Pre-Feasibility Study

INLAND FISH FARMING

Small and Medium Enterprises Development Authority

Ministry of Industries & Production

Government of Pakistan

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1. INTRODUCTION TO SMEDA

The Small and Medium Enterprise Development Authority (SMEDA) was established with the objective to provide fresh impetus to the economy through the launch of an aggressive SME support program.

Since its inception in October 1998, SMEDA had adopted a sectoral SME development approach. A few priority sectors were selected on the criterion of SME presence. In depth research was conducted and comprehensive development plans were formulated after identification of impediments and retardants. The all-encompassing sectoral development strategy involved recommending changes in the regulatory environment by taking into consideration other important aspects including financial aspects, niche marketing, technology up gradation and human resource development.

SMEDA has so far successfully formulated strategies for sectors including, fruits and vegetables, marble and granite, gems and jewelry, marine fisheries, leather and footwear, textiles, surgical instruments, urban transport and dairy. Whereas the task of SME development at a broader scale still requires more coverage and enhanced reach in terms of SMEDA's areas of operation.

Along with the sectoral focus a broad spectrum of business development services is also offered to the SMEs by SMEDA. These services include identification of viable business opportunities for potential SME investors. In order to facilitate these investors, SMEDA provides business guidance through its help desk services as well as development of project specific documents. These documents consist of information required to make well-researched investment decisions. Pre-feasibility studies and business plan development are some of the services provided to enhance the capacity of individual SMEs to exploit viable business opportunities in a better way. This document is in the continuation of this effort to enable potential investors to make well-informed investment decisions.

2. PURPOSE OF THE DOCUMENT

The objective of pre-feasibility study is primarily to facilitate potential entrepreneurs in project identification for investment. The project pre-feasibility may form the bases of an important

investment decision, in order to serve this objective; the document/study covers various aspects of project concept development, start-up, production, and finance and business management.

3 PROJECT PROFILE

3.1 Project brief

The project is about establishing an Inland Fish Farm in the potential areas of Pakistan which provide desired suitable environment. The project would serve as facility to utilize the everyday resources in the form of feed for inland fish farm that usually ends up as cultural waste. On the other hand it would generate employment for the local inhabitants and more over would possibly cause cash inflow as well. Currently the project is being designed / proposed for the high temperature areas/cities such as Sibi and Jacobabad, however the same can be proposed for the areas which can fulfill input and logistic requirements of the project.

The proposed project is primarily focused on the local customers and national markets due to the prevailing high demand and taste preferences. The main feature of the project would include naturally grown fisheries in clean environment keeping in view the quality standards and principles. This prefeasibility study explores the viability of setting up inland fish farm based on economic and technology trends and available local strengths, weaknesses, opportunities and threats.

3.2 Background

Fish farming is an ancient practice that had been used for food purposes for centuries. Australian, African and Asian regions were the historical fish breeding centers since 6000 BC. The concept of inland aquaculture away from the seacoast and big rivers was widely practiced in cerntral Europe during the middle ages. Inland fish farming was started on commercial basis in 18th century. Seth Green was the first to practice commercial inland fish farming in 1864 at Caledonia (USA). It laid down the foundation of commercial fish farming and people has started practicing it in other countries like UK and Canada. During 19th century improvement in transportation made fish farming more convenient and profitable business by targeting the adjoining market of the inland fish farming zone.

In recent times the industry has experienced a tremendous growth level as compare to any agri food industry on record. Many remarkable developments and initiatives has been made in the said industry, however the most important step was taken in 1960's when the intensive breeding of different fish species was started at commercial level around the world. These factors helped to accelerate the fish farming industry to unprecedented levels of growth, making it one of the world's fastest growing agri food sector.

3.3 Defining the Product

Fish is an animal which lives and breathes in water. All fish are vertebrates (have a backbone) and most breathe through gills and have fins and scales. Fish make up about half of all known vertebrate species.

Fish is a high protein, low fattening food that provides high range of health benefits. The white fleshed fish is lower in fat than any other source of protein and enrich in omega 3 fatty acids. Fish meat is medically recommended as a diet for human body, it produced essential nutrients in significant amount which is required for healthy body. Moreover fishes are low in the bad fats commonly found in red meat, called omega 6 fatty acids that make it even more favorable product as compare to red meat.

3.4 Raw Material

The primary raw materials used for fish farming are Katti and cow dung, in addition urea is added to enhance the water quality and enhance productivity for better growth.

Globally some artificial feeds such as fish meal are used for feeding purpose but these are very expensive and are not recommended as economical in Pakistan. However, it is the choice of entrepreneur or feed specialist to use or decide the amount of daily feed requirement.

3.5 Proposed Fish Farm

Globally three techniques are practiced for inland fish farming.

a) Extensive Fish Farming
b) Intensive Fish Farming
c) Semi intensive Fish Farming

a) ***Extensive fish farming***

Extensive fish farming is a self sustaining natural production system in which the fishes are totally feed on naturally grown plants and species within the water. Extensive system uses low stocking densities (e.g., 5,000-10,000 larvae/ha/crop) and no supplementary feeding, although fertilization may be done to stimulate the growth and production of natural food in the water. Water changes are done on regular basis to maintain the oxygen level and provide fresh water to fishes for better growth. The ponds used for extensive culture are usually large (more than two hectare), may be shallow and not fully cleared of tree stumps. Production is generally less than 1 ton/ha/year.

b) ***Intensive technique***

Intensive fish farming is a technique in which the fish are sustained in artificial culture i.e. external food supply, artificial aeration and water filtration. Intensive culture uses very high densities of culture organisms (e.g. 200,000-300,000 larvae/ha/crop) and is totally dependent on artificially formulated feeds. Financial returns are therefore much more attractive than those from extensive culture. Production is of course much higher (i.e. 10 tons/ha/crop)

c) ***Semi intensive fish farming technique***

Semi Intensive farms harvested in ponds and supply with artificial feeds along with natural feeds. This technique is basically a mixture of both Extensive and Intensive fish farming. This technique is usually practiced in small ponds i.e. about 1 acre each in size for ease of management. Semi intensive system uses densities higher than extensive systems (e.g., 50,000-100,000 larvae/ha/crop) and use supplementary feeding. Semi intensive culture system is managed by the application of inputs (mainly feeds, fertilizers) and the manipulation of the environment primarily by way of water management through the use of pumps. Feeding of the stock is done at regular intervals during the day. In Semi intensive culture production is much higher then extensive technique (i.e. 1.5 tons/ha/crop).

The management of each stated inland fish farming technique/system is completely different with implications on capital and operational cost, requirement of technical expertise and economies of farming. However, keeping in view the cultural, economical and environmental

aspects of Pakistan market, Semi Intensive Fish Farming is proposed for the said project.

3.6 Opportunity Rationale

Fish are nutrient product and wildly consumed around the world in verities of food items. They are used in various traditional dishes such as Fish meal, Amritsari Fish, Tandoori Fish, Fish Tikka and Fish Pakora etc. and also consumed in modern dishes like burgers, pizzas and canned products. In addition, fish are also used in medicine industry. Such factors contribute to making fish farming a viable project for investment.

The raising and selling of fish on commercial basis has proven to be economically successful throughout the world. Fish meat is recognized as a healthy food, low in calories and cholesterol, but rich in protein. This has led to a dramatic increase in the consumption of fish products. Fish can convert feed into body tissue more efficiently than other animals, transforming about 70 percent of their feed into flesh. Fish also have excellent dress out qualities, providing an average of 60 percent body weight as marketable product. Fish farming is a profitable business if the necessary arrangements are made and properly managed. There is a huge business opportunity in this sector.

3.7 Market Entry Timing

Market entry timing is very critical in inland fish farming and can result in high loss if not considered accordingly. The harvesting of fish should be initiated before March so that the fish are matured enough for market till November.

3.8 Proposed locations

The proposed location for the establishment of the fish farms will primarily be warm areas that provide suitable environment and particularly water temperature range between 5-30 degree centigrade. It is suggested that the farms may be established in Sibi, Naseerabad, Jacobabad, Multan, and Bahawalpur, Thatta etc. and any other place having similar attributes of the mentioned locations.

3.9 Proposed Business Status

The proposed legal structure of the business entity is sole proprietorship whereas it can be established by creation of partnership. Even though selection totally depends upon the choice of the entrepreneur but proposed prefeasibility is based on a Sole Proprietorship.

3.10 Viable Economics Size

The total investment required for this project is Rs 7.1 millions. The investment mainly covers capital costs of Rs. 6.4 millions and working capital requirement of Rs. 0.74 millions.

Table 1: Project Investment

Description	**Amount (Rs)**
Total Fixed Cost	6,415,500
Working Capital	746,667
Total	**7,162,166**

4. CRITICAL FACTORS IN DECISION MAKING

Following are the key factors recommended for initiating a successful business.

4.1 Key Success Factors

The commercial viability of the proposed project depends on the following factors

- Selection of proper location, equipment, and staff would facilitate the project to run successfully.
- Farm should be located in an area that is not subject to flooding.
- Farm must not be located near river belt.
- Farm should have enough elevation so it can easily be desiccated during the off season.
- Each farm should be prepared with proper soil i.e. China Clay to avoid water seep.
- Availability of fresh water supply throughout the year.
- Farm should have road access even during the rainy season.
- It should be positioned away from agricultural activities to avoid spray application of pesticides.
- Seeds must be purchased from certified dealers for the assurance of desire fish species.
- Continuous efforts should be made for improving and marketing the product on time.

- To attract larger number of customers the product must be processed on basic quality standards.
- Each farm should maintain a written health and welfare program for elimination of diseases and quality production.
- Economical Prices of final product.
- Efficient delivery will provide a competitive edge in capturing market.

4.2 Opportunities

Following are some major opportunities for the proposed project:

- Diversified demand of the product from the food industry and medicine.
- Availability of abundant raw material.
- Lack of specialized producer.
- Established market and demand.

4.3 Threats

The proposed project will be facing the following threat:

- Substitute's availability.
- Price fluctuations and macroeconomic instability.

5. MARKET ANALYSIS

5.1 Target Customer

The target customers for fish are households, hotels, restaurants and pharmaceutical companies. Initially the project will focused on local market, depending upon its successful operation it would be market in other customer groups of the country at national level.

5.2 Global Market

Fish production, trade and utilization in the world has been increasing dramatically fast due to the prevalence of huge demand. In 2007 the world's total fish output i.e. both inland and marine production was 140.4 million tons that is double as compare to the production of 1980. The

statistics further reveals that there is gradual increase in production and consumption since 1980. Table 1 describes the statistics on world fish production, trade and utilization as below

Table 1: World fish production, trade, and utilization

	1980	1990	2000	2006	2007
Production (million tons)	71.9	97.7	125.9	137.2	140.4
Inland water	7.7	14.5	27.9	38.5	41.0
Marine water	64.2	83.2	98.0	98.7	99.4
Capture (million tons)	67.2	84.6	93.5	89.9	90.1
Inland water	5.1	6.4	8.6	9.8	10.0
Marine water	62.1	78.2	84.9	80.1	80.0
Trade (million tons)					
Imports	19.8	33.7	49.2	55.0	54.8
Exports	21.0	32.4	48.6	53.8	53.1
Trade (USD billion)					
Imports	16.0	39.4	60.3	90.0	98.1
Exports	15.4	35.5	55.8	86.1	93.5
Utilization					
Human consumption (million tons)	51.6	70.4	95.7	111.0	113.7
Non food use (million tons)	20.3	27.3	30.1	26.1	26.7
Per capita food fish supply (kg)	11.5	13.6	15.7	16.8	17.0

Source: FAO

5.2.1 Major Producers

Out of total world production the Chinese production in terms of Quantity and Value is at top as per data provided by FAO. China is contributing 31.42 million tons of fish while India and

Vietnam are other large producers by contributing 3.35 and 2.15 million tons of fish respectively. Table 2 describes the world leading producers of fish in term of quantity and value as below.

Table 2: Major Producers of Fish

Country		2005	2006	2007
China	Quantity (tons)	28,120,690	29,856,841	31,420,275
	Value (USD)	29,954,213	33,299,141	39,684,662
India	Quantity (tons)	2,961,978	3,169,303	3,354,754
	Value (USD)	3,757,523	4,172,561	4,383,498
Vietnam	Quantity (tons)	1,437,300	1,657,727	2,156,500
	Value (USD)	2,930,650	3,316,142	4,525,750
Indonesia	Quantity (tons)	1,197,109	1,292,899	1,392,904
	Value (USD)	1,999,246	2,254,855	2,461,909
Thailand	Quantity (tons)	1,304,213	1,406,981	1,390,031
	Value (USD)	1,740,400	2,240,232	2,432,761
Bangladesh	Quantity (tons)	882,091	892,049	945,812
	Value (USD)	1,246,479	135,914	1,522,552
Norway	Quantity (tons)	661,811	712,281	830,190
	Value (USD)	2,135,712	2,748,562	2,977,742
Chile	Quantity (tons)	698,214	802,410	829,842
	Value (USD)	3,108,248	4,428,299	5,277,272
Japan	Quantity (tons)	746,221	733,891	765,846
	Value (USD)	3,178,416	3,098,904	3,172,949
Philippines	Quantity (tons)	557,251	623,369	709,715
	Value (USD)	793,580	981,504	1,234,199

Source: FAO

5.2.2 Major Exporters

China is the biggest exporter of fish in world in year 2007, China has exported US$ 9,250,710 million of fish. Norway ranks second in world exports while Thailand is third largest exporter of fish. Table 3 describes the major exporters as follows.

Table 3: Major Exporters of Fish (US$ 1,000)

Country	2005	2006	2007
China	7,519,357	8,968,051	9,250,710
Norway	4,885,226	5,503,429	6,228,123
Thailand	4,494,183	5,266,742	5,708,849
USA	4,232,041	4,143,146	4,436,746
Denmark	3,685,243	3,986,519	4,128,359
Vietnam	2,756,139	3,372,242	3,783,834
Canada	3,595,693	3,659,857	3,711,890

Chile	2,966,917	3,556,594	3,677,002
Netherlands	2,820,138	2,811,705	3,280,643
Spain	2,579,057	2,848,676	3,230,749

Source: FAO

5.2.3 Major Importers

USA is biggest consumer of fish in 2007, it's imported worth US$ 13,631,511 million, Japan is the second major importer with imports of US$11,384,490 million and Spain stood at third position with imports of US$ 6,980,372 million. Table 4 further describes the world major importers of fish

Table 4: Major Importers of Fish in (US$ 1,000)

Country	2005	2006	2007
USA	11,982,336	13,271,315	13,631,511
Japan	14,438,337	13,970,740	13,184,490
Spain	5,632,087	6,359,092	6,980,372
France	4,562,629	5,069,238	5,366,203
Italy	4,224,081	4,716,917	5,143,834
China	3,979,232	4,125,990	4,511,576
Germany	3,234,841	3,738,906	4,278,560
UK	3,174,317	3,713,854	4,140,438
Korea Republic	2,366,543	2,752,606	3,090,028
Denmark	2,554,663	2,838,443	2,887,159

Source: FAO

5.4 Fisheries Sector of Pakistan

The total area covered by fish ponds across all provinces of Pakistan is about 60,470 ha, with Sindh having 49,170 ha, Punjab 10,500 ha, Khyber Pakhtunkhwa 560 ha, Balochistan, Azad Jammu Kashmir and Northern Area 240 ha. According to FAO report a number of 13,000 fish farms have established across Pakistan, employing around 50,000 people either directly or indirectly.

Inland fish farming is regularized by fisheries department of provincial governments, fisheries department supply seed, operate hatcheries, provide extension services, collect primary data and promotes fisheries. Production, capture and aquaculture details are given in table 5.

Table 5: Pakistan fish production, Capture, and Aquaculture

	2005	2006	2007	2008
Production (Quantity in tons)	515,472	611,246	570,280	586,512
Capture (Quantity in tons)	434,850	489,421	440,188	451,414
Aquaculture (Quantity in tons)	80,622	121,825	1,30,092	135,098
Aquaculture (US$)	1,09,684	191,981	214,163	203,648

Source: FAO

5.5 Marketing

The marketing of Fish follows the traditional channels of distribution. Generally fish are distributed in the market through middlemen and wholesalers. The role of middlemen and wholesalers is to identify buyers and negotiate the price. Fish are transported to the urban market and are sold to retailers. The time spent in getting fish from the farm to the retail shop varies from area to area. Although collection and handling of fish has improved with the use of loader vehicles, but it is an established fact that greater the distance between the farm and consumer, more complicated will be marketing system including their collection, handling and transportation to the middlemen or consumer as per perishable nature of the product. The trick in marketing is availability of current market information of fish supply and demand, which will determine the selling price.

6. Farm Management

6.1 Description of Fish Farming Technique

Basically, three different techniques are used for inland fish farming as described earlier. However, keeping in view the economical, technical and managerial factors, Semi intensive fish farming technique is suggested for the proposed project.

In Semi intensive fish farming feeding is carried out at least once per day and fertilizing once per week. In addition natural sources of feeding are used simultaneously with artificial feed sources for maximizing output. Feeding and fertilizing were chosen as indicators of the intensity level as

these parameters are more operational than others. Semi intensive fish farming uses higher densities (e.g., 50,000-100,000 larvae/ha/crop) and use supplementary feeding. Semi intensive culture system is managed by the application of inputs (mainly feeds and fertilizers) and the manipulation of the environment primarily by way of water and fresh air management through the use of pumps. Feeding of the stock is done at regular intervals during the day.

6.2 Site Selection

Special consideration should be given to the location of proposed facility. It should be located in an area that is neither subject to flooding nor near to rivers. The selected location should have enough elevation so that it can easily be dried in off season. In addition many other factors must be considered while selecting site. These factors may include availability of china clay in soil, round the year adequate water supply, road access even during the rainy season and location away from agricultural activities to avoid pesticides application and noise pollution.

6.3 Structural Design of the Land

The site for proposed fish farm will require proper surveying to determine the slope , bed of pond should be kept slight in slope to take advantage by allowing the water to flow as much as possible by gravity. This slope will provide water to move easily hence increase the natural oxygenation process and reduce the soil excavation due to water strike which ultimately results in the lowering of operational costs.

Water distribution channels should be placed on top of the pond dikes and the drainage channels from the ponds should be kept at the lowest point of the land. Effort should be made to utilize the natural attributes of the land to minimize capital costs and to facilitate the operational efficiency.

6.4 Soil sampling

Soil samples should be taken in account of the proposed site for analysis. These samples should be collected from the surface, middle and depth. The required lab tests are pH, soil composition (the ratio of sand to silt to clay), total dissolved salts, calcium and magnesium etc. Clay is most desirable for water retention in the fish ponds. If the soil is sandy at the surface but contains sufficient clay at an accessible depth, the sandy soil should be excavated completely, and the

clay will be used for the final layers of the pond bottom and pond banks to minimize water losses.

6.5 Electricity Fixtures

Fish farms must be furnished with proper electricity facilitation for daily routine operations and particularly for the management of water and air. In addition, for quality inland farming machinery like filter, water pumps and blower must be installed.

6.6 Pond

The most appropriate pond type is the combination of both excavated/elevated ponds. If the soil has sufficient clay content, the dikes can be built form the soil that is removed during pond excavation, thus excavation costs are minimized. Elevated ponds are recommended appropriate for natural oxygenation and could be partially drained by gravity.

The proposed project will be established on 9 acres of land, consisting of 8 ponds with an area of 1 acre per pond. Appropriate walkways must be designed between ponds for ease of management

Preferably a rectangular shaped pond is desirable. It should be constructed by excavation 2 to 3 feet soil and elevating for 4 to 5 feet from ground level. The crest of the embankment should be 4 to 5 feet and depth should not be more then 8 to 10 feet, having a minimum slope of 1 to 2 feet.

6.7 Fertilizers

Nitrogen and Phosphorus are the primary Nutrients required to stimulate productivity of the pond. In Pakistan, there are two sources of organic fertilizers, Chicken manure and Cow dung. The recommedded inorganic fertilizers are Urea, Di ammonium Phosphate, Single Super Phosphate, Ammonium Sulphate and Nitrogen.

Different fertilizers require different application procedures, The inorganic fertilizers urea and others except DAP dissolves quite rapidly, and can be placed directly into the pond water, Di ammonium phosphate, however, requires extra effort to dissolve and should be mixed with water

in a bucket or basin and dissolved as much as possible prior to distribution in the pond. Fertilizers should be added on regular basis throuthout the summer to sustain the productivity.

6.8 Water Requirement

Water is the most essential component of inland fish farming. Normally two sources of water are preferred i.e. tube well and Irrigation canal water. Irrigation water comes from the entire catchments area of the drainage, thus it carries high loads of silt, and is subject to change in environmental conditions and water quality (temperature changes, rainfall silt loadings, alkali salt runoff, etc.) it may also carry a large number of trash/ carnivorous fish. In case of selecting irrigation water, proper filtration method must be used for obtaining the desire quality.

The water quality of the tube well should be analyzed, oxygenation is main problem with the tube well water, arrangement must be made for oxygenation of water that can be accomplished by installing air blowers. Thus temperature and dissolved oxygen should be tested at the site. A sample should be taken in one liter bottle capable of being sealed and transported immediately to a lab for further examination analysis, tests of the total alkalinity, pH, nitrogen, salinity, and total dissolved solids are required.

Water color is a good indicator of its quality. A good robust green color is most desirable, maintainable by the addition of feed (Cow dung) when the green starts to fade to a light brown. Selection of the water source i.e. Tube well or Irrigation is totally dependent on the choice of entrepreneur however keeping in view the economical factor, irrigation water is proposed.

6.9 Species Selection

The proposed fish's species for the said project are Thaila, Moraka and Rohu. These species provide an ideal environment for farm management and as per their feeding pattern. Rohu feeds near the water surface, Thaila in the middle and Moraka takes feeds from the bottom. This pattern will provide an efficient utilization of feeds and prevent feed losses. It is the choice of entrepreneur, however it is recommended that these species may be used in ratio of Rohu (40%), Thaila (30%) and Moraka (30%) respectively.

6.10 Fish Growth

Growth is defined as weight gain during a specific period of time. Fish are cold blooded animals, and as such, their metabolic rate is governed directly by the ambient water temperature. Every specie has an optimum temperature for growth, a temperature at which all of its physiological functions are optimized, including growth rate and resistance to disease. Although the optimum temperature for growth has not been precisely determined, the available empirical growth data suggests that their optimum growth occurs at approximately temperature between 25 to 30 degree centigrade. At higher temperature than this, a thermal stress occurs, resulting in an excessive metabolic rate, reduced growth, increased oxygen consumption, and greater susceptibility to diseases. If temperature is significantly high than 30 degree centigrade then recommended management strategy should be add fresh water to the pond to reduce water temperature.

Growth monitoring of all species are required at intervals of thirty days before final harvest. The desired final product for all species is a minimum of 1.5 kg at harvest.

6.11 Supplementary Feeding

In a well managed pond enough food will be produced to permit the moraka, rohu and thaila to attain marketable size in a prescribed growth period. All species including the specialist plankton feeders will accept supplementary feeds and additional weight gain may be realized, but the bottom and water column feeding species (Rohu and Moraka) may receive the most benefits, especially if the amount of organic material in the pond is limited.

Four rules should be followed when feeding fish.

1) A regular feeding schedule must be followed, because infrequent feeding will have little measurable effect on growth. The fish should be fed on daily basis during the warm months.
2) The quantity of feed given must be calculated by the farmer based on the actual sample weight data collected at the end of each month,
3) The fish must be fed at the same time each day, and at the same place in the pond. The fish will quickly become accustomed to being fed, and will often move to the feeding

area as soon as the farmer appears at the edge of the pond, This practice would avoid feed waste.

4) The farmer must carefully observe feeding behavior and determine the extent to which the fish are consuming the feed given.

Supplementary feeds and feed mixtures must be fresh, since the materials quickly disperse and become unavailable to the fish. Instead, the feed should be mixed with enough water to form a sticky ball. Balls of feed measuring 2-4 inches in diameter may be carefully placed in the pond at the designated feeding areas, where they will be readily located and consumed by the fish. The fish should be fed slowly, and the farmer must stop feeding when there is no feeding activity especially in cloudy/ rainy days.

6.12 Production Cycling

The overall production cycle for the inland fish farming comprises of 8-9 months which is mainly subjected to the life/age of the seed (specie). If fresh seed is used (with an age of less than 20 days) the production cycle will take 9 months for the production of desire output. It varies respectively with the selection of fish (seed) age. Keeping in view the economical prospective, it is suggested that fish with different age may be used for different ponds.

7 INPUT REQUIREMENT

7.1 Machinery and Equipment Requirement

Table 7.1: Equipment Details

Description	No	Total Price (PKR)
Tube well	1	1,200,000
Transformer	1	500,000
Air Pump/ Water Pump	4	80,000
Net	1	20,000
Telephone Set	1	15,000
Filters	4	80,000
Total	**12**	**1,895,000**

7.2 Human Resource Requirement

Table 7.2: Human Resource Requirement Details

Description – HR Requirements	Nos	Salary per month	Salary per year
Farm Manager	01	15,000	180,000
Helpers	03	5000	180,000
Guards	01	5000	60,000
Total			**420,000**

Note: *The staff salaries are estimated according to the market trends; however, the investor may set different pay scales.*

7.3 Land and Building Requirement

Table 7.3: Land and Building Requirement Details

Description – Land and Building	Cost/Sq. Ft	Area in Sq. ft	Total Cost
Land	7	391,500	2,740,500
Office Building cum Store	200	250	125,000
Construction of Ponds 8	5	320,000	1,600,000
Total			**4,465,500**

7.4 Furniture and Fixture Requirement

Table 7.4: Furniture and Fixture Details

Description	Total Cost
Furniture and Carpeting Requirement	20,000

8. PROJECT ECONOMICS

8.1 Total Capital Requirement

Table 8.1: Total Capital Requirements

Capital Investment	Rs. in actual
Land	2,740,500
Building/Infrastructure	1,725,000
Equipment/ Machinery	1,880,000
Furniture and fixtures	20,000
Office equipment	15,000
Pre-operating Cost	35,000
Total Capital Costs	**6,415,500**

Working Capital	Rs. in actual
Equipment spare part inventory	141,667
Raw material inventory	255,000
Cash	350,000
Total Working Capital	**746,667**
Total Investment	**7,162,167**

8.2 Capital Structure of the project

Table 8.2 Project Financing

Initial Financing	Rs. in actual
Debt	3,543,583
Equity	3,543,583
Total Investment	**7,162,166**

9. FINANCIAL ANALYSIS

Financial Evaluation of Inland Fish Farm — **SMEDA**

Key Variables		
Type of Machinery		...
Cost of One Machine		...
Number of Machines		...
Total Investment in Project		7,162,166
Equity	50%	3,581,083
Debt	50%	3,581,083
Lease	0%	-
Export-refinance	0%	-
Interest Rate		18%
Debt Tenure		5
Debt Payments per year		1
Total Number of Employees		...

Rs. in actuals

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Free Cash Flow to Equity (FCFE)	(18,371)	1,013,484	1,324,865	1,788,864	2,320,689	4,019,431	4,851,565	5,814,733	6,927,044	9,528,577
Free Cash Flow to Firm (FCFF)	1,413,870	2,039,251	2,350,632	2,814,632	3,346,456	4,019,431	4,851,565	5,814,733	6,927,044	15,183,666
Profit margin on sales	17%	25%	31%	37%	43%	50%	56%	61%	67%	73%
ROE	17%	29%	28%	27%	26%	25%	23%	22%	21%	20%
Times interest earned	2.16	3.65	5.38	9.06	20.20	-	-	-	-	-

		Equity		Project
Internal Rate of Return (IRR)		44%		37%
Modified Internal Rate of Return (MIRR)*		31%		24%
Payback Period (yrs)		3.69		3.48
Net Present Value (NPV)	@ 20%	7,531,905	@ 19%	8,465,508

**Re-investment rate has been taken to be the interest on cash in bank, which in this case is 9%*

Statement Summaries

SMEDA

Income Statement

Rs. in actuals

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue	4,250,000	5,225,000	5,747,500	6,322,250	6,954,475	7,649,923	8,414,915	9,256,406	10,182,047	11,200,252
Cost of goods sold	2,356,000	2,800,525	3,002,878	3,220,094	3,453,283	3,703,646	3,972,470	4,261,145	4,571,167	4,904,147
Gross Profit	1,894,000	2,424,475	2,744,622	3,102,156	3,501,192	3,946,277	4,442,445	4,995,261	5,610,879	6,296,104
General administration & selling expenses										
Administration expense	247,200	271,268	297,679	326,661	358,465	393,366	431,665	473,692	519,812	570,421
Travelling & Comm. expense (phone, fax, etc.)	48,000	52,673	57,802	63,429	69,605	76,382	83,818	91,979	100,934	110,761
Office vehicles running expense	-	-	-	-	-	-	-	-	-	-
Office expenses (stationary, etc.)	6,000	6,584	7,225	7,929	8,701	9,548	10,477	11,497	12,617	13,845
Depreciation expense	276,750	276,750	276,750	276,750	276,750	276,750	276,750	276,750	276,750	276,750
Amortization expense	7,000	7,000	7,000	7,000	7,000	-	-	-	-	-
Property tax expense	-	-	-	-	-	-	-	-	-	-
Miscellaneous expense	21,250	26,125	28,738	31,611	34,772	38,250	42,075	46,282	50,910	56,001
Subtotal	606,200	640,400	675,193	713,380	755,293	794,295	844,785	900,201	961,023	1,027,779
Operating Income	1,287,800	1,784,075	2,069,428	2,388,776	2,745,898	3,151,982	3,597,660	4,095,060	4,649,857	5,268,325
Other income	30,673	29,886	89,545	229,662	414,592	699,898	1,099,093	1,579,076	2,152,456	2,892,959
Gain / (loss) on sale of assets	-	-	-	-	-	-	-	-	-	-
Earnings Before Interest & Taxes	1,318,473	1,813,961	2,158,973	2,618,438	3,160,491	3,851,879	4,696,752	5,674,136	6,802,313	8,161,284
Interest expense	610,536	496,688	401,454	289,077	156,473	-	-	-	-	-
Earnings Before Tax	707,937	1,317,273	1,757,519	2,329,361	3,004,018	3,851,879	4,696,752	5,674,136	6,802,313	8,161,284
Tax	-	-	-	-	-	-	-	-	-	-
NET PROFIT/(LOSS) AFTER TAX	707,937	1,317,273	1,757,519	2,329,361	3,004,018	3,851,879	4,696,752	5,674,136	6,802,313	8,161,284
Balance brought forward		707,937	1,012,605	2,770,125	5,099,486	8,103,503	11,955,383	16,652,135	22,326,271	29,128,583
Total profit available for appropriation	707,937	2,025,210	2,770,125	5,099,486	8,103,503	11,955,383	16,652,135	22,326,271	29,128,583	37,289,868
Dividend	-	1,012,605	-	-	-	-	-	-	-	-
Balance carried forward	707,937	1,012,605	2,770,125	5,099,486	8,103,503	11,955,383	16,652,135	22,326,271	29,128,583	37,289,868

Statement Summaries — SMEDA

Balance Sheet

Rs. in actuals

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Assets											
Current assets											
Cash & Bank	350,000	331,629	332,507	1,657,372	3,446,237	5,766,926	9,786,357	14,637,922	20,452,655	27,379,700	36,908,277
Accounts receivable	-	232,877	259,589	300,616	330,678	363,746	400,120	440,133	484,146	532,560	585,816
Finished goods inventory	-	-	-	-	-	-	-	-	-	-	-
Equipment spare part inventory	141,667	174,563	192,455	212,182	233,930	257,908	284,344	313,489	345,622	381,048	-
Raw material inventory	255,000	320,198	359,742	404,170	454,085	510,165	573,170	643,956	723,485	812,835	-
Total Current Assets	746,667	1,059,265	1,144,293	2,574,340	4,464,930	6,898,744	11,043,991	16,035,500	22,005,908	29,106,143	37,494,093
Fixed assets											
Land	2,740,500	2,740,500	2,740,500	2,740,500	2,740,500	2,740,500	2,740,500	2,740,500	2,740,500	2,740,500	2,740,500
Building/Infrastructure	1,725,000	1,638,750	1,552,500	1,466,250	1,380,000	1,293,750	1,207,500	1,121,250	1,035,000	948,750	862,500
Machinery & equipment	1,880,000	1,692,000	1,504,000	1,316,000	1,128,000	940,000	752,000	564,000	376,000	188,000	-
Furniture & fixtures	20,000	19,000	18,000	17,000	16,000	15,000	14,000	13,000	12,000	11,000	10,000
Office vehicles	-	-	-	-	-	-	-	-	-	-	-
Office equipment	15,000	13,500	12,000	10,500	9,000	7,500	6,000	4,500	3,000	1,500	-
Total Fixed Assets	6,380,500	6,103,750	5,827,000	5,550,250	5,273,500	4,996,750	4,720,000	4,443,250	4,166,500	3,889,750	3,613,000
Intangible assets											
Pre-operation costs	35,000	28,000	21,000	14,000	7,000	-	-	-	-	-	-
Legal, licensing, & training costs	-	-	-	-	-	-	-	-	-	-	-
Total Intangible Assets	35,000	28,000	21,000	14,000	7,000	-	-	-	-	-	-
TOTAL ASSETS	7,162,166	7,191,015	6,992,293	8,138,590	9,745,430	11,895,494	15,763,991	20,478,750	26,172,408	32,995,893	41,107,093
Liabilities & Shareholders' Equity											
Current liabilities											
Accounts payable	-	142,617	168,307	181,398	195,567	210,908	227,525	245,532	265,054	286,227	236,142
Total Current Liabilities	-	142,617	168,307	181,398	195,567	210,908	227,525	245,532	265,054	286,227	236,142
Other liabilities											
Long term debt	3,581,083	2,759,378	2,230,298	1,605,984	869,294	-	-	-	-	-	-
Total Long Term Liabilities	3,581,083	2,759,378	2,230,298	1,605,984	869,294	-	-	-	-	-	-
Shareholders' equity											
Paid-up capital	3,581,083	3,581,083	3,581,083	3,581,083	3,581,083	3,581,083	3,581,083	3,581,083	3,581,083	3,581,083	3,581,083
Retained earnings	-	707,937	1,012,605	2,770,125	5,099,486	8,103,503	11,955,383	16,652,135	22,326,271	29,128,583	37,289,868
Total Equity	3,581,083	4,289,021	4,593,688	6,351,208	8,680,569	11,684,586	15,536,466	20,233,218	25,907,354	32,709,667	40,870,951
TOTAL CAPITAL AND LIABILITI	7,162,166	7,191,015	6,992,293	8,138,590	9,745,430	11,895,494	15,763,991	20,478,750	26,172,408	32,995,893	41,107,093
Note: Total assets value will differ from project cost due to first installment of leases paid at the start of year 0	-	-	-	-	-	-	-	-	-	-	0

Statement Summaries

SMEDA

Cash Flow Statement

Rs. in actuals

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Operating activities											
Net profit	-	707,937	1,317,273	1,757,519	2,329,361	3,004,018	3,851,879	4,696,752	5,674,136	6,802,313	8,161,284
Add: depreciation expense	-	276,750	276,750	276,750	276,750	276,750	276,750	276,750	276,750	276,750	276,750
amortization expense	-	7,000	7,000	7,000	7,000	7,000	-	-	-	-	-
Deferred income tax	-	-	-	-	-	-	-	-	-	-	-
Accounts receivable	-	(232,877)	(26,712)	(41,027)	(30,062)	(33,068)	(36,375)	(40,012)	(44,013)	(48,415)	(53,256)
Finished good inventory	-	-	-	-	-	-	-	-	-	-	-
Equipment inventory	(141,667)	(32,896)	(17,893)	(19,727)	(21,749)	(23,978)	(26,436)	(29,145)	(32,133)	(35,426)	381,048
Raw material inventory	(255,000)	(65,198)	(39,544)	(44,428)	(49,915)	(56,079)	(63,005)	(70,786)	(79,529)	(89,350)	812,835
Accounts payable	-	142,617	25,690	13,091	14,169	15,341	16,617	18,007	19,522	21,173	(50,085)
Other liabilities	-	-	-	-	-	-	-	-	-	-	-
Cash provided by operations	(396,667)	803,334	1,542,563	1,949,179	2,525,555	3,189,983	4,019,431	4,851,565	5,814,733	6,927,044	9,528,577
Financing activities											
Change in long term debt	3,581,083	(821,706)	(529,079)	(624,314)	(736,690)	(869,294)	-	-	-	-	-
Issuance of shares	3,581,083	-	-	-	-	-	-	-	-	-	-
Purchase of (treasury) shares	-	-	-	-	-	-	-	-	-	-	-
Cash provided by / (used for) financ	7,162,166	(821,706)	(529,079)	(624,314)	(736,690)	(869,294)	-	-	-	-	-
Investing activities											
Capital expenditure	(6,415,500)	-	-	-	-	-	-	-	-	-	-
Acquisitions	-	-	-	-	-	-	-	-	-	-	-
Cash (used for) / provided by invest	(6,415,500)	-	-	-	-	-	-	-	-	-	-
NET CASH	350,000	(18,371)	1,013,484	1,324,865	1,788,864	2,320,689	4,019,431	4,851,565	5,814,733	6,927,044	9,528,577
Cash balance brought forward		350,000	331,629	332,507	1,657,372	3,446,237	5,766,926	9,786,357	14,637,922	20,452,655	27,379,700
Cash available for appropriation	350,000	331,629	1,345,112	1,657,372	3,446,237	5,766,926	9,786,357	14,637,922	20,452,655	27,379,700	36,908,277
Dividend	-	-	1,012,605	-	-	-	-	-	-	-	-
Cash carried forward	350,000	331,629	332,507	1,657,372	3,446,237	5,766,926	9,786,357	14,637,922	20,452,655	27,379,700	36,908,277

10. KEY ASSUMPTIONS

Table 10-1 Cost of Goods Sold per Unit of Production

COGS (Raw material per unit)	Per Fish/ Day	Per Fish / Year
Seed (Fingerlings)	Rs. 15	Rs. 15
Katti (Daily requirement 35 kg/ farm) (Average price of 1 kg Rs. 18)	Rs. 0.25	Rs. 67
Cow dung (Average weekly requirement is Rs. 2000)	Rs. 0.12	Rs. 33
Urea		Rs. 3
Calcium Bicarbonate (lime Stone)		Rs. 2
COGS 1 (Raw material per unit)		Rs. 120

Cost of Goods Sold per Unit of Production (CoGS)

The per unit CoGS for one production cycle calculated as about Rs. 120 rupees, the amount consist of 15 rupees of fish on average basis, whereas the katti, Urea, Calcium bicarbonate (Lime Stone) and Cow dung used per fish for the whole period are of Rs. 67, Rs. 3, Rs 2 and Rs. 33 respectively

Table 10-2 Production Related Assumptions

Production capacity per year (Fish)	20,000
Sale price per unit in year 1	250
Sale price growth rate per annum	10%
Production capacity utilization in first year	85%
Production capacity utilization growth rate	10%
Maximum production capacity utilization	95%

Table 10-3 Economic Related Assumptions

Inflation rate	10%
Wage growth rate	10%
Electricity Growth Rate	10%

Table 10-4 Financing Assumptions

Interest rate on long term debt	18%
Required rate of return on equity	20%
WACC	19%

Table 10-5 Expense Assumptions

Administrative benefit expense	3% of administrative expense
Communication expense	5% of administrative expense
Office expense	2.5% of administrative expense
Bad debt expense	0.5% of revenue
Traveling Expense	15% of administrative expense

Table 10-6 Depreciation Rates

Building and Infrastructure	5%
Furniture and fixtures	5%
Machinery	10%
Office equipment	10%

Table 10-7 Cash Flow Assumptions

Accounts Receivables Cycle (In Days)	30
Accounts Payable Cycle (In Days)	30
Initial cash on hand	Rs. 350,000
Pre-Operating Cost	Rs. 35,000