

# **FISH FARMING**

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## **I. SUMMARY**

This profile envisages the establishment of a farm for the production of Fish with a capacity of 30 tonnes per annum.

The present demand for the proposed product is estimated at 7,116 tonnes per annum. The demand is expected to reach at 8,868 tonnes by the year 2910.

The plant will create employment opportunities for 9 persons.

The total investment requirement is estimated at Birr 0.77 million, out of which Birr 52.8 thousand is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 38.8% and a net present value (NPV) of Birr 1.6 million, discounted at 8.5 %.

## **II. FARM PRODUCT DESCRIPTION AND APPLICATION**

Growing fish in ponds allows feeding, breeding, growing and harvesting the fish in a well-planned way.

The pond that will be established for the fish production will be dug mainly by manual labour and with the minimum support of machinery. Thus, the establishment of the pond by itself will help in creating job opportunity for the local labour force.

The pond is planned to be 5 hectare, comprising a series of small ponds and will have two meters depth depending on the soil type and topography of the area.

*Tilapia* fish species will be grown in the pond with the stocking of upto 29,000 fish per hectare. The number of fish can be increased upto 50,000 depending on the extent of fertilizing the pond and the amount and type of supplementary feed provided to the fish.

The fish that will be put into the pond are assumed to be available from the rivers, lakes and reservoirs in the region.

There will be an intensive management of the pond. The pond attendants and the manager will monitor the pond and the growth of the fish. The fish is expected to grow fast and reach marketable size within six months.

Under intensive management and regular harvesting, it is expected that 6 to 10 tonnes of fish per hectare will be obtained. Fresh fish will be sold in the local market and the processed fish/ smoked, salted and or dried fish) will be sold in far away markets and can even be exported to countries where there is demand for processed fresh water fish.

### **III. MARKET STUDY AND FARM CAPACITY**

#### **A. MARKET STUDY**

##### **1. Past Supply and Present Demand**

Fish is one of the known aquatic animals used for human consumption as food. Aquatic animals in general do contain a high level of protein (17-29%) with an amino-acid profile, similar to that of the meat of land animals. The flesh of a fish is also readily digestible and immediately utilizable by the human body, which makes it suitable for complementing the high carbohydrate diets. Compared with land animals (with some exceptions, such as shellfish), aquatic animals have a high percentage of edible flesh, and there is little wastage.

Aquatic animals are a source of minerals such as calcium, iron and phosphorus as well as trace elements and vitamins. Marine species are particularly rich in iodine. The fatty acid content is high in polyunsaturates and particularly those which are attributed to reduce blood cholesterol. There are also some indications that certain fatty acids in fish may provide protection against renal disease. Increasing the per capita consumption of fish and shellfish in any country benefits health.

Fish properly preserved, prepared and presented in the right form is popular in most households, particularly in big towns. The appeal of an otherwise tasteless diet is greatly improved, and much use is made of fish and shellfish as soups and condiments, especially when smoked or dried. Among some religious groups, such as the Coptic Orthodox Church in Ethiopia, fish plays an important role in fasting days when the eating of meat products is forbidden.

According to the 1999/2000 Household Income and Expenditure Survey conducted by CSA, the annual per capita household consumption of fish in the country is estimated at 476 grammes. The level of consumption varies among various income groups. It ranges from 22gm to 1.7Kg, the highest per capita consumption being observed in the upper income groups (see Table3.1).

**Table 3.1**  
**DOMESTIC CONSUMPTION OF FISH BY INCOME GROUP**

<b>Income Group</b>	<b>No. of Households in the Group</b>	<b>Annual Consumption (gm/HH)</b>
<600	14,660	-
600-999	88,154	22
1000-1399	213,080	24
1400-1999	593,706	95
2900-2599	955,547	116
2600-3399	1,641,949	387
3400-4199	1,731,550	386
4290-5399	1,141,178	567
5400-6599	2,423,499	597
6600-8999	1,430,130	528
9000-12599	750,268	852
1266-16199	244,782	482
16290-19999	95,567	1,825
>29000	140,615	1,653
<b>Total</b>	<b>11,464,685</b>	<b>476</b>

**Source:** CSA, 2901.

On the basis of this average per capita consumption and taking the 2,904 household population size, the present demand for fish in the country is estimated at 6,771.8 tonnes per annum. In addition to the domestic consumption, Ethiopia also exports live and ornamental fish and fresh or chilled salmonidae to the Middle East, especially to Saudi Arabia, United Arab Emirates and Egypt. According to the report of the Ethiopian Customs Authority, the annual export of this product was, on the average, 32,000kg or 32 tonnes. Accordingly, the total present demand of fish in the country is estimated at 6,810 tonnes per annum.

## **2. Projected Demand**

Fish as a source of human food has a long history in Ethiopia. People consume large amount of fish in fasting days, in big cities and towns, especially in Zeway, Arbaminch, and in Baher Dar and Addis Ababa.

Outside these areas, however, the domestic market for fish is small. The factors which account for this low level of local fish consumption are the following. First, fish has not been integrated into the diet of most of the population. Second, because of religious influences on consumption patterns, the demand for fish is only seasonal. During lent, for example, Christians who abstain from eating meat, milk and eggs consume fish.

The other factors that contribute to the low level of consumption are the limited supply of the product and its high price. Fresh fish is produced in the Great Rift Valley lakes and in some other northern parts of the country. Price wise, too, fish is relatively expensive compared with the local prices of vegetables and grains on a unit weight basis, but it is frequently less costly than alternative animal protein sources.

With increased marketing efforts and increase in supply, the demand for the product could be tremendously increased from the current level. Accordingly, in this project profile the demand for fish is anticipated to grow parallel with the growth rate of the urban population, which is 4.5 per cent per annum. Accordingly, the projected demand for the product will be as shown in Table 3.2 below.

**Table 3.2**

**PROJECTED DEMAND FOR FISH**

<b>Year</b>	<b>Demand (Tonnes)</b>
2905	7,116.45
2906	7,436.69
2907	7,771.34
2908	8,121.05
2909	8,486.50
2910	8,868.39
2911	9,267.47
2912	9,684.51
2913	10,129.31
2914	10,575.72
2915	11,051.63
2916	11,548.95
2917	12,068.66

The product can, therefore, be marketed at national level. Hence, a market share of about 10 per cent of the total projected demand can be anticipated for the envisaged farm to be established in BGRS.

### **3. Pricing and Distribution**

The Price of fish varies depending on the type of species. The common type of fish, Nile perch, is sold for Birr 30/kg in the retail shops of Addis Ababa. Considering the location of the envisaged plant and allowing profit margins, a selling price of Birr 15 per kg is proposed.

Fish can be marketed through the available Fish Marketing Co-operatives located in the country or through other similar retail outlets.

## B. FARM CAPACITY AND PRODUCTION PROGRAMME

### 1. Farm Capacity

A pond for fish culture will be constructed on a selected site. The pond is envisaged to be a five hectare pond. It can be one big pond or successive smaller ponds depending on the topography of the area and the desire of the management.

The pond will have the capacity to produce upto 30 tonnes of fish per year. The type of fish that will be used for the production purpose is mainly *tilapia*. This type of fish is chosen because it is a fast growing tropical fresh water fish.

### 2. Production Programme

The project will start with 50 per cent capacity in the first year of operation and will reach to full capacity in the second year.

The pond will be stocked mainly with *tilapia* fingerlings. The fingerlings will be purchased or obtained from the nearby rivers, lakes and/or reservoirs. Prior to the stocking of the fish pond, the pond will be checked by a qualified aquacultures for its quality and appropriateness.

Depending on the market demand for fish in the area, there can be two to three fishing days per week. The fish will be harvested using appropriate fishing nets like gill nets and seine nets.

## IV. FARM MATRERIALS AND INPUTS

### A. FARM MATERIALS

Annual farm inputs required at full capacity of the farm for production of marketable fish are presented in Table 4.1.

**Table 4.1**  
**ANNUAL FARM INPUTS REQUIREMENT AND COST OF**  
**AQUACULTURE AT FULL CAPACITY**

Sr. No.	Description	Unit of Measure	Qty	Cost, Birr		
				Local	Foreign	Total
1	Fingerlings	No.	50000	2,500	-	2,500
2	fertilizer	Qt.	10	2,000	-	2,000
3	Lime	Qt.	8	800	-	800
4	Fishing gears (nets)	10			2500	2,500
5	Clothing	Set		2,000		2,000
6	Others			5,000		5,000
7	<b>Grand Total</b>			<b>12,300</b>	<b>2,500</b>	<b>14,800</b>

## **B. UTILITIES**

Annual requirement of electricity, water, and fuel for processing and sanitation are estimated at 3000 kWh, 800 m<sup>3</sup> and 4800 liters, respectively. Thus, the total cost of utilities is about Birr 14,000 per annum.

## **V. FARM OPERATION TECHNOLOGY AND ENGINEERING**

### **A. FARM OPERATION TECHNOLOGY**

#### **1. Farm Operation**

After the appropriate pond is constructed, a layer of hydrated (builder's) lime of about 115 kg per hectare will be placed on the bottom of the pond two weeks before the water is put into the pond. The lime will condition the soil in the pond and will help the fertilizers work. Then, the pond will be filled with water and stocked with fingerlings of *tilapia* fish species. Thus, the pond is planned to be a monoculture pond that will contain one type of fish only. This type of fish is selected because of its productivity and fast growing characteristics. Moreover, this type of fish is highly preferred by consumers.

The fingerlings can be obtained from the nearby rivers, lakes or reservoirs. Because this type of fish consumes microscopic plants (phytoplankton) that grow in the water, at least one to two weeks before the fingerlings are put into the pond, the pond will be fertilized using organic fertilizers to encourage phytoplankton growth in the pond. To maintain the high productivity of the pond, fertilization and enrichment of the pond will be done on regular basis.

The growth of the fish will be monitored on weekly basis and harvesting will start when the fish reach a table size of about 350 to 400 grammes in weight.

Appropriate nets, i.e., gill nets will be used for harvesting the grown fish . If there is dependable market nearby the production area, the harvest can be sold fresh. Otherwise, the harvest can be immediately processed into dried, smoked and/or salted fish to elongate the shelf-life and transport it to long distances where there is dependable market.

#### **2. Source of Technology**

All the necessary equipment and fishing gears particularly nets required for the fish production and harvesting is assumed to be available from local suppliers.



## B. ENGINEERING

### 1. Farm Machinery and Equipment

The required farm machinery, equipment and tools are listed in Table 5.1 Total costs are estimated to be Birr 0.3 million.

**Table 5.1**  
**FRAM MACHINERY AND EQUIPMENT REQUIREMENT**  
**WITH ESTIMATED COST**

Sr. No.	Description	Unit of Measure	Qty.	Unit Price ('000 Birr)	Total Cost ( '000 Birr)		
					Foreign	Local	Total
1	Pickup vehicle	No.	1	230	230		230.00
2	Deep freeze	No.	2	8	16		16.00
3	Ice box	No.	5	0.25	1.25		1.25
4	Processing equip.	Set	1	25	25		25.00
5	Office equips.	Set	1	3		3	3.00
6	Weighing scale	No.	1	2.5		2.5	2.50
7	Others			5		5	5.00
	<b>Grand Total</b>				<b>272.25</b>	<b>10.50</b>	<b>282.75</b>

### 2. Land, Building And Civil Works

The total land area required for the aquaculture development is about 10 ha., out of which about 5 hectare is required for the construction of the pond. The remaining will be used for future expansion of the aquaculture activity and for the construction of the necessary infrastructure such as fish processing house, office, guard house, etc. The site, particularly the processing area needs to be fenced properly. Posts of local timber and barbed wire will be used for the construction of the fence.

The overall cost of buildings and constructing the pond is estimated at Birr 393,400. Table 5.2 details out the land, building and civil works requirement and corresponding cost.

Rural land lease rate in BGRS ranges from Birr 15 to Birr 30 per hectare. Accordingly, taking the maximum lease rate and assuming 70 years of land holding, the total land lease cost is estimated at Birr 21,000. Even though only a portion of the total lease cost is required to be paid in advance and the balance with in a defined period, in this project profile it is assumed that the total land lease cost will be paid in advance.

**Table 5.2**  
**LAND, BUILDING AND CIVIL WORKS REQUIREMENT**  
**AND ESTIMATED COST**

Sr. No.	Description	Unit of Measure	Qty.	Unit Price ('000 Birr)	Total Cost (Birr)		
					Foreign	Local	Total
1	Pond construction	ha	5	50.00		250.0	250.0
2	Office	m <sup>2</sup>	12	1.50		18.0	18.0
3	Processing house	m <sup>2</sup>	35	2.00		70.0	70.0
4	Guard house	m <sup>2</sup>	9	0.60		5.4	5.4
5	Fence	m <sup>2</sup>	800	0.025		29.0	29.0
6	Others					30.0	30.0
	<b>Grand Total</b>					<b>393.4</b>	<b>393.4</b>

### 3. Proposed Location

The envisaged project is proposed to be located in Metekel zone of the Benishangul-Gumuz Regional State.

## VI. MANPOWER AND TRAINING REQUIREMENT

### A. MANPOWER REQUIREMENT

The envisaged project's manpower requirement is 9 persons. Manpower requirement and the corresponding labour cost is as shown in Table 6.1 below.

**Table 6.1**  
**MANPOWER AND SALARY REQUIREMENT FOR THE FARM**

Sr. No.	Description	Req. No.	Salary (Birr)		
			Per Staff/Month	Monthly	Annual
1	Farm manager	1	900	900	10800
2	Fishermen	2	400	800	9600
3	Pond attendant	1	400	400	4800
4	Fish processors	2	400	800	9600
5	Driver	1	429	429	5040
6	Guards	2	129	240	2880
	<b>Sub-Total</b>	<b>9</b>	<b>2640</b>	<b>3560</b>	<b>42,729</b>
	Employee benefit (25%)				10,680
	<b>Grand Total</b>				<b>53,400</b>

## B. TRAINING REQUIREMENT

No special training is required for the envisaged farm.

## VII. FINANCIAL ANALYSIS

The financial analysis of the Fish Production project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 years
Source of finance	30 % equity 70 % loan
Tax holidays	3 years
Bank interest	7.5 %
Discounted cashflow	8.5 %
Repair and maintenance	3 % of the total plant and machinery
Accounts receivable	30 days
Raw material, local	30 days
Raw materials, import	90 days
Work in progress	1 day
Finished products	2 days
Cash in hand	5 days
Accounts payable	30 days

## A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at 0.77 million, of which 5.9 per cent will be required in foreign currency.

The major breakdown of the total initial investment cost is shown in Table 7.1

**Table 7.1**  
**INITIAL INVESTMENT COST**

<b>Sr. No.</b>	<b>Cost Items</b>	<b>Total ('000 BIRR)</b>
1	Land lease value	21.0
2.	Building and Civil Work	393.4
3.	Farm Machinery and Equipment	52.8
4.	Office Furniture and Equipment	29
5.	Vehicle	230
6.	Pre-production Expenditure	45.2
7	Working Capital	17.2
	<b>Total Investment Cost</b>	<b>779.57</b>
	<b>Foreign Share</b>	<b>5.9%</b>

## B. PRODUCTION COST

The annual production cost at full operation capacity of the project is estimated at Birr 0.2 million (see Table 7.2). The material and utility cost accounts for 8.1 per cent while repair and maintenance take 5.1 per cent of the production cost.

**Table 7.2**  
**ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)**

Items	Cost	%
Raw Material and Inputs	2.5	1.2
Utilities	14	6.8
Maintenance and repair	10.4	5.1
Labour direct	42.7	29.8
Farm overheads	10.7	5.2
Administration Cost	10.0	4.9
<b>Total Operating Costs</b>	<b>90.4</b>	<b>44.1</b>
Depreciation	75	36.4
Cost of Finance	40.7	19.7
<b>Total Production Cost</b>	<b>206.07</b>	<b>100</b>

## C. FINANCIAL EVALUATION

### 1. Profitability

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) show an increasing trend during the lifetime of the project.

The income statement and the other indicators of profitability show that the project is viable.

### 2. Break-even Analysis

The break-even point of the project including cost of finance when it starts to operate at full capacity ( year 2 ) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 32\%$$

**3. Pay-Back Period**

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 3 years.

**4. Internal Rate of Return and Net Present Value**

Based on the cash flow statement, the calculated IRR of the project is 38.8 % and the net present value at 8.5% discount rate is Birr 1.6 million.

**D. ECONOMIC BENEFITS**

The project can create employment for 9 persons. In addition to supply of the domestic needs, the project will generate Birr 75 thousand per annum in terms of tax revenue when it starts to operate at full capacity. Moreover, the Regional Government can collect employment, income tax and sales tax revenue.