FISH FARMING ECONOMICS

Definition of economics

Economics is the study of the production and distribution of economic goods and services, bearing in mind that the necessary resources (land, water, money, inputs, etc.) are always limited. Farmers therefore have to make choices on how best to utilize the resources that are available to them for maximum benefit.

Opportunity cost

Opportunity cost is the next best opportunity one foregoes as a result of selecting one out of several possibilities. For example, if a farmer decides to invest in fish farming, that decision implies a loss of the benefits that would have resulted from investing in poultry farming, crop farming, cattle-rearing, or another farming enterprise.

Farm management

In a commercial setup, the fish farmer has to understand that fish are usually reared for economic benefit. The farm manager has to make many organizational and operational decisions; key among these are:

- What species of fish to produce?
- What quantity of the selected species to produce?
- What mix of resources and technology to use?
- When and where to sell or buy?
- How to finance the operation?

Objectives of a private enterprise

Fish farmers should expect economic gain through providing food for the family, selling fish crops, or offering services such as sport-fishing in exchange for monetary gains. This should be every farmer's goal.

Examples of aquaculture enterprises

Some possible aquaculture enterprises include the following:

- Culture of Nile tilapia (*Oreochromis niloticus)*
- Culture of African catfish (*Clarias gariepinus)*
- Polyculture of tilapia and African catfish
- Culture of trout (*Onchorynchus mykiss*)
- Culture of ornamental fish in fresh and sea water, e.g., goldfish
- Culture of marine shrimp, crayfish, or freshwater shrimp
- Culture of oysters
- Culture of the spiny lobster
- Providing support services for aquaculture (harvesting, water treatment)
- Processing farmed fish for sale
- Manufacturing fish feed
- Consulting and training for the aquaculture industry

Types of fish products derived from aquaculture

- Fingerlings, fry, and live eggs
- Live or fresh food-fish (tilapia, catfish, trout, and crustaceans)
- Live ornamental fishes
- Processed fish: smoked, filleted, de-headed, sun-dried
- Eggs

1: Enterprise Budgets

Introduction

An enterprise budget is a tool you can use to estimate all expected costs and income for your enterprise over a specified period of time, e.g., your fish production operation during one growing season or one year. Preparing an enterprise budget helps you predict whether or not the fish farming enterprise will be profitable.

If we assume that a farmer has made all the capital investments required to start the enterprise, normal operating costs incurred and revenues received per unit time (e.g., one year) can be summarized into an enterprise budget.

To develop an enterprise budget, the following types of assumptions must be made:

- Establish the source of operating funds: Are they from loans or from savings?
- There is a ready market for the fish
- The investor is not salaried; she/he relies solely on farm profits
- Establish the interval of harvest (growing period) and expected yield
- Estimated mortality or survival rate for the fish stock
- Prevailing bank interest rate

Components of an enterprise budget

Gross Receipts

The first step in developing an enterprise budget is to estimate the total fish production and expected output price. The total value of the fish sold is called the Gross Receipts.

Variable Costs

The second step is to estimate the variable costs. Variable Costs are the cash expenses directly related to production. These costs vary with the scale of production or farm size.

Fixed Costs

Fixed Costs are incurred regardless of whether or not production occurs. Certain items that outlive one production period must be purchased. Only expenses related to land and equipment should be considered (land lease, annual depreciation of machinery, interest rates) because it is assumed that ponds are already constructed. Salaries for permanent staff may also be considered.

Total Costs

This is the sum of Variable and Fixed Costs.

Net Returns

This is the difference between Gross Receipts and Total Costs.

Break-even Analysis

A "break-even price" can be calculated and used to gauge whether your operational costs are covered by your income. The break-even price is the price at which expenses per kg and income per kg are just equal. It is expressed in KShs per unit weight (kg).

Break-even Price

This can be calculated to cover:

a) Variable expenses:
   Total variable expenses (KShs)/total fish produced (kg)

b) Total expenses:
   Total expenses (KShs)/total fish produced (kg)

Break-even Yield

a) Break even yield (BEY) above total cost (TC) is defined as production where total gross receipts are equal to total costs. This is calculated as follows:

BEY above TC = Total costs/price per unit

b) Break even yield (BEY) above total variable cost (TVC) is defined as production where total gross receipts are equal to total variable costs. This is calculated as follows:

BEY above TVC = Total variable costs/price per unit

Income per Unit Area

Some people may want to find out how much they are earning per unit area of pond water. To calculate earnings per unit area:
Income = Net Income (KShs)/Total area of pond (ha)

A Sample Enterprise Budget

An example of an enterprise budget is shown on the following page.

Moving on

As we have seen, an enterprise budget helps a farmer evaluate the farming operation by estimating all costs and expenses over a particular period of time. In the next section we will see how cash flow analyses help visualize the month-to-month inflow and outflow of cash, making it easier for a farmer to plan for periods of low income and/or high expenses.

Table 6.1-1. An example of an enterprise budget for a five-hectare production farm.

		Price			Value	
Variable costs	Unit	(KSh)	($US)	Quantity	(KSh)	($US)
First phase: no feed						
Urea	kg	19	$0.27	2700	51,300	$733
D.A.P.	kg	23	$0.33	2000	46,000	$657
T.S.P. to satisfy soil phosphorus demand	kg	25	$0.36	3125	78,125	$1,116
Tilapia fingerlings	piece	3	$0.04	112500	337,500	$4,821
Clarias fingerlings	piece	5	$0.07	12500	62,500	$893
Field labor: stock, feed, fertilize, harvest	man-day	120	$1.71	400	48,000	$686
Security personnel	night	150	$2.14	416	62,400	$891
Second phase: bran plus fertilizer						
Bran cost including transport	kg	3	$0.04	75000	225,000	$3,214
Urea	kg	19	$0.27	3896	74,017	$1,057
D.A.P.	kg	25	$0.36	5915	147,875	$2,113
Field labor: stock, feed, fertilize, harvest	man-day	120	$1.71	525	63,000	$900
Labor, levee renovations, after draining	man-day	120	$1.71	375	45,000	$643
Security personnel	night	150	$2.14	416	62,400	$891
Sub total variable costs					1,303,117	$18,616
Interest on operating capital:16% p.a.					208,499	$2,979
TOTAL VARIABLE COSTS					**1,511,616**	**$21,595**

Fixed costs						
Amortization of ponds, equipment, 15 yrs	ponds	2000000	$28,571	0.067	133,333	$1,914
Interest on investment, ponds only	16% p.a.	2000000	28,571	0.16	320,000	$4,571
TOTAL FIXED COSTS FOR 1 YEAR					**453,333**	**$6,486**
Gross receipts						
Tilapia sold	kg	100	$1.43	30453	3,045,313	$43,504
Clarias sold	kg	100	$1.43	4693	469,281	$6,704
TOTAL REVENUE					**3,514,594**	**$50,209**
RETURNS TO LAND, WATER AND MANAGEMENT:					**1,549,645**	**$22,128**
Breakeven price per kg fish					55.9	$0.80
Breakeven yield (above total costs)	kg			19,662		
Breakeven yield (above total variable costs)	kg			15,101		

Assumptions:

- Fingerlings are purchased off-station.
- Price for tilapia and catfish is KShs 100/kg
- Fingerlings are stocked at an average weight of 15 g and a density of 25,000 per hectare
- First phase is 140 days; second phase is 200 days.
- Exchange rate: KShs 70 to 1 USD (Jan. 2007 rate)

2: Cash Flow Analysis

Introduction

Apart from the enterprise budget, it is important for a farmer or a funding agency to gauge the day-to-day revenues and expenses incurred by a farm so as to determine its viability. Cash flow analysis deals with how cash is utilized by the production systems within a farm setting. Cash should always be available to purchase farm inputs, pay for labour and other costs, or long-term financial commitments during the course of production, whether it be obtained from farm sales, savings, or bank loans (short-term).

If the cash flow analysis indicates that cash inflow is greater than cash outflow, there are no cash flow problems but this does not indicate profitability. However, if expenses are greater than income, then the farm business will have cash flow problems. In fish farming, expenses are incurred every day, whereas revenues may be received only after harvests. This means that careful utilization of the operation's funds is critical.

Components of cash flow analyses

There are three main components in a cash flow analysis: cash inflow, cash outflow, and summaries and balances.

Cash Inflow
This includes all sources of revenue received by the fish farming enterprise.

Cash Outflow
This includes all cash utilized for variable and fixed expenses (farm input purchases, salaries, etc.).

Financial Section Summaries and Balances
Net cash balance for each month is the difference between cash inflow and total cash outflow for that month. This amount is brought forward to be the beginning cash at the start of the next month and so on throughout the year. If expenses (cash outflow) are greater than income (cash inflow) for any given month, the net cash for that month will be a negative value.

An example of a Cash Flow Analysis is shown in Table 5.2-1. The example is for a tilapia farm having two fishponds and using a semi-intensive management production strategy. Fish are stocked in January and the harvest does not take place until October, although the farmer starts selling fingerlings in March. The farmer has a start up capital of KShs 50,000 to help him through the ten months before he begins to make major sales. Note that during the period of cash deficit, i.e., from June to September, the farmer can either 'borrow' from his other farm enterprises, such as poultry or dairy, or seek a bank overdraft.

This is a simple analysis to begin with; for larger, cost-intensive fish farms, other items can be added to account for additional inflow and outflow items. Your extension agent can work through more detailed examples with you to help you understand the fundamentals of cash flow analysis as well as analyze cash flow for your enterprise.

Uses of cash flow analyses

- Prediction of cash shortfalls
- Planning for interim financing, loans
- Assessment of the business's ability to repay loans
- Evaluation of timing of loan payments
- Prediction of future cash flow scenarios for the business
- Prediction of additional capital needed in the future

Table 5.2-1 Cash flow for a tilapia farm with two ponds measuring 800 m^2 each.

			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
1.0	**Beginning cash**		50,000	32,400	21,200	12,400	8,700	7,000	-1,900	-11,200	-22,500	-28,700	11,500	38,300	51,800
2.0	**Cash Inflow**														
2.1		Sales of fingerlings	0	0	2,400	6,000	8,000	2,400	2,000	0	3,600	5,000	6,600	12,000	500
2.2		Sale of food fish	0	0	0	0	0	0	0	0	0	45,000	30,000	10,000	4,000
2.3		Sale of feed bags	0	0	0	0	0	0	0	0	0	0	0	500	0
2.4		Total Inflow	50,000	32,400	23,600	18,400	16,700	9,400	100	-11,200	-18,900	21,300	48,100	60,800	56,300
3.0	**Cash Outflow**														
3.1		Fish seed	6,400	0	0	0	0	0	0	0	0	0	0	0	0
3.2		Fertilizer	3,000	3,000	3,000	1,500	1,500	1,500	1,500	1,500	0	0	0	0	0
3.3		Wheat bran	0	0	0	0	0	1,600	1,600	1,600	1,600	1,600	1,600	800	800
3.4		Labour	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
3.5		Home Expenses	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
3.6		Payment of loan	0	0	0	0	0	0	0	0	0	0	0	0	0
3.7		Total Outflow	17,600	11,200	11,200	9,700	9,700	11,300	11,300	11,300	9,800	9,800	9,800	9,000	9,000
4.0	**Net cash**		**32,400**	**21,200**	**12,400**	**8,700**	**7,000**	**-1,900**	**-11,200**	**-22,500**	**-28,700**	**11,500**	**38,300**	**51,800**	**47,300**