

## Capacity Utilization in the Fish Processing Plants in Kerala

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The production and capacity utilization in the fish processing plants in Kerala was estimated using a stratified random sampling procedure. The capacity utilization for the year 1996 was estimated to be 15% based on 365 working days with three shifts per day. The seasonal production and capacity utilization indicate that trawl ban adversely affected the processing industry during June, July months (about 10.6% utilization) whereas the utilization increased substantially during post ban period (about 25%). This increase was observed to be mainly due to the increased production of squids, cuttlefish and other diversified products. The main reason for the low capacity utilization was that the availability of raw material was not commensurate with existing installed capacity in the fish processing sector in the State.

**Key words:** Fish processing, installed capacity, seasonal production, trawl ban, capacity utilization, stratified random sampling.

The infrastructure facilities have been considerably enhanced in the fish processing industry in Kerala, thanks to the developmental activities in this sector during the last two decades. It is reported that the state with a coast line of 590 km has built up freezing plants of about 569,000 tonnes of installed capacity per annum (Anon, 1997a) which is 2.35 times the capacity that existed in the late 70's. This naturally necessitated huge capital investments, the merits of which is to be evaluated only by the quantum of production and marketing attained in the fish processing sector. The economic viability of this industry largely depends on the optimum utilization of the installed capacity. Iyer *et al.* (1981, 1982) studied the idle capacity of fish processing plants in India statewise. They had estimated the idle capacity in Kerala as high as 83 percent in 1979, based on 250 working days per year with three shifts per day. However, based on practical

considerations the capacity utilisation was also worked out at 28% based on 300 working days with 2 shifts per day. Since then, many measures aiming at protection and conservation of fishery resources were initiated by the Government of Kerala. Based on the recommendations of expert committees (Kalawar *et al.* 1985 and Nair, 1989) a ban on trawling in the coastal waters of Kerala during monsoon period was introduced. Simultaneously, the marine products export scenario also was undergoing structural changes. India's marine product exports boosted to 378199 tonnes in terms of quantity and to Rs. 4121 crores in terms of value during 1996-97 (Anon, 1997b). The concepts of product diversification and value-added products have come to dominate the scene. The focus shifted from frozen shrimps, frog legs and lobster tails to frozen fish, squid, cuttlefish and many other diversified products. Marine

landings in India recorded an impressive increase, reaching 2.42 million tonnes in 1996 as per the estimate of the Central Marine Fisheries Research Institute, Cochin. There were conspicuous changes in the marine product exports market as well. Japan emerged as India's major export market, keeping United States at the second place, with a share of 45.76% in terms of value during 1996-97. This background of the fish processing industry necessitated an overall evaluation of the production pattern and extent of capacity utilization of the processing plants in Kerala. The capacity utilization in both lean and peak seasons with reference to product diversification also assumes great significance to researchers and policy makers for evolving suitable fishery management strategies. Kee - Chai Chong *et al*; (1987) studied the bio economics and socioeconomics of the total trawl ban in Indonesia. They found that trawl ban had a positive impact on fishing profitability, in particular on shrimp fishing.

The seasonal capacity utilization estimates, the seasonal cum product-wise distribution, the identification of major causes, if any, of the under utilization of processing plants and impact of trawl ban on the processing industry were investigated for the year 1996 and results are reported in this paper.

### Materials and Methods

Sampling frame for the study was prepared by including all the 127 fish processing plants in Kerala, which forms about 32 percent of the total number of plants in India and contributes 1581 tonnes of installed freezing capacity per

day. There also exist 661 tonnes capacity per day of ice making, 23087 tonnes of cold storage capacity and other infrastructure facilities which will fully cater to the requirements of the existing freezing activities in the fish processing sector in Kerala.

As the production data from the sampled factories showed high variability, the factories were stratified into three, based on their installed capacities, viz. up to 10 tonnes, 10-15 tonnes and 15-30 tonnes (plate freezer and IQF) per day. Varying sample sizes were determined for each stratum by fixing the sampling error at 10% on the annual production. A sample size of 38 factories were selected for the study by adopting stratified random sampling technique (Sukhatme & Sukhatme, 1970).

Data on installed capacity of plants, type of freezing employed, number of normal working days (excluding allowance to maintenance etc.), the month-wise and variety-wise production, sources of raw materials and major constraints resulting in under utilization, if any, were collected from the sampled factories through personal interviews with the plant authorities and through mail (on the basis of a proforma) and also from the Marine Products Exports Development Authority, Cochin.

The estimates of seasonal and annual production as well as variety-wise production were made for each stratum, which were further pooled to obtain the state level estimates.

Estimate of production in each stratum was obtained by using the formula,  $\hat{Y}_h = (N_h/n_h)\Sigma y_{hi} = N_h\bar{Y}_h$

where, for the  $h^{\text{th}}$  stratum,

$N_h$  = total number of plants

$n_h$  = number of units in the sample and

$y_{hi}$  = value of the  $i^{\text{th}}$  unit

The pooled estimate of production for the state worked out to

$\hat{Y} = \sum_h^h \hat{Y}_h$  the summation runs over all the  $h$  strata.

The standard error of estimate of production for the  $h^{\text{th}}$  stratum is given by  $\sqrt{V(\hat{Y}_h)}$  where variance is obtained by the formula,

$$V(\hat{Y}_h) = \frac{[N_h(N_h - n_h)]}{n_h} \times \left( \frac{1}{n_h - 1} \left[ \sum_{i=1}^{n_h} y_{hi}^2 - \frac{(\sum y_{hi})^2}{n_h} \right] \right)$$

The percentage error estimate for the state is obtained by pooling the strata variances and given by

$$\text{S.E.} = \sqrt{\frac{\sum V(\hat{Y}_h)}{\sum \hat{Y}_h}} \times 100$$

The annual and monthly utilized capacity of the processing plants were estimated on the basis of the assumption that the freezing plants have a monthly installed capacity of 47400 tonnes. The stratum wise capacities per month worked out to 16,200 tonnes, 10710 tonnes and 20490 tonnes for 1st, 2nd and 3rd stratum respectively. The ratio of production and installed capacity multiplied by 100 gives the percentage utilized capacity.

The annual installed capacity is based on the theoretical assumption of 365 working days per year with three shifts per day. But the field data

indicated that under practical conditions the processing factories run for 300 working days per year with two shifts per day. 250 working days were considered to be normal with respect to many organised industries (Mensinkai, 1969). The capacity utilization was estimated both for 365 days (three shifts) and 300 days (2 shifts).

The seasonal production estimates were made to focus on the peak and lean periods of capacity utilization. Monthly capacity utilization figures were worked out as the ratio of the monthly production and monthly installed capacity. The impact of trawl ban on production was studied by comparing the capacity utilization of plants during ban and post ban periods.

The role of product diversification on capacity utilization was investigated by estimating the contribution of each variety to the total production and capacity utilization on a seasonal basis.

## Results and Discussion

The stratum-wise distribution of processing plants, estimates of annual installed capacity, annual production, the percentage error estimates and capacity utilization are presented in Table 1. The lower stratum (up to 10 tonne capacity) had the highest number of plants (61%) followed almost equally by the other two strata (19.5% each). However, the first stratum contributed an installed capacity of 34.2% while the second and third strata contributed 22.6% and 43.2% respectively of the total installed capacity of 1581 tonnes per day. Of the total annual production of 88540 tonnes, the contribution of 1st, 2nd and 3rd stratum were 36.2%, 19.6% and

Table 1. Stratum-wise capacity utilization

Stratum	Number of Plants	Annual installed capacity '000 tonnes	Estimated annual production (tonnes)	% capacity utilization*	% capacity utilization**	% error of estimation
0-10	78	194.4	32060	16.5	29.7	7.2
10-15	24	128.5	17400	13.5	24.4	6.2
15-30	25	245.9	39086	16.0	28.6	3.2
Total	127	568.8	88540	15.5	28.0	5.2

\* Based on 365 working days a year & 3 shifts per day.

\*\* Based on 300 working days a year with 2 shifts per day.

44.2% respectively with the corresponding estimated errors of 7.2, 6.2 and 3.2 percentages. The pooled error estimates for the state was only 5.2% which was well within reasonable limits and thus established the reliability of the estimates. The capacity utilization was worked out on the basis of 365 working days per annum with three shifts per day, as 16.5% for the first stratum, 13.5%

for the second and 16.0% for the third stratum. The pooled capacity utilization for the state was only 15.5 percent.

The majority of the processors sampled (80%) reported that 300 working days with two shifts only were practically feasible for the fish processing industry. Re-estimating the installed capacities accordingly, the utilized capacities for the 1st, 2nd and 3rd stratum were 29.7, 24.4 and 28.6 percentages respectively and the estimate for the state worked out to 28.0 percent. This low capacity utilization is a matter of grave concern and requires urgent consideration by the fishery managers to keep the industry viable.

Seasonal utilization of processing plants was examined to identify the lean and peak periods of capacity utilization. Monthly capacity utilization for each stratum is presented in Fig. 1.

A steady increase in the capacity utilization was observed from January up to May. Then there was a sudden decrease during June and July, followed by a substantial increase during the months of August, September and October. This trend held good for all the strata and also for the state. Significantly,

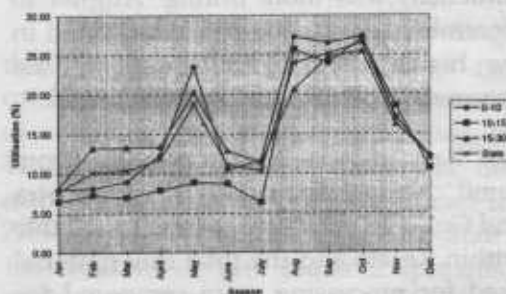
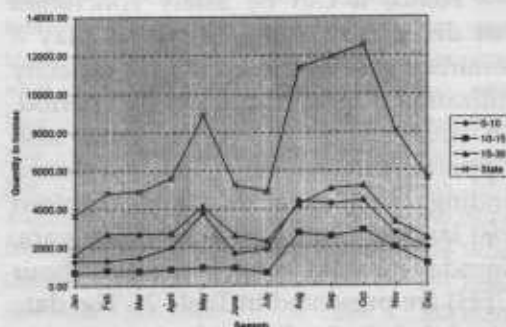


Fig. 1. Seasonal production in the processing factories.

the June-July was the trawl ban period and August-October, the post-trawl ban period on the Kerala coast. For the first stratum, the average capacity utilization during trawl ban was only about 11 percent which sharply increased to 27.1 percent during post-ban period. For the second and third strata, the increase was from 7.5 to 25.7, and 12.1 to 23.6 percent respectively during the above period. The utilized capacity for the state as a whole increased from 10.6% (June-July) to 24.7% (August-October). Thus it is evident that the trawl ban has adversely affected the processing industries during June-July months, whereas the capacity utilisation registered a substantial increase during the post-ban period of August, September and October.

The capacity utilization pattern was further examined in the light of product diversification. The main products exported during the study were shrimps, squid, cuttlefish and other varieties which included frozen fishes namely seer fish, ribbon fish and mackerel, frozen crab, mussel, clam, octopus etc. Of the 15.5 percent capacity utilization in the state, the contribution of shrimp, squid and cuttlefish were 5.86, 3.12 and 3.22 percent respectively. All other varieties of fish and crab varieties registered a significant share of 3.35 percent.

The variety-season wise utilization pattern is furnished in Fig. 2. It can be seen that the capacity utilization contributed by shrimp improved from 6.0 percent in July to 10.0 percent in August, and then declined to 6% in September and further to 4.5% in October. It was observed that the increased capacity utilization during August-

October (average 25.25%) was due to the substantial contribution by squid, cuttlefish and other varieties of fish. The combined contribution of these three was 14.47 percent in August, 19.90 in September and 21.06 percent in October. The share of these products in November and December were 14.74% and 11.60% respectively, which were much higher than that of shrimp with 2.52% in November and 3.86% in December.

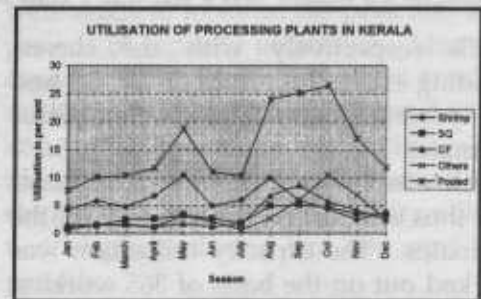


Fig. 2. Utilization of processing plants in Kerala

Hence it can be safely concluded that diversified fishery products play a dominant role in the enhanced capacity utilization during post trawl ban period. An analysis of the catch data also supports this view. The combined landings data of the major mechanised boat landing centres at Sakthikulangara, Neendakara and Cochin fisheries harbour (CFH) are presented in Table 2. The data reveal that the landings of varieties other than shrimp (including squid and cuttlefish) was more during August to December which in turn has reflected in the higher capacity utilization of the processing plants during this period.

Raw materials are brought from Tamil Nadu, Karnataka, Maharashtra and Goa also. The raw material available within Kerala and the total raw material used for processing were compared for obtaining a quantified picture of the

arrivals from outside the state. The raw material used for processing was quantified based on earlier studies (Anon, 1990; Nair *et al.*, 1991; Unnithan *et al.*, 1975). It was estimated that the processing industry depended on other states for about 30 percent of shrimps and about 40 percent of the cephalopods processed in 1996. During the trawl ban period, the dependency for shrimp on outside supply rose to around 75%. But for the arrival of large quantities of raw material from outside sources, the capacity utilization in June-July months would have been drastically reduced from the present 10.6%.

Table 2. Month-wise Shrimp catch - Kerala - 1996

Months	Sakthikulangara & Neendakara		CFH		Pooled catch for the 3 centres	
	Shrimp	Others	Shrimp	Others	Shrimp	Others
January	345	2213	1039	2427	1384	4640
February	640	3626	677	1255	1317	4881
March	542	4473	726	1255	1268	5728
April	584	5982	803	2074	1387	8056
May	851	5840	1034	3966	1885	9806
June	189	2401	308	1402	497	3803
July	616	1371	19	539	635	1910
August	5785	25220	1192	3356	6997	28576
September	1123	13548	601	2768	1724	16316
October	890	13388	101	5579	991	18967
November	527	8203	3	2058	530	10261
December	984	7038	261	2759	1245	9797

Source: CMFRI

On the basis of the average landings during 1990-95 period, the trawl net catches worked out to be 252,487 tonnes, of which, prawn catches amounted to 41,097 tonnes, (16% of the trawl net catches). The trawl nets contributed to 77% of the prawn catches of the state. The sources of raw material (prawns) could be broken up as material brought from outside the state (30%), contribution

from trawl net catches of Kerala (54%) and contribution from country boat catches of Kerala (16%). In the absence of trawl catches during the ban period, the contribution of the country boats was reported to be substantial.

The present level of 15 percent capacity utilization is not a healthy sign for any viable industry. According to the processors, non-availability of raw material was the main reason for low capacity utilization. Unhealthy competition for purchase of raw material, unsteady increase in raw material prices, huge investment required for upgradation of plants, financial constraints, insufficient and unsteady power supply, high cost of production, unsteady export markets, non-judicious licensing to new processing units and shortage of potable water were other major factors responsible for the under utilization of plants.

Processing plants are designed for optimum utilization of their installed capacity during season. The raw material availability being seasonal, some percentage of unutilised capacity is inevitable. At the same time, economic viability of the processing industry is to be achieved by maximisation of the capacity utilisation. This can be ensured by steady supply of raw materials throughout the year and minimising the constraints mentioned above by adopting appropriate fishery management strategies including promotion of ecofriendly aquaculture and import of fish for processing.

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