A Principal Component Analysis of the Problems Faced by Seafood Processing Export Firms in Kerala

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The significance of the seafood processing export units has been undisputed owing to its contribution towards employment of skilled and semi-skilled workers, and its potential to generate foreign exchange earnings through export. The State of Kerala has been contributing a significant portion towards the Indian export of seafood products both in terms of value and quantity. Yet, there are evidences that the contribution has a staggered trend over the years, and it is declining. Studies in the past have highlighted the existence of various problems that are faced by the sea food processing export firms. These problems include raw material prices, quality of products, export regulations etc. The present study is an attempt to identify the specific nature of these problems through Principal Component Analysis. It is found that the problems faced can be segregated into four major components, namely, Labour Problems, Technical and Training Problems, Raw Material Problems, and Power and Other Inputs Problems.

Keywords: sea food processing, labour, raw material, power and other inputs, technological and training, principal component analysis

INTRODUCTION

Seafood is any kind of marine life considered as human food, including fish, mollusks, crustaceans, echinoderms. Seafood industry denotes an industry concerned with culturing, processing, preserving, storing, transporting, and selling marine food items. Fish and fish items have a very significant role in the economic development of the country, including earnings in foreign exchange through exports. The sector has been accepted to be a priority area by the government. In Kerala, Seafood Industry occupies an important position in its economy. The catching sector of seafood industry of Kerala constitutes both inland sector and marine sector. Among these, marine sector constitutes two major sector such as traditional sector

and modern sector. Both these sectors with auxiliary industries provide ample employment and foreign exchange to the state. Kerala has a coastline of 590 kms and has an exclusive economic zone of 2.18 lakh sq. kms. with the right to regulate fishing activities in the sea up to 12 nautical miles. Territorial waters expanding to nearly 13000 sq. kms., the fishing sector plays a vital role in the economy of Kerala state and provides livelihood to a vast number of coastal population (Directorate of Fisheries, 2015).

LITERATURE AND CONCEPTUAL FRAMEWORK

Statistics reveal that both in terms of export quantity and value, though decadal growth has been recorded by the Kerala fishing sector, the year-wise trends are very staggered, and unpredictable. The share of the State in Indian exports (quantity and value) has been consistently recording a decreasing trend from 23 percent (value) and 27 per cent (quantity) during 1999-2000 to 13 per cent (quantity and value) by 2018-19. The existence of problems in the seafood processing and export sector has been a concern since ages. Kannappan (1975) found that wages, ill-treatment, and sanitary conditions in the processing units are prevalent in the sector. Low productivity and poor product quality aggravated by insufficient supply of raw materials has been reported by Ramachandran (1988). Productivity issues with escalations in operational expenses and diminishing returns have been recorded by the Department of Fisheries (1990). Sebastian (1994) has reported that the causes of problems are related to the new policies of the governments and the way those were implemented. Shahjahan (1994) pointed out that the sector is suffering due to ecological degradation, resource depletion, and increase in price of raw materials. Achari (1994) suggested the need for proper regulations to preserve the industry. Shassi (1998) suggested adoption of total quality management practices in the industry to enhance competitiveness to face food safety regulations and quality controls imposed by the importing markets. Suresh (2004) identified that the anti-dumping duties and other controls imposed by the import markets could severely damage the seafood processing industry in Kerala. Kulkarni (2005) stressed the need to improve the fisheries supply chain to increase the sustainability of the sector. Clean ice and water supply, hygienic working environment was also found to be important. Lack of innovativeness, operational and technical deficiencies was found to be factors detrimental to the prospects of the industry (Gopal, Manjrekar, & Dhond, 2008). Based on the literature available on the problems faced by the seafood processing and export firms, the researcher has identified 17 items, that would reasonably measure the level of problems faced by the firms in Kerala. These items are:

1. Delays in the supply of raw material
2. Price fluctuations of raw material
3. Long and sluggish distribution channels
4. Undue intervention of intermediaries
5. Poor credit facility from suppliers
6. Unpredictable availability of power
7. High and unaffordable Cost of power
8. Low Availability of Fresh water
9. Poor transportation and storage facility
10. Poor level of technology in processing and storage
11. Low availability of qualified and trained staff
12. Inadequate support from Government for training
13. Increased operating costs due to training needs
14. High rate of labour turn over
15. High rate of Absenteeism
16. Poor adoption of new technology by workers
17. Health and hygiene issues faced by workers

METHODOLOGY

The present study included a population of 226 seafood exporting firms registered in Kerala, according to the statistics of Marine Product Development Authority (MPEDA). They were approached for data collection, with request for top management personnel to complete their responses, sent through the official e-mail of the firms. There were 193 firms who responded positively. Questionnaires were sent to these firms, and reminders were also sent as follow-up. Filled-up questionnaires were returned by 193 firms. List wise method was used to identify missing values for exclusion. A sample size of 162 firms was identified for analysis. The sample size is found to be adequate, based on Yamene's formula, where computed value was 142.

Problems faced by the firms were measured using the 17 items carefully selected and finalized through a two-stage approach. First, various items of problems were developed through review of existing literature on problems faced by the firms. In the second stage, discussions were held with experts from related academic and research fields, which helped in confirming the items. These items were scrutinized by selected top management personnel of 12 seafood exporting firms, for corrections. This process allowed the finalization of the set of the selected 17 items to measure various problems faced. These problems generally related to regulatory and procedural compliances, raw materials, technology and labour. All these items were measured on five-point Likert type scale ranging from strongly disagree to strongly agree. The data were collected during the period 2020 March to 2020 June. The sample respondents consisted of 45 (28 percent) firms with an age of less than 10 years, 56 (34 percent) firms with an age of 10 to 20 years and 61 (38 percent) firms with an age of above 20 years. There were 82 firms working in owned premises, while the remaining 80 rented their premises. Based on investment size, 61 (38 percent) firms had less than 5 cr. in investment, 53 (32 percent) firms had between 5 cr. to 10 cr. investment, and 48 (30 percent) firms had above 10 cr. investment.

DATA ANALYSIS AND RESULTS

With a view to reduce the observed 17 variables into lesser number of components extracted to reveal the specific nature of the processing related problems faced by the firms, Principal Component Analysis was performed employing SPSS Version 21.0.Principal Component Analysis (PCA) is the oldest and most popular method of analysis involving multivariate data (Mishra et al., 2017). The dimensionality of the original data set with a large number of inter-related variables is reduced in PCA (Tharwat, 2016) and the attempt is to interpret the original data set in a few variables called principal components (Smith, 2002). To test the suitability of data to perform PCA, Kaiser-Meyer-Olkin measure of Sampling Adequacy and the Bartlett's test of Sphericity were performed. Since the PrincipalComponent Analysis is based on correlation matrix of the observed variables, size of the sample or the number of observations have to be adequate. Based on Comrey& Lee's (1992) suggestion of 1000 or more observations being excellent, use of Principal Component Analysis in processing related problems is accepted since there are 2754 observations. The reliability or internal consistency of the variables was measured through Cronbach's Alpha.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy reveals that the computed value (0.764) is above the recommended value of 0.60. Bartlett's test of Spericity reveals that the computed value (Chi-Square = 176.455) is statistically significant (p value <0.001), rejecting the null hypothesis that the correlation matrix is an identity matrix (Hair, et al., 2010). Thus, suitability of data reduction analysis procedure is proved. Reliability statistics reveal that the Cronbach's Alpha is 0.881, which is above the recommended value of 0.80, proving that the variables are reliable and possesses relatively high internal consistency. It is a proof that all the variables are closely related as a group.

TABLE 1
KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.764
Bartlett's Test of Sphericity	Approx. Chi-Square	176.455
	df	120
	Sig.	0.000

TABLE 2
RELIABILITY STATISTICS

Cronbach's Alpha	No. of Items
0.881	17

The Scree Plot is a graph where the component numbers are plotted on the x axis and the eigen value on the y axis. It indicates the number of components to be retained in a Principal Component Analysis. The figure reveals that the line flattens out (elbow) after four components. This proves that the components after the fourth accounts for decreasing amounts of variance in the observed variables. Hence, it is decided to extract four components only.

FIGURE 1
SCREE PLOT

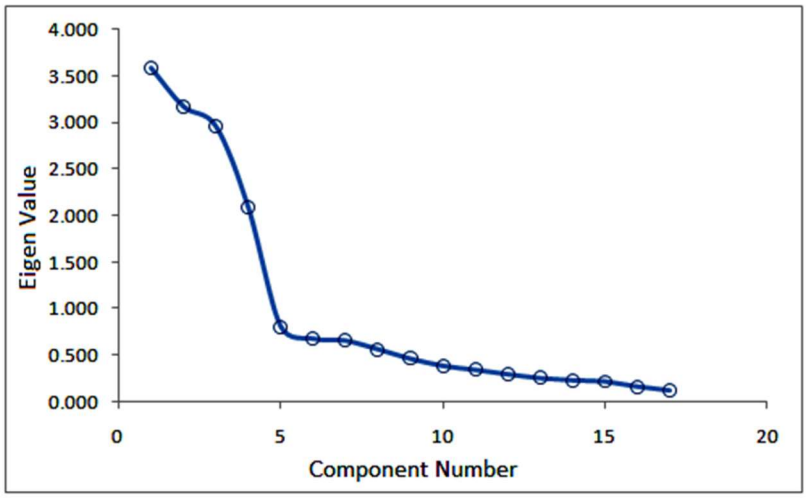

Table 1 of Principal Component Analysis (Total Variance Explained) reveals that there were four principal components that were extracted. The four extracted components account for a cumulative 69.535 % of the variance of the observed variables. The Component One accounts for 21.124 % of variation in the observed variables (Eigen Value = 3.591). The Component Two accounts for 18.682 % of variation in the observed variables (Eigen Value = 3.176). While the Component Three accounts for 17.435 % of variation (Eigen Value = 2.964), Component Four accounts for 12.294 % variation (Eigen Value = 2.090) in the observed variables.

TABLE 3
TOTAL VARIANCE EXPLAINED

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.591	21.124	21.124	3.591	21.124	21.124
2	3.176	18.682	39.806	3.176	18.682	39.806
3	2.964	17.435	57.241	2.964	17.435	57.241
4	2.090	12.294	69.535	2.090	12.294	69.535
5	0.809	4.759	74.294			
6	0.678	3.988	78.282			
7	0.658	3.868	82.150			
8	0.564	3.316	85.466			
9	0.462	2.721	88.187			
10	0.386	2.271	90.458			
11	0.342	2.013	92.472			
12	0.296	1.742	94.214			
13	0.253	1.489	95.703			
14	0.230	1.354	97.056			
15	0.217	1.277	98.333			
16	0.162	0.955	99.288			
17	0.121	0.712	100.000			

The Component Matrix Table shows the correlation values between the observed variables and the components that are extracted. It evident that the loadings of each of the observed variable are very high on the corresponding extracted component. Moreover, each variable loads only on one extracted component, and exhibits very low cross-loadings. There were four each observed variables that highly correlated to the Component One and Two while there were five variables that correlated to the Component Three and another four observed variable that correlated to Component Four. Communalities show the extent of variance in the observed variable that is accounted for by the extracted two components. All the variables are seen to have high communality, ranging between 0.529 - 0.909), proving that the observed variables are adequately represented in the common factor space.

The Principal Component Analysis involving 17 observed variables relating to problems of seafood companies reduced the variables into four dimensions.

They are identified as:

1. Labour Problems,
2. Technology and Training Problems,
3. Raw Material Problems, and
4. Power and Other Inputs Problems

TABLE 4
COMPONENT LOADINGS AND EXTRACTED COMPONENTS

Items	Component Matrix[a]				Communalities
	Component				
	1	2	3	4	
R_Mat_01	*0.411*	*-0.011*	**0.637**	*-0.126*	0.590
R_Mat_02	*0.351*	*0.218*	**0.733**	*-0.038*	0.709
R_Mat_03	*0.147*	*-0.129*	**0.801**	*-0.201*	0.720

R_Mat_04	*0.439*	*0.067*	**0.704**	*-0.175*	0.724
R_Mat_05	*0.206*	*-0.479*	**0.731**	*0.037*	0.807
Pwr_Inp_01	*0.203*	*0.392*	*0.341*	**0.773**	0.909
Pwr_Inp_02	*0.412*	*-0.265*	*-0.083*	**0.673**	0.700
Pwr_Inp_03	*0.238*	*0.097*	*-0.048*	**0.717**	0.583
Pwr_Inp_04	*0.235*	*-0.008*	*0.014*	**0.635**	0.459
Tec_Trng_01	*0.329*	**0.783**	*-0.193*	*0.022*	0.760
Tec_Trng_02	*-0.039*	**0.881**	*0.127*	*0.024*	0.794
Tec_Trng_03	*0.156*	**0.709**	*0.043*	*0.024*	0.529
Tec_Trng_04	*0.332*	**0.842**	*0.198*	*-0.023*	0.859
Lbr_01	**0.764**	*-0.048*	*-0.220*	*-0.117*	0.648
Lbr_02	**0.818**	*-0.168*	*0.178*	*-0.027*	0.730
Lbr_03	**0.738**	*-0.039*	*0.174*	*-0.115*	0.589
Lbr_04	**0.823**	*-0.107*	*0.141*	*-0.052*	0.711

DISCUSSIONS AND IMPLICATIONS

The study was undertaken with an aim to identify the specific nature of problems faced by the seafood processing export firms in Kerala. The significant overall problems faced by the firms were identified through literature and discussions with experts. The major finding of the study shows that the problems of the firms can be classified into four components - Labour Problems, Technical and Training Problems, Raw Material Problems, and Power and Other Inputs Problems.

Labour problems were composed of: (1) High rate of labour turn over; (2) High rate of Absenteeism; (3) Poor adoption of new technology by workers; and (4) Health and hygiene issues faced by workers. Technology and Training problems were composed of: (1) Poor level of technology in processing and storage; (2) Low availability of qualified and trained staff; (3) Inadequate support from Government for training; and (4) Increased operating costs due to training needs. Raw materials problems were composed of: (1) Delays in the supply of raw material; (2) Price fluctuations of raw material; (3) Long and sluggish distribution channels; (4) Undue intervention of intermediaries; and (5) Poor credit facility from suppliers. Power and Other Inputs problems were composed of: (1) Unpredictable availability of power; (2) High and unaffordable Cost of power; (3) Low Availability of Fresh water; and (4) Poor transportation and storage facility.

Given the strategic importance of the sector in providing employment and earning foreign exchange, the governments have to prioritize the sector and provide subsidies and financial assistances to the firms to boost their export potential. Established sufficient number of accredited labs to check the presence of impurities and chemical content in raw materials, and ensuring use of technology to effectively remove the contaminants can improve the quality of the products, thereby making it easier to overcome the hurdles posed by the food safety measures imposed by the importers. Improvement in working environment, particularly since employees are continually handling ice and cold water, is extremely important. Hygiene and safety of workplace has to be insisted upon. Sufficient training and technology induction programmes can in a large way affect the attitude of the employees, thereby reducing turnover and absenteeism. Strategic alliances with research institutions can create improvements in productivity and quality of operations, thereby reducing the possibilities of rejection of consignments by importing countries.

CONCLUSION

The study found that the seafood processing export firms face several problems that can be categorized into raw material related, technology and training related, labour related and power and other related problems. It was also found that the labour related problems are the most significant followed by technology and training related. Since both these are intensely related to the employees and production process, focus

have to be on developing policies and strategies, with employees and processes as the key. With the undisputed significance of the sector, it is highly possible that with proper measures, the sector could revive its significance in contributing to employment and foreign exchange generation in the future.

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