Economics of Fish Processing

4.01 Introduction

Current economic analysis of economic behaviour relies heavily on decisions made by production units customarily assumed to be seeking perfectly optimal situations. There are two criteria adopted in the literature. One of them is profit maximization. According to this criterion, appropriate types of action are indicated by marginal or neighbourhood inequalities which, if satisfied, yield an optimum (Alchian, A., 1950). It is in this context that present chapter seeks to examine the various economic aspects of the processing industry.

This chapter has five sections. Section one deals with the cost and returns from fish processing. Section two deals with the value added products. Section three deals with the packaging. Section four deals with the quality standards, and Section five deals with the financing in fish processing and conclusions.

<u>Section – I</u>

COST AND RETURNS

This section first looks at the cost involved in fish processing and cost variations among fish processing units. The discussion then turns to item-wise profit and loss in fish processing, and the reasons behind the losses.

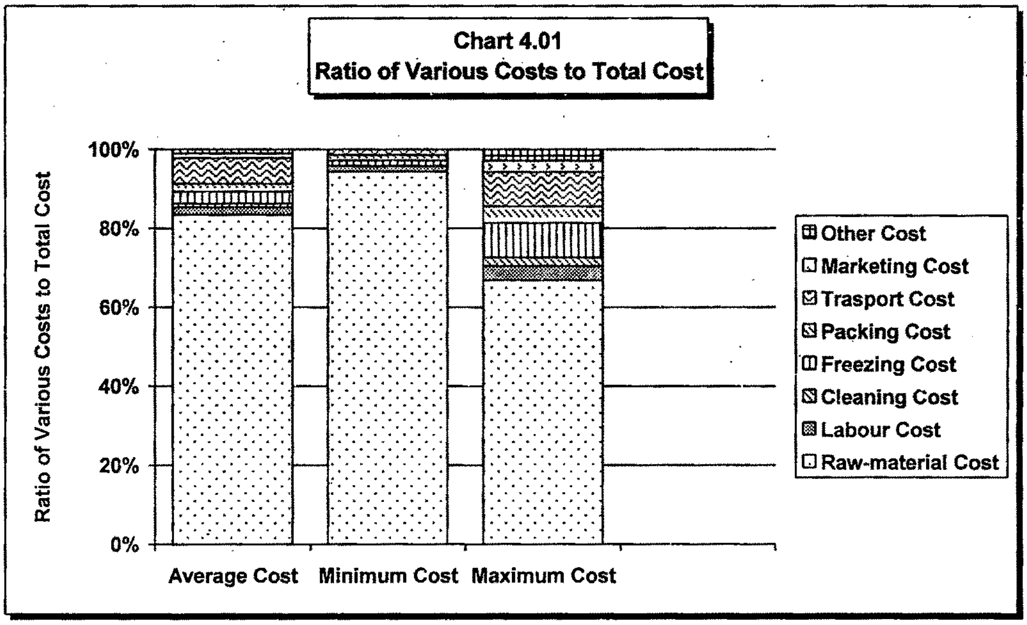
4.02 Cost of Fish Processing

Operational cost determines a firm's profit. Reducing this cost can help the firm to earn and increase the profit among fish processing units. Many fish processing firms have closed down due to increasing operational cost. This study is therefore important. The range of various types of cost is shown in the table.

Table 4.01
Costs (Per rupee/ Kg)

Types of cost	Range (in Rs.)
Raw-material cost	25 to 800
Labour cost	0.50 to 10
Cleaning cost	0 to 6
Freezing cost	0.30 to 8
Packing cost	0.50 to 10
Transport cost	4 to 30
Marketing cost	0 to 8
Other cost	0 to 8
Total cost	33.50 to 854

The ratio of these costs to the total has been given in three distinctive categories, namely, average, minimum and maximum in the following chart.



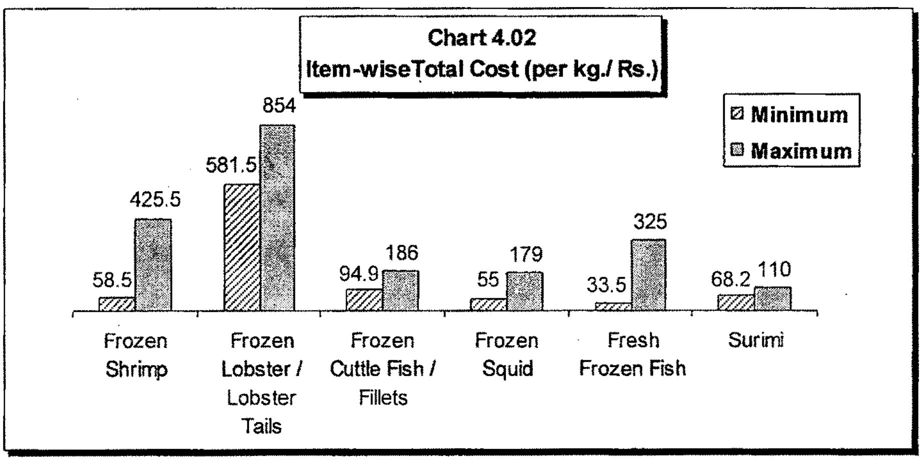
Since the range of cost is wide, it is pertinent to understand the type of products for getting a detailed understanding of the cost. An analysis of item-wise cost is shown in the following table

Table 4.02
Average Cost of Production by Product and Type

Items	cost/Kg in rupees								
	Raw-Material	Labour	Cleaning	Freezing	Packing	Transport	Marketing	Other	Total
Frozen Shrimp	130	4.84	1.52	2.95	3.28	6.23	1.77	0.75	151.34
Frozen Lobster	772	5.09	3.36	5.09	5.22	18.72	3.77	5.36	818.61
Frozen Cuttle Fish / Fillets	121	1.96	0.64	2.37	1.89	6.01	1.08	1.14	136.09
Frozen Squid	83	2.30	1.21	2.75	2.26	6.96	1.52	1.10	101.1
Fresh Frozen	56	1.65	0.67	2.33	2.14	6.39	1.11	0.97	71.26
Surimi	65	1.25	1.05	4.10	1.90	7.50	1.50	1.50	83.8

It is therefore clear that various costs are significantly different with different types of products. At the same time, there are wide variations in the range of different costs in different firms. This is shown in the following chart that shows the range of costs. Since the processes involved are different in various products, it can be said that differences in processes and products are the cause of differences in the prices of various products.

4.03 Item-wise Total Cost



The above chart shows that item-wise minimum and maximum of total cost. The variation in total cost for the same product is due to distinct raw-material purchasing policy, difference in the number of labour, nature of finished products, distinct method of freezing, distinct packing design, different in quality standard, distinctive marketing policies and different management systems of the enterprises.

Along with this, the production of value added products (VAP) are important in the cost analysis of the fish processing industry. T-test was used to understand if VAP had any impact on the average cost.

Table 4.03
Comparison of Average Cost

	Mean	Std. Deviation	t-value (df)	Sig. (2-tailed)
Having VAP	176.20	91.28025	4.731	.000
No VAP	86.46	49.70427	(56)	

The independent-samples t-test analysis indicates that those firms that had value added products had a mean production cost of Rs. 176.20, whereas those who did not produce any value added products had a mean production cost of Rs. 86.46. The means differ significantly at the $p<.05$ level (note: $p = .000$). This indicates that cost of production is higher for those who have value added products than for those who did not have value added products. Value added products increase the average cost of production.

- **Regression showing Relationship between Turnover and Average Cost**

The model is:

$$\gamma = \alpha + \beta\chi$$

Average Cost = 109.965 + 0.01085 Turnover
t = (8.436)*[1] (4.082)*
r^2 = 0.229

As the table shows, F-value was significant. This indicates that turnover and average cost have a positive relationship. As turnover increases, the average

[1] Note: * , ** and *** indicate level of significance at 1 per cent, 5 per cent and 10 per cent respectively.

cost of fish processing also increases. But, the average cost does not increase proportionally. The coefficient for Turnover is 0.01. So, for every unit increase in turnover, average cost increases by 0.01 unit, holding other variable constant. If turnover was zero, the average cost would be about Rs. 109. Here in case of fish processing owing to the seasonal nature of the business, even if the turnover is zero (e.g. because of off-season or there is no order), fish processing unit may have to bear some fixed costs. The value of R^2 was found to be 0.229, indicating that 22 per cent variation in average cost is explained by turnover. As turnover increases, the average cost of fish processing increases. This means that fish processing units do not enjoy economies of scale as turnover increases. This may also be an indication of the third phase of production whereby an increase in production is resulting into an increase in the average cost of production. This however, needs further probing using long term trends in the cost of production.

4.04 Capacity Utilization

Two parameters useful in assessing a firm or industry's performance are utilization of installed capacity and average cost of production. Optimum utilization of installed capacity and production at lowest average cost are the features of an optimum firm (Desai and Bhalerao, 1999).

India has a tremendous potential for the development of fish processing and there were 367 units in 1996 having a total capacity of 6,496.0 tons per day. About 45 per cent of these units are said to be modern. The capacity utilisation of fish processing units, however, is very low (Government of India, 1997).

An attempt is made here to examine the capacity utilisation in the processing industry of Gujarat.

Table 4.04
Installed Capacity/ Day/Tons

Installed Capacity	Percent
≤ 30	32.8
31-60	53.4
61-90	10.3
> 90	3.4
Total	100.0

As shown in the table, 32.8% of the units had installed capacity less than or equal to 30 tons per day. Around 64% of the fish processing units had installed capacity between 31 to 90 tons per day. Only 3.4% had more than 90 tons per day installed capacity. The processing capacity varies from firm to firm, and product to product. The average installed capacity was found to be 42.69 tons per day.

More than 62% of the units in survey utilised only 30-35% of the installed capacity whereas the proportion of units utilizing 50-55% of the installed capacity is only around 15%. Hence, half of the installed capacity remains unutilised. This may have an impact on the turnover. To understand this, regression technique has been used.

- **Relationship between Installed Capacity and Turnover**

The model is:

$$\gamma = \alpha + \beta\chi$$

Turnover = 66.403 + 64.816 Installed Capacity
t = (0.073)* (3.619)*
r^2 = 0.190

As capacity utilised increases, the turnover from fish processing also increases. However, turnover does not increase proportionally. From the regression analysis, F-value was found to be significant. It indicates a positive relationship between capacity utilised and turnover. The coefficient for capacity utilised is 64.816. So, every unit increase in capacity utilised will result into an increase in turnover by 64.81 units, holding other variables constant. The value of

R^2 was found to be 0.190, indicating that 19 per cent variation in turnover is explained by capacity utilised.

4.05 IQF-Freezing

Fish processing units use three different freezing methods for freezing fish. These are Individual Quick Freezing (IQF), Plate Freezing, and Blast Freezing. If a product is frozen and each frozen unit is separated from the others, then it is called an IQF product. The freezing is complete only when the average temperature reaches -18°C (Seafood Export Journal, 1993). Most of the (84.5%) processing units had no IQF-freezing facility even though it fetches higher price in the international market. Of those possessing it, only 6.9% of the units utilized around 45% of the installed IQF-Freezing capacity. Hence, in case of IQF freezing also, the capacity utilisation is less than 50%

4.06 Plate-Freezing

Plate freezing of the products is done by placing them in contact with a metal surface, cooled by expanding refrigerants. Double contact plate freezers are commonly used for freezing fish/prawn blocks. This equipment consists of a stack of horizontal cold plates with intervening spaces to accommodate a single layer of packaged product. The filled unit appears like a multi-layered sandwich containing cold plates and products in alternating layers. When closed, the plates make firm contact with two large surfaces of the packages, facilitating heat transfer and preventing packages from bulging. Contact plate freezing is an economical method that minimizes problems related to dehydration, defrosting of equipment, and package bulging. The packages must have uniform thickness. A packaged product of 3 by 4 cm thickness can get frozen in 1 to 1.5 hours, when cooled by plates at -35°C. Freezing time is extended considerably when package contains a significant volume of void spaces (Government of India, 2006). Even in case of this type of freezing, majority of the units (63%) utilised around 45% of the installed capacity.

4.07 Blast-Freezing

Blast Freezing is used for freezing Fin fishes. An upright freezer in which air at a very low temperature is circulated by blowers and is used to freeze food in the minimum time. The adoption of freezing method depends on the type of product. For instance, plate freezing method is used for Surimi fish. Generally plate-freezing is considered as an appropriate method of freezing for this product that is exported to Japan. Blast-freezing is a popular freezing method for other types of fish due to its cost effectiveness. The installed blast-Freezing capacity varied between 9 to 135 tons per day. 6.9% of the units did not adopt blast freezing. However, the capacity utilisation was higher in this case being around 75% in case of majority units (68.2%).

4.08 Cold Storage

The cold storage is used to preserve fish until marketed. Of the total units, 47% of the units could barely use 50% of the installed capacity. While rest 35.8 % of the units could use only around 35% of the installed capacity. Hence, under-utilization of installed capacity is widespread in the fish processing industry. However, 17.2 % of the units wanted to increase their capacity, due to near full utilization of the existing cold storage capacity.

A high level of underutilized capacity could be due to over capitalisation. The major economic threat to the sustainability of Indian fisheries is the problem of over-capitalization, or over-investment in the catching and processing branches of the industry. Over capitalization in the industry was largely due to lack of restriction on entry and the public policy support by way of capital advances and subsidy to the industry in the past (Korakandy, R., 2002).

In order to find out whether fish processing units of Gujarat are utilizing their installed capacity, the following efforts have been made.

Table 4.05
Capacity Utilization in Fish Processing in Gujarat

Category	Mean Installed Capacity (in tons)	Mean Utilized Capacity (in tons)	Mean Utilized Capacity (in %)	Unutilized Capacity (in %)
Processing Capacity	42.69	27.10	63	37
Freezing – IQF	9.89	5.25	53	47
Freezing – Plate	22.33	14.21	64	36
Freezing – Blast	33.74	21.21	63	37
Cold Storage	601.26	439.12	73	27

The mean utilized capacity (in %) has been calculated with the help of the following formula:

$Z = M_U / M_I \times 100$

Where,

Z = means utilized capacity (in %)
M_U = means utilized capacity (in tons)
M_I = means installed capacity (in tons)

In order to calculate the unutilized capacity (in %), the following formula has been used.

$Uz = Z - 100$

Where,

Uz = unutilized capacity (in %)
Z = means utilized capacity (in %)

From the economic point of view, it is important to assess whether the capacity of fish processing units is fully utilized or not, because turnover depends on processing capacity. Fish processing units install fish processing capacity according to the resources available to them. Installed capacity in the Fish processing industry in Gujarat ranges from 9 to 160 tons per day. Average capacity was 42.69 tons per day. Of this, the fish processing units were able to utilize only 27 tons per day. On average, there was 37% idle fish processing capacity as a whole. The firms were of the view that poor fish landings and heavy competition in purchase of raw-material were responsible for idle fish processing capacity.

As discussed earlier, the processing units use three different freezing methods. The installed capacity of IQF-Freezing ranged from 5 to 25 tons per day, with the average capacity being 9.89 tons per day. Of this, the fish processing units were able to utilize only 5 tons per day. It was found that an average of 47% of IQF processing capacity remained idle.

In case of Plate-Freezing, installed capacity ranges from 5 to 78 tons per day. The average Plate-Freezing capacity was found to be 22.33 tons per day. Of this, the fish processing units were able to utilize only 14 tons per day. It was found that 36% of the plate freezing capacity remained idle.

Similarly, Blast-Freezing capacity ranged from 9 to 135 tons per day, with an average of 33.74 tons per day. Of this, the fish processing units were able to utilize only 21 tons per day. On an average, 37% of installed capacity of Blast Freezing remained idle.

Cold storage capacity ranges from 150 to 2,600 tons per day, with average capacity being 601.26 tons per day. Of this, the fish processing units were able to utilize only 429 tons of capacity per day. Even in this case, an average of 27% of installed capacity remained idle.

It was reported that only 7% of fish processing units were utilizing their installed capacity almost fully. In case of 93% of the units installed capacity was not utilised efficiently, though barring a few these units earned profit.

The other parameter is the average cost of production. Ratio analysis method has been used for finding out the share of each cost in total cost as under.

Table 4.06
Share of Each Cost in Total Cost

	N	Minimum	Maximum	Mean	Std. Deviation
Raw-Material Cost	58	0.68	0.93	0.8353	0.7275
Labour Cost	58	0.01	0.05	0.0206	0.1178
Cleaning Cost	58	0.00	0.03	0.0083	0.0064
Freezing Cost	58	0.01	0.12	0.0306	0.0287
Packing Cost	58	0.01	0.06	0.0199	0.0091
Transport Cost	58	0.01	0.12	0.0650	0.0289
Marketing Cost	58	0.00	0.04	0.0122	0.0096
Other Cost	58	0.00	0.04	0.0099	0.0090

N is the number of fish processing units. The ratio of raw-material cost to total cost ranges from 68% to 93%, with average ratio being 83%. Similarly, the ratio of labour cost ranges from 1% to 5% in total cost with the average being 2% in total cost. Standard deviation shows a variation in ratio of labour cost in total cost. To find the lowest average cost per unit, the standard deviation is deducted from the mean as under.

Table 4.07
Lowest Average Cost / Per Unit

Type of cost	Mean-SD
Raw-material cost	0.76255
Labour cost	0.00882
Cleaning cost	0.00187
Freezing cost	0.00181
Packing cost	0.01071
Transport cost	0.03605
Marketing cost	0.00253
Other cost	0.00088

The range was found to be 0.76255 in case of raw-material cost. If ratio of raw-material cost of any fish processing unit is ≤ 0.76255, then one can say that the performance of the unit is good from an economic point of view. Similarly for other costs. The following table explains the percentage of such firms.

Table 4.08
Distribution of Firms by Optimality and Costs (%)

	Raw-material cost	Labour cost	Cleaning cost	Freezing cost	Packing cost	Transport cost	Marketing cost	Other cost
Above average	24.1	3.4	15.5	0.0	12.1	13.8	15.5	17.2
Below optimum	75.8	96.6	84.5	100.0	87.9	86.2	84.5	82.7

Among the fish processing units, 24.1% were found be working above the average, in terms of raw-material cost, 3.4% in terms of labour cost, 15.5% in terms of cleaning cost, 0% in terms of freezing cost, 12.1% in terms of packing cost, 13.8% in terms of transport cost, 15.5% in terms of marketing cost and 17.2% in terms of other cost. More than 75% of the units were below optimum in relation to all costs.

The theory of optimum firm is a tool for measuring the effectiveness of any firm or industry. Accordingly, majority of the fish processing units (75%) were found to be working below optimum level on both parameters i.e. utilization of installed capacity and average cost of production.

As the results have shown that 93% of the firms were economically inefficient in terms of capacity utilization and more than 75% of the firms in terms of costs. Thus, it can be said that fish processing industry is economically inefficient.

4.09 Profit and Loss in the Fish Processing

Profit is necessary for the survival and growth of every business. It is the prime aim of any private business. It is also a very broad indicator of efficiency. The primary goal of a business firm is to ensure its own viability and survival, making profits indispensable. Also, profits are a natural concomitant of growth and development of a business over time. In fact, profits are essential as a means to end, they are not an end in themselves, although essential for the continuity and growth of the firm.

In the present study it was found that profit varied from Rs. -20 to 112 per kg in fish processing in Gujarat, where 93.1% of the fish processing units reported earning profit and 6.9% reported loss. Business was being run at a loss in the hope that loss would soon turn into profit. Loss is the result of factors like recession in overseas markets, inaccuracy in raw-material purchasing, and competition.

In the fish processing industry in Gujarat, the item-wise profit/loss figures per kg are given below.

Following is the item-wise average and range of profit and loss in the industry is shown in the following table.

Table 4.09
Item-wise Profit/Loss per kg

	No. of Units undertaking production	Minimum Profit	Maximum Profit	Average Profit	Std. Deviation
Frozen Shrimp	26	3.50	112.00	16.31	21.13
Frozen Lobster / Lobster Tails	11	18.50	91.00	62.27	24.81
Fr. Cuttle Fish / Fillets	32	-20.92	39.90	3.73	11.80
Frozen Squid	36	-1.22	25.85	4.60	6.47
Fresh Frozen Fish	51	-4.00	38.40	5.07	9.65
Surimi	4	20.11	78.40	61.13	27.67

As shown in the table, the item wise profit and loss differ from Rs. -20.92 to 112.00. Loss was reported in a few items in some enterprises. The average profit varied between Rs. 3 to 62 per kg for all items. The highest profit reported was in the case of frozen lobster/ lobster tails of Rs. 62 per kg, and the lowest profit in the case of frozen cuttle fish / fillets being Rs. 3 per kg.

There were a few firms that were incurring loss. This was mainly due to competition from large firms and also due to concentration of firms in the region (Hay and Morris, 1979).

4.10 Export and Profit

Why should a firm participate in international trade? A simple assumption could be that international markets offer better prices for the product as compared to the domestic market. What are the differences in domestic prices and international market prices? If there are price differences, does this increase profit of the firm? An attempt has been made here to answer these questions.

It was found that gross profit turned out to be Rs. 92.88 per kg in the domestic market whereas the same was Rs. 123.03 per kg from sales in the international market. Thus, net profit turns out to be Rs. 30.15 per kg. Hence, this additional profit from export is an incentive for the firms to produce for the international market.

To, sum up, profit of a firm or of an industry depends on many factors, such as investment, turnover, product, capacity utilisation, availability of raw-material, raw-material price, value added products, quality, standards, packaging, managerial skill, degree of competition and prices.

Section – II

VALUE ADDED PRODUCTS (VAPs)

4.11 Introduction

Value added products (VAP) are a source of profit for the firm or strategy to decrease losses. For the fish processing industry, value addition is one of the possible approaches for raising profitability in a highly competitive and increasingly expensive market (ICAR, 2006).

Value added products (VAP) are a great source of increasing income for the fish processing units. Japan produces half the quantity of India, but its foreign exchange earnings are more than India due to VAP. Similarly, Thailand earns more foreign exchange than India although its fish production is less than India, because it makes value added products from 85% of its fish catch.

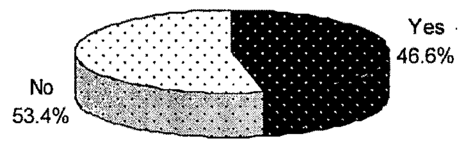
In the fish processing industry, value addition depends on markets and the products can range from live forms to ready-to-serve products. The products currently being exported are accelerated freeze dried shrimp, battered and breaded products like cutlets, burgers, breaded shrimp, butterfly shrimp, frozen crab products like soft shell crab, pasteurised crab, crab meat, cut crab with claws, other frozen products like cooked salad shrimp, sushi, analogue products, IQF shrimps, crab, baby octopus, octopus, octopus tentacles, lobster, cuttle fish and squid, live crabs, aquarium fishes, snail, lobster, shrimp and baigai, fish, prawn and clam pickles, ready to eat products like fish curry, spiced and fried shrimp prawns chutney, fried fish and edible fish powder, by-products like chitin, chitosan, glocosamine hydrochloride, agar, fish maws, shark fin, shark fin rays and squalene (Devadasan, K., 2006).

"Post liberalisation India's seafood export has seen steady growth over the last few years. However, recent international trade issues have had a negative effect and export had fallen by 11.83% in terms of quantity and 11.47% in terms of value during 2003-04, before picking up in 2004-05. Analysis reveals that the majority of our seafood export even in the present times consists of frozen products. Our average unit value realisation has been around 3 US $ per kg for over a decade. Idle capacity is high and many smaller firms have been unable to withstand competition. These inherent limitations in the industry have been coupled with tariff and non-tariff barriers imposed by buyers. Another phenomenon in the consumer market is the gradual disappearance of conventional processed products and their re-emergence in new styles and forms. This is a time for a paradigm shift to value addition, while maintaining high quality standards, with diversified products and processes, to ensure sustainability as well as profitability of the industry" (Devadasan, K., 2006).

The objective of this section is to focus on value added products. The section attempts at magnitude of the value added products, problems and other economic aspects.

The bulk of marine production is low value fish, so there is a need for applying appropriate technologies of value addition in processing and marketing (Nair, 2001).

Chart 4.03
Have VAP



The above graph shows that 46.6% of the fish processing units in Gujarat report that they undertook production of VAP, whereas 53.4% did not. The reasons for producing VAP is briefly summarised below:

It is generally believed that more the number of VAP, more the income and profit. In the present study, 12.1% of the fish processing units had two VAPs, 8.6% had four VAPs, 1.7% had six VAPs and 24.1% had more than six VAPs. This indicates that fish processing units produce a variety of value added products.

Table 4.10
Economics of VAP

	Economics of VAP		Mean Value	Benefit in %
(A)	Price of Ordinary Fish		96	100
(B)	Price of VAP of that Same Fish		147.41	190.46
(C)	Gross Benefit	(B)-(A)	51.41	90.46
(D)	Cost of Fish Processing		21.70	57.58
(E)	Net Benefit of VAP	(C)-(D)	29.70	32.87

Fish processing units export two types of fish products: (1) whole fish and (2) Value added products (VAP). Generally, VAP fetches a higher price than whole fish. It has been mentioned by the respondents that by exporting an ordinary (whole) fish they get Rs. 100, but if they produce VAP from the same fish, they get Rs. 190.46. This means that they would earn Rs. 90.46 more, although this is not the net benefit. To derive the net benefit, cost of processing

VAP is deducted. The cost of VAP has been calculated at Rs. 57.58. So the net profit from VAP was Rs. 32.87. This means that if fish processing units produce VAP, they can get an additional profit of Rs. 32.87 per Kg.

4.12 Investment on VAP

VAPs help in increasing profit, but it requires investment of 5 lakhs to 4000 lakhs, depending on the nature of VAP and the number of VAPs. The average investment was found to be Rs. 840.48 lakhs in VAP. This may be the reason for 53.4% of the units not undertaking production of VAP.

4.13 Inspired to make VAP

Chart 4.04
Inspired to make VAP

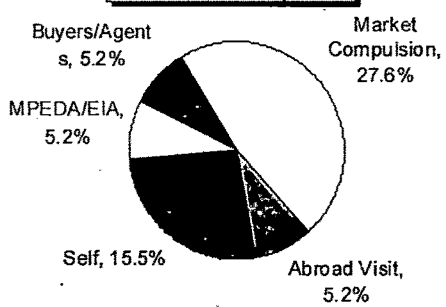


Table 4.11
Inspired to Make VAP

Inspired to make VAP	Responses		Percent of cases
	N	Percent	
Self	9	13.4	15.5
MPEDA / EIA	3	4.5	5.2
Buyers / Agents	3	4.5	5.2
Market Compulsion	16	23.9	27.6
Abroad Visit / Trade fair	3	4.5	5.2
No VAP	33	49.3	56.9
Total Responses	67	100.0	115.5

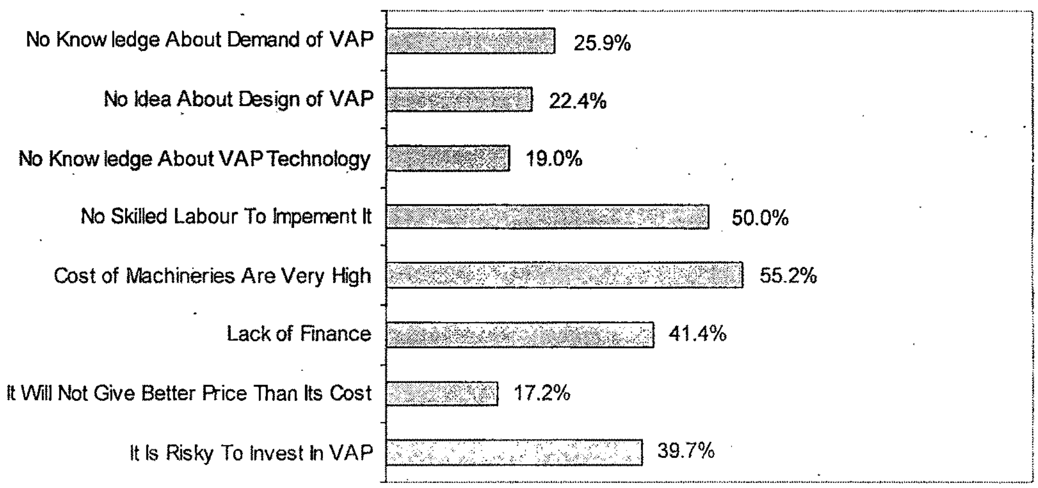
The table shows that majority of the processors (24% nearly) have adopted VAP owing to market forces. Whereas there were a few respondents who after their foreign visits were inspired to undertake VAP. There were other few who were inspired by MPEDA/EIA to undertake VAP. This shows that market plays an important role in the growth of products though at a very low level, government via its agencies has been playing a role in encouraging the growth of the firms and industry.

4.14 VAP and Exports

VAP and export have a positive relationship, with 44.8% of the fish processing units reporting that VAP had resulted in to an increase in their export.

It is worthwhile to understand the extent to which export increase due to VAP. Among those who produced VAP, in case of 10.3 % of the respondents, export increased up to 10%. Other 31% reported an increase of 10-40 and 3.4% reported an increase of more than 50%. This clearly indicates that value added products results into an increase in sales and profit. This raises the question as to why half of the firms did not produce VAP if the production of VAP increases sales. The reasons for the same are summarised in the following chart which shows that there are a multiple of problems in the development of VAPs. This includes mainly lack of technical skill and finance. Many of the respondents are also not willing to undertake risk involved in the production of VAP.

Chart 4.05
Problems in Development of VAP



MPEDA imparts training for the production of VAP so that the problems related to skill are resolved. However, this is limited only to a few firms. A few firms are willing to take a few steps for development of the product.

Table 4.12
Steps for Product Development

Steps For Product Development	Percent
No Idea	29.3
Hiring Trained Staff/ Retraining of Existing Labour	31.0
R&D (including market research)	13.7
Adoption of New Technology	26.0
Total	100.0

The above table shows that the emphasis has been on adoption of new technology, R& D and training of the staff for production of VAP.

India's fish production was 3.8 million tonnes whereas Thailand's fish production was 2.9 million tonnes in 2002 as per 'The State of World Fisheries and Aquaculture – 2004. However, India's export was only US 1.2 billion, whereas Thailand's export was US $ 3.92 billion. Further, 96.3% of the fish processing units in Gujarat reported that VAP increases the income of units producing VAP. Even so, more than 50% of the units did not undertake production of VAP, because fish processing units are facing problems in the development of VAP. It is considered as a risky activity, with non-availability of skilled labour to implement it and lack of finances.

Section – III

PACKAGING

4.15 Introduction

"Packaging must protect what it sells and sell what it protects. Packaging as a subject of study is of fairly recent origin. The art of packaging is as old as man himself. Possibly, the first use of packaging was when primitive man used leaves to wrap uneaten portions of meat. Another early package was the wicker basket, while materials such as cloth, paper and wood also made early contributions to packaging. Glass too has a long history, while metal was comparatively late on the scene but was responsible for the enormous market which now exists for processed food. Plastic was the latest arrival on the packaging scene and is still carving out its own particular niche" (Gopakumar, K., 2006).

"The importance of packaging function should be obvious. The packaging protects the product and delivers it to the point of sale in sound condition. In addition, it adds sales appeal to the product and helps to build up sales. If packaging is to perform its proper function, it must be considered at as early stage as possible. This means that packaging must be considered at the design or formulation stage. The final form of any package is influenced by many factors. The logical packaging development can be achieved by considering various packaging criteria. These are appearance, protection, function, cost and disposability" (Gopakumar, K., 2006).

"Food packaging like any other packaging is external means of preservation of food during storage, transportation and distribution and has to be provided at the manufacturing centre. Hence, it forms an integral part of the product manufacture and has an important function in the distribution of foodstuffs. In today's consumer oriented economy a package is an extremely vital link between the manufacturer of the product and the ultimate user. (Gopakumar, K., 2006). Study of various aspects of packaging is therefore important. The present section deals with the same.

4.16 Packing Materials Used by Fish Processing units

"Unlike many other manufactured consumer products like leather, machineries, chemicals etc. the packaging needs of food and food products, and particularly fish, are very complex because of the intrinsic characteristics and the need to retain or preserve them while in the package" (Gopakumar, K., 2006). Fish has to be packed carefully as compared to any other commodity due to its perishable nature. Packing materials used by fish processing units are mostly Glass Containers, Metal Cans, Paper, Paper Board, Cellophanes, Low Density Polyethylene (LDPE), High Density Polythene (HDPE), Liner Low Density

Polythene (LLDPE), Polypropylene, Polystyrene, Polyester, Nylon, Polyvinyl Chloride (PVC), Lonomers, Copolymers, and Aluminium Foil.

Recent methods used for packing fish are: vacuum packaging, hyperbaric storage, modified atmosphere packaging and retort pouch packaging. In vacuum packaging process, the product is placed inside the pack or tray, and air is evacuated and the pack is sealed. Hyperbaric storage refers to the use of high pressure systems, which can stop microbiological growth and reduce enzymatic activity. Because of the technological difficulties in building a commercial feasible high pressure storage unit, this preservation method is not popular. In a modified atmosphere packaging air is replaced with different gas mixtures to regulate microbial activity and/or retard discolouration of the products. In retort pouch packaging, the most common form of pouch consists of a 3-ply laminated material, generally polyester/aluminium foil/cast polypropylene. The polyester film is 12 micron thick and serves to protect the foil and provides the laminate with strength and abrasion resistance (Gopakumar, K., 2006). These methods not only extend the shelf life of fish products but are also acceptable by customers. As many as 77.6% of the fish processing units in the present study agreed that attractive packing gives a better price.

Table 4.13
Economics of Packing

	Aspects of Packing	Mean Value
(A)	Price of Ordinary Packing Design	86.18
(B)	Price of Improved Packing Design of That Same Fish	100.49
(C)	Gross Benefit (B)-(A)	14.31
(D)	Cost of Improved Packing Material	7.58
(E)	Net Benefit of Improved Packing Design (C)-(D)	6.73

Packing is regarded as the most important factor in raising profit. The respondents accepted that with improved packing design, they are able to earn an extra profit of Rs. 18.18 including cost of packaging. The net profit was found to be Rs. 8.84. It can therefore be concluded that better packaging of the final product can help the firm in reaping higher profit. Two understand this relationship Karl Pearson correlation method has been used. The results are as follows:

Table 4.14
Relationship between Packing Material Cost and Price Received

		Price Received in Rs.
Packing Material Cost (Rs. Per Kg)	Pearson Correlation	0.750
	Sig. (2-tailed)	0.000
	N	58

The correlation coefficient for packing material cost and price received is 0.750, indicating a high positive correlation.

<u>Section – IV</u>

QUALITY STANDARDS

4.17 Introduction

"From the time that trading in fishery products commenced and monetary system was developed, it is likely that considerations of quality started to enter into commercial transactions. There would have been no point in developing a system of weights and measures to ensure fair quantity for money if fair quality was not given too. Cutting (1962) tracing the historical development of trade of fishery products, records that in Egyptian times fish to be eaten fresh had to be marketed daily and there was a requirement that pickling should be entrusted to qualified specialists"(Salim, S. et al, 2005).

Growther (1968) has pointed out that while per capita consumption of poultry and meat in USA has increased substantially over the years, the consumption of fish has remained substantially constant. He observed, "When a person is served, fresh well prepared fish or shellfish at home or in a restaurant, he looks forward to his next seafood dinner. On the other hand, when the individual eats a poor quality of fish product his memory of that experience stays with him a long time. Uncertainty of quality causes both the housewife and the restaurant patron to hesitate to try seafood" (Salim, S. et al, 2005). According to Anjani Kumar, the growth of fish export may be limited by strict quality standard of foreign countries (Kumar, A., 2004).

The objective of this section is to identify the issues related to quality standards for fish.

4.18 Quality Standards

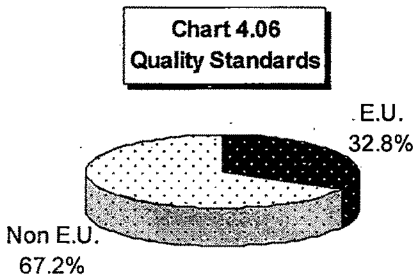


Table 4.15
Quality Standards

Quality Standards	Percent
E.U.	32.8
Non E.U.	67.2
Total	100.00

There are two quality standards prevailing in the market for fish. The first is the National Standard (non-EU) and the other one is the European Union (E.U.) standard. Fish processing units wanting to export to European countries, have to follow E.U. quality standards. As the above table shows, 67.2% of the fish processing units followed non-EU (national) standards. Non-EU standard is popular owing to its simplicity and requires less investment. Legal procedures are easy for non-EU standard. China is the destination for products with non-EU standards. As many as 30% of the fish processing units followed EU standards which are considered as costly and complex, but fetches a higher price and more market share.

4.19 Investment in EU standard quality

"The imposition of quality standards by the United States and the European Union for production and export of seafood on the exporting countries has affected the processing industry adversely in terms of investment. The industry has been compelled to modernize the processing methods and machinery and improve hygienic conditions to meet the prescribed standards. Only a few dozen units could modernize as heavy capital investment is required for this purpose" (Venkatesan, 2001).

The EU quality standards have been adopted by only 19 of the 58 units in Gujarat. An average of Rs. 193.43 lakhs investment is required to establish an EU fish processing plant. 24.1% fish processing units invested between Rs. 1.25crores to 2 crores for establishing a plant as per EU standards and 8.6% of the firms invested between Rs. 2 to 3 crores. The reason for such a high investment is the high return.

Table 4.16
Percentage differences in Price of EU and Non EU

Adoption of Quality Standards	Price (in Rs.)
Non EU	100
EU	115.89
Net difference	15.89

Gujarat Fisheries Statistics 2006-07 shows that if fish processing units export to the European Union Countries, they can get a price of Rs. 109, as compared to Rs. 50 in China. However, exporting to the European Union requires adherence to certain quality standards by the fish processing units.

In the present study, it was found that EU units were getting more price than non-EU ones. There was a net difference of nearly 16% between the price of product with quality standard as per EU norms and for those without it. For instance, if a non-EU unit gets Rs. 100 for its Croaker fish, an EU unit gets Rs. 115 for the same Croaker fish.

EU fish processing units not only get a higher price, but also increase their market share. Does adoption of EU quality standard improve sales? 29.3% of the fish processing units were of the view that sales improve with better quality standards. EU quality standards do help in getting a higher price as well as a higher market share.

This relationship will be more certain by assessing the percentage of sales increase due to quality standards.

Table 4.17
% Increase in Sales

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness
% Increase in Sales	17	10	100	30.47	27.72	2.087

Sales increase ranging from 10% to 100% is due to quality standards. The standard deviation is 27, showing a high percentage difference than normal distribution. Therefore method of skewness was applied, which indicates how much a distribution varies from a normal distribution. In general, a skewness value greater than one indicates a distribution that differs significantly from the normal, symmetric distribution. In the table, value of skewness is 2.087, meaning that % increase in sales due to quality standards is very different from fish processing unit to fish processing unit although on an average about 30% sales increase is on account of adoption of quality standards.

4.20 Labour and Quality standards

Quality standards are made and imposed by European nations. These standards are made on the basis of value, philosophy, and principles of those countries. In contrast, the education of Indian labour and their understanding and value of hygienic food is different. These standards are also new for them, leading to some difficulties in implementing. 22.4% of the firms were of the view that they faced problems with their employees due to the adoption of quality standards, and 8.6% did not face any such problem as employees were retrained. The nature of problems include discomfort with clothing (dress, gloves, head cover, long shoes) and lack of knowledge about the new methods of process.

Table 4.18
Nature of Problems in Adoption of EU Quality Standards

Nature of Confrontation	Percent
Difficulty in Making Fish Products	8.6
Uncomforted with Clothing	3.4
Do Not Have Knowledge About Process of Quality Standards	10.3
Not applicable	77.6
Total	100.0

The respondents were of the opinion that Gujarat labour was not pro-business and labour not skilled compared to Kerala and other states. "Otherwise Gujarat would have been able to double its export" as one of the respondents mentioned.

"Yet, another difficulty faced by the exporters is the high quality and safety standards imposed by importers. These relate to regulations, standards and procedures, including border controls where seafood products can be rejected, destroyed or detained" (Ababouch, L. et al, 2005). Since fish is a highly perishable commodity and international markets adhere to hygienic quality, the chances of rejection are great.

However, the rate of rejection is quite low in case of Gujarat Fish processing industry and only 3.4% of the fish processing units have faced rejection of shipment, whereas 27.6% of fish processing units have never faced this rejection. It was reported that the total number of rejection in India was 32 containers in 2002 as compared to the last 16 years and a majority of them were because of detection of antibiotics in shrimp exports (Deeptha, R., 2002). "If a consignment is rejected in any one country of E.U., the exporter is listed on Rapid Alert List by all member states. However, to get off the Rapid Alert List of each country, the unit needs to clear 10 consignments in each of the member states. To date, there are over 30 member states and it would take an exporter a life time to get off the Rapid Alert under this procedure" (SEAI, 2007).

The reasons for rejection include growth of bacteria, presence of heavy metal, bad appearance, or colour. These may be due to low freezing temperature. A majority of the rejections are due to Nitro faun reported in consignments from Andhra Pradesh region and cadmium reported from Gujarat Region (SEAI, 2007).

Sudhi K. reported that the presence of residual antibiotics like cholaranphenecol and nitrofuran in some of the seafood consignments from India led to the rejection of the consignments in 15 European ports. Veterinary authorities of the European Union (E.U.) had reported that the presence of cholaranphenecol in prawns could cause aplastic anaemia, whereas nitrofuran could cause genetic disorders. It is also feared as a carcinogenic. However, other seafood varieties like cuttle fish, squid and octopus were exempted from such tests, as they are totally marine and caught from the wild, sources (Sudhi, K., 2002).

There has been considerable debate on the efficacy of such stringent requirement for antibiotic residue. SEAI also reported, "At present the antibiotic residue levels required by the EU for seafood exports are extremely rigid and beyond the actual requirements of food safety according to most experts. It should be given certain relaxation in the antibiotic residue level that has been given for wine and dairy products in the E.U." (SEAI, 2007).

Shipment rejection is a huge economic loss and steps and preventive steps need to be taken by the processing units. These measures include buying hygienic fish to and intensive testing of fishes in its own laboratory prior to shipment. "To give exports a further boost various sanitary and phyto-sanitary measures should be taken up vigorously to ensure international hygiene standards for Indian fisheries products" (Kumar, A., 2004).

Shipment is rejected due to problem related to quality. The average shipment cost was found to be 18 lakhs. This is a huge loss for any firm which the firm cannot afford to bear. Through personal contacts it was known that rejection of products by European countries is only on paper. Actually the firms re-process and export the same shipment to other countries such as China and Dubai.

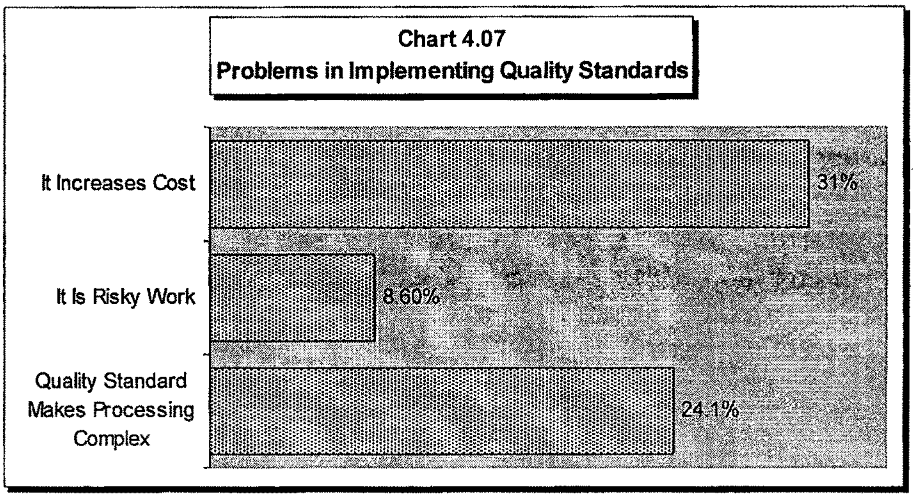


Table 4.19
Problems in Implementing Quality Standards

Problems in Implementing Quality Standards	Responses		Percent of cases
	N	Percent	
It Increases Cost	18	23.4	31.0
It Is Risky Work	5	6.5	8.6
Quality Standard Makes Processing Complex	14	18.2	24.1
Not Applicable	40	51.9	69.0
Total Responses	77	100.0	132.8

The processing units were of the view that adoption of quality standards increases cost (31.0%), raises risk (8.6%) and makes processing complex (24.1%). All the processing units are of the opinion that this results into an increase in the cost of production. Nevertheless, quality standard attracts a better price, offsetting the cost as already seen.

According to Marine Products Export Development Authority (MPEDA), seafood processing units that do not upgrade themselves to at least the 'national standards' will not be allowed to continue production. In India, currently there are around 200 units that conform to this standard. It was also mentioned by MPEDA that over the last two years around 60-70 units had been shut down for not complying with the norms. Another 15-20 units have not been approved and are likely to lose their licence. (Deeptha, R., 2008).

In the present study, 25.9% of the fish processing units were willing to comply with the EU quality standards, and 31% were not willing to adopt them. 12.1% have already converted their units into EU. Other 18 units have already complied with EU quality standards.

4.21 Comparison between E.U. and Non-E.U. Fish Processing Units

A wide variation exits between the EU complaint units and EU non complaint units in terms of turnover, investment, employment, cost, price, profit. This analysis will be useful in improving the performance of individual firms and the industry as a whole. T-test has been used for understanding these variations.

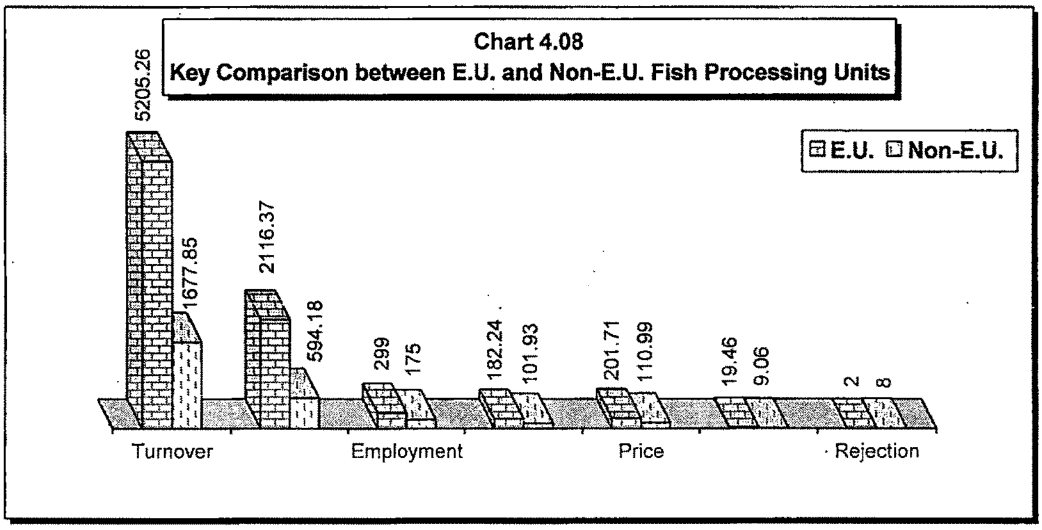


Table 4.20
Comparison between E.U. and Non-E.U. Fish Processing Units

	E.U.		Non-E.U.		t-value	Sig.
	Mean	Standard Deviation	Mean	Standard Deviation		
Average Annual Turnover (Rs. In Lakhs)	5205.26	5502.472	1677.85	2430.622	3.401	.001
Total Investment (Rs. in Lakhs)	2116.37	2731.431	594.18	939.976	3.142	.003
Total Number of Employee	299	236.77	175	152.12	2.406	.019
Cost per Kg	182.24	86.62677	101.93	70.61595	3.771	.000
Price receipt per kg	201.71	85.13635	110.99	79.68927	3.979	.000
Profit per kg	19.46	20.38179	9.06	15.15549	2.186	.033
Rejection of shipment	2 cases		8 cases			-

There are 19 E.U. fish processing units and 39 Non-E.U. fish processing units in Gujarat. Data of these units have been used in the analysis.

4.21.01 Turnover

The independent-samples t-test analysis indicates that the E.U. fish processing units had a mean turnover of 5205.26 lakhs whereas non-E.U. had a mean turnover of 1677.85 lakhs and also the means differ significantly at the $p<.05$ level (note: $p = .001$). It clearly shows that E.U. fish processing units have higher turnover than the non-E.U. fish processing units. Non-E.U. fish processing units cannot export in European countries like France, Germany, Italy, Sweden, Netherlands, UK, Spain, Portugal, Denmark, Belgium, Greece, Austria etc. Whereas there are no such barriers for E.U. complaint units. As a result, E.U. fish processing units can export in more markets. Hence, adoption of higher quality standard results into an increase in turnover by widening the market.

4.21.02 Investment

It is interesting to know the differences in the investment for establishing an E.U. complaint unit and non-E.U. fish processing unit. The independent-samples t-test analysis indicates that the E.U. fish processing units had investment mean of 2116.37 lakhs whereas non-E.U. had investment mean of 594.18 lakhs and also the means differ significantly at the $p<.05$ level (note: $p =$

.003). It clearly shows that to establish E.U. fish processing unit, higher investment is needed compared to a non-E.U. fish processing unit.

4.21.03 Employment

In terms of employment, the study apparently shows that E.U. fish processing units can employ 70% more than the non-E.U. fish processing units. The independent-samples t-test analysis indicates that the E.U. fish processing units had mean employment of 299 whereas the non-E.U. firms had a mean employment 175 and also the means differ significantly at the $p<.05$ level (note: $p = .019$). To process value added products and ready to eat fish products, it needs more labour compared to others. Thus, E.U. fish processing units generate more employment than the non-E.U. one.

4.21.04 Cost

The independent-samples t-test analysis indicates that the E.U. fish processing units had cost per kg mean of 182.24 (Rs.) whereas the non-E.U. has cost per kg mean of 101.93 (Rs.) and also the means differ significantly at the $p<.05$ level (note: $p = .000$). It clearly denotes that the cost of fish processing is higher in E.U. processing units compared to that in the non-E.U. processing units. The reasons are most likely to be the same as in case of investment and employment. Besides this, the difference lies in the cost of fish processing due to transportation cost between E.U. and non-E.U. processing units. Mostly, non-E.U. fish processing units export to China and transportation cost is Rs.4/per kg for China whereas E.U. fish processing units export to European countries and USA; and transportation cost is Rs.6/per kg for European countries and it is Rs.12/per kg for USA.

4.21.05 Price

The independent-samples t-test analysis indicates that the E.U. fish processing units had price receipt per kg mean of 201.71 (Rs.) whereas non-E.U. had price receipt per kg mean of 110.99 (Rs.) and also the means differ significantly at the $p<.05$ level (note: $p = .000$). This shows that E.U. fish processing units receive higher price than the non-E.U. fish processing units. This may be due to value added products. As regards the differences in the profit, this has already been discussed earlier.

One can therefore say that economic performance of E.U. fish processing units and non-E.U. fish processing units is different in terms of turnover, investment, employment, cost of production, price and profit. And the economic performance of E.U. fish processing units is better on all terms better than non-E.U. fish processing units.

Section -V

FINANCE

Finance is undoubtedly the life-blood of the business. The ambitious plans of a businessman would remain mere dreams unless adequate money is available to convert them into reality. The non-availability of credit at the right time and in adequate quantity can create impending problem for the industry" (Salim, S. et al, 2005). It is therefore, important to identify the financial problems of these fish processing units, the financial needs of fish processing units, and their capital and sources of finance.

4.22 Difficulties in Availing a Loan

72.4% of the units in the present study did not face any difficulty while 27.6% of the fish processing units reported facing difficulty in availing loans. This was for several reasons. 13.8% of the fish processing units had no security to get a loan. Another 13.8% reported that bank loan procedures were complex. They had no much knowledge about industrial financial schemes.

32.8% of the fish processing units borrowed loans as EPC (export packing credit), FBP (foreign bill purchase) and cash credit. 6.9% of the units for new plant, whereas 3.4% borrowed for the purchase of equipment. The sources of loans were Gujarat Finance Corporation and friends and relatives.

Interest rate varied from 7.5% to 21%, and changes with the purpose of the loan and the lending institutions. The average interest rate was 10.95%. Around 50% of the fish processing units reported that interest rates were higher for the industry, even though the government had recently reduced 2% interest rate for the fish processing industry to protect against rupee appreciation.

4.23 Conclusions

This chapter deals with economics of fish processing. The fish processing units can earn higher profits by exports rather than selling in the domestic market. Profit depends on many factors, such as investment, turnover, product, installed fish processing capacity, availability of raw-material, raw-material price, value added products, quality standards, packaging, managerial skill, degree of competition, having fishing boats, exchange rate, cost of production and price received. VAP is a source of reaching higher profits. However, firms face problems in the development of VAP. It is considered as a risky activity, with non-availability of skilled labour and lack of finances. Packaging can improve profits. Hence, a majority of the fish processing units wish to improve the packing designs of their products. But the cost of packaging machineries is high and unaffordable. Similarly, adoption of quality standards can improve profit level.

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