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AN ECONOMIC ANALYSIS ON CERTAIN VITAL DYNAMICS OF INDIAN FISH EXPORT

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Abstract

This study on certain vital dynamics of Indian fish export was undertaken with the following specific objectives *viz.*, to assess the composition and direction of Indian fish export, to analyse the reasons hindering 'Direct –fish export' by fishermen. This study was taken up in the national perspective. Both primary and secondary data were used for the analyses. Markov chain analysis identified that European Union and U.S.A. are the reliable partners of Indian fish trade. India depending on very few number of countries for export is perceived as a weakness for the Indian exporters. Indian exporters should be guided and encouraged by agencies like MPEDA, EXIM Bank and Department of Animal Husbandry, Dairying and Fisheries (GOI), so as to be in continuous search for new markets, to maintain their supremacy in international bargaining. Garrett analysis has identified that "Lack of financial support for creating export pre-processing infrastructure", is the major reason hindering direct fish export by fishermen, the prime stakeholder of fish industry. The Government may extend a group lending scheme on line with the norms of Joint Liability Group so as to enable fishermen to take part in international trade. The fishermen may also be engaged in direct fish export through specially formed Fishermen Co-operative Societies. Fishermen Export Councils at identified places may be established for providing continuous guidance and training to solve export related issues. Encouraging and involving Fishermen in fish export would enhance the income of fishermen to much greater heights.

Key words : Fish export, Direction of Trade, Fishermen participation in Trade.

Introduction

India with a fishery production of about ten million tonnes (2016-17) from both captured and cultured source is ranked second among the largest fish producing countries and 5th among the fish exporting countries of the world. During the year 2016-17, the exports of fish products from the country stood at 11,34,948 tonnes with a value of 37,870 crores (MPEDA 2017). Shrimp continued to be the mainstay of fish exports, contributing more than 50 per cent in terms of value. The share of fish products in the total exports of the country was 1.1 per cent and India has a share of 2.58 per cent of the world fish trade (NFDB, 2017).

Before 1960, the markets of Indian fish were largely confined to neighbouring countries like Sri Lanka, Myanmar, Singapore etc., when our exports were dominated by dried items. This situation changed with the development of technology/modernization. Dried products gave way to canned and frozen items. The product shift also resulted in market shift. More sophisticated and affluent markets, *viz.*, Japan, USA, Europe, Australia, etc. became our important buyers. Consequent to the global recession, export of marine product to EU, USA and Japan experienced a stagnation in recent years. India, somehow maintained its export level with the help of other trading partners during the years. The tilt in the direction of international fish trade led exporters to a chaotic market scenario, where in they needed to explore new buyers then and there to sustain their turnover.

The export potential of fish, being immense, an another vital dimension which also needs to be taken care of is, the participation of Fishermen in export business. In a healthy and rational business environment, the producer is expected to be a direct partner in the international trade to certain proportion or atleast he should be aware of the trends in the export business. It's a very serious drawback that Indian fishermen, do not

know anything about his "caught or cultured stock", as it crosses out of his village border. Under this background, the research was undertaken with the following specific objectives.

1. To assess the composition and direction of Indian fish export.
2. To analyse the reasons hindering 'Direct –fish export' by fishermen.

Materials and Methods

Study Area

This study was taken up in the national perspective. The Direction of trade was analysed using the secondary data on countrywise export of fish products. The primary data required for analysing the reasons hindering 'Direct-fish export' by fishermen was collected in the villages around Chennai port. The respondent selection was restricted to a single port considering the time and expenditure limitations. The reference period of the study was 2015-16.

Tools of Analysis

Markov Chain Analysis

The structural change in the countrywise share of export of fish and fish product was analyzed by estimating the transitional probability using Markov chain model. This model is a stochastic process which describes the finite number of possible outcomes S_i (i = 1, 2... r) which is a discrete random variable X_t (t = 1, 2..., t) and which assumes that (a) the probability of an outcome on the t^{th} trial depends only on the outcome of the proceeding trial and (b) this possibility is constant for all time periods (Lee, T.C., G.G. Judge and T. Takayama, 1965).

Central to Markov chain analysis is the estimation of the transitional probability matrix, 'P'. The element 'P_{ij}' of this matrix indicates the probability that exports will switch over from country 'i' to country 'j' with the passage of time. The diagonal element 'P_{ij}' measures the probability that the export share of a country will be retained. An examination of this matrix will indicate the loyalty of an importing country to a particular country's exports.

In the context of the current application, the transitional probability matrix of sea food trade would be estimated for the period from 2006-07 to 2015-16, with major importers of Indian sea food, *viz.*, Japan, USA, European Union, China, Southeast Asian and Middle east countries.

In the study, the average export to a particular country would be considered as random variable which depends only on its past exports to that country and following a first order Markov model, it can be denoted algebraically as,

$$E_{jt} = \sum_{i=1}^{r} E_{it-1} \quad P_{ij} + e_{ij}$$

where,

E_{jt} = Exports from India during the year 't' to j^{th} country.

E_{it-1} = Exports to i^{th} country during the year t-1.

P_{ij} = The probability that exports will shift from i^{th} country to j^{th} country.

e_{ij} = The error term which is statistically independent of E_{it-1}

r = The number of importing countries.

The transitional probabilities P_{ij}, which can be arranged in a [c x r] matrix have the following properties.

$$0 \leq P_{ij} \leq 1.$$

$$\sum_{i=1}^{r} P_{ij} = 1 \text{ for all i.}$$

Thus, the expected export shares of each country during period 't' can be obtained by multiplying the exports to these countries in the previous period (t-1) with the transitional probability matrix. Similarly, the future export shares of the importing countries is estimated.

The transitional probability matrix is estimated in the Linear Programming (LP) framework by a method referred to as minimization of Mean Absolute Deviation (MAD). The LP formulation is stated as:

Min OP* + Ie

Subject to;

XP* + V = Y

GP* = 1

P* $\geq$ 0.

Where,

P* is a vector of the probability P_{ij}

O is a vector of zero

I is an appropriately dimensional vector of areas

e is the vector of absolute errors

Y is the vector of exports to each country

X is a block diagonal matrix of lagged values of Y

V is the vector of errors

G is a grouping matrix to add the row elements of P arranged in P*, to unity.

The Garrett Ranking Technique

Ranking is an expression of the respondent's priority about their thoughts and feelings. Garrett and Woodworth (1971) for converting the ranks into scores, when the number of items ranked differ from respondent to respondent. The conversion method used is as follows.

As a first step, the per cent position of each rank was found out by the following formula:

$$\text{Percent Position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

Where,

R_{ij} – rank given for i^{th} factor by j^{th} individual

N_j – number of factors ranked by j^{th} individual

The per cent position of each rank, thus, obtained was then converted into scores by referring to the table given by Garrett. The respondents were requested to rank the opinions / reasons relevant to them according to the degree of importance. The ranks given by each of the respondents were converted into scores. Then for each reason, the scores of individual respondents were added together and divided by the total number of respondents. These mean scores for all the reasons were arranged in the descending order and ranks were given. By this method, the accuracy in determining the preference was obtained. In this study, the Garrett ranking Technique was used to rank the reasons hindering 'Direct-fish export' by fishermen and also used to rank the feasible remedial measures to address the issue.

Results and Discussion

Direction of Indian Fish Trade

An attempt was made to forecast the future direction of Indian fish trade using Markov Chain Analysis. The results of the analysis would help to identify the reliable trading partners and assess the probability of retention of old partners, in fish trade.

Markov Chain Analysis on the Direction of Indian Fish Export

An assessment on the possible changes in the countrywise direction of export and probable degree of consistency of the trading partners, is inevitable for a country to decide at its future policy framework. On this account, the Markov-chain analysis was employed and the transition probabilities and steady state probabilities pertaining to different trading partners of fish trade were computed. Markov analysis is the way of analyzing the current movement of variable in an effort to predict its future movement. In the transition probability matrix, the rows identify the current state of fishery export to different countries and the column identify the alternatives to which the export pattern could move. Here the row probabilities are associated with export retention and shift to other countries while the column probabilities are associated with export retention and shift towards the country further adding to the share. The diagonal elements represent probability of retaining the same level of export with a specific country.

The transition probabilities and steady state probabilities of Indian fishery export were computed separately for 'Value of export' and 'Quantity of export' as presented in table 1 & 2 respectively.

Quantitywise Transition Probabilities and Steady State Probabilities of Direction of Indian Fish Export

The transition and steady state probabilities computed based on Quantity of fish export to different countries reveal the following inferences.

(i) The probability of retention of the present quantity of Indian fish export to U.S.A is estimated to be 47.5 per cent, Middle East countries –36.9 per cent and Japan –30.6 per cent. For other countries, it is found to be still less.

(ii) The analysis reveals that, quantity wise, probability of shifting of export from South East Asian countries to Japan was 37 per cent, Middle East countries to U.S.A was

Table 1: Quantitywise Transitional Probabilities and Steady State Probabilities of Direction of Indian Fish Trade.

Country	Japan	USA	European Union	South East Asia	China	Middle East	Others
Japan	0.30634	0.074403	0.00568	0.0535	0.084018	0.202	0.273869
USA	0.054919	0.475486	0.027497	0.0116	0.0347	0.136652	0.259159
European Union	0.197685	0	0	0.038987	0.028129	0.135535	0.599664
South East Asia	0.372028	0	0	0.073371	0.052938	0.255067	0.246597
China	0.222709	0	0.036298	0	0.140764	0	0.60023
Middle East	0.190516	0.249854	0	0.037573	0.027109	0.368665	0.126283
Others	0.133676	0.181814	0.0329	0.006929	0.101501	0.007306	0.535884
Steady State Probabilities	0.165202	0.212569	0.0223	0.020717	0.076194	0.116135	0.386889

Table 2: Valuewise Transition Probabilities and Steady State Probabilities of Direction of Indian Fish Export.

Country	Japan	USA	European Union	South East Asia	China	Middle East	Others
Japan	0.179222	0	0.421525	0	0.142903	0.118736	0.137614
USA	0.113425	0.292822	0.194403	0.263532	0.002717	0.0292	0.104
European Union	0.172456	0.036314	0.523187	0.012154	0.17973	0.006022	0.070137
South East Asia	0.125648	0.443542	0	0.401149	0	0.015415	0.014246
China	0.141008	0.242439	0.114758	0.163	0.258462	0.0285	0.051694
Middle East	0.020767	0.434	0	0.535312	0	0.00734	0.002355
Others	0.014146	0.052009	0	0.367076	0.0884	0.239003	0.239375
Steady State Probabilities	0.126814	0.216779	0.218527	0.21997	0.0865	0.048657	0.08278

25 per cent and South East Asian countries to Middle East countries was 26 per cent.

(iii) The steady state probabilities show that if the trend continues like this, in future, quantity wise, 16.52 per cent of Indian fish export would go to Japan, 21.26 per cent to USA, 2.23 per cent to European Union, 2.07 per cent to South East Asian countries, 7.62 per cent to China, 11.61 per cent to Middle East countries and 38.69 per cent to other trading partner countries.

Valuewise Transition Probabilities and Steady State Probabilities of Direction of Indian Fish Export

The transition and steady state probabilities computed based on Value of fish export to different countries reveal the following inferences.

(i) The probability of retention of the present level (value wise) of Indian export are higher with the following countries *viz.*, European Union (52.31 per cent), South East Asian countries (40.11 per cent) and U.S.A. (29.28 per cent). The probabilities indicate that the above referred countries could be treated as comparatively better consistent trading partners.

(ii) The analysis reveals that, value wise probability of shifting of export from Japan to European Union countries is 42.15 per cent, U.S.A. to South East Asian Countries 26.35 per cent, China to U.S.A is 24.24 per cent and South East Asian Countries to U.S.A is 44.35 per cent.

(iii) The estimated steady state probabilities reveal that, in future the present trend would get settled down with 12.68 per cent of Indian fish export to Japan, 21.68 per cent to U.S.A, 21.85 per cent to European Union, 21.99 per cent to South East Asian countries, 8.65 per cent to China, 4.86 per cent to Middle East countries and 8.28 per cent to other countries.

In the context of foreign exchange earnings vis-à-vis fish exports, the 'Value of fish export' is more important than 'Quantity of fish Export'. Considering the retention probability and steady state probability, South East Asian countries would prove to be a better market for Indian fish exporters, followed by U.S.A and European Union. But, an another point which has to be taken into consideration is that, the export to South East Asian countries is higher in recent years because of the reduction in their domestic production of inland fish especially shrimp, due to the outbreak of the viral disease, Early Mortality Syndrome (EMS). The export scope to South East Asian countries, in future may be less if they recuperate from their referred setback.

Markov Chain Analysis on the Direction of Indian Shrimp Exports

Since Shrimp Export continues to be the major item of export, it becomes important to fore see its future trend for policy revamps. The transition probabilities and steady state probabilities of Indian shrimp export were computed separately for 'Quantity of export' and 'Value of export'

Table 3: Quantitywise Transitional Probabilities and Steady State Probabilities of Direction of Indian Shrimp Trade.

Country	South East Asia	USA	European Union	Others	China	Middle East	Japan
South East Asia	0.192378	0.050414	0.434982	0	0	0.121034	0.201193
USA	0.252682	0.234953	0.333309	0.0388	0.0427	0.0188	0.78668
European Union	0.179531	0.154	0.460825	0.043509	0.010851	0.05481	0.096557
Others	0.197724	0.158721	0.332588	0.00504	0.021736	0.096245	0.187941
China	0.026805	0.007024	0.921274	0	0	0.016864	0.028033
Middle East	0.218899	0.422043	0.064861	0.0162	0.076267	0.038939	0.162814
Japan	0.104068	0.060548	0.702536	0.005942	0.00E+00	0.047668	0.079238
Steady State Probabilities	0.184439	0.149998	0.445304	0.027003	0.016432	0.060331	0.116494

Table 4: Valuewise Transitional Probabilities and Steady State Probabilities of Direction of Indian Shrimp Trade.

Country	South East Asia	USA	European Union	Others	China	Middle East	Japan
South East Asia	0.276	0.019495	0.355244	0	0.007848	0.144412	0.196706
USA	0.212723	0.319994	0.306579	0.0449	1.87E-02	0.00395	0.093131
European Union	0.196965	0.185	0.457236	0.032364	0.0106	0.048334	0.069266
Others	0.195813	0.0187063	0.413242	0.01192	0.01062	0.053851	0.127491
China	0.292887	0.021116	0.308012	0	0.008501	0.156421	0.213064
Middle East	0.220782	0.540307	0	0.035757	0.023474	0.007315	0.172366
Japan	0.204859	0.0854	0.549437	0.001831	0.00453	0.061649	0.092291
Steady State Probabilities	0.220767	0.182093	0.386712	0.023423	0.01156	0.061745	0.113701

as presented in table 3 & 4 respectively.

Quantitywise Transition Probabilities and Steady State Probabilities of Direction of Indian Shrimp Export

The transition and steady state probabilities computed based on Quantity of Shrimp export to different countries reveal the following inferences.

(i) The probability of retaining the present quantity of shrimp export to European Union is estimated to be 46.08 per cent followed by U.S.A (23.49 per cent) and South East Asian countries (19.24 per cent).

(ii) The Markov analysis results show that, quantity wise, probability of shifting of export from South East Asian countries to European Union is found to be 43 per cent, U.S.A. to European Union is 33.3 per cent, China to European Union is 92 per cent, Middle East to S.A. is 42 per cent and Japan to European Union is 70 per cent.

(iii) Steady State Probabilities reveal that in future, quantitywise India would export 44.5 per cent of total Shrimp to European Union, 18.4 per cent to South East Asians countries, 15 per cent to U.S.A. and 11.6 per cent to Japan.

Valuewise Transition Probabilities and Steady State Probabilities of Direction of Indian Shrimp Export

The Markov analysis undertaken based on the 'Value of Shrimp export' reveal the following inferences.

(i) The probability of retention of the present value of Indian Shrimp export is estimated to be higher with European Union (45.72 per cent), followed by U.S.A. (31.99 per cent) and South East Asian countries (27.63 per cent).

(ii) Markov analysis also reveals that in future, 54.94 per cent of Shrimp by value, exported to Japan, 30.00 per cent of shrimp exported to U.S.A., 35.52 per cent of shrimp exported to South East Asia and 30 per cent of shrimp exported to China may get shifted to European Union. These estimates confirm that European Union might be a reliable trading partner.

(iii) With regard to steady state probabilities, the probability share in future Indian Shrimp trade is estimated to be higher with European Union (38.67 per cent) followed by South East Asian countries (22.08 per cent) and U.S.A. (18.21 per cent).

The overall inferences derived from the Markov-chain analyses on the direction of trade of fish in general and shrimp in specific are presented below.

(i) In recent years, South East Asian countries dominate in importing Indian fish esp. shrimp (P. Vannamei). This scenario seems to be volatile since quantity of their imports primarily depends on the quantity of their domestic production, which was at stake in recent past due the outbreak of the viral disease Early Maturity Syndrome (EMS).

(ii) The other reliable markets are *viz.*, European Union countries, U.S.A. and Japan. Dependence on very few countries for fish trade does not prove to be a healthy trend. Indian fish trade should be promoted in many countries, esp. in countries where fish production feasibility is less.

Reasons Hindering direct-fish export by Fishermen

The prime stakeholder of any export business is none other than the producer of the commodity. Unfortunately, in the fish export business, the prime stake holder namely the fishermen are totally unaware of certain vital facts like, who is exporting it, at what price it is exported, to which country it is exported. Lack of market intelligence reduces their bargaining power. Of course, we may have to endorse the fact that an exporter as an individual, may not like to reveal his trade secrets, which he acquired after a course of struggle and experience, to a fishermen. But for this single and simple reason a fishermen, the producer of the fish, cannot be denied of his due share since he is ignorant.

Fishermen are in the business for generations together and had they been included in the process of nation's inclusive development, by this time they should have got

evolved as a producer cum exporter. He is the one who taught others the secrets of ocean and quality of fish stock with his traditional knowledge during the initial years of fishery research. He is fully eligible to be a partner of nation's fish trade. But this did not happen yet. Hence an attempt was made to probe and rank the reasons hindering direct fish export by fishermen as an individual or as a Joint Liability Group/Association and the remedies to be thought of to achieve the objective. The results are presented in Table 5 & 6.

As per Garrett ranking, out of the seven reasons identified, for fishermen not getting involved in direct export business, the reason "Lack of financial support for creating export – pre processing infrastructure" ranked first, followed by the reasons "Unaware of export formalities" and "Unaware of quality standards required for fish export".

Table 5: Reasons Hindering Direct-Fish Export by Fishermen.

Sl. No.	Reason	Garrett Mean Score	Rank
1.	Lack of financial support for creating export-preprocessing infrastructure	65.82	I
2.	Unaware of export formalities	64.73	II
3.	Unaware of the quality standards required for fish export	52.62	III
4.	Lack of global trade information	49.90	IV
5.	Lack of supportive common infrastructure facilities	39.30	V
6.	Presumes illiteracy as a barrier	38.12	VI
7.	Wants to evade financial risk	36.42	VII

The results also reveal that, though fishermen are illiterate and lack sound financial back-up they are confident of undertaking export business if guided properly. This is evident from the fact that, in the Garrett rank analysis the reasons *viz.*, "Presumes illiteracy as a barrier" and "Wants to evade financial risk" occupied the last ranks, the sixth and seventh respectively.

Preferred Remedies for the Major Reasons Hindering Direct Fish Export by Fishermen

An attempt was made to rank the remedial measures preferred, in fishermen's perspective for addressing the reasons identified for fishermen's non-involvement in export business.

Lack of Financial Support for Creating Export Pre-Processing Infrastructure

Traditionally, fishermen reside on sea-shore. They do not even possess a legal ownership deed for the land in which they reside. The fixed asset position of fishermen are, in general very low. This is the reason why they are unable to get financial assistance from banks for establishing "Export Pre-processing Units", the cost of which runs in crores. As given in table 6 the best remedy suggested is "Group lending scheme on line with the norms of Joint Liability Group". Mutual moral security among group members would ensure promp repayment, the fact which got proved by the successful SHG model.

The next best remedy suggested by

Table 6: Preferred Remedies for the Major Reasons Hindering Direct Fish Export by Fishermen.

Reason-I: Lack of financial support for creating export pre-processing infrastructure			
Sl. No	**Remedial Measure**	**Garrett Mean Score**	**Rank**
1.	Group lending scheme on line with the norms of Joint Liability Group	62.7	I
2.	Engaging in export through specially formed Fishermen Co-operative Societies	48.9	II
3.	Financing to individuals with collateral security	32.5	III
Reason-II: Unaware of export formalities			
Sl. No	**Remedial Measure**	**Garrett Mean Score**	**Rank**
1.	Establishing Fishermen export-councils for guidance to solve export related issues	58.2	I
2.	Providing periodical training to innovative fishermen by existing, relevant institutional agencies	49.3	II
3.	Government directly involving in fish trade by creating a special agency to support fishermen	39.2	III
Reason-III: Unaware of quality standards required for fish export			
Sl. No	**Remedial Measure**	**Garrett Mean Score**	**Rank**
1.	Establishing Fishermen export-councils for guidance related to export quality standards	72.8	I
2.	Providing periodical training to innovative fishermen by existing, relevant institutional agencies	58.7	II
3.	Government directly involving in fish trade by creating a special agency to support fishermen	41.2	III

fishermen was to engage fishermen in export through specially formed 'Fishermen Co-operative Societies' facilitated by Government. Functioning and engaging as a society in trade would enhance the bargaining power and also would complement to better market intelligence, there by sustaining the performance even in longer run.

Unaware of Export Formalities

Knowledge on export formalities is new even to a highly literate man if he is not accustomed to the specific field of export business. Hence, it is understandable that fishermen, whose literacy level is much limited, may not be aware of the export formalities. For addressing this constraint, the remedy suggested is establishment of "Fishermen Export-Councils" at identified places for continuous guidance and training to solve export related issues. The functioning of the council may be designed in such a way that it delivers result oriented counselling, guidance, support and training for matters related to fish export.

Unaware of Quality Standards Required for Fish Export

Awareness on HACCP standards, compliance with EU approval norms, Eco-labelling procedures and other private standards of international buyers, is very much essential for a fish exporter. The fore most remedy suggested for a fishermen getting accustomed to all above mentioned and more of such standards, is to establish a 'Fishermen Export Council' at identified centres. 'Fishermen Export Council' should handle these referred fish export issues in a focused and holistic fashion.

These suggestion and remedies in fishermen's perspective would enhance the role of fishermen, the prime stakeholder of fishery business, in fish export. This could improve the livelihood standards of the fishermen who are ignored in the process of development, for generations together, as well as would contribute to nations foreign exchange reserve.

Conclusion and policy implication

1) Markov chain analysis identified that European Union and U.S.A. are the reliable Partners of Indian fish trade. India depending on very few number of countries for export is perceived as a weakness for the Indian exporters. Indian exporters should be guided and encouraged by agencies like MPEDA, EXIM Bank and Department of Animal Husbandry, Dairying and Fisheries (GOI), so as to be in continuous search for new markets, to maintain their supremacy in international bargaining.

2) Garrett analysis has identified that "Lack of financial support for creating export pre-processing infrastructure", is the major reason hindering direct fish export by fishermen, the prime stakeholder of fish industry. The Government may extend a group lending scheme on line with the norms of Joint Liability Group so as to enable fishermen to take part in international trade. The fishermen may also be engaged in direct fish export through specially formed Fishermen Co-operative Societies. Fishermen Export Councils at identified places may be established for providing continuous guidance and training to solve export related issues. Encouraging and involving Fishermen in fish export would enhance the income of fishermen to much greater heights.

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