



Indian Marine Products Export: Growth, Market Instability, And Forecast Analysis

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Citation: Amulya Kumar Sahoo, et al, (2023) Indian Marine Products Export: Growth, Market Instability, And Forecast Analysis, *Educational Administration: Theory and Practice*, 29(4), 1365-1373
Doi: 10.53555/kuey.v29i4.5238

ARTICLE INFO

ABSTRACT

The marine economy for India means a vast ocean of economic opportunities playing an important role in generating and sustaining livelihoods. India's Marine economy supports 95% of its business through transportation and contributes an estimated 4% to its Gross Domestic Product (GDP). Among these, the marine fisheries sector plays a vital role in India's national economy in multiple ways, providing livelihood and contributing to economic growth, and generating employment opportunities. It is not only providing job to about 16 million fisher folk and fish farmers at the primary but also contributing solving food security problems and poverty reduction. In this paper, the primary focus will be on India's economic growth concerns in the marine sector, namely fisheries. This study examines the export performance of marine fish from India from 2009-2021 using the panel data extracted from the official portal of Marine Products of the Export Development Authority (MPEDA). The study also aims to investigate the growth and instability of market in terms of quantity and value. Adding to these, the study is also a forecast of the marine product export in terms of amount and market needs.

Keywords: Marine Economy, Food Security, Poverty, Export Performance, Instability.

Introduction

Professor Gunter Pauli first introduced Marine Economy as an idea in 1994. It achieved a large amount of attention only the recent 2012 Rio+20 Conference. When people in India think of "marine economy," they may only think of economic activities that take place on the water. Oceanic economic activities constitute a crucial aspect of the marine economy; however the term "marine economy" does not encompass all types of water-based industries or even only maritime ones. The term "marine economy" encompasses an expansive and multifaceted field. It spans both established sectors of the ocean economy like shipping and fishing, as well as newer ones like offshore aquaculture, sea bed extractive activities, bioprospecting, and marine biotechnology. Among these, the fisheries sector is crucial to India's national economy in numerous ways. alone providing livelihood, contributing to economic growth, and generating employment opportunities. It is not only to about 16 million fisher folk and fish farmers at the primary but also food security problems and poverty reduction. In this paper, the major focus will be the Economic growth of India with reference to the marine economic sector namely fisheries of India's total fish output of 14.73 MMT, 3.48 MMT came from the marine industry. The fishing industry is an important part of the national economy and a major source of revenue for the government abroad. Sixty-six percent of the marine fisheries were taken out in the year 2020-21. In 2021, India would account for 5.41 percent of the world's total marine fish output. When it comes to global fish production, India is in second place.

Aquaculture in India has become an important contributor to the nation's food supply. At the present time, fisheries and aquaculture are responsible for 0.83 percent of the national GDP and 4.75 percent of agricultural and allied activities. Over the past decade, India's marine product output has increased annually. The marine fish export which was 678436 Mt in 2009-10 has increased to 1149341Mt in 2020 - 21. This reflects the potential for increasing marine fish exports from India. In order to determine which international market is best suited for Indian marine products, this study aimed to examine the growth and volatility of exports to the United States, Japan, ASEAN (South East Asian Countries), the European Union, and the Middle East. The export of marine products is vital to the Indian economy, hence attempts have been made to predict how much would be shipped and to which markets using ARIMA (Autoregressive Integrated Moving Average) models. This not only enables the policymakers and exporters to plan strategies for the different market but also increase the volume of export for the forthcoming years.

Literature Review

After reviewing various past research articles from different sources both online and offline the above issues are addressed. According to Poulomi Bhattacharya and Aruna Kumar Dashe(2020) size of the blue economy is not only determined by the size of the blue economy and GDP but also sustainable use of the marine resources. The current governance framework of marine resource management is explored by Aparna Roy (2019) and recommended ways for blue economy governance in order to address pressures and ensure sustainable development in the region. B. Swaminathan, V. D. Tarpara, M. G. Dhandhalya (2018) compared the export growth rates of marine products of India during the pre and post of WTO periods and revealed that the growth rate was positive during the pre WTO periods which gradually declined in post WTO periods. Islam, M. K., Rahaman, M., & Ahmed, Z. (2018) has presented the blue economy scenario of Bangladesh and concluded that with out skilled ,trained and educated human resources it is very difficult to sustain the marine resources production and export.N. Manjunath, H. Loksha, and B.Jagrati Deshmanya, (2017) explored that the major factors responsible of increase in growth marine goods export are the change in consumption pattern and increasing demand for animal products whereas Das, A., Kumar, N. R. and Rani, P. (2016) explored from their study that the major export market of Indian marine export mainly concentrated in Japan, the USA, the European Union, Southeast Asia and the Middle East countries. Ancy, V. P., and Raju, K. V. (2016) in their research paper revealed that infusion of appropriate technologies, new commercial policies, and introduction of new processing industries are major responsible of growth in marine production. D. K. Kusuma and H. Basavaraja, (2014) have found that the efficiency of production and price competitiveness are major determinants of exported items. P. Parvathy and D.Rajaseenan had concluded that though there is a free trade agreement between India and ASEAN countries(TIGA) as but it fails to expand market for India specially for the marine products due to the reason mostly prominent exported items are included in the restrictive lists of ASEAN nations. Shinoj, Ganesh Kumar, Joshi and Datta (2009) found that apart from other determinants of export of marine products from India the agreement on Sanitary and Phytosanitary (SPS) measures has emerged one of the a major determinant Rajeev (2009) has concluded that the adoption liberalization policy in 1991 is one of the game changer policy for fisheries sector basically export of marine fish which not only legalized fishing in deep sea but also attract MNC companies to invest in Indian marine sectors.

Methodology and Sources of DATA:

Various government published sources and the Marine Products Export Development Authority website portal were used to compile the secondary time series data used in the study, Kochi during last 12years starting from 2009-2021(MPEDA,2021) and hand book of statistics of fisheries. Both the commodity make-up and the final destinations for exported marine products are examined to shed light on the structural shifts that have taken place in this sector. Countries in the Middle East, Europe, Asia, and Southeast Asia Japan, the United States, and Southeast Asia the European Union China which are constitute more than 80 percent share its exports during above said periods of the study are selected for the market analysis.

Statistical Tools

Compound rate of Growth

$$Y_t = Y_0 (1 + r)^t$$

Y_t = Export of marine fish year t

Y_0 = Export of marine fish during Initial year (i.e., 2009-10)

r = the compound growth rate of growth of Y_t . Where Y_t stands for the year t

Index of Instability

The advantage of Coppock's instability index is that it evaluates price volatility in respect to the trend, providing a good approximation of the average year-over-year percentage variation trend-adjusted. Instability increases as the index value increases. Coppock's Index is calculated as the antilog of the square root of the logarithmic variance using the following formula:

$$CII = \{[\text{Antilog}(\text{Vlog})] - 1\} \times 100$$

Where, Vlog = logarithmic difference of $\log x_{t+1}$ and $\log x_t$.

Cuddy Della Valle Index

It is calculated as follows:

$$\text{Instability Index (CDVI)} = CV \times \sqrt{1 - \text{Adj } r^2}$$

Where CV is the coefficient of variation and r^2 is the coefficient of determination adjusted for a number of degrees of freedom obtained from trend regression in the above equation

Forecasting of exports from India

The success or failure of a nation's exports might hinge on a wide variety of concrete and abstract elements, making export performance unpredictable including trade policies of the reporting country with exporting country, and inter-country relationships, volatility in the exchange rate, production and Per capita consumption. So past performance is no guarantee for future exports, so it is very difficult to predict future export basically for long-run periods. Hence, the forecast of marine exports was carried out for a limited period of the next four years (i.e from 2020-21 to 2025-26). For the prediction of exports from India the ARIMA (Autoregressive Integrated Moving Average)

$$Y_t = c + \theta_1 Y_{t-1} + e_t$$

Where c and θ_1 are both constants, and e_t represents random error at time t. Thus, the next value in the series is equal to a constant c plus a multiple of the last value in the series plus some random error. Other observed values of the series can be included on the right-hand side of the equation to give higher-order autoregressive (or AR) processes:

$$Y_t = c + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \dots + \phi_p Y_{t-p} + e_t$$

Where Y_t represents the export of marine fish in the current period

Y_{t-1} represents the export of marine fish in the previous period

c and ϕ are both constants and e_t represent random error at time t

Results and Discussion

Market wise growth

Table-1: Market-wise compound growth rate analysis of Marine Fish exports from India

Export Market	CGR_Q(%)	CDVI_Q(%)
	2009-21	2009-21
Japan	8.08	1.13
USA	29.90	6.88
EU	6.50	0.92
China	13.06	8.06
ASEAN	11.45	4.31

Middle East	11.56	2.18
Others	11.61	1.89
Total	14.30	3.31

Source: Author's own calculation by compiling data from various annual reports MPEDA Govt of India.

Possible factors for growth erosion

The exports growth of marine fish in terms of volume were found to be highly positive during the period from 2013-17 as compared to the period 2017-21. In the first period, highest export growth rate found in the case of the USA, whereas in the second phase the rate of growth was highest in the case of China. During the second phase, there is negative growth in the export of marine fish due to the reason of import restrictions imposed by Japan on shrimp because of higher levels of ethoxyquin an anti-oxidant and also an ingredient found in shrimp feed. The major reason for the slowdown of export growth in EU may be decline in overall export due to the financial crisis in 2008-09 which adversely impact on mostly EU countries. The factors responsible for increase in marine exports are hike in international price of the frozen shrimp and lobster, and the Infrastructure development like introduction of deep sea fishing vessels at fishing harbors and different marine fish landing centers for seafood processing industries.

Marketwise Instability

Table-2: Market-Wise instability analysis of Marine Products exports from India

Country Exported	CGR_Q (%) 2009-21	CDVI_Q(%) 2009-21
Japan	41.75	1.13
USA	50.47	6.88
EU	39.21	0.92
China	50.32	8.06
ASEAN	81.91	4.31
Middle East	41.05	2.18
Other Countries	49.21	1.89

Source: Author's own calculation by compiling data from various annual reports MPEDA Govt of India.

To generate maximum foreign exchange reserves (FER) from the export of marine products, stabilization of international market is essential requirement Excessive fluctuation in the export The major factors responsible for market instability are market concentration ,instability in exchange rate and change in consumption pattern people of the destination countries The table above represents Coppock's Instability Index analysis of Marine Fish Export (in Million Dollars). From the table, it can be inferred that Marine Fish exports to South East Asia exhibit the highest level of instability with the absolute value of its CII being 81.91%. Marine fish exports to EU showed the lowest level of instability with the absolute value of its CII being 39.24. During the above said period, it is found that the traditional market like Japan, Middle East countries and the EU are instability whereas the new market of the ASEAN and China are showing less instability. After the global financial crisis, the export market is stable for marine products and direction has shifted from EU to ASEAN countries overalls.

Commodity wise Growth

Table-3: Growth rate analysis of Marine Fish Exports from India (Commodity-wise)

Item	CGR (%)	CII (%)
	2009-21	2009-21
Frozen shrimp	20.50	24.41
Frozen Fish	3.42	22.62
Fr Cuttle Fish	5.28	9.14
Fr Squid	11.19	12.64
Dried Items	1.44	13.28
Live Items	5.07	35.58
Chilled Items	5.53	14.21

Others	10.71	22.68
Total	14.30	18.09

Source: Source: Author's own calculation by compiling data from various annual reports MPEDA Govt of India.

Factors responsible

In the post-WTO period, marine fish have become environmentally regulated products. Due to this, the country's trade performance, especially those exporting marine products should have to take environmental measures at international levels. Among all the exported marine fish exported from India, the four major marine fish, namely Frozen shrimp, Frozen cuttlefish, and Frozen squid constitute more than 80 percent of total exports during the above said periods, but gradually the other marine products export increased. The major factors responsible for this are due to the reason of diversification of marine fish exports by adding pomfrets, ribbonfish, seer fish, and, snapper to the frozen fish category. During the second phase of the time period, the growth of export of all marine fish declined but there is negative growth of export in chilled items and live items due to the reduced air cargo connectivity due to the Covid pandemic situation. Frozen shrimp still dominates among the various commodities marine sea foods exported from the country, and the USA continues to be a preferred destination for shrimp exports. In terms of marine fish, less instability was found in the export of non-shrimp products like frozen fish (22.62%), Cuttlefish (9.14), and squid items (12.64) as compared to other items. The primary reason for less instability is the export diversification a reduced average import tariffs on marine products from 10.5 % to 4.5% in most developed countries. During the same period, the intensity of instability is more for frozen shrimp. The primary reason for this may be due to the ban on imports by USA and EU, citing environmental concerns. As India is facing tuff competition from south east Asian countries like Thailand, Vietnam in export of marine fish specially in shrimp fish there is a drastic reduction of export of marine fish to Japan. Adding to this due to presence of antibiotics in Indian preserve marine fish, Japan has restricted marine exports from India.

Direction of Trade

Table-4: Change in Direction of Marine Product Export Market (value and Quantity in Percent)

Export Share (%)	Market	Japan	US	EU	China	ASEAN	Middle East	Others
2009-10	V	12.83	10.08	29.99	17.82	14.72	5.51	9.05
	Q	9.24	4.93	24.29	21.27	22.01	5.15	13.11
2010-11	V	13.05	15.43	26.81	15.33	16.39	5.20	7.80
	Q	8.70	6.16	21.03	19.57	28.77	5.41	10.36
2011-12	V	12.90	17.94	22.96	7.59	25.26	5.39	7.96
	Q	9.95	7.93	17.89	9.80	39.90	4.43	10.09
2012-13	V	10.60	21.35	22.15	7.66	23.11	5.90	9.22
	Q	8.26	9.96	17.06	9.46	36.73	4.46	14.07
2013-14	V	8.15	25.63	20.29	5.85	26.63	5.29	8.15
	Q	7.27	11.27	17.76	7.70	38.63	5.90	11.47
2014-15	V	9.09	26.40	20.08	4.03	25.78	6.04	8.57
	Q	7.49	12.33	17.89	5.66	38.99	6.15	11.48
2015-16	V	8.58	28.38	20.75	4.71	24.65	5.90	7.04
	Q	7.97	16.25	19.70	5.29	34.77	5.70	10.32
2016-17	V	6.92	30.32	18.20	3.54	30.27	4.83	5.92
	Q	6.08	16.62	16.73	4.00	42.72	4.67	9.18
2017-18	V	6.31	32.74	15.78	3.21	31.59	4.10	6.27
	Q	6.22	17.99	13.82	3.61	44.78	4.52	9.07
2018-19	V	6.27	34.81	13.43	12.18	22.67	4.25	6.40
	Q	6.04	20.24	11.89	16.19	32.10	4.33	9.21
2019-20	V	6.26	38.37	13.15	20.61	10.56	4.46	6.59
	Q	6.09	23.66	12.85	25.55	17.32	4.45	10.07
2020-21	V	6.94	41.15	13.78	15.80	11.15	4.22	6.96
	Q	7.55	25.40	13.29	19.00	18.94	4.23	11.59

Source: Author's own calculation by compiling data from various annual reports MPEDA Govt of India.

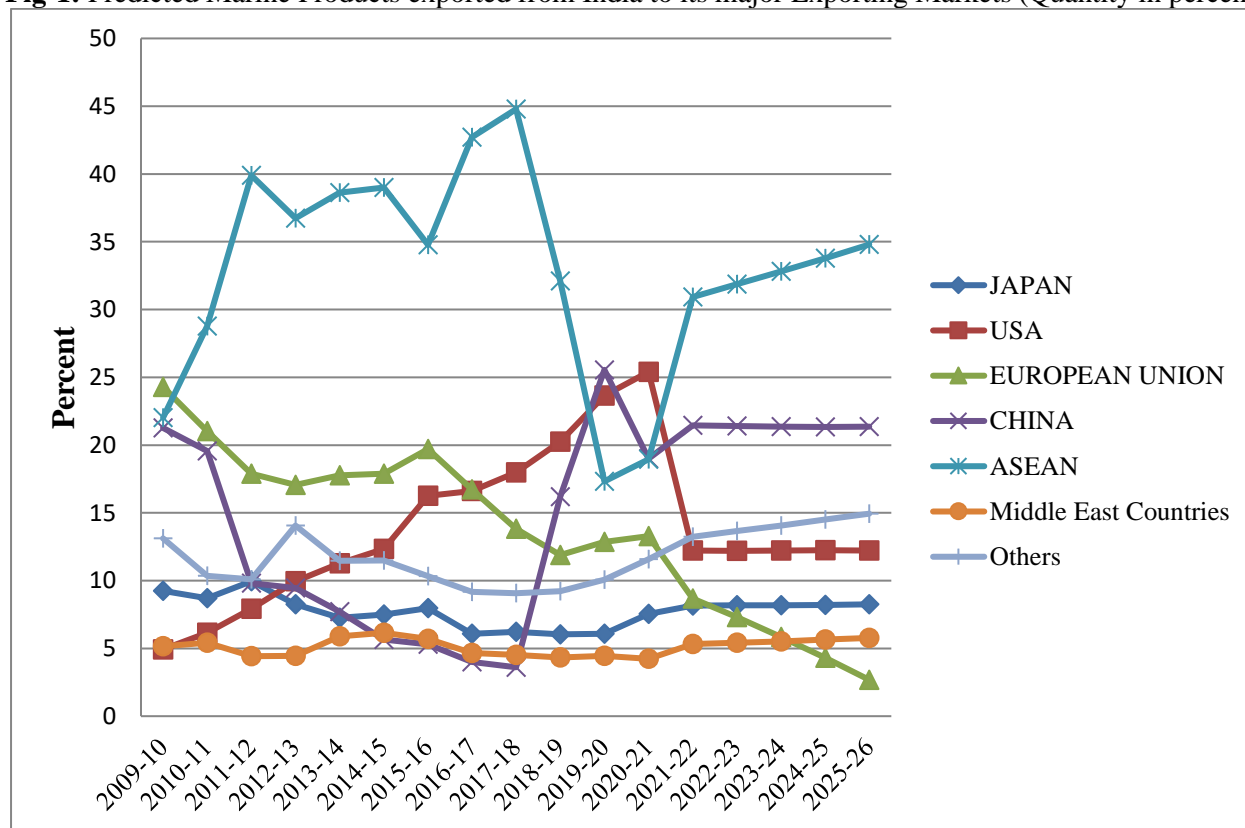
The change in export direction from the EU to the USA could be due to the euro crisis. Since 2009 South East Asian (ASEAN) countries have had significant major importers of marine products both in value and quantity due to the relaxation of sanitary standards on marine products imported from India. But in the case of Japan, high strict quality standards in this country are the primary reason for the drastic fall in import of marine fish from India. Middle East countries remain the major export destinations of marine export from India due to the cause of less strict quality standards followed for these products.

Table-5: Projections of Export Market (Quantity in percent)

Export Market	JAPAN	USA	EUROPEAN UNION	CHINA	ASEAN	Middle East Countries	Others
	Projected	Projected	Projected	Projected	Projected	Projected	Projected
2009-10	9.24	4.93	24.29	21.27	22.01	5.15	13.11
2010-11	8.70	6.16	21.03	19.57	28.77	5.41	10.36
2011-12	9.95	7.93	17.89	9.80	39.90	4.43	10.09
2012-13	8.26	9.96	17.06	9.46	36.73	4.46	14.07
2013-14	7.27	11.27	17.76	7.70	38.63	5.90	11.47
2014-15	7.49	12.33	17.89	5.66	38.99	6.15	11.48
2015-16	7.97	16.25	19.70	5.29	34.77	5.70	10.32
2016-17	6.08	16.62	16.73	4.00	42.72	4.67	9.18
2017-18	6.22	17.99	13.82	3.61	44.78	4.52	9.07
2018-19	6.04	20.24	11.89	16.19	32.10	4.33	9.21
2019-20	6.09	23.66	12.85	25.55	17.32	4.45	10.07
2020-21	7.55	25.40	13.29	19.00	18.94	4.23	11.59
2021-22	8.16	12.21	8.67	21.46	30.92	5.33	13.24
2022-23	8.17	12.20	7.30	21.40	31.87	5.41	13.66
2023-24	8.18	12.23	5.84	21.35	32.81	5.51	14.07
2024-25	8.21	12.24	4.30	21.33	33.78	5.65	14.50
2025-26	8.25	12.22	2.68	21.35	34.79	5.77	14.94

Source: Author’s own calculation by compiling data from various annual reports MPEDA Govt of India

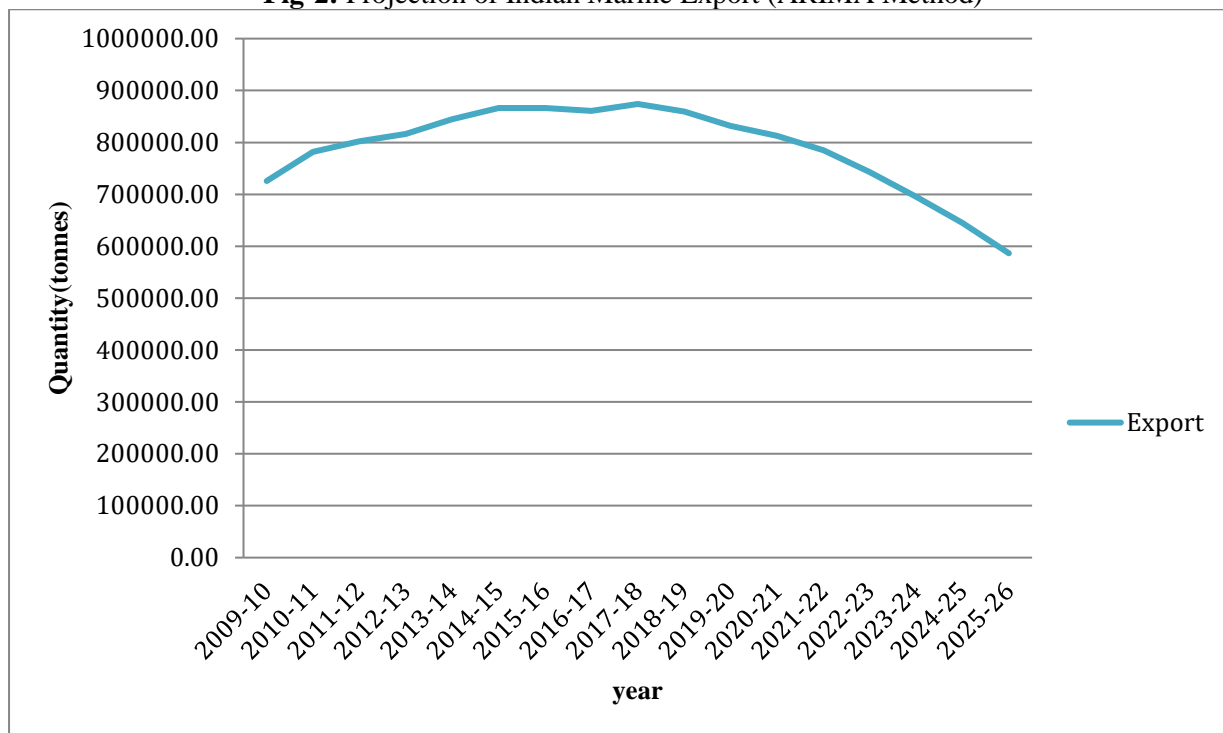
Fig-1: Predicted Marine Products exported from India to its major Exporting Markets (Quantity in percent)



Source: Author’s own calculation by compiling data from various annual reports MPEDA Govt of India

Using data of annual marine export (quantity) from 2001-02 2021-22 as input in the ARIMA model, which forecasts the marine export for the year 20250-26 is estimated that Southeast Asian countries are significant emerging export destinations for Indian marine products. In contrast, EU market is crashing and Japan, USA, and China remain unchanged for export point of view.

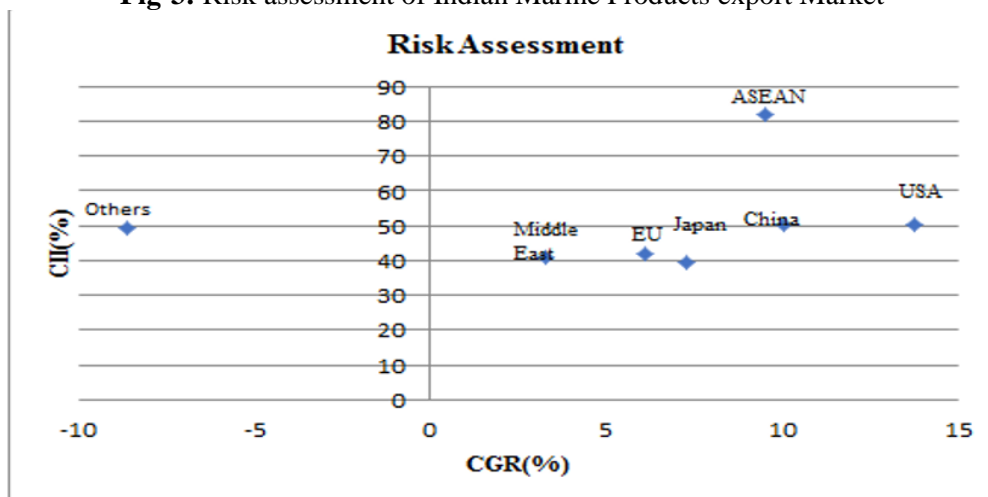
Fig-2: Projection of Indian Marine Export (ARIMA Method)



Source: Author’s own calculation by compiling data from various annual reports MPEDA Govt of India

From the above results, it is revealed that export in terms of quantity is declining. The study also analyzed the export of marine products from India, mainly focusing on less desirable and least desirable countries. Results of ARIMA model estimated that decreasing trend in the forecasted quantity of exports in future basically after covid periods, which brought attention for policy makers to identify more stable and high growth trading partners like ASEAN. Due to the impact of covid-19, the growth of marine fish sectors also shown negative growth and it is also estimated it that export will declined in future too. Apart from pandemic which reduced the demand of marine fish, the production of marine sector is affected by from production side too. Due to reduction of fish landing and slow logistic movements which lead not only reduction in supply of marine fish but also export.

Fig-3: Risk assessment of Indian Marine Products export Market



Source: Author's own calculation by compiling data from various annual reports MPEDA Govt of India

Risk assessment of Indian Marine Products Export

On angle of Indian marine products export market risk assessment revealed that in terms of quantity; USA and China were less desirable countries as they are under the category of high growth (13.77%,10.07%) and high instability (50.47%,50.32%). Japan, EU, and ASEAN countries are falling under the category of low growth and high-risk countries, from which India should be restrained its marine export. As there is no country found which should be high growth less risk means the value of CII should be less, so government should effort more concentration on emerging trading partners like ASEAN which was low growth and high risk by adopting more export promotion policies.

Conclusion and policy recommendations

Indian fishery sector especially the marine segment is going through rough phase. One of the major reasons for this is the environmental issue. During the post-WTO era mostly marine f countries which are importing marine fish are putting forth non-tariff barriers (NBT) in the form of sanitary and phytosanitary (SPS), and technical barriers of trade (TBT) agreements. The situation in overseas market after pandemic is another matter of concern. In case of china especially due to container deficiency, rising freight tariff and reduction of consignments due to covid pandemic caused market uncertainties. Where as in case of USA, due to scarcity of containers made it difficult for exporters to execute orders in time. As a result of covid-19 there was of closure of hotel, restaurant, and café in both domestics and international market also affect demand of marine fish. So, government has to implement new policies to promote marine fish both in domestic and international market. The government has signed many bilateral trade agreements and regional trade agreements like ASEAN in recent periods to promote export. But still, more to be done to promote the export of marine products as India is facing challenges from the countries like Vietnam, Bangladesh, and Thailand with respect to marine fish. Last but not least the government also makes rule and regulations for the sustainable use of marine resources by exploring ways for the better utilization of deep-sea fishing potentiality by increasing number of deep-sea vehicles.

Relevance of the Study:

The study will highlight the opportunity for the government and private sector to invest in the marine sectors basically fisheries and is also paved the way for all the stake holders to explore for the new market for the export. All the stake holders can focus on greater opportunities to exploit the market potential by increasing its production and establishing proper marine fish value chain system. Last but not least the study is also bringing attention of the government and policy makers to make policies to boost up export of marine fish and reduce export instability.

Limitations of the Study:

A serious deficiency of the study is even after defining commodities but they are very close substitutes to each other. Another major limitation of the study is certain countries are grouped as "others:" which sometimes are quite large and may therefore form a bias towards a higher degree of market concentrations.

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