Growth performance and trade direction of Indian fish products

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ABSTRACT

The present study analyses the growth performance of production and export of fish products and its trade direction. The results of the study revealed that fish production of India has registered a annual growth rate of 3.8 per cent. Among the major fish producing states, Chhattisgarh has witnessed highest compound growth rate of 15 per cent per annum. The vast production base offers India has tremendous opportunities for enhancing surplus exportable quality fish products. During 2014, India exported about 983.756 million tonnes of fish products to South East Asian countries. Frozen shrimp is the major export value item accounting to the value of 19368.3 crore rupees. It can be observed that among the fish products, dried fish has registered a highest growth rate of 21 and 26 per cent per annum in terms of quantity and value respectively. It can be further noticed that South East Asia has been the most stable market among the major importers of Indian fish products as reflected by the higher probability of retention of 0.85 whereas Japan has shown the least retention probability of 0.36 which has only retained 36 per cent of its share in export.

Keywords: Indian fisheries, growth rate, trade direction export performance and markov chain

Indian fisheries and aquaculture is an important sub sector of food production providing nutritional security to the food basket, contributing to the agricultural exports and providing employment to about fourteen million people. Fisheries is being a predominant industry in the coastal states of the country and has its role in increasing food supply, generating job opportunities, raising nutritional level and earning foreign exchange. According to the FAO, the fish production in India has increased by ten folds between 1990 and 2010. India stands third in global fisheries and second in aquaculture with 8,118 kilometres of marine coastline, 3,827 fishing villages and 1,914 traditional fish landing centres. India's fresh water resources consist of 195,210 kilometres of rivers and canals, 2.9 million hectares of minor and major reservoirs, 2.4 million hectares

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of ponds and lakes, and about 0.8 million hectares of flood plain wetlands and water bodies. The country has 429 Fish farmers' development agency and 39 brackish water fish farms development agencies for promoting fresh water and coastal aquaculture.

India contributes about 4.4 per cent to the global fish production. Presently, fisheries and aquaculture contribute 1.1 per cent to the national GDP and 5.3 per cent to agriculture and allied activities. Fish production in the country during the year is 6.4 million metric tonnes with inland fisheries contributing about 3.4 million metric tonnes and marine fisheries contribution of 3 million metric tonnes. Major contribution towards fish production of the country is from the coastal states with West Bengal having the highest production of 508.89 metric tonnes followed by Andhra Pradesh and Gujarat with production of 358.68 and 294.92 metric tonnes respectively (FAO, 2014).

India is a major supplier of fish in the world. Fish and fish products have presently emerged as the largest group in agriculture exports of India. During 2014 India exported about 983.756 million tonnes of fish products accounting to total value of 30213.26 crore rupees. South East Asian countries are the major importers of marine products from India. During 2014, the quantity exported to these countries was 380 million tonnes, followed by European Union with 174.68 million tonnes. Other major importers include US, Middle East, Japan and China. Frozen shrimp is the major export value item followed by frozen fish, frozen cuttlefish, frozen squid, dried item and live items. Considering the increase in production and better export performance of fishery sector, the present study has been taken up with some specific objectives i.e. (1) to estimate growth of fish production in India, (2) to study the growth pattern in exports, and trade direction of fish products export from India

Database and Methodology

The time series data on production and export for a period of 1990-91 to 2013-14 was collected from MPEDA agri-exchange website, National Fisheries Development Board and other related websites, published literatures, etc. The growth rate and Markov chain analytical tools were used in the study.

The growth rates of fish production were computed for major states of India. Annual growth rate was used to assess production of fish by using the following exponential growth function.

$$Y = a\, b^{t} e \qquad (1)$$

Where

- Y = Fish production for which growth rate is estimated
- a = Intercept
- b = Regression coefficient
- t = Time period ranging from 1999-2014
- e = Error term

The trade directions of Indian fisheries exports was analysed using the first order Markov chain approach (Jayesh, 2001). In the context of the current application, five major importing countries of fish products were considered. The average exports to a particular country was considered to be a random variable which depends only on the past exports to that country, which can be denoted algebraically as:

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

Where,

- E_{jt} = Exports from India to j th country during the year t.
- E_{it-1} = Exports to i thcountry during the period t-1.
- P_{ij} = Probability that the exports will shift from i th country to j th country.
- e_{jt} = The error term which is statistically independent of E_{it-1}.
- t = Number of years considered for the analysis (13 years)
- r = Number of importing countries (5 countries)

The transitional probabilities P_{ij} which can be arranged in a (c * r) matrix, have the following properties.

$$O \le P_{ij} \le 1$$

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

Thus, the expected export shares of each country during period't' were obtained by multiplying the export to these countries in the previous period (t-1) with the transitional probability matrix. The conventional linear programming technique was used, as this satisfies the properties of transitional probabilities of non-negativity restrictions and row sum constraints in estimation. The linear programming formulation is stated as:

$$\text{Min } OP^* + Ie$$

Subject to,

$$XP^* + V = Y$$

$$Z \quad GP^* = 1$$

$$P^* \geq 0$$

Table 1: Growth of fish production in India (1999-00 to 2013-14)

Year	West Bengal	Andhra Pradesh	Gujarat	Maharashtra	Kerala	Karnataka	Tamil Nadu	Bihar	Uttar Pradesh	Chhattisgarh	India
1999-00	1045.70	547.06	741.28	533.29	667.85	292.3	475.00	254.74	192.71	20.40	5675.03
2000-01	1060.23	589.69	660.74	526.10	651.81	303.38	481.42	222.16	208.29	43.39	5655.35
2002-02	1100.10	676.11	701.60	537.05	671.82	249.61	485.00	240.40	225.37	95.76	5955.93
2002-03	1120.00	827.90	777.91	514.10	678.32	266.42	437.50	261.00	249.84	99.80	6199.68
2003-04	1169.60	944.64	654.62	545.13	684.70	257.00	474.14	266.49	267.00	111.05	6399.39
2004-05	1215.00	853.05	635.21	548.02	678.31	251.23	459.43	267.51	277.07	120.07	6304.75
2005-06	1250.00	891.09	733.82	580.55	636.89	297.57	463.03	279.53	289.58	131.75	6571.62
2006-07	1359.10	856.93	747.33	595.94	677.63	292.46	542.28	267.04	306.73	137.75	6869.05
2007-08	1447.26	1010.08	721.91	556.45	667.33	297.69	559.36	319.10	325.95	139.37	7126.83
2008-09	1484.00	1252.78	765.90	523.10	865.99	361.85	534.17	300.65	349.27	158.70	7616.09
2009-10	1505.00	1293.86	771.50	538.35	663.12	408.05	534.17	297.40	392.93	174.25	7853.15
2010-11	1443.26	1368.20	774.90	595.25	681.61	526.58	614.81	299.91	417.48	228.21	8230.71
2011-12	1472.05	1603.17	783.72	578.79	693.21	546.44	611.49	344.47	429.72	250.70	8666.45
2012-13	1490.02	1808.08	788.49	586.37	679.74	525.57	620.40	400.14	449.75	255.61	9040.36
2013-14	1580.65	2018.42	793.42	602.68	708.65	555.31	624.30	432.30	464.48	284.96	9578.91
CAGR	3.16	8.96	1.05	0.82	0.46	6.09	2.46	3.74	6.56	15.02	3.84

CAGR: Compound Annual Growth Rate (per cent)

Source: www.mpeda.com

Table 2: Export of fish products from India (1999-00 to 2013-14)

Value in Rs. crore & Qty in million tonnes

Year	Frozen Shrimp		Frozen Fin Fish		Frozen Cuttlefish		Frozen Squid		Dried items		Live items		Chilled items		Others	
	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value
1999-00	110275	3645.22	131304	537.34	32799	286.22	34918	296.8	6853	44.33	1678	37.99	3088	44.97	22116	223.81
2000-01	111874	4481.51	212903	874.68	33677	288.99	37628	324.43	7532	70.22	1844	39.88	3820	71.63	31195	292.54
2001-02	127709	4139.92	174976	713.11	30568	280.07	39790	329.67	8307	67.96	1628	40.57	3284	63.66	38209	322.09
2002-03	134815	4608.31	196322	841.65	41381	417.09	37838	384.37	8178	84.23	2115	53.66	3350	59.14	43299	432.88

2003-04	129768	4013.07	138023	620.73	39610	435.17	37832	372.92	12574	145.68	2341	51.1	3779	64.03	48090	389.23
2004-05	138085	4220.67	159689	759.27	44239	474.01	48124	477.26	9692	121.01	2262	50.75	3988	68.14	55250	475.58
2005-06	145180	4271.51	182344	998.7	49651	549.15	52352	575.52	14167	132.56	2568	61.71	5060	81.56	60841	574.58
2006-07	137397	4506.08	270751	1452.88	55701	797.37	47252	568.32	24293	183.16	2478	64.06	7200	117.3	67571	674.35
2007-08	136223	3941.62	220200	1303.41	45955	744.13	34172	408.42	22414	258.88	2498	69.07	6541	118.11	73698	777.29
2008-09	126039	3779.8	238544	1722.34	50750	761.05	57125	632.35	31688	420.75	3434	99	21453	217.34	73801	975.33
2009-10	130553	4182.35	260979	2032.33	63504	923.83	61445	622.63	47053	981.11	5492	139.14	28817	264.49	80592	902.64
2010-11	151465	5718.13	312358	2623.89	59159	1104.57	87579	1010.57	79059	954.94	5208	142.15	21118	257.54	97145	1089.67
2011-12	189125	8175.26	347118	3284.15	54671	1346.72	77373	1228.19	53721	562.65	4199	154.61	21278	357.42	114538	1488.24
2012-13	228620	9706.36	343876	3296.86	63296	1354.28	75387	1378.08	72953	819.9	4373	197.89	26868	537.11	112841	1565.78
2013-14	301435	19368.3	324359	4294.81	68577	1386.98	87437	1731.97	67901	998	5080	281.85	19755	527.84	109212	1623.5
CAGR	4.95	7.56	6.40	15.42	5.46	13.54	6.88	12.59	21.64	26.44	9.19	14.81	20.02	19.88	11.28	15.16

CAGR: Compound Annual Growth Rate (per cent)
Source: www.mpeda.com

Table 3: Transitional probability matrix for export of fish products

Country	Japan	USA	European Union	China	South East Asia	Others
Japan	0.36905	0.06523	0.04286	0.52286	0.00000	0.00000
USA	0.00000	0.75791	0.24209	0.00000	0.00000	0.00000
European Union	0.06635	0.00000	0.75723	0.00000	0.00000	0.17642
China	0.16610	0.00000	0.11907	0.68973	0.02510	0.00000
South East Asia	0.04134	0.08273	0.00000	0.00000	0.85884	0.01710
Others	0.00000	0.00000	0.00000	0.00000	0.44333	0.55667

Where,

0 is the vector of zeroes.

P* is the vector in which probability P_{ij} are arranged.

I is an apparently dimensioned vector of area.

e is a vector of absolute error (1 U 1).

Y is the vector of export to each country.

X is the block diagonal matrix of lagged values of Y

V is the vector of errors

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

Using the estimated transitional probabilities, the exports of fish products to various destinations were predicted by multiplying the same with the respective shares of base year.

Results and Discussion

Growth of fish production in India is presented in Table-1. The production of fish has been showing an increasing trend and has registered a positive compound growth rate of around 4 per cent per annum. Among the major fish producing states Chhattisgarh has registered the highest annual growth rate of 15 per cent followed by Andhra Pradesh, Uttar Pradesh and Karnataka.

The export performance of fish products can be seen from Table-2. It is evident from the table that Frozen

shrimp is the major export value item accounting to the value of about 19368.3 crore rupees followed by frozen fish, frozen cuttlefish, frozen squid, dried item and live items, whereas the highest annual growth rate could be seen in dried fish registering an annual growth rate of 21 and 26 per cent in terms of quantity and value respectively.

The trade direction of fish products to different importing countries was studied by estimating the transitional probability matrix using the Markov chain framework. Transitional probabilities are presented in Table 3 which depicts a broader idea of change of the direction of trade over a period of thirteen years. There were five major countries, which imported fish products from India *viz*., South East Asia, USA, European Union, China, and Japan. The exports to remaining countries were pooled under the 'other' countries.

It is evident from the table that South East Asia has been the most stable market among the major importers of Indian fish products as reflected by the higher probability of retention of 0.85884 i.e., the probability with which South East Asia had retained its export share is 85 per cent over the study period. Thus, South East Asia was the most reliable and loyal market for Indian fish products. USA and European Union have shown probability retention of 0.75 and 0.75 respectively, which has retained its export share of 75 per cent each. China has shown the retention probability of 0.68 which has retained 68 per cent of share in fish product export from India. Japan has shown the least retention probability of 0.36 which has retained only 36 per cent of its share in export; other countries have also shown the good retention probability of 55 per cent. So it can be concluded from the table that South East Asia is the most stable market followed by USA and European Union and Japan being the least stable market. It can be seen from the figure that Japan has lost 55 per cent of its share to China, whereas it has gained as less as 16 per cent share from the same country. USA has lost 24 per cent share to European Union and has gained 11 per cent share from China. South East Asia has retained its share of 85 per cent and has also gained 44 per cent from other countries.

Conclusion

Though fisheries are one of the high potential sectors, it has been neglected for various reasons. If properly organised and regulated, fisheries sector can add to the food and nutritional security of the country. Attempts has to be made for replacing the highly unorganised and unregulated auction system of fish marketing by co-operative federations to ensure better prices to fishermen. The transportation and storage of fisheries needs to be facilitated by providing proper infrastructure. There is tremendous scope for increasing the export of quality fish products from India due to the ever increasing demand for Indian fish products in the International market. Even though there are number of organisations and policies related to promotion of fish marketing in the country still there is a need to formulate a uniform market policy for fishes, so that it can ease operation and regulation.

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