor organizations are assumed to subsidise the price of fingerlings. An offer of fingerlings at zero cost (giving) could be a way to encourage laziness in the fish farmers. For this not to happen, the fry will be sold at half price $0.04 for identified fish farmers and the quantity for each group will be: 3/5 of total fingerlings for association of aquaculture, 1/5 for self-consumption and 1/5 for market oriented.

Since there are no absolute statistics on the potential market for such a large number of fingerlings that will be produced in the Centre of Chokwe, other ways are used to try to estimate the market size of both of fingerlings and fish. Omar, *et al.*, estimated that in 2005 there were about 3,500 ponds altogether of the size 400-500m^2 in Manica, Niassa, Sofala, Zambezia and Tete provinces. In 2007 this number of ponds had increased to 7.170 ponds of 100-400m^2 where around 2000 families where involved (INFOSA, 2009).

To estimate the total capacity for Tilapia the local artea of the ponds was stimated and multiplied by the stoking density of 5 fingerlings per m^2 (Table 1). That estimates the total needs of fingerlings for the country around 14.340.000 or less if carp is partly used for farming (2 fingerlings pr. m^2). The estimation is shown in table below.

Table 1: An estimated capacity of fingerlings in Mozambican ponds.

	Number of ponds	Stoking Density (m^2)	Pond Size (m^2)	Total area (m^2)	Needs of fingerlings
Tilapia	7,170	5	400	2,868,000	14,340,000
Carp	7,170	2	400	2,868,000	5,736,000

Though a 9,663 thousand total capacity of fingerling production has been calculated (Appendix 18) from the total capacity of the hatchery a smaller production quantity is used. In a close accordance with the developmental objectives of a production of 4 million fingerlings each year the study, for practical reasons conserning demand estimation and the use of the ponds, only assumes that 3,760,000 of fingerlings will be produced each year (model A) as fish farmers may not be able to buy a greater portion of the production of the centre and then Centre will be obligated to hold fingerlings for long period, which is not sustainable.

For the model B, the first three years the production will be 4,400,000 of fingerlings because its assumed that the fish farmers will be motivated to buy more than in the model A due to the subsidy from donor of the half part of price of fingerlings. It's also assumed that the small fish farmers will buy 10% more than they otherwise would do and the associations will buy 25% more. But after the three years of the operations with the donor subsidy, the Centre will go back to the normal quantity of fingerlings which is 3,760,000.

4.2.2 Key Factors for competitive success

Important step in the analysis of a business attractiveness and competitiveness is to study the market position of competing actors. It is the key success factors of a firm in a market environment that enables it to survive and prosper (Grant, 2005). In order to do that, it has to meet two criteria. It has to offer what the customers want and it must survive competition (Feller, Shunk, & Callarman, 2006). To offer what the customers want calls for not only identifying the customers but their needs and what determines their choice of a product or preference. For example in Sri Lanka Gestsson *et al.* (2010) found that much as local customer's choice of fish was driven by price, foreign customers were driven by quality. Key success factors are functions, activities or business practices, defined by the market and as viewed by the customers that are critical to the vendor/customer relationship and ultimately determine competitive success or failure (profit or loss).

Key success factors for the operations of the centre will be having the knowledge and facilities to keep quality brood stock for the production of seeds, fry and fingerlings. Having the marketing and supply chain ability to sell whole fish to middlemen and end users and being able to have a stable production.

As of now in Mozambique, there is only one supplier of fingerlings in the country. He is located in Inhambane province in the south part of the country. He has a good reputation with is business but only sells tilapia fingerlings to buyers all over the country. Over the last two years his most important customer was the National Institute of Aquaculture Development - INAQUA. His major advantage is to be the only supplier of fingerling in the country, a growing market. The supplier does not provide fry and fingerlings as his main activity; he also has a business of breeding, capture and sale of marine shrimp.

Being a governmental institution specialized in aquaculture and quality seed production, training fish farmers and offering products (by way of subsidy or not) the Freshwater Aquaculture Demonstration and Training Centre surely could have an advantage in cultivating its customers.

4.3 Production planning model

Below is a short description of the production planning model for the Centre as used for the profitability model.

4.3.1 36 ponds model

The 5.1 ha farm comprised 36 ponds each measuring in average 1430m^2. Twenty-two ponds were simultaneously stocked with Nile and Mozambican tilapia, eleven ponds with grass and common carp fingerlings and 3 ponds reserved for brood stock. After the first nine months of operations all the thirty-six ponds were stocked. In the ninth month all stoked ponds were due for harvesting (Table 2).

Table 2: Production Characteristics & main assumptions of tilapia and carp (Engle & Neira, 2005).

Production Characteristic	**Assumed Values**		
	Unit	**Tilapia**	**Carp**
Average pond area	m^2	1,430	1,430
Total area used first year	m^2	31,460	15730
Stoking density	fish/m2	5	2
Initial number of fish	individual	157,300	31,460
Initial weight of fish stocked	g	10.00	10
Initial biomass	kg	1,573,	314,6
Cost of fingerlings	$/individual	0.09	0.7
Survival rate	%	90	70
Cycle length	Days	270	270
Year	yr	365	365
Selling price of fish	$/Kg	6.4	6.4
Selling price of fingerlings	Per fingerling	0.08	0.08
FCR	ratio	3.46	3.46
Pelleted diet	$/Kg	1	1
Growth rate	g/day	1.85	1.85
Final number of fish	individual	141,570	22,022
Individual harvest weight	G	500	500
Yield-live	Kg/ha	70785	11011
Total amount of feed per batch	kg	27327	7,340
Equipment I depreciation	%		14%
Equipment II depreciation	%		20%
Equipment III depreciation	%		50%
Income Tax	%		12%
Dividend	%		100%
Depreciation on Building	%		2%
Depreciation on other costs	%		2%
Loan management	%		20%

The first year of the operations of the Freshwater Aquaculture Demonstration and Training Centre of Chokwe will be focused on buying fingerlings that will be selected for future breeders and growing up.

The expected number of staff for the first year will be 12, namely: one Coordinator, two Administrative and financial staff, two research technicians, two foreign aquaculture specialists, two Aquaculture technicians, one driver, one Administrative assistant, one watch. Some people will be hired for casual labour during the harvesting time and for other extra work.

The operations will start in January 2015 after all the start-up investment work has been completed in 2014. The first activity will be to buy the number of fingerlings for the production ponds. For that, it was assumed that for tilapia five fingerlings/m2 will be used and, two fingerlings/m2 for carp (FAO, 2006).

The total number of the ponds is forty-two ponds with different following sizes: four ponds with 30x40m, twenty-four pounds with 30x50m, and eight ponds with 30x60m and four ponds with 30x70m. The ponds will be distributed in a quarter of the total number of the ponds for carp and the rest for tilapia, because the tilapia is most sold species in the local market and has the lower price for fingerlings than carp. The average area of the ponds is 1,430m2 and the total area of the ponds is about 60,060m2.

In the first year of the operations, 33 ponds will be used for production of fish, divided in 11 for carp, 22 for tilapia, 3 ponds will be for selected fingerlings for future brood stock and 6 ponds will be in maintenance. The stoking density will be 5/m2 for tilapia and 2/m2 for carp. The number of fingerlings will be 157,300 for tilapia 31,460 for carp, 1,270 carp fingerlings selected for brood stock and 2,200 for tilapia.

The selected fingerlings will be divided by 520 grass carp, 650 common carp, 1,100 Nile tilapia and 1,100 of tilapia Mozambican. The survival rate of 70% of both grass and common carp and 90% of both Nile and Mozambican tilapia is used.

The estimated batch cycle of the production to reach 400-500g for tilapia and carp, ideal weight for selling will be 9 months for all species.

After the selection of brood stock and considered survival rate of 70% for carp and 90% for tilapia, the total number of fish to the end of the cycle will be 22,022 for carp and 141,570 for tilapia. This quantity in kg will be 11,011kg for carp and 70,785kg for tilapia and the total quantity of fish will be 81,796kg.

According to Salia, (2008) the average price of each kg of fish in Mozambique was then $3.6. Currently the market price to end users for tilapia is estimated around $ 8 per kilo according to a conversation with Gelane Ussene from the INAQUA).

4.4 Profitability model assumptions and analysis

As was shown in the flow chart of the profitability model (Figure 2), underlying assumtions are used in various parts of the model.

4.4.1 Investment cost

As mentioned previously the lack of reliable data means that a number of assumptions had to be made. Below, the assumptions are shown in italic (Table 3).

Table 3: Breakdown of investment cost.

Breakdown of Investment costs		
Equipment		USD
	Hatchery in house	16,810
	Hatchery Outside	52,730
	Hatchery - Electricity system in & out side	100,100
	Harvesting	4,000
	2 Vehicles pick Up (buy)	100,000
Equipment total		**273,640**
Other Investment		50,000
Total investment cost		**323,640**

This calls for a more reliable study and means that some inputs should be revaluated and possibly be changed by user before a business decision is made. The most important information will be presented here in the table form, so the user can easily analyse all the costs involved.

4.4.2 Operating costs

A similar procedure was followed to deal with operations cost.

Operating costs are composed by variable and fixed costs. Variable cost factor that are probably to change by the time of operation. The variable costs in this study for example: Fuel cost, fish feed, cost of fingerlings, (Table 4) can easily fluctuate within a short period depending on the dynamic of the market of those products.

The design of the table fits the profitability model that is such that an operator can tell at a glance the total costs, income and operating surplus for a whole year of operations.

When the price of fuel increases in the market, the cost of transportation increases and because of that, the price of feed will also increase. The fixed costs are those costs that will not change in a short period relative to kilos of fish produced, such as a salary of permanent employe.

Table 5 shows the growth in biomass and the costs associated.

The operating costs are inputs into the profitability model and, along with the investment costs, form the basis for the profitability and the expected returns of the investment.

4.5 Contribution margin

Even as a non-profit, project the result of sales proves to be economically viable. The contribution margin of the centre´s operations will in Model A receive yearly from the sales of total production of the ponds including the sales of fingerlings (Table 6).

The importance of the contribution margin is great as it highlights the centres ability to pay for all ather cost than the variable cotsts and to make a profit.

Table 4: Breakdown of Operation Costs.

Variable costs	**Description**	**Unit**	**Quantity**	**Price Unit ($)**	**Total cost ($)**
Tilapia fingerlings	Hatchery-raised	Individual	157300	0.09	14,157
Carp fingerlings	Hatchery-raised	Individual	31460	0.7	22,022
Pellet diet for both	15% crude protein	kg	34,667	1	34,667
Fertilizer	Urea	Kg	4000	0.4	1,600
	Ammonium Phos-phate	kg	4000	0.4	1,600
	Vitamins				1,000
Other chemicals		kg			500
Utilization of water					110
Agricultural lime	Lime	kg	4000	0.2	800
Total Variable costs					**76,456**
Fuel	Diesel	Litre	4000	1.3	5,200
Hired specialists		$/year	2	18000	36,000
casual labour		$/year	2	960	1,920
Security personnel		$/year	2	960	1,920
General maintenance		$/year			30,000
Administration		$/year			35,000
Insurance (10%)		$/year			32,000
Licence and certifica-tion		$/year			15,000
Permanent Labour		$/year			138,200
Contingency (10%)		$/year			32,000
Laboratorie service		$/year		18000	18,000
Total fixed costs		**$/year**			**390,596**
Depreciation:					
Equipment Group I		%			14%
Equipment Group II		%			20%
Equipment Group III		%			50%
Income tax		%			12%
Dividend		%			100%
Depreciation Building		%			2%
Depreciation other costs		%			20%
Loan Management Fee		%			2%
Interest on Investment		%			0%

Table 5: Table: Production data of cultured Tilapia and Carp on density of 2 & 5 Fingerlings.

Month	Survival rate %		No. of fish		Mean body weight	Biomass in Kg	Feeding rate %/biomass/day	quantity Feed/ 33 pond/Cycle Kg	Cost of feed/month/ cycle $	Fertilizing cost/cycle ($)
	Carp	Tilapia	Carp	Tilapia						
0	100	100	31,460.0	157,300	10	188.8	15%	28.32	127.4	1600
1	95	98	30,830.8	154,154	55.5	10266.7	10%	1,026.67	3.080.0	1600
2	90	96	28,314.0	151,008	111	19904.7	6%	1,194.28	2149.7	1600
3	85	95	26,741.0	149,435	166.5	29,333.3	5%	1,466.67	2,200.0	1600
4	80	93	25,168.0	146,289	222	38,063.4	4%	1,522.54	1,827.0	1600
5	75	92	23,595.0	144,716	277.5	46,706.5	3%	1,401.20	1,261.1	1600
6	73	91	22,965.8	143,143	333	55,914.2	2%	1,118.28	671.0	1600
7	72	90	22,651.2	141,570	388.5	63,799.9	1.5%	1,276.00	574.2	1600
8	70	90	22,022.0	141,570	444.0	72,634.8	1.5%	1,452.70	635.7	1600
9	70	90	22,022.0	141,570	**500.0**	**81,796.0**	1.5%	1,635.92	736.2	1600
								34,667	**34,667**	**1,600**

Table 6: Contribution margin.

Gross revenues					
Item	Description	Unit	Quantity	Price in $	Total cost in $
Tilapia	Live	kg	70,785	6.4	453,024
Carp	Live	kg	11,011	6.4	70,470
Tilapia & Carp fingerlings.	Live	1	3,760,000	0.08	300,800
Total gross revenues					**824,294**
Cost of fingerlings/cycle					36,179
Cost of feeding / cycle					34,667
Cost with fertilizer					1,600
Cost of limestone					800
Diverse					3,210
Contribution margin					**747,838**

4.6 Model A

In Figure 4 an insight is given into the performance of the project during the operations was monitored using the profitability model on Model A. This is useful to the manager of the centre as it tells whether the venture is feasible and what would be the payback period of the investment.

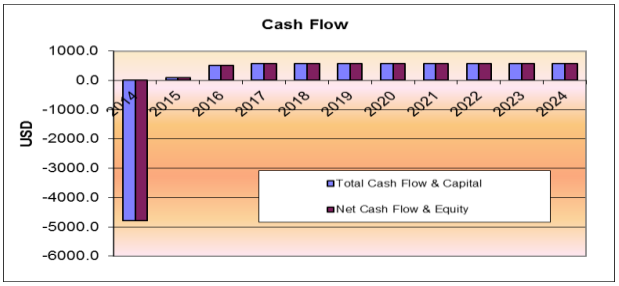

Figure 4: Total cash Flow & capital and Net cash flow and equity.

For the present study, the total cash flow and capital and the Net cash flow and equity is negative in the first year and its beginning to be positive on the second and increasing year by year. The cash flow is negative for the first year due to the capital outlet of the start-up.

1.1.1 Accumulative Net Present Value (NPV)

Net Present Value is a measure that is commonly used to evaluate the profitability of the investment. It is indicate how much value an investment adds to the company. Figure 5 shows the accumulated net present value of Model A.

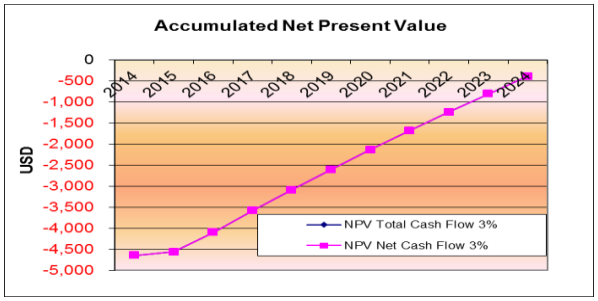

Figure 5: Accumulative Net Present value.

The picture shows that the Net Present Value (NPV) in 10 years of operations with the discounting rate of 3% the payback period is in the 10th year of the operations, see figure 5 Above.

1.1.2 Internal Rate of Return

This component of the model evaluates the profitability of the investment. In this study, the total internal rate of return on the total cash flow is 1.4% during the 10 years of operations (Figure 6).

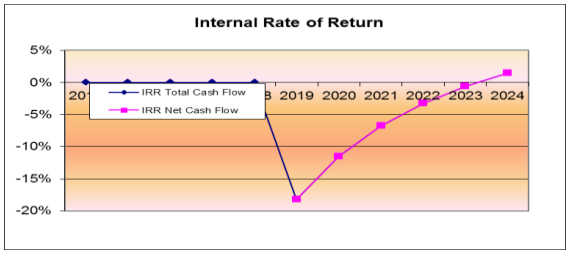

Figure 6: Internal rate of return.

The internal rate of return is lower than the expected discounting rate of 3% so the investment is not seen as feasible in the model A.

4.6.1 Net Current Ratio

Net current Ratio is a measure used to compare current assets and current liabilities of the firm. It is an indicative that the firm's market liquidity and ability to meet short–term debt obligations. In the study the net current ratio is increasing year by year as you can see in the (Figure 7 below).

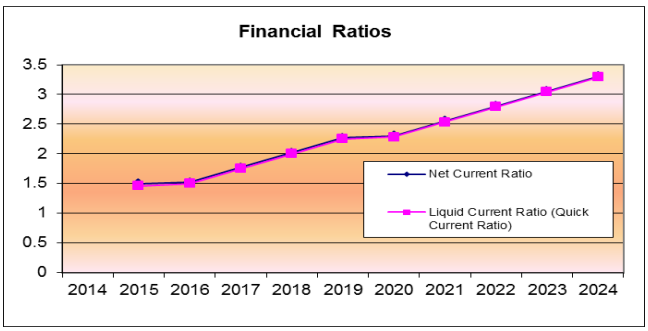

Figure 7: Net Current ratio.

When the net current ratio is higher than liquidity current ratio or liabilities, its mean there is a problem in the firm, which is not the case of the present study.

4.6.2 Sensitivity Analysis

Sensitivity analysis is a tool for measuring the risks of the operations. It is a good method to understand the uncertainties of the business. In this study, sensitivity analysis was used to analyse the risks of the operations of the Freshwater Aquaculture Demonstration and Training centre and in this process was carried out the changing one major financial element at a time, sales price of fish, sales quantity of fish, sales price of fingerlings and the sales quantity of fingerlings see (Figure 8).

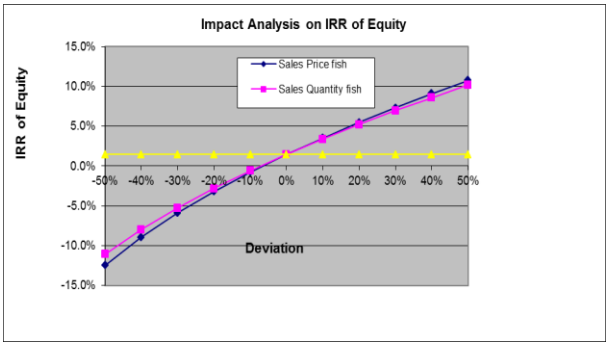

Figure 8: Sensitivity Analysis.

The impact, when the sales price decrease -10%, the price reduces to 90%, the return of investment falls to -0.8%. When the decreasing is highest, about 50%, the return of investment is reduces to -12.5%. When the sales price increase 10% positively, price increases to 110% and the internal rate of return becomes about 3.5%. For the sales price of fingerlings, there are no changes since the selling price is the same, but when the quantity of fingerlings reduces by 10% the internal rate of return only falls to 2.1%

4.7 Model B

For model B the data and assumptions will be the same for model A but with changes as it is assumed that the price of fingerlings will be subsidized by donor. Donors will be also pay salary for laboratories service and one of the hired aquaculture specialist. The subsidy of the price of the fingerlings will lead to higher sales of fingerlings in the three year period.

The quantity of fingerlings sold in the first three years will be 4,400,000. The price of fingerlings will be the same ($0.08) but the donors will subsidize 50%, its means the donors will pay ($0.04). In this model, due to the subsidy of the donors for fingerlings, it's assumed that the customers will increase they demand of the fingerlings. For the small fish farmers (family based), will increase in 10% of the quantity and the Associations will increase in 25%. After the first three years the quantity of fingerlings sold goes back down to 3,760.000.

4.7.1 Cash flow projection for Model B

Figur 9 shows that in the 10 years of operations for the model B the cash flow will be negative in the first year and will increase the rest of the years.

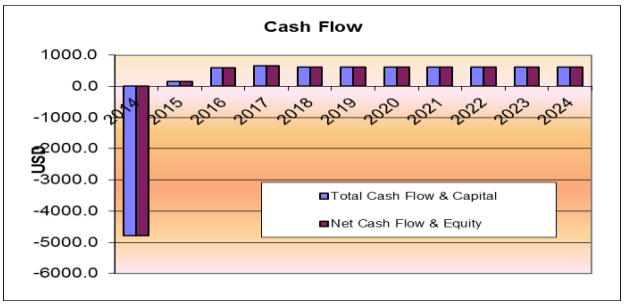

Figure 9: Cash flow projection for model B.

It is similar to the cash flow in model A as the only difference is the increased sales of fingerlings in the first three years and the donors grants for labour and research..

4.7.2 Accumulative Net Present value model B

In 10 years of operations with the discounting rate of 3% the net present value payback period will be the last years, see Figure 10 below

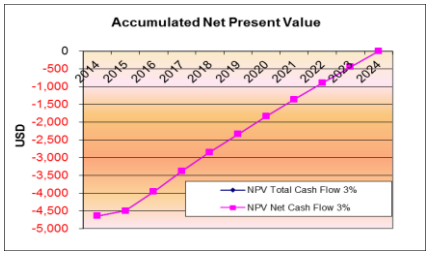

Figure 10: Accumulative Net Present value model B.

It is quit similar to the findings in model A.

4.7.3 Internal Rate of Return model B

Figure 11 shows that in 10 years of operations the internal rate of return is about 3%, equal to the decscounting rate. Its mean in 10 years of operations the project is just profitable.

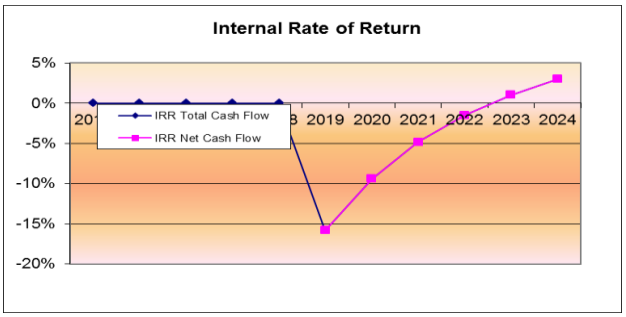

Figure 11: Internal rate of return model B.

It has to be stressed that the end-value of the cenre and its operations has not been calculated at the end of year 10.

4.7.4 Net Current Ratio model B

The net current ratio is equal to liquidity current ratio or liabilities (Figure 12)

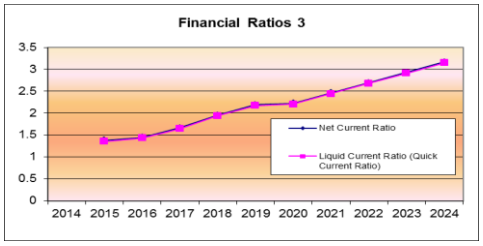

Figure 12: Net current Ratio model B.

Its mean the assets in of the the model B are enough to pay the liabilities in this study.

1.1.3 Sensitivity Analysis for model B

In the model B the impact, when the sales price decrease -10%, the price reduces to 90%, the return of investment is reduced to 0,8%. When the decreasing is greatest, about 50%, the return of investment reduces to -10.2 (Figure 13).

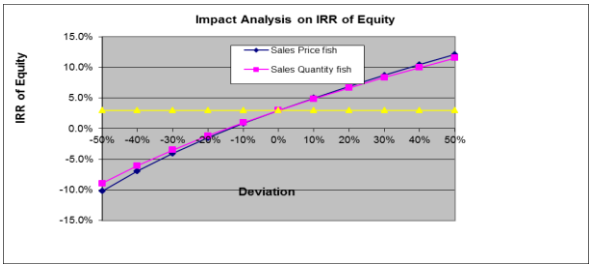

Figure 13: Sensitivity analysis for model B.

When the sales price increase 10% positively, the rate of return increases from 3% to 5%. In the sales price of fingerlings, there are no changes since the selling price is the same.

5 DISCUSSION

The overall goal of this study was to design a business model that ensures economically sustainable operations of the Freshwater Aquaculture Demonstration and Training Centre, and produces fingerlings that can supply both the centre and all the fish farmers in the country. It is critical for the managers and the investors to understand how the centre will be structured and managed before to making the investment in order to try to ensure that it will achieve the objectives for which it is designed.

From the two business models designed it was possible in this study through the use of the profitability model to generate good perspectives of production and sales that can in the future make the operations of the Freshwater Aquaculture Demonstration and Training Centre economically sustainable. This can then also help the leading institutions to better assess the viability of aquaculture projects and reduce the possible failures in their investiments.

It is very important to understand the key processes of the organization, to know its strengths and weaknesses. Investors plan to get a return on their investment, but must also have a credible plan for containing cost and receiving net income.

In this study, a profitability model was developed and used to assess the feasibility of fingerlings and fish production. It is important for both managers of the Freshwater Aquaculture Demonstration and Training Centre and the owners/investors to appreciate that for such a considerable amount of capital used exact planning is needed before starting up a proper production on such a scale. In addition, the profits of the operation must be able to give a return on the capital.

There are a few points that must be taken into account based on the results of the study:

a) The positive results in the study may be resulted from assumptions about investment the equipment, variable and fixed costs

b) The infrastructure of the Freshwater Aquaculture Demonstration and Training Centre is not yet been built, it is still being planned in the papers. Its causes the study to become somehow a bit difficult

c) The price of equipment was estimated in 2009 by the technicians who prepared the first document of the centre and some price may be changed

During the Study, It was estimated that the full operations of freshwater Aquaculture demonstration and Training Centre of Chokwe may require $ 323,640 to purchase and install the equipment needed for fingerlings and fish production. For variable costs will be necessary $76,456.00 and for fixed costs $390,596.00 and working capital of $10,000. It means that the Freshwater Aquaculture Demonstration and Training centre will need approximately $ 800,692.00for full operations in the first year.

6 CONCLUSION

Even as non-profit project the result of operations proves to be almost economically viable as can be seen through the positive net revenues, the net present value and the Internal Rate of Return. The returns consists of the earning that the centre will receive from the sales of total production of the ponds including the sales of fingerlings, without those being subsidized in plan A but subsidized for fish farmers in business plan B.

With the subsidy of half price of fingerlings in the business model B, fish farmers will be attracted to practice aquaculture. The earnings from the sales of fish and fingerlings will be used to organize courses for fish farmers, extensionists and other stakeholders.

Based on the assumptions and analysis of the profitability model, both, fingerlings and fish farming in the Freshwater Aquaculture Demonstration and Training centre appears Sustainable minly in the business model B. However, for a sustainable development of fish farming in general, managers are challenged with the responsibility of planning conducting aquaculture in a sustainable way.

The comparison between business model A and B, it was found that the business model B is the most viable than A due to the reduction of some expenses supported by donors as the Payments for one of the specialist in aquaculture, expenses on the laboratories service and subsidy of the half price of fingerlings for fisher farmers, that will increase the motivation for the widespread activity in fish farming in Mozambique. Due to the lack of funds to initiate the project, the donors are encouraged to consider cooperation in accordance with Business plan B.

ACKNOWLEDGEMENTS

I would like to pay my gratitude to the board of Directors of UNU-FTP and those who invisibly contributed to the success of the training.

To be able to succeed in a course like this I required a great team work consisting of my supervisors Mr. Helgi Gestsson & Dr. Ogmundur Knutsson, assisted by Bjarni Eriksson who I extend my special thanks for the excellent guidance, comments, and support in all stage of the specialist course and project.

My deepest appreciations goes to Dr. Tumi Tomasson, programme Director, Mr. Thor Asgeirsson, Deputy programme Director, to have selected me for the great opportunity to build my professional capacity that will enable me to become a better specialist in the near future. To Ms. Sigridur Ingvarsdottir, programme officer and Mary Frances Davidson, my warm thanks and admiration for the professionalism and organization, but also for their special attention that paid to each of us.

My deepest gratitude goes also to Ms. Isabel Omar my National Director at the National Institute for Aquaculture Development, even knowing my limitations and weaknesses; she never stopped giving me opportunities.

I thank Catarina my wife; Henry and Larissa, my sons; for their patience and love during the six months.

To the fellows of 2012 my hugs.

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APPENDICES

Appendix 1: Business model A: Summary

		Assumptions and Results											
		2014		Discounting Rate	3.0%								
Investment:		000USD		Planning Horizon	10	years							
Buildings		4500.0											
Equipment type 1	100%	155.7			Total Cap.	Equity							
Equipment type 2	100%	117.6											
Equipment type 3	100%	0.3											
Other		0.0		NPV of Cash Flow	-393.0	-393.0							
Total		**4773.6**		Internal Rate	1.4%	1.4%							
Financing:													
Working Capital		10.0		Capital/Equity (Internal Value of Shares)			1.0						
Total Financing		**4783.6**		after 10 years									
Equity	100%	1.0											
Loan Repayments	100%	10.0	years	Minimum Cash Account	10								
Loan Interest	100%	0.1											
Operations:			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Sales Quantity fish	100%		81.8	122.7	122.7	122.7	122.7	122.7	122.7	122.7	122.7	122.7	
Sales Price fish	100%		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	tons/year
Sales Quantity fingerl	100%		3760.0	3760.0	3760.0	3760.0	3760.0	3760.0	3760.0	3760.0	3760.0	3760.0	KUSD/ton
Sales Price fingerl	100%		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	number of fingerlings in 1000
Variable Cost fish	100%	0.5	KUSD/ton										price per fingerling in 1000
Variable cost fingerl	100%	0.0											
Fixed Cost	100%	390.6	000USD/year										
Inventory Build-up			**10**										
Debtors	40%	of turnover											
Creditors	70%	of variable cost											
Income Tax	12%	of taxable profit											
Dividend	100%	of profit											
Depreciation Buildings	2%	of buildings											
Depreciation Equipment	14%	of equipment for 7 years											
Depreciation Equipment	20%	of equipment for 5 years											
Depreciation Equipment	50%	of equipment for 2 years											
Depreciation Other Cost	20%	of other cost											
Loan Management Fee	2%	of loan											

Appendix 2: Business model A: Investment and Finance

		Investment											
000$		**2014.0**	**2015.0**	**2016.0**	**2017.0**	**2018.0**	**2019.0**	**2020.0**	**2021.0**	**2022.0**	**2023.0**	**2024.0**	**Total**
Investment and Financing			1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	
Investment:													
Buildings		4,500.00	4,410.00	4,320.00	4,230.00	4,140.00	4,050.00	3,960.00	3,870.00	3,780.00	3,690.00	3,600.00	
Equipment Type I		155.7	133.4	111.2	88.9	66.6	44.4	22.1	-0.2	-22.4	-44.7	-67.0	
Equipment Type 2		117.6	94.1	70.6	47.0	23.5	0.0	94.1	70.6	47.0	23.5	0.0	
Equipment Type 3		0.3	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	
Equipment other		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Booked Value		**4,774**	**4,638**	**4,502**	**4,366**	**4,230**	**4,095**	**4,076**	**3,941**	**3,805**	**3,669**	**3,533**	
Depreciation:													
Depreciation Buildings	2%		90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	**900**
Depreciation Equipm. T	14%		22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	**223**
Depreciation Equipm. T	20%		23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	**235**
Depreciation Equipm. T	50%		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	**1.65**
Depreciation Other	20%		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Total Depreciation			**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**1360**
Financing:		**4783.6**											**4784**
Equity	100%	4783.6											**4784**
Loans	0%	0.0											**0**
Repayment	10		**0.0**	0.0	0.0	0.0	0.0	0.0	0.0				**0**
Principal		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Interest	12%		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Loan Managem. Fees	2%	0.0											

Appendix 3: Business model A: Operation statement

		Operations										
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Operations Statement													
Sales Volume tons/year	fish		81.796	122.694	122.694	122.694	122.694	122.694	122.694	122.694	122.694	122.694	**1186.042**
Price 000$	fish		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	
sales volume fingerlings	000		3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	
Price 000$			0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	
Revenue			**824**	**1086**	**1086**	**1086**	**1086**	**1086**	**1086**	**1086**	**1086**	**1086**	**10599**
Variable Cost	0		49.3254	58.9881	58.9881	58.9881	58.9881	58.9881	58.9881	58.9881	58.9881	58.9881	**580.2183**
Net Profit Contribution			**774.969**	**1027.054**	**1027.0535**	**1027.05**	**1027.05**	**1027.054**	**1027.05**	**1027.05**	**1027.054**	**1027.054**	**10018.451**
Fixed Cost	391		391	391	391	391	391	391	391	391	391	391	**3905.9624**
Diverse Taxes	0.000%												**0**
Operating Surplus (EBITDA)			**384**	**636**	**636**	**636**	**636**	**636**	**636**	**636**	**636**	**636**	**6112.4881**
Inventory Movement			10										**10**
Depreciation			135.95153	135.95153	135.95153	135.9515	135.9515	135.95153	135.95153	135.9515	135.95153	135.95153	**1359.5153**
Operating Gain/Loss			**258**	**501**	**501**	**501**	**501**	**501**	**501**	**501**	**501**	**501**	**4762.9728**
Interest + Loan Man. Fee		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Profit before Tax		**0.0**	**258.4**	**500.5**	**500.5**	**500.5**	**500.5**	**500.5**	**500.5**	**500.5**	**500.5**	**500.5**	**4762.9728**
Loss Transfer	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Taxfree Dividend	0%												**0**
Taxable Profit		0.0	258.4	500.5	500.5	500.5	500.5	500.5	500.5	500.5	500.5	500.5	**4762.9728**
Income Tax	12%	0	31.010548	60.0606876	60.0606876	60.1	60.1	60.1	60.1	60.1	60.1	60.1	**571.55674**
Net Worth Tax	0.00%												**0**
Profit after Tax		**0.0**	**227.4**	**440.4**	**440.4**	**440.4**	**440.4**	**440.4**	**440.4**	**440.4**	**440.4**	**440.4**	**4191.4161**
Dividend	100%	0.0	227.4	440.4	440.4	440.4	440.4	440.4	440.4	440.4	440.4	440.4	**4191.4161**
Net Profit/Loss		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0**

Appendix 4: Business model A: Cash Flow

		Cash Flow											
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Cash Flow													
Operating Surplus (EBITDA)		**0**	**384.37276**	**636.45726**	**636.4573**	**636.4573**	**636.4573**	**636.457**	**636.457**	**636.4573**	**636.4573**	**636.45726**	**6,112**
Debtor Changes			-329.71776	-104.69888	0	0	0	0	0	0	0	0	**-434**
Creditor Changes			34.52778	6.76389	0	0	0	0	0	0	0	0	**41**
Cash Flow before Tax		**0**	**89.18278**	**538.52227**	**636.4573**	**636.4573**	**636.4573**	**636.457**	**636.457**	**636.4573**	**636.4573**	**636.45726**	**5,719**
Paid Taxes			0.0	31.0	60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1	**511**
Cash Flow after Tax		**0**	**89.18278**	**507.511722**	**576.3966**	**576.3966**	**576.3966**	**576.397**	**576.397**	**576.3966**	**576.3966**	**576.396572**	**5,208**
Interest + Loan Man. Fee		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Repayment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Net Cash Flow		**0.0**	**89.2**	**507.5**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**5,208**
Paid Dividend			0.0	227.4	440.4	440.4	440.4	440.4	440.4	440.4	440.4	440.4	**3,751**
Financing - Expenditure (W.Cap.)		10			**-0.33**		**-0.33**	**-117.6**	**-0.33**		**-0.33**		**-109**
Cash Movement		**10.0**	**89.2**	**280.1**	**135.6**	**136.0**	**135.6**	**18.4**	**135.6**	**136.0**	**135.6**	**136.0**	**1,348**
(changes in Cash Account)													

Appendix 5 Business model A: Source and allocation of Funds

		Source and Allocation of Funds											
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Source of Funds													
Profit before Tax		0.0	258.4	500.5	500.5	500.5	500.5	500.5	500.5	500.5	500.5	500.5	**4,763**
Depreciation		0	135.95153	135.95153	135.95153	135.95153	135.95153	135.9515	135.9515	135.95153	135.95153	135.95153	**1,360**
Funds from Operations		**0.0**	**394.4**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**6,122**
Loan Drawdown		0											**0**
Equity Drawdown		4783.64											**4,784**
Funds for allocation		**4783.6**	**394.4**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**636.5**	**10,906**
Alloction of Funds													
Investment		4774			0.33		0.33	117.6	0.33		0.33		
Repayment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Paid Taxes		0	0	31.0105476	60.060688	60.060688	60.060688	60.06069	60.06069	60.060688	60.060688	60.0606876	**511**
Paid Dividend		0	0	227.4106824	440.44504	440.44504	440.44504	440.445	440.445	440.44504	440.44504	440.4450424	**3,751**
Total allocation		**4774**	**0**	**258**	**501**	**501**	**501**	**618**	**501**	**501**	**501**	**501**	**9,155**
Changes Net Curr. Assets		**10**	**394**	**378**	**136**	**136**	**136**	**18**	**136**	**136**	**136**	**136**	**1,751**
Analysis of Changes													
Current Assets													
Cash at start of year		0	10	99	379	515	651	786	805	940	1076	1212	**6,474**
Cash at end of year		10	99	379	515	651	786	805	940	1076	1212	1348	**7,822**
Changes in Cash		**10**	**89**	**280**	**136**	**136**	**136**	**18**	**136**	**136**	**136**	**136**	**1,348**
Debtor changes		0	329.71776	104.69888	0	0	0	0	0	0	0	0	**434**
Stock Movements		0	10	0	0	0	0	0	0	0	0	0	**10**
Changes in Current Assets		**10**	**429**	**385**	**136**	**136**	**136**	**18**	**136**	**136**	**136**	**136**	**1,792**
Liabilities													
Creditor changes		0	34.52778	6.76389	0	0	0	0	0	0	0	0	**41**
Changes Net Curr. Assets		**10**	**394**	**378**	**136**	**136**	**136**	**18**	**136**	**136**	**136**	**136**	**1,751**
Check		0	0	0	0	0	0	0	0	0	0	0	

Appendix: 6 Business model A: Balance sheet

		Balance										
		2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Balance Sheet												
Assets												
Cash Account	0	10	99	379	515	651	786	805	940	1076	1212	1348
Debtors (Accounts Receivable)	40%	0	329.7178	434.4166	434.417	434.41664	434.41664	434.41664	434.4166	434.41664	434.4166	434.4166
Stock (Inventory)	0	0	10	10	10	10	10	10	10	10	10	10
Current Assets		**10**	**439**	**824**	**959**	**1095**	**1231**	**1249**	**1385**	**1521**	**1656**	**1792**
Fixed Assets (Booked Value)		4774	4638	4502	4366	4230	4095	4076	3941	3805	3669	3533
Total Assets		**4784**	**5077**	**5325**	**5325**	**5325**	**5325**	**5325**	**5325**	**5325**	**5325**	**5325**
Debts												
Dividend Payable		0.0	227.4	440.4	440.4	440.4	440.4	440.4	440.4	440.4	440.4	440.4
Taxes Payable		0.0	31.0	60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1
Creditors (Accounts Payable)	70%	0.0	34.5	41.3	41.3	41.3	41.3	41.3	41.3	41.3	41.3	41.3
Next Year Repayment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Current Liabilities (Short Term De		**0.0**	**292.9**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**
Long Term Debt (- next year repayme		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Debt		**0.0**	**292.9**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**	**541.8**
Equity (Shareholders Capital)	0	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6
Profit & Loss Balance	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Capital		**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**
Debts and Capital		**4784**	**5077**	**5325**	**5325**	**5325**	**5325**	**5325**	**5325**	**5325**	**5325**	**5325**
Check		0	0	0	0	0	0	0	0	0	0	0

Appendix 7: Business model A: Profitability assessment

		Profitability										
		2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**Total**
Profitability Measurements													
NPV and IRR of Total Cash Flow													
Cash Flow after Taxes		**0**	**89.2**	**507.5**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	
Loans		0											
Equity		-4783.64											
Total Cash Flow & Capital		**-4783.6**	**89.2**	**507.5**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	
NPV Total Cash Flow	3%	**-4,644**	**-4,560**	**-4,096**	**-3,584**	**-3,086**	**-2,604**	**-2,135**	**-1,680**	**-1,238**	**-809**	**-393**	
IRR Total Cash Flow							**-18%**	**-12%**	**-7%**	**-3%**	**-1%**	**1%**	
NPV and IRR of Net Cash Flow													
Net Cash Flow		**0.0**	**89.2**	**507.5**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	
Equity		-4783.64											
Net Cash Flow & Equity		**-4783.6**	**89.2**	**507.5**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	**576.4**	
NPV Net Cash Flow	3%	**-4,644**	**-4,560**	**-4,096**	**-3,584**	**-3,086**	**-2,604**	**-2,135**	**-1,680**	**-1,238**	**-809**	**-393**	
IRR Net Cash Flow							**-18%**	**-12%**	**-7%**	**-3%**	**-1%**	**1%**	
Financial Ratios													
Profit+Interest/Debt+Capital (ROI=Return on Investment))			5%	10%	9%	9%	9%	9%	9%	9%	9%	9%	
Profit/Shareh. Capital (ROE=Return on Equity)			5%	9%	9%	9%	9%	9%	9%	9%	9%	9%	
Revenue/Debt+Capital (Asset Turnover Ratio)			17%	21%	20%	20%	20%	20%	20%	20%	20%	20%	
Capital/Debt+Capital			94%	90%	90%	90%	90%	90%	90%	90%	90%	90%	
Net Current Ratio			1.5	1.5	1.8	2.0	2.3	2.3	2.6	2.8	3.1	3.3	
Liquid Current Ratio (Quick Current Ratio)			1.5	1.5	1.8	2.0	2.3	2.3	2.5	2.8	3.0	3.3	
Total Capital/Equity (Internal Value of Shares)			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Debt Service Coverage			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!				

Appendix 8: Business model B: Summary

		Assumptions and Results												
		2014		**Discounting Rate**		**3.0%**								
Investment:		000USD		**Planning Horizon**		**10**	**years**							
Buildings		4500.0												
Equipment type 1	100%	155.7				**Total Cap.**	**Equity**							
Equipment type 2	100%	117.6												
Equipment type 3	100%	0.3												
Other		0.0		**NPV of Cash Flow**		**-4.0**	**-4.0**							
Total		**4773.6**		**Internal Rate**		**3.0%**	**3.0%**							
Financing:														
Working Capital		10.0		**Capital/Equity (Internal Value of Shares)**				**1.0**						
Total Financing		**4783.6**		**after 10 years**										
Equity	100%	1.0												
Loan Repayments	100%	10.0	years	**Minimum Cash Account**		**10**								
Loan Interest	100%	0.1												
Operations:			**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**		
Sales Quantity fish	100%		81.8	122.7	122.7	122.7	122.7	122.7	122.7	122.7	122.7	122.7		
Sales Price fish	100%		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	tons/year	
Sales Quantity fingerl	100%		4400.0	4400.0	4400.0	3760.0	3760.0	3760.0	3760.0	3760.0	3760.0	3760.0	KUSD/ton	
Sales Price fingerl	100%		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	number of fingerlings in 1000	
Variable Cost fish	100%	0.5	KUSD/ton										price per fingerling in 1000	
Variable cost fingerl	100%	0.0												
Fixed Cost	100%	354.6	000USD/year											
Inventory Build-up			**10**											
Debtors	40%	of turnover												
Creditors	70%	of variable cost												
Income Tax	12%	of taxable profit												
Dividend	100%	of profit												
Depreciation Buildings	2%	of buildings												
Depreciation Equipment	14%	of equipment for 7 years												
Depreciation Equipment	20%	of equipment for 5 years												
Depreciation Equipment	50%	of equipment for 2 years												
Depreciation Other Cost	20%	of other cost												
Loan Management Fee	2%	of loan												

Appendix 9: Business model B Investment and Finance

		Investment											
000$		**2014.0**	**2015.0**	**2016.0**	**2017.0**	**2018.0**	**2019.0**	**2020.0**	**2021.0**	**2022.0**	**2023.0**	**2024.0**	**Total**
Investment and Financing			1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	
Investment:													
Buildings		4,500.00	4,410.00	4,320.00	4,230.00	4,140.00	4,050.00	3,960.00	3,870.00	3,780.00	3,690.00	3,600.00	
Equipment Type I		155.7	133.4	111.2	88.9	66.6	44.4	22.1	-0.2	-22.4	-44.7	-67.0	
Equipment Type 2		117.6	94.1	70.6	47.0	23.5	0.0	94.1	70.6	47.0	23.5	0.0	
Equipment Type 3		0.3	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	
Equipment other		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Booked Value		**4,774**	**4,638**	**4,502**	**4,366**	**4,230**	**4,095**	**4,076**	**3,941**	**3,805**	**3,669**	**3,533**	
Depreciation:													
Depreciation Buildings	2%		90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	**900**
Depreciation Equipm. T	14%		22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	**223**
Depreciation Equipm. T	20%		23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	**235**
Depreciation Equipm. T	50%		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	**1.65**
Depreciation Other	20%		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Total Depreciation			**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**136.0**	**1360**
Financing:		**4783.6**											**4784**
Equity	100%	4783.6											**4784**
Loans	0%	0.0											**0**
Repayment	10		**0.0**	0.0	0.0	0.0	0.0	0.0	0.0				**0**
Principal		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Interest	12%		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Loan Managem. Fees	2%	0.0											

Appendix 10: Business model B: Operation statement

		Operations										
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Operations Statement													
Sales Volume tons/year	fish		81.796	122.694	122.694	122.694	122.694	122.694	122.694	122.694	122.694	122.694	**1186.042**
Price 000$	fish		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	
sales volume fingerlings 000			4400	4400	4400	3760	3760	3760	3760	3760	3760	3760	
Price 000$			0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	
Revenue			**875.4944**	**1137.242**	**1137.2416**	**1086.04**	**1086.04**	**1086.042**	**1086.04**	**1086.04**	**1086.042**	**1086.042**	**10752.269**
Variable Cost	0		49.3254	58.9881	58.9881	58.9881	58.9881	58.9881	58.9881	58.9881	58.9881	58.9881	**580.2183**
Net Profit Contribution			**826.169**	**1078.254**	**1078.2535**	**1027.05**	**1027.05**	**1027.054**	**1027.05**	**1027.05**	**1027.054**	**1027.054**	**10172.051**
Fixed Cost	355		355	355	355	355	355	355	355	355	355	355	**3545.9624**
Diverse Taxes	0.000%												**0**
Operating Surplus (EBITDA)			**472**	**724**	**724**	**672**	**672**	**672**	**672**	**672**	**672**	**672**	**6626.0881**
Inventory Movement			10										**10**
Depreciation			135.95153	135.95153	135.95153	135.9515	135.9515	135.95153	135.95153	135.9515	135.95153	135.95153	**1359.5153**
Operating Gain/Loss			**346**	**588**	**588**	**537**	**537**	**537**	**537**	**537**	**537**	**537**	**5276.5728**
Interest + Loan Man. Fee		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Profit before Tax		**0.0**	**345.6**	**587.7**	**587.7**	**536.5**	**536.5**	**536.5**	**536.5**	**536.5**	**536.5**	**536.5**	**5276.5728**
Loss Transfer	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Taxfree Dividend	0%												**0**
Taxable Profit		0.0	345.6	587.7	587.7	536.5	536.5	536.5	536.5	536.5	536.5	536.5	**5276.5728**
Income Tax	12%	0	41.474548	70.5246876	70.5246876	64.4	64.4	64.4	64.4	64.4	64.4	64.4	**633.18874**
Net Worth Tax	0.00%												**0**
Profit after Tax		**0.0**	**304.1**	**517.2**	**517.2**	**472.1**	**472.1**	**472.1**	**472.1**	**472.1**	**472.1**	**472.1**	**4643.3841**
Dividend	100%	0.0	304.1	517.2	517.2	472.1	472.1	472.1	472.1	472.1	472.1	472.1	**4643.3841**
Net Profit/Loss		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0**

Appendix 11: Business model B: Cash Flow

		Cash Flow										
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Cash Flow													
Operating Surplus (EBITDA)		**0**	**471.57276**	**723.65726**	**723.6573**	**672.4573**	**672.4573**	**672.457**	**672.457**	**672.4573**	**672.4573**	**672.45726**	**6,626**
Debtor Changes			-350.19776	-104.69888	0	20.48	0	0	0	0	0	0	**-434**
Creditor Changes			34.52778	6.76389	0	0	0	0	0	0	0	0	**41**
Cash Flow before Tax		**0**	**155.90278**	**625.72227**	**723.6573**	**692.9373**	**672.4573**	**672.457**	**672.457**	**672.4573**	**672.4573**	**672.45726**	**6,233**
Paid Taxes			0.0	41.5	70.5	70.5	64.4	64.4	64.4	64.4	64.4	64.4	**569**
Cash Flow after Tax		**0**	**155.90278**	**584.247722**	**653.1326**	**622.4126**	**608.0766**	**608.077**	**608.077**	**608.0766**	**608.0766**	**608.076572**	**5,664**
Interest + Loan Man. Fee		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Repayment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Net Cash Flow		**0.0**	**155.9**	**584.2**	**653.1**	**622.4**	**608.1**	**608.1**	**608.1**	**608.1**	**608.1**	**608.1**	**5,664**
Paid Dividend			0.0	304.1	517.2	517.2	472.1	472.1	472.1	472.1	472.1	472.1	**4,171**
Financing - Expenditure (W.Cap.)		10			**-0.33**		**-0.33**	**-117.6**	**-0.33**		**-0.33**		**-109**
Cash Movement		**10.0**	**155.9**	**280.1**	**135.6**	**105.2**	**135.6**	**18.4**	**135.6**	**136.0**	**135.6**	**136.0**	**1,384**
(changes in Cash Account)													

Appendix 12 Business model B: Source and allocation of Funds

Source and Allocation of Funds

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Source of Funds												
Profit before Tax	0.0	345.6	587.7	587.7	536.5	536.5	536.5	536.5	536.5	536.5	536.5	**5,277**
Depreciation	0	135.95153	135.95153	135.95153	135.95153	135.95153	135.9515	135.9515	135.95153	135.95153	135.95153	**1,360**
Funds from Operations	**0.0**	**481.6**	**723.7**	**723.7**	**672.5**	**672.5**	**672.5**	**672.5**	**672.5**	**672.5**	**672.5**	**6,636**
Loan Drawdown	0											**0**
Equity Drawdown	4783.64											**4,784**
Funds for allocation	**4783.6**	**481.6**	**723.7**	**723.7**	**672.5**	**672.5**	**672.5**	**672.5**	**672.5**	**672.5**	**672.5**	**11,420**
Alloction of Funds												
Investment	4774			**0.33**		**0.33**	**117.6**	**0.33**		**0.33**		
Repayment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**
Paid Taxes	0	0	41.4745476	70.524688	70.524688	64.380688	64.38069	64.38069	64.380688	64.380688	64.3806876	**569**
Paid Dividend	0	0	304.1466824	517.18104	517.18104	472.12504	472.125	472.125	472.12504	472.12504	472.1250424	**4,171**
Total allocation	**4774**	**0**	**346**	**588**	**588**	**537**	**654**	**537**	**537**	**537**	**537**	**9,633**
Changes Net Curr. Assets	**10**	**482**	**378**	**136**	**85**	**136**	**18**	**136**	**136**	**136**	**136**	**1,787**
Analysis of Changes												
Current Assets												
Cash at start of year	0	10	166	446	582	687	822	841	976	1112	1248	**6,891**
Cash at end of year	10	166	446	582	687	822	841	976	1112	1248	1384	**8,275**
Changes in Cash	**10**	**156**	**280**	**136**	**105**	**136**	**18**	**136**	**136**	**136**	**136**	**1,384**
Debtor changes	0	350.19776	104.69888	0	-20.48	0	0	0	0	0	0	**434**
Stock Movements	0	10	0	0	0	0	0	0	0	0	0	**10**
Changes in Current Assets	**10**	**516**	**385**	**136**	**85**	**136**	**18**	**136**	**136**	**136**	**136**	**1,828**
Liabilities												
Creditor changes	0	34.52778	6.76389	0	0	0	0	0	0	0	0	**41**
Changes Net Curr. Assets	**10**	**482**	**378**	**136**	**85**	**136**	**18**	**136**	**136**	**136**	**136**	**1,787**
Check	0	0	0	0	0	0	0	0	0	0	0	

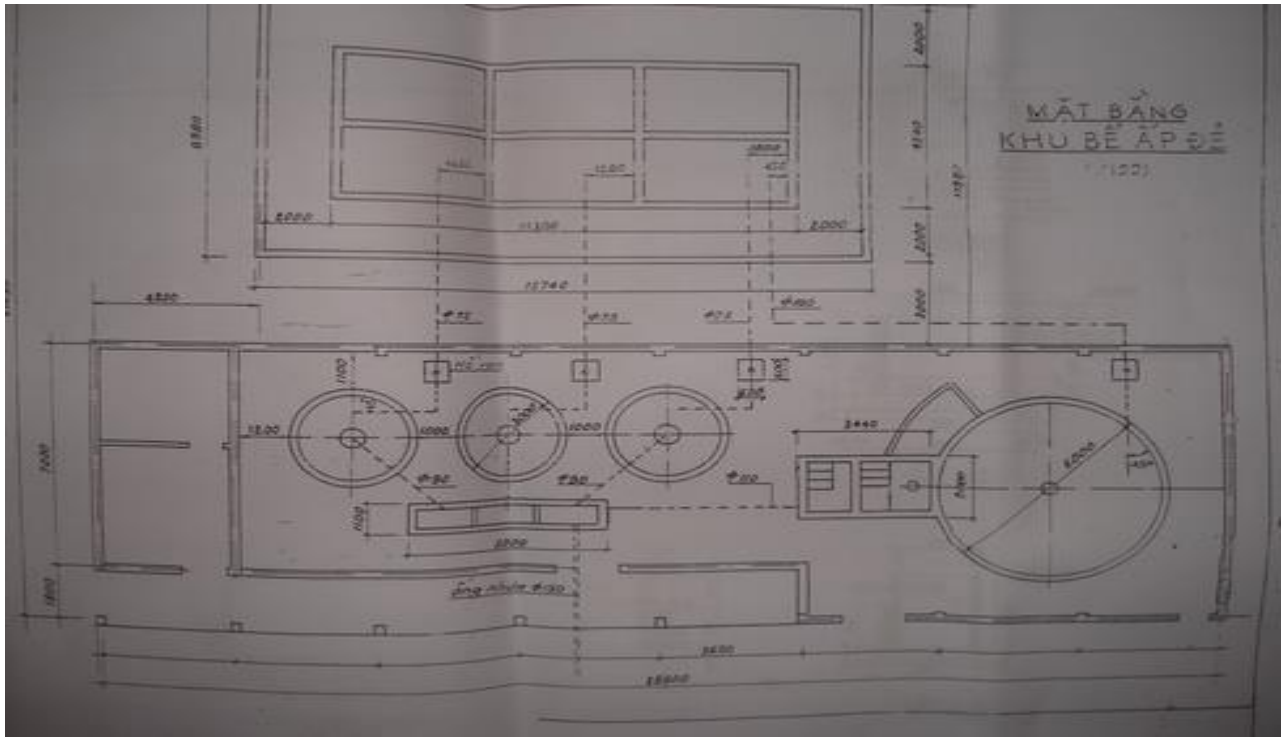
Appendix: 13 Business model B: Balance sheet

		Balance										
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Balance Sheet												
Assets												
Cash Account	0	10	166	446	582	687	822	841	976	1112	1248	1384
Debtors (Accounts Receivable)	40%	0	350.1978	454.8966	454.897	434.41664	434.41664	434.41664	434.4166	434.41664	434.4166	434.4166
Stock (Inventory)	0	0	10	10	10	10	10	10	10	10	10	10
Current Assets		**10**	**526**	**911**	**1047**	**1131**	**1267**	**1285**	**1421**	**1557**	**1692**	**1828**
Fixed Assets (Booked Value)		4774	4638	4502	4366	4230	4095	4076	3941	3805	3669	3533
Total Assets		**4784**	**5164**	**5413**	**5413**	**5361**	**5361**	**5361**	**5361**	**5361**	**5361**	**5361**
Debts												
Dividend Payable		0.0	304.1	517.2	517.2	472.1	472.1	472.1	472.1	472.1	472.1	472.1
Taxes Payable		0.0	41.5	70.5	70.5	64.4	64.4	64.4	64.4	64.4	64.4	64.4
Creditors (Accounts Payable)	70%	0.0	34.5	41.3	41.3	41.3	41.3	41.3	41.3	41.3	41.3	41.3
Next Year Repayment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Current Liabilities (Short Term De		**0.0**	**380.1**	**629.0**	**629.0**	**577.8**	**577.8**	**577.8**	**577.8**	**577.8**	**577.8**	**577.8**
Long Term Debt (- next year repayme		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Debt		**0.0**	**380.1**	**629.0**	**629.0**	**577.8**	**577.8**	**577.8**	**577.8**	**577.8**	**577.8**	**577.8**
Equity (Shareholders Capital)	0	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6	4783.6
Profit & Loss Balance	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Capital		**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**	**4783.6**
Debts and Capital		**4784**	**5164**	**5413**	**5413**	**5361**	**5361**	**5361**	**5361**	**5361**	**5361**	**5361**
Check		0	0	0	0	0	0	0	0	0	0	0

Appendix 14: Business model B: Profitability assessment

		Profitability										
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Profitability Measurements													
NPV and IRR of Total Cash Flow													
Cash Flow after Taxes		0	155.9	584.2	653.1	622.4	608.1	608.1	608.1	608.1	608.1	608.1	
Loans		0											
Equity		-4783.64											
Total Cash Flow & Capital		-4783.6	155.9	584.2	653.1	622.4	608.1	608.1	608.1	608.1	608.1	608.1	
NPV Total Cash Flow	3%	-4,644	-4,497	-3,963	-3,382	-2,845	-2,336	-1,842	-1,362	-896	-443	-4	
IRR Total Cash Flow							-16%	-9%	-5%	-1%	1%	3%	
NPV and IRR of Net Cash Flow													
Net Cash Flow		0.0	155.9	584.2	653.1	622.4	608.1	608.1	608.1	608.1	608.1	608.1	
Equity		-4783.64											
Net Cash Flow & Equity		-4783.6	155.9	584.2	653.1	622.4	608.1	608.1	608.1	608.1	608.1	608.1	
NPV Net Cash Flow	3%	-4,644	-4,497	-3,963	-3,382	-2,845	-2,336	-1,842	-1,362	-896	-443	-4	
IRR Net Cash Flow							-16%	-9%	-5%	-1%	1%	3%	
Financial Ratios													
Profit+Interest/Debt+Capital (ROI=Return on Investment))			7%	11%	11%	10%	10%	10%	10%	10%	10%	10%	
Profit/Shareh. Capital (ROE=Return on Equity)			6%	11%	11%	10%	10%	10%	10%	10%	10%	10%	
Revenue/Debt+Capital (Asset Turnover Ratio)			18%	22%	21%	20%	20%	20%	20%	20%	20%	20%	
Capital/Debt+Capital			93%	88%	88%	89%	89%	89%	89%	89%	89%	89%	
Net Current Ratio			1.4	1.4	1.7	2.0	2.2	2.2	2.5	2.7	2.9	3.2	
Liquid Current Ratio (Quick Current Ratio)			1.4	1.4	1.6	1.9	2.2	2.2	2.4	2.7	2.9	3.1	
Total Capital/Equity (Internal Value of Shares)			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Debt Service Coverage			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!				

Appendix 15: Design of Grass carp breeding tank



Appendix: 16 Clear circular incubator for Common Carp

Appendix 17: Tilapia egg incubator (Incubating Trays and water supply system)

Appendix 18: Components of Hatchery and other costs

Hatchery - in house	Group	Quantity	Price (US$)	Amount (US$)
Common carp incubator	1	3	1200	3,600
Chinese carp breeding tank	1	23	210	4,830
Chinese carp incubating tanks (5.6m3/tank)	1	12	210	2,520
Tilapia incubator (tray)	1	60	6	360
Tilapia Hatchery pump (7KW)	2	1	2500	2,500
Chinese carp hatchery pump (10KW)	2	1	3000	3,000
Sub - total				**16,810**

Hatchery Out side	Group	Quantity	Price (US$)	Amount (US$)
Seine net	3	5	40	200
Hatchery scoop net	3	5	4	20
Tape measure	3	5	4	20
Weighing scale	3	5	10	50
Fish baskets	**3**	5	8	40
Water filter ration package	2	1	2500	2,500
UV system	2	2	2000	4,000
PVC tube and valves	**2**		0	2,000
180 m3 water storage tanks at 1m high with ground level (1 tank)	**1**	180	210	37,800
4-5m3 water supply tank at 4m high to the ground level	**1**	5	500	2,500
7KW water pump	**2**	2	600	1,200
2KW water pump	**2**	2	200	400
PVC tube and valves	**2**			2,000
Maturations ponds		6		

Hatchery - Electricity system outside and inside

Descriptions		**Quantity**	**Price $**	**Amount $**
Transformer (50KVA)- Set	1	1	12000	12000
Cable (4 x 50VAV) - (m)	1	1200	38	45600
Wooden Poles (12.5m 50m/a pole)- Unit	1	30	250	7500
set-up fee for overall system (by contract) - Set	1	1	10000	29000
Spare generator (15KVA) -Set	1	1	6000	6000
Sub-total				**100100**

Rearing Ponds

Outdoor rearing		Quatity	Price (US$)	Amount (US$)
4 ponds of 40*30		4	0	0
24 ponds 50*30		24	0	0
8 ponds of 60*30		8	0	0
4 ponds of 70*30		6	0	0

Harvesting Cost

Harvesting		Quantity	Price	Amount in USD
Freezer	1	1	4000	4,000
Sub total				**4,000**

Selling and Marketing

Selling and Marketing				
Pick Up Vehicles	2	2	50000	100,000
Sub total				**100,000**

Expenses For Lab & Equipment

Descriptions for Environmental & Disease Lab	**Unit**	**Price (US$)**	**Amount (US$)**
Dissolved Oxygen meter (YSY 58)	2	1,200.00	2,400.00
pH meter	1	800.00	800.00
Water distiller. 51/hour	1	3,000.00	3,000.00
Water - quality test Kit	3	8,000.00	24,000.00
Microscope	2	1,500.00	1,500.00
High speed shaker	2	700.00	1,400.00
Compact Orbital shaker	1	3,000.00	3,000.00
Magnetic stirrer	2	500.00	1,000.00
Technical Balances	1	1,000.00	1,000.00
Analytical balances	1	4,000.00	4,000.00
Oven	1	2,000.00	2,000.00
Deep freezer	1	5,000.00	5.000.00
Furnace	1	5,000.00	5,000.00
Refrigerator	2	500.00	1,000.00
Chemical resistant pump	2	2,000.00	4,000.00
Glassware (additional)		10,000.00	10,000.00
Chemicals		30,000.00	30,000.00
Flame-spectrophotometer with computer system	1	32,000.00	32.000.00
Non expendable		5,000.00	5,000.00
Sub Total			**136,100.00**

Descriptions for Genetic Selection Lab.	**Unit**	**Price (US$)**	**Amount (US$)**
Vertical electrophoresis	2	10,000.00	20,000.00
Densitometer	1	15,000.00	15,000.00
Ultraviolet Lamp	1	2,000.00	2,000.00
Incubator	2	1,500.00	3,000.00
Monochrome closed circuit TV system	1	3,500.00	3,500.00
High speed centrifuge	1	5,000.00	5,000.00
Facilities assess to electrophoresis		4,000.00	4,000.00
Cell cutter	1	5,000.00	5,000.00
Drop fractometer	1	3,500.00	3,500.00

Diesel pump	2	2,500.00	5,000.00
Chemicals		30,000.00	30,000.00
Glassware		10,000.00	10,000.00
Non-expendable		5,000.00	5,000.00
Sub total			**111,000.00**

Total number of fingerlings per cycle

	Grass carp	**Common carp**	**Nile Tilapia**	**Mozambican Tilapia**
Number of female/ 500g	266	333	666	666
Number of eggs per female	25,000	25,000	7,000	7,000
Total number of eggs	6,650,000	8,325,000	4,662,000	4,662,000
Rate of fertilization (%)	80	80	80	80
Fertilized Eggs	5,320,000	6,660,000	3,729,600	3,729,600
Survival rate of larvae %	80	80	80	80
Hatching larvae	4,256,000	5,328,000	2,983,680	2,983,680
Survival rate in hatching (%)	80	80	80	80
Total number of hatched finger-lings	3,404,800	4,262,400	2,386,944	2,386,944
Survival rate of fingerlings (%)	70	70	90	90
Total fingerlings per specie	**2,383,360.00**	**2,983,680.00**	**2,148,249.60**	**2,148,249.60**
Total number of fingerlings				**9,663,539.20**