Pre-feasibility Study

BIOFLOC FISH FARMING

December 2023

"The figures and financial projections are approximate due to fluctuations in exchange rates, energy costs, and fuel prices etc. Users are advised to focus on understanding essential elements such as production processes and capacities, space, machinery, human resources, and raw material etc. requirements. Project investment, operating costs, and revenues can change daily. For accurate financial calculations, utilize financial calculators on SMEDA's website and consult financial experts to stay current with market conditions"

Small and Medium Enterprises Development Authority
Ministry of Industries and Production
Government of Pakistan

Table of Contents

Table of Tables

Table of Figures

1. DISCLAIMER

This information memorandum is to introduce the subject matter and provide a general idea and information on the said matter. Although, the material included in this document is based on data / information gathered from various reliable sources; however, it is based upon certain assumptions, which may differ from case to case. The information has been provided on, as is where is basis without any warranties or assertions as to the correctness or soundness thereof. Although, due care and diligence has been taken to compile this document, the contained information may vary due to any change in any of the concerned factors, and the actual results may differ substantially from the presented information. SMEDA, its employees or agents do not assume any liability for any financial or other loss resulting from this memorandum in consequence of undertaking this activity. The contained information does not preclude any further professional advice to be obtained by the users. The prospective user of this memorandum is encouraged to carry out additional diligence and gather any information which is necessary for making an informed decision, including taking professional advice from a qualified consultant / technical expert before taking any decision to act upon the information.

For more information on services offered by SMEDA, please contact our website:

www.smeda.org.pk

Document Control

Document No.	296
Revision	01
Prepared by	SMEDA-Punjab
Revision Date	December 2023
For information	helpdesk.punjab@smeda.org.pk

2. EXECUTIVE SUMMARY

This pre-feasibility document provides information for setting up a medium sized fish farm for producing Tilapia fish by utilizing Biofloc technology.

Biofloc fish farming technology was introduced in the world about 7-8 years ago and it quickly became very popular in India, Thailand, Malaysia, Japan, and some other countries. This technology is relatively new in Pakistan. The trend of producing/farming fish by using Biofloc technology is evolving due to its multiple advantages over traditional fish farming methods.

Biofloc technology is an environmental friendly aquaculture technique. The microbial community in Biofloc system is able to rapidly utilize dissolved nitrogen leached from fish excreta and unconsumed feed and convert them into microbial protein; which can serve as fish meal. It has been realized that the traditional fish meal be used in aquaculture production system as a protein source for the formulation of fish feed can be easily replaced by Biofloc meal. It could be used in brooder and larval feed to obtain better growth performances. Consumption of microorganisms in this system reduces FCR (feed conversion ratio) and subsequently the feed cost. The technology thus leads to decreasing the overall cost of fish production. Promotion of Biofloc fish farming technology can play a significant role in increasing food supplies in the country and ensuring nutritional security of the poor people.

Biofloc technology is an emerging concept which enables the fish farmers to produce fish in bio-secured and controlled environment with less space requirement. Improved water quality, better waste treatment, better disease prevention, improved biosecurity, decreased feed conversion ratio, increased water-use efficiency and increased land-use efficiency are some key advantages of this latest technology for producing fish.

Tilapia, locally known as *Chira Machhli* is in high demand in the local market. Tilapia is rich in nutrients with a high growth rate and it is also good for strengthening immunity system. The production potential of this species of fish is very high. These fish can be produced on a large scale on lesser space compared to that required for fish production using traditional fish farming techniques.

The proposed project will create no hazards to both human and environment.

The farming unit should ideally be set up on 4,500 square feet (sq. ft.) of owned / purchased agriculture land. For setting up Biofloc fish farming, 4 districts of Balochistan, 8 districts of Khyber Pakhtunkhwa, 5 districts of Sindh and 10 districts of Punjab are suitable.

The proposed fish farming unit will have 16 Biofloc tanks, with a maximum capacity of producing 16,000 kgs of fish per year during a season of 7-8 months; during the months from May to December. Average number of fish produced per Biofloc tank will be 2,000; having an average weight of 0.5 kilogram per fish. It means that total fish production per tank will be 1,000 kilograms.

Procurement of healthy, certified mono-sex[1] seed from reliable sources, suitable location, matching of fingerlings' stocking density to feed, and strict pond management are the main critical factors for the production of fish using this technology. The water in the Biofloc tanks can be utilized for 6 months for producing Tilapia.

The total investment cost of this proposed is PKR 11.54 million. This includes capital investment of PKR 8.83 million and working capital of PKR 2.70 million. This project is financed through 100% equity. The Net Present Value (NPV) of project is PKR 0.12 million with an Internal Rate of Return (IRR) of 20% and a Payback period of 5.29 year.

The proposed project will provide employment opportunities to 4 to 5 persons. High return on investment and steady growth of business is expected with the entrepreneur having some prior experience or education in the related field of business. The legal business status of this project is proposed as Sole Proprietorship.

3. INTRODUCTION TO SMEDA

The Small and Medium Enterprises Development Authority (SMEDA) was established in October 1998 with an objective to provide fresh impetus to the economy through development of Small and Medium Enterprises (SMEs).

With a mission "to assist in employment generation and value addition to the national income, through development of the SME sector, by helping increase the number, scale and competitiveness of SMEs", SMEDA has carried out 'sectoral research' to identify policy, access to finance, business development services, strategic initiatives and institutional collaboration and networking initiatives. Preparation and dissemination of prefeasibility studies in key areas of investment has been a successful hallmark of SME facilitation by SMEDA.

Concurrent to the prefeasibility studies, a broad spectrum of business development services is also offered to the SMEs by SMEDA. These services include identification of experts and consultants and delivery of need-based capacity building programs of different types in addition to business guidance through help desk services.

National Business Development Program for SMEs (NBDP) is a project of SMEDA, funded through Public Sector Development Program of Government of Pakistan.

The NBDP envisages provision of handholding support / business development services to SMEs to promote business startup, improvement of efficiencies in existing SME value chains to make them globally competitive and provide conducive business environment through evidence-based policy-assistance to the Government

[1] Monosex tilapia are male fishes. Tilapia exhibits early sexual maturity that leads to uncontrolled reproduction. Single-sex culture eliminates this problem, and males are the obvious choice, as they exhibit considerably faster growth and achieve larger size than females.

of Pakistan. The Project is objectively designed to support SMEDA's capacity of providing an effective handholding to SMEs. The proposed program is aimed at facilitating around 314,000 SME beneficiaries over a period of five years.

4. PURPOSE OF THE DOCUMENT

The objective of the pre-feasibility study is primarily to facilitate potential entrepreneurs in project identification for investment. The project pre-feasibility may form the basis of an important investment decision and in order to serve this objective, the document/study covers various aspects of project concept development, start-up, and production, marketing, finance and business management.

The purpose of this document is to provide information to the potential investors about “Biofloc Fish Farming”. The document provides a general understanding of the business to facilitate potential investors in crucial and effective investment decisions.

The need to come up with pre-feasibility reports for undocumented or minimally documented sectors attains greater imminence as the research that precedes such reports reveal certain thumb rules; best practices developed by existing enterprises by trial and error, and certain industrial norms that become a guiding source regarding various aspects of business setup and its successful management.

Apart from carefully studying the whole document, one must consider critical aspects provided later on, which form the basis of any investment decision.

5. BRIEF DESCRIPTION OF PROJECT & PRODUCTS

Rapid increase in population of Pakistan has made it mandatory that the growing food demand is met while safeguarding the natural resources. In this regard, aquaculture has a crucial role to play in the elimination of hunger, promotion of good health, reduction of poverty and provision of jobs and economic opportunities. Several technologies have been developed to ensure increased and sustainable production of fish. Biofloc technology or commonly known as BFT is a relatively new aquaculture technology, gaining popularity in the world.

Biofloc fish farming can be used to farm Tilapia (Chira Fish), Catfish (Khagga Fish), Trout, Salmon and Shrimp (Jheenga). This prefeasibility study provides information on Tilapia fish farming using Biofloc technique. Tilapia fish is selected because of its rapid growth, and high protein content as compared to other kinds of fish species. Tilapia fish is also proposed because this fish has a high demand in Pakistani domestic market. 16 biofloc tanks will be used in the proposed farm, each having a production capacity of 1000 kg fish and a total capacity of producing 16000 kg of fish per year in a season of 7 to 8 months.

This project can be used to encourage farmers and unemployed youth to use BFT technology for fish farming in small areas. Thus, this would help in creating

employment on a large scale and would require small amount of investment compared to tradition fish farming.

5.1. What is Biofloc technique?

Biofloc is an assemblage of beneficial microorganisms, such as heterotrophic bacteria, algae, fungi, ciliates, flagellates, rotifers, nematodes, metazoans & detritus. A Biofloc consists of a heterogeneous mixture of microorganisms, particles, colloids, organic polymers, cations and dead cells.

Biofloc Technology (BFT) is a relatively new and potentially revolutionary technology that is especially productive for farming Tilapia fish. The technique is meant for improving water quality in aquaculture and also for producing feed for the farmed fish. In Biofloc farm, besides provision of the required quantity of oxygen, controlling the quantity of toxic nitrogen compounds is also one of the major concerns. The main sources of ammonia are the excretion of the cultured organism (farmed fish) and the decomposition of nonliving matter (dissolved and particulate). In BFT, nitrogen conversion takes place in three ways for the removal of ammonia nitrogen. These are photoautotrophic removal by algae, autotrophic bacterial conversion from ammonia to nitrate and heterotrophic bacterial conversion of ammonia nitrogen directly to microbial biomass which becomes feed for the farmed fish.

Biofloc fish farming is less expensive and more productive compared to the conventional fish farming.

Understanding the Biofloc system is essential for having the required production of fish. Biofloc technology is based upon pond management using minimal water exchange. Main features of BFT are as under:

Eco-friendly: BFT offers the benefit of zero-water exchange which means that the entire water from Biofloc tank does not have to be removed and only sludge removal is sufficient to maintain the desired water quality. This feature of Biofloc makes it eco-friendly. In conventional farming, nitrogen is flushed out through water exchange every 25-30 days to keep fish stress-free[2] and disease-free. The Biofloc technique keeps the pH[3] levels steady and feed on the nitrogen produced by the fish and use up the nitrogen and convert it into proteins, for the farmed fish. This also leads to improvement in use of water.

Improving Water Quality: Biofloc is comprised of bacteria, other organisms, and organic and inorganic matter. The microbial aggregates, through using the chemical energy in the organic matter (nitrogenous compounds assimilated by bacteria), contribute to the control of water quality and toxic nitrogen compounds. The waste in

[2] "Stress is a term used in vet medicine to describe any condition in the environment that causes the release of cortisol and adrenaline in the body. When the cause of the stress is continuous, like poor water quality or harassment from other more aggressive fish, the normal immune functions are blocked, which often leads to sick fish with disease conditions like parasites, bacterial infections and fungi.

[3] pH is a measure of how acidic/basic water is.

water is treated because Biofloc system reduces solid discharge into the environment by maintaining the organic solids in suspension which helps in controlling the ammonia in the aqua system.

Improvement of Biosecurity: The reduced water exchange decreases pollution, and no external elements are added to the water in Biofloc tanks, this allows for greater biosecurity during production. As a result, the chances of disease decrease to a great extent.

Disease Prevention: The presence of Biofloc also enhances immune functions of the fish. Therefore, an improved immunity in fish and better antioxidant defence mechanism likely results in higher resistance against pathogens, to prevent disease outbreaks.

Improvement of Feed Conversion: Consumption and regeneration of Biofloc can increase feed utilization efficiency of the microbial population by recycling feed residues and/or recovery of some fraction of excreted nutrients.

Improvement of Water Use Efficiency: Since there is no water exchange except sludge removal, this system uses the water in the most efficient way compared to traditional fish farming.

Increasing Land Use Efficiency: Biofloc utilizes less space with more production compared to the traditional pond farming which increases the land utilization efficiency. A 12 feet tank can produce equivalent fish compared to a traditional pond that requires 4,500 sq. ft. (1 kanal) of land.

Cost effective: Fish farmers can cut the cost of farming by half by reducing the cost of feed. Use of Biofloc technology, not only improves quantity, but also the quality of the production. The capital investment required for this technology is low, due to lower space requirement and reduction of investment in terms of construction cost and less water usage.

Figure 1 Scheme of Biofloc Technology Pond

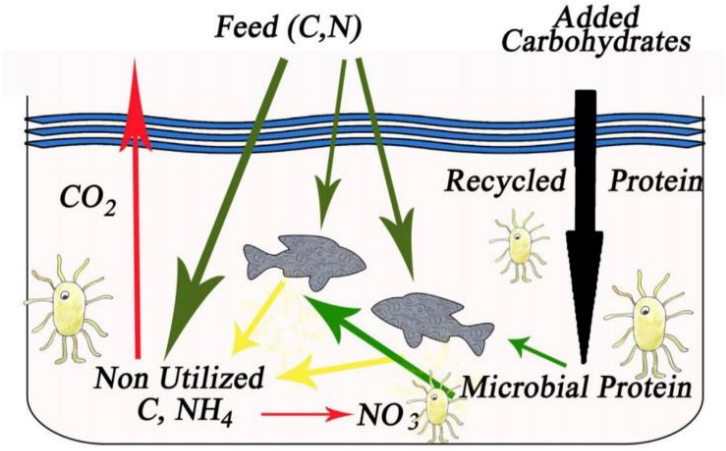


Figure 1 shows the scheme of Biofloc technology pond indicating how recycling of proteins is done.

Biofloc Tank Specifications

The tanks that will be used in Tilapia Biofloc faming will be circular, made up of polythene material and this material will cover the tank from both inside and outside. Each tank will take 225 sq. ft. of area; this area will also include the open space that is left between individual tanks. The diameter of the tank will 4 meters and depth will be between 1 to 1.4 meters. Two thousand Tilapia fish will be stocked in each tank. Each tank will be filled with approximately 12,000 liters of water. All the tanks will be covered by an artificial roof.

Figure 2 shows the image of a typical biofloc tank.

Figure 2 Biofloc Tank

5.2. Comparison of Biofloc Technique with Traditional Fish Farming methods

Farmers can have better productivity with Biofloc system when compared to conventional aquaculture techniques. Biofloc production can decrease mortality rates, increase larval growth and improve growth rates in the cultured species. The other key advantage of Biofloc technology lies in its improved water, land use rates, low environmental impact. The reduced water inputs decrease pollution and allow for greater biosecurity and disease control during fish production.

Biofloc system requires a startup period and yields are not always consistent between seasons. Since farmers must constantly mix and aerate the culture water, energy costs could be higher than expected. In addition to these factors, farmers must consistently manage Biofloc system to prevent nitrite accumulation and to keep alkalinity levels within a healthy range. Monitoring fish health and welfare is also key of biofloc systems, because increase in the levels of suspended solids in the water, will expose fish to environmental stress.

In traditional farming systems, only about 25% of the protein content of feeds is actually utilized by farmed fish. However, by converting ammonia into microbial proteins, these proteins can be consumed by the farmed fish. Biofloc systems are able to double this figure which is one of the main savings for Biofloc farmers.

5.3. Tilapia fish and its certain features

Some typical characteristics of Tilapia fish are narrated below:

- Tilapia have become the second most cultivated fish in Pakistan.
- Tilapia have a small head, light vertical stripes, thick body and light-colored belly.
- Tilapia have a rapid growth rate in comparison with other kinds of fish. The production potential of Tilapia is very high. These can be produced on a very large scale by utilizing less space.
- The males attain large size and at faster rate i.e., 2-3 times that of females. Male and female Tilapia have similar growth rates for the first few months but as they reach sexual maturity, the males continue fast growth, whereas the growth rate of the females slows down, since they have to expend more energy in producing eggs and incubating them in their mouths.
- Tilapia have versatile feeding habits and can grow well on a purely vegetable source of protein. They also consume some aquatic plants, snails, and bacterial films that grow on decomposing organic matter. These are omnivores. Their feed can vary from herbs to bugs.
- Tilapia are very strong resistant to disease and parasites. This makes it highly favorable choice for the fish farmers
- They are tolerant to wide variety of water conditions like high salinity, high water temperature, low dissolved oxygen and high ammonia.
- They are rich in taste nutrients, have Omega 3[4] and are also rich in proteins. In addition to the nutrient value of Tilapia, these fish are also good for immunity system.

[4] Omega-3 are the fatty acids that help in keeping the human heart healthy in several ways. They curb inflammation in the blood vessels and the rest of the body.

Figure 3 Tilapia Fish

5.4. Tilapia and Biofloc

Biofloc systems enable more intensive Tilapia production as they are ideally adapted to Biofloc systems. Tilapias grow well by utilizing the Biofloc as a feed source. The recycling of feed and minimization of water exchange are important contributions to the Tilapia production.

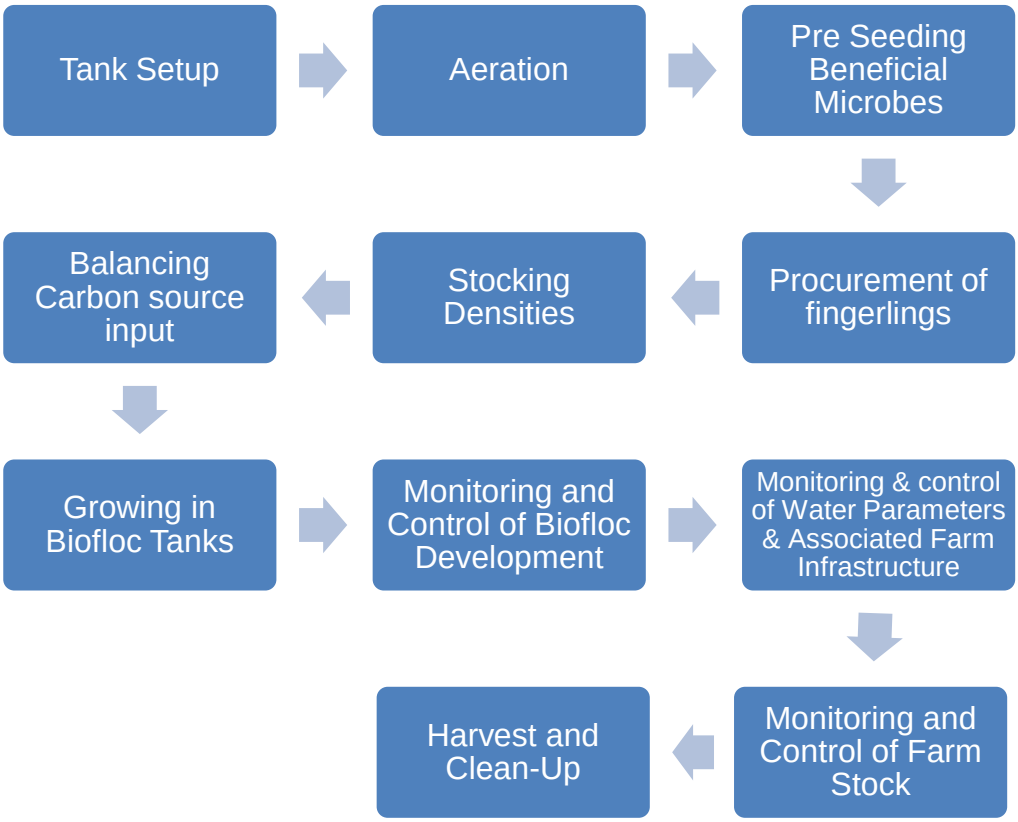
This technology for fish production is mainly for developing, more populous countries, as it requires:

- Less space
- Less resources
- Less water

5.5. Production Process

Production process of Tilapia by using Biofloc technology is shown in Figure 4. .

Figure 4 Production Process Flow



Brief description of production process for producing Tilapia fish using Biofloc technology is provided hereunder.

Tank Setup

It's best to start Biofloc fish farming with lined ponds, concrete ponds or Tarpaulin sheet indoor tanks wherein soil has no influence over water parameters or Biofloc processes. There are areas which experience heavy rainfall; therefore, alkalinity and pH are easily affected in outdoor systems. Therefore, in these areas, having covered tanks is a good option. When indoor tanks are used, there is absence of natural sunlight and algae do not grow in sufficient quantity or in certain cases, do not grow at all. Therefore, these tanks create a Biofloc system based solely on bacteria. The Biofloc system that is produced without algae (because of absence of direct exposure of sunlight) by using bacteria are called "Brown Biofloc Systems ", the name being derived from the color of this system.

Figure 5 Biofloc Tank for the Proposed Project

Aeration

After selection of the right pond or tank setup, provision of aeration system is the next important step. All Biofloc systems require constant motion to maintain both high oxygen levels and to keep solids from settling. Areas without movement rapidly lose oxygen and turn into anaerobic zones, which release large amounts of ammonia and methane.

To prevent this, every pond or tank needs a well-planned layout of aerators. Biofloc systems require up to 6 milligrams of oxygen per liter per hour. In line with the proposed capacity of this proposed tank, it is recommended to install one water pump and one ring blower of 1.5 horsepower.

Figure 6 Aeration Process

Procurement of Fingerlings

The proposed project will require procuring mono-sex Tilapia, weighing (0.2 to 0.5 grams) fingerlings from Tilapia hatcheries. Tilapia can be procured easily from local hatcheries at the rate of PKR 3 per fingerlings. For procuring fingerlings, an advance order is placed in the first quarter of every year (i.e., from January to March). The order is normally placed two months in advance to obtain the fingerlings in the month of April. The hatcheries take 50% payment in advance at the time of placing the order. There are three breeds of Tilapia fingerlings which cost around PKR 3, PKR 10 and PKR 15 each fingerling. Normally, the fingerlings costing PKR 3 is used in the Biofloc farming to keep the cost low, because this is cheap and more affordable for commercial farming.

Department of Fisheries of Government of Punjab has 20 fish seed hatcheries in Punjab. These are located in all the big cities of Punjab. These cities include Lahore, Bahawalpur, Multan, Rawalpindi, Gujranwala, D.G.Khan, Faisalabad, Sargodha and Murree. These hatcheries supply fish seed to the fish farmers of Punjab and other provinces including Azad Jammu Kashmir. Apart from these government hatcheries, many private hatcheries are also working in Punjab, which can be contacted in order to obtain the Tilapia fingerlings.

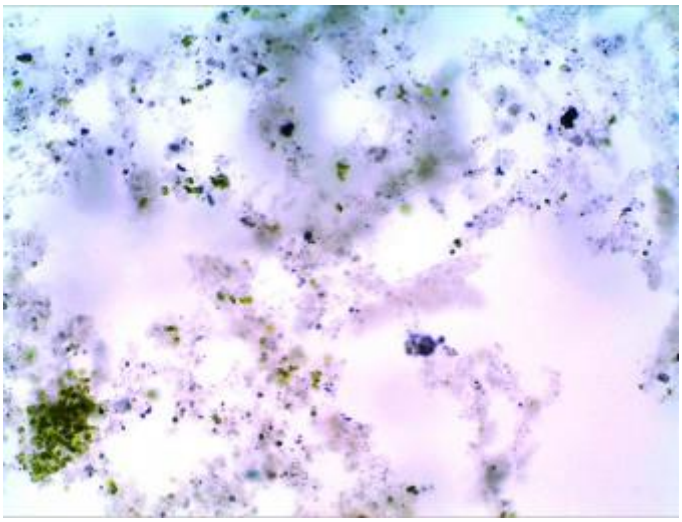
In order to obtain higher quality of fingerlings, these may also be imported from international market such as India and Thailand. The order has to be placed two months in advance. Figure 7 show the Tilapia Fingerlings.

Figure 7 Tilapia Fingerlings

Pre-seeding Beneficial Microbes

To accelerate the development of Biofloc system and stabilize the pond more quickly, the culture water of the pond is pre-seeded. This is done by adding a number of commercial or homemade recipes to the culture water. A simple homemade recipe to quickly produce probiotic and prebiotic microbes uses wheat pollard and Red Cap 48 mixed in a closed drum and left to ferment for 48 hours, after which the contents can be added to the pond. Figure 8: Pre-seeding Beneficial Microbes presents the pre-seeding microbes.

Figure 8: Pre-seeding Beneficial Microbes



Stocking Densities

In fish-farming systems the stocking density is expressed as the number or weight of fish per unit area (square meters) or water volume (cubic meters).

Due to strong aeration and self-filtering capacity of culture water, high stocking densities can be considered. It is common to stock Tilapia at densities of 200 to 300 fingerlings per cubic meter. Many farmers try to use higher stocking densities but this significantly increases the risk of disease, compromising both the health and welfare of the animals.

Figure 9: Stocking Density

Balancing Carbon Source Input

Ammonia is the most harmful thing which threatens the success of fish farming. If allowed to accumulate in Biofloc systems, fish cannot extract energy from feed efficiently. If the ammonia concentration gets high enough, the fish become lethargic and eventually fall into a coma and die. The main source of ammonia is fish

excretion. The rate at which fish excrete ammonia is directly related to the feeding rate and the protein level in feed. High stocking density and intensive feeding lead to the accumulation of organic waste, which results in an increase in ammonia.

The increase in quantity of ammonia has to be controlled during the entire farming period, right from the planting stage of fingerlings to the harvesting stage.

At the start of the farming cycle, the increase in quantity of ammonia in the Biofloc tanks is prevented by ensuring sufficient availability of carbohydrates. The carbon in these carbohydrates enables heterotrophic[5] bacteria to multiply and synthesize ammonia, thus maintaining water quality. The growth of heterotrophic bacteria in the biofloc system leads to removal of ammonia from the system through assimilation into microbial biomass. Any material that contains simple sugars and breaks down quickly can be used, such as molasses, sugarcane or starch.

Fish Growing in Biofloc Tanks

With plenty of aeration, natural light (in most systems) and a readily available source of carbon, Tilapia fish starts to grow quickly. The growth of fish depends on a variety of factors, including feed quality, water temperature, available nutrients and sunlight. The fingerlings are kept in the tanks until they gain the weight above 600 grams. With the Soya based pallet feed, an average weight of 800 grams may be achieved.

The amount of feed given to the fish and the growth in the weight of fish is expressed as a ratio, known as Feed Conversion Ratio (FCR). Simply stated, it is the amount of feed required for production of meat unit. For ideal growth of Tilapia fish, FCR, is 1:2.Figure 10 shows the growing Tilapia in Biofloc tank.

[5]The heterotrophic bacteria use the organic compounds as a carbon source. This community can minimize ammonia accumulation in the water.

Figure 10 Tilapia Fish in Biofloc Tank

Monitoring and Control of Biofloc Development

Water samples must be regularly taken to monitor the tank water. Regular monitoring of water quality parameters, especially dissolved oxygen and ammonia levels, gives a good idea of the system's performance and any need for increasing aeration.

Monitoring and Control of Water Parameters and Associated Farm Infrastructure

Once the Biofloc system has turned brown, aeration must be significantly increased to sustain the high oxygen level. Oxygen level at this stage can reach 6 milligrams per liter per hour, requiring up to six times more energy per hectare compared to that in the start of operations.

There is requirement for good maintenance and monitoring of the aerators and the power system that provides the energy to run this system. Any power failure at this stage can quickly result in total crop failure due to lack of oxygen due to which many heterotrophic bacteria start producing ammonia. It is vital for the aeration system to stay functional at all times.

Monitoring and Control of Farm Stock

Besides maintaining water quality at lower cost and without water exchange, the second goal of a Biofloc system is to improve growth rates and feeding efficiencies, thereby improving the profitability and sustainability of farming operations.

To check how the farm is doing, regular monitoring of the performance of the farm stock, calculating and recording growth rates, overall appearance of the fish, FCR and stock survival (this means that the accumulative number of dying fish stock in

Biofloc system is not more than the mortality rate of 3%) is required. It has been estimated that for every unit of growth in the stock from the standard feed, an additional 0.25 to 0.5 units of growth can come from the Biofloc in the system.

Harvest and Clean-Up

Harvesting is done in the last week of October and beginning of November. Fish will be harvested when the fish have attained weight of approximately 500 grams. The fish will be harvested through a small net that can be handled by a single person. After harvesting, the fish are first weighed and then are packed either in polypropylene bags or in the polystyrene boxes (for improved quality during the transportation and handling).

Proper cleaning and preparation of the pond setup is vital after harvest time, which is often underestimated. Although it might seem appealing to reuse the culture water since it took intensive effort to build up the populations of microorganisms, this is not advisable. Pathogens might have built up the culture and can pose a serious biosecurity risk. Research has also indicated that over time, heavy metals can build up in the culture water, which can accumulate in stock, making it unsuitable for human consumption.

5.6. Installed and Operational Capacities

The proposed farm will have maximum operational capacity of producing 16,000 kg fish in a year. For proposed project 16 biofloc tanks are installed which require 3,600 sq. feet (16 Marla) area. The average area required per tanks is 225 sq. ft. (1 Marla). The average number of fish produced per biofloc tank will be 2,000; having an average weight of 0.5 kilogram per fish. It means that total fish production per tank will be 1,000 kgs. For details of biofloc tank specifications refer to section **5.2** subheading **"Biofloc Tank Specifications"**. It is assumed to operate at 100% capacity from 1st year of operations.

Table 1 shows details of maximum annual capacity and operational capacity utilized during first year of operations.

Table 1: Installed and Operational Capacity

Total Number of tanks (A)	Number of Fish Per Tank (B)	Average Weight of Completely Grown Fish (kgs) (C)	Total Capacity (kgs) (A*B*C) = D
16	2,000	0.5	16,000

6. CRITICAL FACTORS

Before making the decision to invest in Biofloc Fish Farming business, one should carefully analyze the associated risk factors. The important considerations in this regard include:

- Tilapia fish cannot bear water temperature below 18. 3°C. Therefore, selected location must have suitable climate with temperature not falling below 18.3°C.and sufficient water availability.
- Water and pond or tank management is the key factor for the production of fish under this technology. As ammonia is highly dangerous for the survival of fish, it must be treated.
- Pond development and maintenance to ensure efficient inflow, retention and drainage of water
- Proper measure will need to be taken to ensure protection against fish theft and fingerlings/fish escape from the Biofloc tank.
- Probiotics[6] as bacteria are essential to consume ammonia in the water. It consumes ammonia and carbon to convert it into feed.
- There is a mortality rate of 3%when fish is transferred into Biofloc tanks at the time of purchase. This is because of distress of fingerlings.
- Procurement of healthy, certified, mono-sex seed from reliable sources recommended by the Fisheries Development Board (Federal Department).

7. GEOGRAPHICAL POTENTIAL FOR INVESTMENT

Biofloc projects should be established in areas which have with sufficient water resources and suitable land and climate conditions. The temperature should not fall below 18.3°C.

Considering the above requirements, Tilapia Aquaculture can be established in majority of areas of Pakistan. Suitable districts in this regard are shown in Table 2.

Table 2: Suitable Districts for Biofloc Farming

Balochistan	Khyber Pakhtunkhwa	Sindh	Punjab
• Awaran	• Bannu	• Hyderabad	• D.G. Khan
• Khuzdar	• Charsadda	• Nawabshah	• Faisalabad
• Lasbela	• D.I. Khan	• Shikarpur	• Sargodha
• Sibi	• Karak	• Sukkur	• Gujranwala
	• Kohat	• Thatta	• Gujrat
	• Mardan		• Multan
	• Nowshehra		• Muzaffargarh
	• Swabi		• Okara

[6] Probiotics are beneficial bacteria which play an important role in the microbial balance of the microorganisms and the water environment. The presence of beneficial bacteria in the Biofloc creates a “natural probiotic” effect, which can act both internally and externally to combat pathogens and improve immune response

			• Sahiwal

In order to obtain support in area selection and technical aspects, the potential investors can contact the Fisheries Development Board (a Federal body) and fisheries and forestry department of each province before the commencement of the project.

Fisheries Development Board has been established to boost up the development of fisheries sector by providing and maintaining a platform to enhance and promote fisheries sector in Pakistan.

8. POTENTIAL TARGET MARKETS

The Tilapia fish can be sold throughout the country, especially within the areas having taste for fresh water fish. These include the non-coastal areas of Balochistan, interior Sindh, Punjab, and Khyber Pakhtunkhwa. The market for Tilapia fish is highly competitive; these fish are in high demand in upper Punjab. These fish are easily available in the local fish markets of Lahore, Gujranwala, Punjab and Rawalpindi. The mega stores of metro cities like, Hyper Star, Al-Fatah, and Metro etc. may become the potential customers of these fish farms.

9. PROJECT COST SUMMARY

A detailed financial model has been developed to analyze the commercial viability of the Biofloc fish farming. Various cost and revenue related assumptions along with the results of the analysis are outlined in this section.

The projected Income Statement, Balance Sheet and Cash Flow Statement are attached as annexures.

All the figures in this financial model have been calculated after carefully taking into account the relevant assumptions and target market.

9.1. Project Cost

Total Project cost of PKR 11,536,729 for our proposed project will be financed through (100%) Equity and is shown in Table 3.

Table 3: Project Cost

Cost Item	Cost (PKR)
Land	1,200,000
Building	5,822,090
Machinery and Equipment	374,600
Furniture & Fixtures	175,000
Office Equipment	543,000

Office Vehicle	165,600
Pre-Operating Cost	551,585
Total Capital Cost – (A)	**8,831,875**
Working Capital – (B)	2,704,854
Total Project Cost – (A+B)	**11,536,730**

9.1.1. Land Requirement

The proposed Biofloc farming unit will be set up on purchased/owned land. In this regard, a land area measuring 4500 sq. ft. will be acquired in any of the proposed locations. Proposed Project will be set up on agriculture land. That is why its cost is less than average land cost normally used for other business setups in city area. This space requirement has been calculated on the basis of proposed number of Biofloc tanks, manpower, required machinery and equipment.

Table 4 provides the details of space requirement and the associated cost.

Table 4: Space Requirement

Cost Item	% Break-Up	Area Sq. Feet
Management building	6%	270
Biofloc Tanks	80%	3,600
Store	6%	270
Kitchen	2%	90
Washrooms	2%	90
Pavement/driveway	2%	90
Grounds	2%	90
Total	**100%**	**4,500**
Land Cost		**1,200,000**

9.1.2. Building/ Civil Works

This project would require construction of a building and an electricity connection of 5 KW under agricultural tariff D-1(a). Civil Works includes management building, store, kitchen and washroom. Construction cost of one Biofloc Tank ranges between PKR 80,000 to 110,000. Plastic sheet is used to cover the tank during winter. In Summer, green colored shade net is used to protect the fish from high temperature. Shed will be constructed on approximately 3,600 sq. ft. area. Remaining 900 sq. ft. has been allocated for administration office and driveway. Cost of precast boundary wall to surround the area of 4500 sq. feet has also been included in building/civil works.

Total cost for constructing a building is estimated as PKR 5,822,090. Details of cost related to building are given in Table 5.

Table 5 : Building/ Civil Works

Cost Item	% Break-Up	Area Sq. Feet	Construction Cost Per Sq. Feet (PKR)	Total Construction Cost (PKR)
Management building	6%	270	4,000	1,080,000
Biofloc Tanks	80%	3,600	489	1,760,000
Store	6%	270	3,500	945,000
Kitchen	2%	90	3,500	315,000
Washrooms	2%	90	2,800	252,000
Pavement/drive way	2%	90	800	72,000
Grounds	2%	90	800	72,000
Shed cost		3,600		624,090
Boundary Wall		4,500		702,000
Total				**5,822,090**

Table 6: Biofloc Tanks Cost Detail

Number of Biofloc Tanks	Cost per tank	Total tank cost	Total area	Cost per sq. ft.
16	110,000	1,760,000	3,600	489

Table 7: Shed Cost Detail

Description	Area / Length	Per Sq. feet/feet	Cost (PKR)
Green Net Shade sheet	3,600	42	151,200
Greenhouse Clear Plastic Polyethylene	3,600	15	54,000
Galvanized Iron Pipe	1,143	330	377,190
Civil Works (Polls Foundation)- Material cost	34	300	10,200
Labour- Installation			22,500
Labour- Polls Civil Works			9,000
Total			**624,090**

Table 8: Precast Boundary Wall Cost Detail

Description	Area / Length (Running Feet	Per Running Feet	Cost (PKR)
Boundary Wall 75 feet- Length	75	2,500	375,000
Boundary Wall 60 feet- Width	60	2,500	275,000
Iron Gate			52,000
Total			**702,000**

9.1.3. Machinery and Equipment Requirement

Table 9 shows costs, units of measurements, specifications, and total cost for machinery and equipment:

Table 9: Machinery and Equipment Requirement

Cost Item	Unit of Measurement	Specifications	No.	Unit Cost (PKR)	Total Cost (PKR)
Water Pump	Number of Water Pump	1.5 HP	1	25,000	25,000
Ring Blower	Number of Blowers	1.5 HP	1	125,000	125,000
Aeration Tubing	Per Tank	0.6 Inch Diameter	16	600	9,600
Invertor (for UPS)			1	40,000	40,000
Batteries (for UPS)		24 Volt	2	25,000	50,000
Generator		3500 Watt	1	125,000	125,000
Total					**374,600**

9.1.4. Furniture and Fixture Requirement

Details of the furniture and fixture required for the project are given in Table 10:

Table 10: Furniture and Fixtures

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Office Tables	1	25,000	25,000
Office Chairs	1	10,000	10,000
Executive Tables	1	30,000	30,000
Executive Chairs	1	20,000	20,000
Sofa Set	1	35,000	35,000
Table for Guests	1	15,000	15,000

Guest Chairs	4	10,000	40,000
Total			**175,000**

9.1.5. Office Equipment Requirement

Following office equipment will be required for the proposed project given in Table 11:

Table 11: Office Equipment

Cost Item	No.	Unit Cost (PKR)	Cost (PKR)
Laptop / Desktop	1	125,000	125,000
Printer	1	40,000	40,000
Security System (4 Cams)	4	3,500	14,000
Digital Video Recorder (DVR)	1	25,000	12,000
LED / LCD 23 inch (Surveillance)	1	50,000	50,000
LED Lights	2	6,000	12,000
Water Dispenser	1	25,000	25,000
Air Cooler	1	190,000	190,000
Electronic Weighing Scale (300 kg)	1	25,000	25,000
Water Parameter Testing Kit [7]	1	50,000	50,000
Total			**543,000**

9.1.6. Office Vehicle Requirement

Vehicles are required for the transport of raw material and finished products. Details of the unit and total cost required along with their cost for the proposed project are provided in Table 12:

Table 12: Vehicles Cost

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Motorcycle	1	165,600	165,600
Total			**165,600**

[7] The Kit includes tools to measure water parameters i.e., pH Level, TDS, Dissolved Oxygen Level Ammonia Kit.
Total dissolved solids(**TDS**) is the term used to describe the inorganic salts and small amounts of organic matter present in solution in water.

9.1.7. Pre-Operating Expense Requirement

The details regarding pre-operating expenses are provided in Table 13:

Table 13: Pre-Operating Expenses

Cost Item	Number of Employee	Number of Months	Per Month Cost (PKR)	Total Cost (PKR)
Farm Officer	1	3	40,000	120,000
Labour	4	2	32,000	256,000
Security Guard	2	1	32,000	64,000
Connection Charges- Electricity			48,600	48,600
Connection Charges- Water			20,000	20,000
Utilities exp.				42,985
Total				**551,585**

9.1.8. Working Capital Requirement

Major cost components are the building rent, utility bills, staff salaries and the routine office management expenses. The details of initial working capital are given in Table 14

Table 14: Initial Working Capital

Cost Item	Basis	Number of Months	Total Cost (PKR)
Equipment Spare Parts Inventory[8]	Machinery and Equipment	1	16,054
Feed Inventory		7	2,188,800
Initial Cash			500,000
Working Capital (A)			**2,704,854**

9.2. Financial Feasibility Analysis

The financial feasibility analysis provides information regarding projected IRR, NPV and payback period of the study. Financial feasibility results are shown in Table 15.

[8] Spare parts cost is estimated on the basis of routine maintenance tools required of the motors and other electric installations per month.

Table 15: Financial Feasibility Analysis

Description	Values
IRR	20%
NPV (PKR)	123,864
Payback Period (years)	5.29
Projection Years	10
Discount Rate used for NPV	20%

9.3. Financial Feasibility Analysis at 50% Debt

The financial feasibility analysis provides information regarding projected IRR, NPV and payback period of the study as per (50:50) Debt: Equity Model. Financial feasibility results are shown in Table 16.

Table 16: Financial Feasibility Analysis at 50% Debt

Description	Project
IRR	20%
NPV (PKR)	- 1,391,984
Payback Period (years)	5.32
Discount Rate used for NPV	23%

9.3.1. Break Even Analysis

Calculation of Product wise break-even analysis is provided in Table 17.

Table 17: Break Even Analysis

Particulars	Amount First Year (PKR)	Profitability Ratio
Sales	7,920,000	100%
Less: Variable cost of sales	4,901,742	62%
Contribution/(deficit)	3,018,258	38%
Fixed Costs	2,103,369	27%
Breakeven (kgs)	11,150	
Sale Price	495	
Breakeven Revenue	5,519,303	
Breakeven Capacity	70%	

9.3.2. Revenue Generation

Table 18 provides details for expected revenue generation of the proposed Biofloc fish farming unit during the first year of operations:

Table 18: Revenue Generation

Description	Sales (kgs) (A)	Price/kg (B)	Total Revenue C=(A*B)
Revenue	16,000	495	7,920,000

9.3.3. Variable Cost Requirement

Variable costs are detailed in Table 19:

Table 19: Variable Cost

Cost Item	Total Cost (PKR)
Cost of goods sold 1 (Fingerlings Cost)	128,000
Cost of goods sold 2- (Feed cost)	2,188,800
Operating costs 1 (Machinery Maintenance)	56,190
Operating costs 2 (Utilities)	299,312
Mortality rate (3%)	3,840
Operating costs 4 - Cost of Probiotics[9]	56,000
Operating costs 1 (Direct Labour)	2,016,000
Travelling expense	76,800
Communications expense (phone, fax, mail, internet, etc.)	76,800
Total	**4,901,742**

Table 20: Cost of goods sold 1 – Fingerling Cost

Cost Item	Cost / Fingerling (PKR) (A)	Number of Fingerling (per kg) (B)	Cost of seeds per kg of Fish (PKR) C=(A*B)	Total Capacity (kgs) (D)	Total Cost (PKR) (C*D)
Fingerling Cost	4	2	8	16,000	128,000
Total					**128,000**

[9] Probiotics are beneficial bacteria which play an important role in the microbial balance of the microorganisms and the water environment. The presence of beneficial bacteria in the Biofloc creates a "natural probiotic" effect, which can act both internally and externally to combat pathogens and improve immune response

Table:21 Cost of goods sold 2 – Feed Cost

Cost Item	Feed Conversion Rate (FCR) (A)	Average Cost / kg of Feed (PKR) (B)	Cost per kg of Production (PKR) C=(A*B)	Total Capacity (kgs) (D)	Total Cost (PKR) (C*D)
Feed Cost	1.2	114	136.8	16,000	2,188,800
Total					**2,188,800**

9.3.4. Human Resource Requirement

For the 1st year of operations, the Biofloc fish farming shall require the workforce and salary cost as projected in Table 22.

Table 22: Human Resource Requirements

Administration Staff	No of Staff	Monthly Salary (PKR)	Annual Salary (PKR)
Farm Officer	1	40,000	480,000
Labour	4	32,000	1,536,000
Security Staff	2	32,000	768,000
Total			**2,784,000**

10. CONTACT DETAILS

In order to facilitate the potential investors, contact details of some relevant vendors for the proposed project is given in Table 23

Table 23: Contact Details

Name of Supplier	Address	Email/ Website	Contact Number
Fisheries Development Board (FDB)	Plot #12, Orchard Scheme, Murree Road Islamabad,	http://fdb.org.pk	051-9230348
Ali Biofloc Fish Farm	Zam Zam Chowk Sargodha	Bossbiofloc@gmail.com	0306-4068080
M/s. Abid Rafique and Co.	Shahrah-e-Faisal Karachi-	www.abidrafique.com	0300-5260128
M/s. Tawakkal Tilapia Hatcheries Muzaffargarh, Punjab	Tilapia Hatcheries Muzaffargarh, Punjab	tawakkalfishhatchery@yahoo.com	049-4001072
M/s. Ayefa Protein Farms (Pvt) Ltd. Business: Tilapia Farm	42 Westwood Colony, Thokar Niaz Baig, Lahore	www.lahoreindustry.com	0322-7172497

11. USEFUL LINKS

Table 24: Useful Links

Name of Organization	E-mail address
Small and Medium Enterprises Development Authority (SMEDA)	www.smeda.org.pk
National Business Development Program (NBDP)	www.nbdp.org.pk
Government of Pakistan	www.pakistan.gov.pk
Ministry of Industries and Production	www.moip.gov.pk
Ministry of Federal Education and Professional Training	www.mofept.gov.pk
Government of Punjab	www.punjab.gov.pk
Security and Exchange Commission of Pakistan	www.secp.gov.pk
State Bank of Pakistan	www.sbp.gov.pk
Federation of Pakistan Chambers of Commerce and Industry (FPCCI)	www.fpcci.com.pk
Technical Education and Vocational Training Authority (TEVTA)	www.tevta.org
Punjab Vocational Training Council (PVTC)	www.pvtc.gop.pk
Punjab Small Industries Corporation	www.psic.gop.pk
Nauman Javed Hasnain Rashid, Chartered Accountants (NJHR)	www.njhr.com.pk
Department of Fisheries Government of Punjab	www.punjabfisheries.gov.pk/
Fisheries Development Board of Pakistan	fdb.org.pk/

12. ANNEXURES

12.1. Income Statement

Statement Summaries **SMEDA**

Income Statement

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue	7,920,000	8,712,000	9,583,200	10,541,520	11,595,672	12,755,239	14,030,763	15,433,839	16,977,223	18,674,946
Cost of sales										
Cost of goods sold 1 (Seed Cost)	128,000	138,624	150,130	162,591	176,086	190,701	206,529	223,671	242,235	262,341
Cost of goods sold 2- (Feed cost)	2,188,800	2,370,470	2,567,219	2,780,299	3,011,063	3,260,982	3,531,643	3,824,770	4,142,225	4,486,030
Operation costs 1 (Direct Labor)	2,016,000	2,163,840	2,322,522	2,492,840	2,675,648	2,871,862	3,082,466	3,308,513	3,551,137	3,811,554
Operating costs 1 (Machinery Maintenance)	56,190	60,854	65,905	71,375	77,299	83,715	90,663	98,188	106,338	115,164
Operating costs 2 (Utilities)	299,312	325,522	354,026	385,027	418,743	455,411	495,290	538,660	585,829	637,128
Mortality rate	3,840	4,159	4,504	4,878	5,283	5,721	6,196	6,710	7,267	7,870
Operating costs 4 - Cost of Probiotics	56,000	60,648	65,682	71,133	77,037	83,432	90,356	97,856	105,978	114,774
Total cost of sales	4,748,142	5,124,116	5,529,987	5,968,142	6,441,159	6,951,823	7,503,142	8,098,368	8,741,010	9,434,861
Gross Profit	3,171,858	3,587,884	4,053,213	4,573,378	5,154,513	5,803,417	6,527,621	7,335,472	8,236,214	9,240,084
General administration & selling expenses										
Administration expense	768,000	824,320	884,770	949,653	1,019,295	1,094,043	1,174,273	1,260,386	1,352,814	1,452,021
Electricity Admin Related	216,513	235,472	256,092	278,517	302,905	329,430	358,277	389,650	423,770	460,879
Travelling expense	76,800	82,432	88,477	94,965	101,929	109,404	117,427	126,039	135,281	145,202
Communications expense (phone, fax, mail, internet, etc.)	76,800	82,432	88,477	94,965	101,929	109,404	117,427	126,039	135,281	145,202
Promotional expense	158,400	174,240	191,664	210,830	231,913	255,105	280,615	308,677	339,544	373,499
Professional fees (Technical Expert, etc.)	79,200	87,120	95,832	105,415	115,957	127,552	140,308	154,338	169,772	186,749
Depreciation expense	770,939	770,939	770,939	770,939	770,939	770,939	708,029	921,852	921,852	921,852
Amortization of pre-operating costs	110,317	110,317	110,317	110,317	110,317	-	-	-	-	-
Subtotal	2,256,969	2,367,272	2,486,568	2,615,602	2,755,185	2,795,877	2,896,356	3,286,980	3,478,316	3,685,403
Operating Income	914,889	1,220,611	1,566,645	1,957,776	2,399,328	3,007,539	3,631,265	4,048,492	4,757,898	5,554,681
Gain / (loss) on sale of machinery & equipment	-	-	-	-	-	-	121,745	-	-	
Gain / (loss) on sale of office equipment	-	-	-	-	-	-	135,750	-	-	
Gain / (loss) on sale of office vehicles	-	-	-	-	-	-	57,960	-	-	
Earnings Before Interest & Taxes	914,889	1,220,611	1,566,645	1,957,776	2,399,328	3,007,539	3,946,720	4,048,492	4,757,898	5,554,681
Subtotal	-	-	-	-	-	-	-	-	-	-
Earnings Before Tax	914,889	1,220,611	1,566,645	1,957,776	2,399,328	3,007,539	3,946,720	4,048,492	4,757,898	5,554,681
Tax	32,233	79,122	148,329	226,555	314,865	467,261	749,016	781,971	1,030,264	1,309,138
NET PROFIT/(LOSS) AFTER TAX	**882,656**	**1,141,489**	**1,418,316**	**1,731,221**	**2,084,463**	**2,540,278**	**3,197,704**	**3,266,520**	**3,727,634**	**4,245,543**

12.2. Balance Sheet

Calculations **SMEDA**

Balance Sheet

	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	500,000	2,301,310	3,271,833	4,142,433	4,958,829	5,732,226	6,382,930	7,423,490	10,910,239	14,740,289	16,733,967
Accounts receivable		377,143	396,000	435,600	479,160	527,076	579,784	637,762	701,538	771,692	848,861
Finished goods inventory		-	-	-	-	-	-	-	-	-	-
Equipment spare part inventory	16,054	10,954	12,812	14,985	17,527	20,501	23,978	28,046	32,804	38,369	-
Inventory- Feed	2,188,800	1,497,545	1,756,454	2,060,125	2,416,298	2,834,050	3,324,026	3,898,713	4,572,758	5,363,337	-
Pre-paid annual land lease	-	-	-	-	-	-	-	-	-	-	-
Total Current Assets	2,704,854	4,186,952	5,437,099	6,653,144	7,871,814	9,113,852	10,310,718	11,988,011	16,217,339	20,913,687	17,582,828
Fixed assets											
Land	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Building/Infrastructure	5,822,090	5,239,881	4,657,672	4,075,463	3,493,254	2,911,045	2,328,836	1,746,627	1,164,418	582,209	-
Machinery & equipment	374,600	318,410	262,220	206,030	149,840	93,650	37,460	641,999	545,699	449,399	353,099
Furniture & fixtures	175,000	148,750	122,500	96,250	70,000	43,750	17,500	355,384	302,076	248,769	195,461
Office vehicles	165,600	140,760	115,920	91,080	66,240	41,400	16,560	336,295	285,851	235,406	184,962
Office equipment	543,000	461,550	380,100	298,650	217,200	135,750	54,300	930,607	791,016	651,425	511,834
Total Fixed Assets	8,280,290	7,509,351	6,738,412	5,967,473	5,196,534	4,425,595	3,654,656	5,210,911	4,289,059	3,367,208	2,445,356
Intangible assets											
Pre-operation costs	551,585	441,268	330,951	220,634	110,317	-	-	-	-	-	-
Legal, licensing, & training costs	-	-	-	-	-	-	-	-	-	-	-
Total Intangible Assets	551,585	441,268	330,951	220,634	110,317	-	-	-	-	-	-
TOTAL ASSETS	**11,536,730**	**12,137,571**	**12,506,462**	**12,841,251**	**13,178,665**	**13,539,447**	**13,965,374**	**17,198,922**	**20,506,398**	**24,280,895**	**20,028,184**
Liabilities & Shareholders' Equity											
Current liabilities											
Accounts payable		159,513	178,324	199,659	223,894	251,466	282,879	318,723	359,679	406,541	199,871
Other liabilities											
Total Current Liabilities	-	159,513	178,324	199,659	223,894	251,466	282,879	318,723	359,679	406,541	199,871
Other liabilities											
Total Long Term Liabilities	-	-	-	-	-	-	-	-	-	-	-
Shareholders' equity											
Paid-up capital	11,536,730	11,536,730	11,536,730	11,536,730	11,536,730	11,536,730	11,536,730	11,536,730	11,536,730	11,536,730	11,536,730
Retained earnings		441,328	791,409	1,104,862	1,418,042	1,751,252	2,145,765	5,343,469	8,609,990	12,337,624	8,291,584
Total Equity	11,536,730	11,978,058	12,328,138	12,641,592	12,954,771	13,287,982	13,682,494	16,880,199	20,146,719	23,874,353	19,828,313
TOTAL CAPITAL AND LIABILITIES	**11,536,730**	**12,137,571**	**12,506,462**	**12,841,251**	**13,178,665**	**13,539,447**	**13,965,374**	**17,198,922**	**20,506,398**	**24,280,895**	**20,028,184**

12.3. Cash Flow Statement

Calculations **SMEDA**

Cash Flow Statement

	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		882,656	1,141,489	1,418,316	1,731,221	2,084,463	2,540,278	3,197,704	3,266,520	3,727,634	4,245,543
Add: depreciation expense		770,939	770,939	770,939	770,939	770,939	770,939	708,029	921,852	921,852	921,852
amortization of pre-operating costs		110,317	110,317	110,317	110,317	110,317	-	-	-	-	-
Accounts receivable		(377,143)	(18,857)	(39,600)	(43,560)	(47,916)	(52,708)	(57,978)	(63,776)	(70,154)	(77,169)
Equipment inventory	(16,054)	5,101	(1,858)	(2,173)	(2,542)	(2,973)	(3,478)	(4,068)	(4,758)	(5,565)	38,369
Raw material inventory	(2,188,800)	691,255	(258,909)	(303,672)	(356,173)	(417,751)	(489,976)	(574,687)	(674,045)	(790,579)	5,363,337
Accounts payable		159,513	18,811	21,335	24,235	27,572	31,414	35,844	40,956	46,862	(206,670)
Cash provided by operations	(2,204,854)	2,242,638	1,761,932	1,975,462	2,234,437	2,524,650	2,796,469	3,304,843	3,486,749	3,830,050	10,285,262
Financing activities											
Issuance of shares	11,536,730	-	-	-	-	-	-	-	-	-	-
Purchase of (treasury) shares											
Cash provided by / (used for) financing activities	11,536,730	-	-	-	-	-	-	-	-	-	-
Investing activities											
Capital expenditure	(8,831,875)	-	-	-	-	-	-	(2,264,284)	-	-	-
Acquisitions											
Cash (used for) / provided by investing activities	(8,831,875)	-	-	-	-	-	-	(2,264,284)	-	-	-
NET CASH	500,000	2,242,638	1,761,932	1,975,462	2,234,437	2,524,650	2,796,469	1,040,559	3,486,749	3,830,050	10,285,262

13. KEY ASSUMPTIONS

13.1. Operating Cost Assumptions

Table 25: Operating Cost Assumptions

Description	Details
Operating costs growth rate	8.3% of general inflation rate
Travelling expenses	10.0% of administration expenses
Communication expenses	10.0% of administration expenses
Promotional expense	2.0% of revenue
Professional fees (legal, audit, consultants, etc.)	1.0% of administration expenses

13.2. Revenue Assumptions

Table 26: Revenue Assumptions

Description	Details
Sale price growth rate	10%
Production capacity utilization	100%

13.3. Financial Assumptions

Table 27: Financial Assumptions

Description	Details
Project life (Years)	10
Debt: Equity	0:100
Discount Rate used for NPV	20%

Small and Medium Enterprises Development Authority

HEAD OFFICE

4th Floor, Building No. 3, Aiwan-e-Iqbal Complex, Egerton Road, Lahore
Tel: (92 42) 111 111 456, Fax: (92 42) 36304926-7

www.smeda.org.pk, **helpdesk@smeda.org.pk**

REGIONAL OFFICE PUNJAB	REGIONAL OFFICE SINDH	REGIONAL OFFICE KPK	REGIONAL OFFICE BALOCHISTAN
3rd Floor, Building No. 3, Aiwan-e-Iqbal Complex, Egerton Road Lahore, Tel: (042) 111-111-456 Fax: (042) 36304926-7 helpdesk.punjab@smeda.org.pk	5TH Floor, Bahria Complex II, M.T. Khan Road, Karachi. Tel: (021) 111-111-456 Fax: (021) 5610572 helpdesk-khi@smeda.org.pk	Ground Floor State Life Building The Mall, Peshawar. Tel: (091) 9213046-47 Fax: (091) 286908 helpdesk-pew@smeda.org.pk	Bungalow No. 15-A Chaman Housing Scheme Airport Road, Quetta. Tel: (081) 831623, 831702 Fax: (081) 831922 helpdesk-qta@smeda.org.pk