

Economics of Fish Processing- Some Concepts

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Scope of fish processing in India

The dynamic seafood processing industry in India has largely been export oriented. Exports have steadily increased having touched Rs. 6647 crores during the year 2004-05. Though traditional frozen products, especially shrimp, continue to dominate our product mix India has been attempting to diversify its products and frozen fish, cephalopods and speciality products are also finding markets abroad. Frozen products accounted for 84.57% in quantity and 89.23% in value of exports. The average unit value realization over the past several years has however been stagnating around 3 \$ / kg and it has marginally decreased by 0.78% in 2004-05. This is indicative of the fact that there is much scope for value addition in the Indian marine products. Value addition has also gained importance due to the fact that there has been rapid expansion of aquaculture. There is immense scope for production of value added products like Centre Peel Shrimp, Cooked Centre Peel Shrimp, Easy Peel Shrimp, Cooked Easy Peel Shrimp, Shrimp Skewer, Butterfly Shrimp ('Sushi'), Stretched Shrimp ('Nobashi'), Breaded 'Nobashi', Barbecue, Shrimp Vegetable Kebab etc., The technologies have been developed for value addition in seafood

products by the CIFT. Diversification of markets, value addition, and introducing modern marketing strategies etc. can fetch better unit price for aquatic products.

Only 20% of our marine catch is processed for export and 80% is utilised within the country itself largely in the fresh condition. For targeting local consumers it is necessary to set up processing units which can produce consumer packs of ready to serve fishery products from quality fish and attractive ready to eat consumer products from low value fishes. There is much scope for introducing products like fish cutlets, coated balls, sausages, burgers etc. that can be prepared from meat of freshwater fish, especially carps, for domestic markets.

Product cycle: Product development goes through a series of phases from the initial research level to the level of actual commercial production. The table given below provides a concise picture of the whole process. Most products and processes go through similar phases. The last phase of the cycle includes saturation and the decline phase. The survival strategy of any firm should be the identification of the saturation point and to evolve strategies for overcoming that through either process upgradation or diversification.

human capital & investment characteristics, implications for locational environments	CYCLE... PHASES		
	EARLY "Research & Development", "Innovation", "Market Development"	GROWTH From "Rapid Growth" to "Competitive Turbulence"	MATURITY Saturation, Life Extension, Possible Decline & Death (Replacement)
Technology	Short production runs. Rapidly changing production technologies and "ways of doing things". Dependence on external (incl. agglomeration) economies favoring incubator-type locations.	Gradual introduction of mass production methods. Frequent variation in production techniques.	Long runs & stable technology. Few innovations of importance, with the possible exception of <ul style="list-style-type: none"> • life-extension- • quality improvement- • production-cost-reduction-technologies.
Capital intensity	Relatively low capital (-goods) intensity [but differing widely between industries] But high human capital intensity	High (due to high rate of obsolescence). Importance of venture capital and venture-capital locations	High (due to large investments in specialized equipment) and Infrastructure & overhead capital equipment (tends to favor large multinational firms "with deep pockets" at low-wage locations).
Industry structure	Entry dependent on know-how. Numerous firms providing specialized services	Initially: more and more firms. But then also failures and mergers (buy-outs & shake-out of the weak, i.e. those unable to make the transition from skilled- labor-intensive to capital-intensive production). Vertical integration.	Less and less firms. New entries become difficult due to need for financial resources.

Critical Human Inputs (required at production locations)	Scientific & engineering. Entrepreneurship.	Management.Skilled workers.	Unskilled and semi-skilled labor(at low, "competitive" wage levels, often leading to moves to less-developed regions in Western countries or to 3rd world countries).
Demand Structure	Sellers' market.Market proximity.Monopolistic pricing.Large profits often hidden by rapid depreciation of development costs and reinvestment.Performance and price of substitutes determined buyers' expectations.	Early entry of many aggressive emulators (attracted by large profits). Individual producers face growing price elasticity.Intra-industry competition leads to price reductions.Competitors begin to encroach on (or "squeeze") one other's market areas. Product information spreading.	Buyers' market.Relatively stable market shares.Product information easily accessible on the Internet or elsewhere.

(Source: <http://faculty.washington.edu/krumme/systems/pcycle.html>)

Economic concepts in seafood production

For the setting up of any enterprise certain concepts have to be clearly understood and practically applied, this being true for any fishery related enterprise as well. A lack of understanding hinders the possibility of self-sustained activities, leading to wastage in human and financial resources. The preparation of the project, giving due weightage to technical and economic aspects, thus is of prime importance. There are usually various alternatives and these should be analyzed vis a vis the benefits as well as the risks involved. Each decision thus involves a choice between technical options; and all involve economic considerations. Other less evident factors are the need for sufficient data, and awareness of the technological

restrictions in order to define the problem, identify possible solutions and determine the best. Consequently, it must be ensured that the design, operation, and economic evaluation form a cohesive whole.

Production engineering is a vital element when conducting an economic evaluation of a process. When all technical data concerning a process have been collected, it is possible to estimate the costs, as detailed specifications of equipment and complete information on the needs of the plant will be available. This will also assist in reducing the number of alternatives for selection.

Market information is necessary to define production level, type of products, required technology, type of packaging, etc. In practice any industrial development starts with a number of questions: How

many tons of a product can be sold? At what price? To whom? What is the current supply? The answers to these questions can be found by conducting a market survey which will establish the size of the market by estimating the quantity of a particular product that will be in demand, and its price. A more complete analysis of market trends can be done by studying variations in demand in relation to income, prices, demographic factors, changes in the geographic distribution of the market, and the influence of the market size on costs.

Market analysis will help to establish the probable amount of fishery products to be sold, and this information will help determine the minimum plant capacity. In turn, plant capacity is directly related to investment and this influences the cost of production. The capacity of the project can be determined from the above and studies can then be undertaken which will allow a decision to be made on whether or not to invest.

The major factors to be considered while preparing a project are:

1. **Plant Capacity:** The size and characteristics of the target market provide the first indication to define production level and hence investment.
2. **Plant location:** The cost of processing, selling and distributing a fishery product is significantly affected by the location of the plant. It depends on the abundance and the regularity of supply of raw materials. Cost of inputs and their transportation, cost of production and cost of transportation of finished products are the main economic and geographic factors affecting this decision. These determine whether processing should be located near the raw material supply, near the market, or in intermediary locations. There can be secondary and tertiary impacts of setting

up a firm in a new area that will in-turn benefit the functioning of the firm. Selection of the location is also influenced by local policies besides availability of utilities like electricity, potable water etc.

3. **Technical Information:** Description of the production process, equipment selection, input assessment and preparation of a detailed flow chart.
4. **Capital investments:** The total amount of money necessary to put a project into operation is known as "Capital investment costs". This investment can be made through in-house capital, credit from national and international financing agencies, and from suppliers. The total capital required to complete and operate the project is composed of two parts:
 - a) **Fixed capital:** the amount of money necessary to completely construct a processing plant with auxiliary services, and to bring it to the point of start-up production. It is basically the total value of all the assets of the plant which are tangible assets (machinery, buildings, auxiliary installations, etc.) and intangible assets (patents, technical knowledge, administration expenses, operation, start-up costs, etc.)
 - b) **Working capital:** the capital resources necessary for the plant to operate at the levels forecasted in the technical and economic studies, once it has been installed and normal operations begin.

The amount of this capital varies within very wide limits, depending on the market for which the products are intended, the characteristics of the process and the conditions established by the source and availability of raw materials.

Various methods can be used to estimate fixed and working capital:

Universal factor method (fixed capital)

- Total fixed capital can be calculated from the current sale price of the product and the annual capacity of the plant. Fixed investment is calculated as follows:
- $I = V * Q / W$ (where: I = Investment, V = Sale price per unit produced, Q = Annual capacity of the plant, expressed in the same units of production as V
W = Universal Factor 1.4 in processes where main costs are raw material or manpower and 1.0 for general application)

Working capital

- Take it as 10-20% of fixed investment. Generally, 10% is used as an acceptable approximate estimate for fish industries when data are lacking.
- Take it as 10% of annual sales.
- Calculate the inventory costs for one month's capacity of raw material, plus two months' capacity of finished products. Add the accounts receivable calculated on one month's sales.

Errors are possible in estimating due to factors of scale and this must be kept in mind while making estimates.

5. Operational capital: operating costs are the expenses necessary to maintain a plant, processing line or equipment in production. In a healthy company the difference between income (from sales and other sources) and production costs indicates the gross profit. It has two opposite characteristics, the first being that to produce goods one must expend; and the second being that costs should be kept as low as possible and eliminated when unnecessary. Production costs are divided into two

- a) Variable costs or direct costs which are proportional to production and includes costs of raw material, direct labour, supervision, maintenance, utilities, supplies, royalties and patents and packaging
- b) Fixed costs which are independent of production and includes depreciation, taxes, insurance, credit, other obligations, R&D, public relations, accounting and auditing,

Straight line method for calculating Depreciation

$$\text{Annual depreciation value} = D = (I_f - L) / n$$

where:

n = total expected useful life in years

I_f = initial fixed capital investment

L = salvage or scrap value at the end of the useful life of an asset

Possible causes of depreciation are:

- a) Physical Depreciation due to breakdown of daily use equipment.
- b) Functional Depreciation due to demands made on an item can exceed its production capacity.
- c) Technological Depreciation due to development of new process rendering it obsolete
- d) Depletion

legal advice and patents,
administration and management
costs, sale and distribution costs

Assessing profitability

Some methods for assessing profitability are given below:

1. Gross profit (GP) for the company equals the income from total sales (S) less total production costs without depreciation (C), as follows:

$$GP = S - C$$

When depreciation is considered we get net profit before taxes (NPBT):

2. $NPBT = GP - e \times IF = S - C - e \times IF$ (where e = internal depreciation factor and IF is original fixed investment)
3. Rate of return on the original investment (ROI) = average annual returns / original investment * 100
4. Net Present Value: This estimates the present value of future income by discounting it.
 $NPV = \sum At / (I+K)^t - I$ (At = cash flow, I = initial investment, t = time, K = cost of capital)
5. Internal rate of return (r) $I = \sum At / (I+r)^t$ (r = rate of return)
6. Pay back period (in years) = Fixed Depreciable Investment / (average profit/year) + (average depreciation/year)

Bankable projects:

Capital plays a vital role in the success of any enterprise. Credit for starting enterprises is available from institutional sources and it is imperative that the projects prepared must convince the institutional lenders about the viability of the project. A bankable project must broadly have the following details:

- a. Introduction
- b. Market survey
- c. Land & location
- d. Layout & building- general particulars
- e. Details of plant & machinery- general and technical particulars
- f. Manufacturing process - flow diagram
- g. Raw material
- h. Utilities
- i. Manpower
- j. Environmental impact assessment
- k. Capital cost of the unit
- l. Year wise techno-economic parameters including installed capacity, capacity utilization, raw material, transportation, salaries & wages, repairs & maintenance, overheads, marketing costs and depreciation
- m. Year wise income and expenditure projections
- n. Cash flow analysis indicating benefit cost ratio.