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Fish for Food or Fish for Feed: New Populism and Blue Economy Perspective



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Abstract

Blue economy-induced growth models are becoming populist in Indian context. In this populism the highlights are capital investment in coastal and marine space, export-led growth, and expansion of trade. This study assesses the magnitude and drivers of India's rapidly growing FMFO industry and explores its implications for India's rampant domestic nutritional security concerns. This entry critically explores the implications of this rapidly expanding sector at three levels. First, the FMFO industry is driving a form of indiscriminate "biomass fishing," targeting species that until recently were considered bycatch, constituting a new manifestation of cheap nature commodification. Second, the FMFO industry undermines the viability of small-scale fishers and local fish traders, who are out competed both at sea (by trawlers) and on land (by the FMFO agents), providing a clear manifestation of accumulation by dispossession. Third, the industry converts cheap small fish that would otherwise be affordable to local markets and poorer households into high value shrimp

destined for export markets and hence compromising on domestic nutrition security. The blue economy agenda backed by new populism is hence creating three important dispossessions, namely ecological, livelihood, and nutrition security.

Keywords

Fish meal · Blue economy · Food and nutrition security · Livelihood · India

Introduction

Blue economy-induced growth model is becoming populist in Indian context. In this populism, the highlights are capital investment in coastal and marine space and export-led growth and expansion of trade. Beneath these glorious popular and state led discourse lies three important dispossessions that this populist discourses are largely silent. These include ecological, livelihoods, and food and nutrition security issues. In this entry, we bring out the impact of the blue economy models on these three aspects of ecology, livelihood, and nutrition through an analytical narrative of utilization shift happening to marine resources. In the process, the entry counters the popular narratives associated with the blue economy model.

Indian marine sector plays an important role in providing livelihoods to four million people comprising in 864,550 families spread over 3288

marine fishing villages (CMFRI Census 2012). The majority of these livelihoods comprise small-scale fishers and women engaged in post-harvest activities including fish processing and marketing. Marine fish, especially the small pelagic fish, are affordable source of rich nutrients. Of this, drying is the most affordable and seasoned strategy of fish preservation. Compared to wet fish, dried fish is found to have a higher concentration of micronutrients. It is also a cheaper and significant source of animal protein and micronutrients. The nutritional quality of dried fish remains intact and sometimes even retains higher quality levels compared to fresh fish (Faruque et al. 2012). Lack of knowledge of the role of fisheries for food and nutritional security could pose a challenge for India that ranks number one in terms of wasted and stunted children (Global Nutrition Report 2018). In this context, small and affordable fish can play an important role to achieve food and nutrition security for India. Dried fish in that context becomes more important due to its durability, which allows it to reach the hinterland, making it one of the most important, affordable, nutrient-rich food for the poor and low-income communities in the region. However, in this entry, we demonstrate that the production of dried fish is challenged by several structural changes in the fisheries sector induced by blue economy models. First, the export-led growth strategy of marine sector in India since the late 1970s have brought in once such structural change increasing the divide of access to fish between small- and large-scale fishers. Second, the growth of aquaculture sector, especially producing shrimp, has led to a second wave of export-led growth path. This in turn has brought out and fueled change in terms of fish catch utilization, integration of distant domestic markets, growth of freezing capacity, and surimi companies for export and fish meal and fish oil (FMFO) activities to cater not only to the domestic shrimp culture demand but also as an ingredient for aquafeed demand abroad. This leads us to the question if the export-driven growth in fisheries thus has had significant implications for fish utilization patterns? Secondly, do such changes have a bearing on livelihood and nutrition security?

Understanding the precise nature of this shift, however, is hampered by a lack of availability of data. We estimate fish going as shrimp feed (via the fish meal) in India, by using innovative methods based on more reliable data and scientific understanding of utilization pattern in the fish processing nodes. Based on the estimations, in this entry, we delineate the trends in the utilization of marine resources from food to nonfood products. In the process, we discuss the repercussion of such shifts on the ecological ramifications of marine harvest and shrimp culture, livelihood of the people (especially women) engaged in the processing and marketing of dried fish, and food and nutrition security of India.

Shrimp Culture as the Demand Driver of Marine Fish

Globally, the growth of capture fisheries production has largely stagnated while the aquaculture sector has been growing at a fast rate. Aquaculture has been among the fastest growing food sectors (Stankus 2021). The world's population now consumes more farmed fish than wild caught fish. People in many developing countries, especially those from lower income groups, are often dependent on fish for their micronutrient requirements. However, farmed fish, especially shrimp and other carnivorous species, require processed feed, which usually include significant proportions of wild fish catches. Research studies have estimated that proportionately more fresh fish is required to produce 1 kg of farmed fish (Torstensen et al. 2008). The transformation happens through reduction of fish to fish meal which is used as one of the main ingredients for aquafeed. Initially, it was believed that increased supplies from aquaculture will depress the market price and reduce pressure on marine resources. Contrary to such claims, some have observed increasing pressure on marine resources to land raw material for supplying needs for aquafeeds (Scholtens et al. 2020).

Shrimp culture depends significantly on reduction fish as feed, with estimates ranging from 14% to 29% of shrimp feed consisting of fish meal. The aquafeed process involves reduction of caught

fish by FMFO industry followed by right mix of fish meal and other ingredients to prepare the aquafeed. The fish meal is rich in micronutrients and a good source of minerals; therefore, it is in great demand for the preparation of feeds and food supplements. Whereas in 1980, the aquaculture section used only 10% of global fish meal production (the majority going to other animal feeds), in 2016, this increased to 73%. Shrimp aquaculture alone consumed 16% of global aquafeed production (6.18 million tonnes) of nearly 40 million tonnes in the year 2012 (Malcorps et al. 2019). These figures together show the importance of shrimp sector as a driver of aquafeed and fish meal production.

From around 10 plants in 2010, India now has more than 90 fish meal plants spread across the western and southern states. Of these, majority of FMFO plants are there in Karnataka. In recent years, there has been further increase in not only the number of plants but also their production capacity. Fish meal and fish oil produced in India is exported to China, Egypt, Australia, South Korea, Japan, Middle Eastern countries, Spain, Pakistan, Thailand, South Africa, New Zealand, and Vietnam. Oil sardines, an affordable and a nutrient-rich edible fish species, as well as other small species are traditionally used species in the FMFO industry. Several studies have found that their landings have remained consistently high with a few downturns due to climatic changes and effects such as cyclones (Joshi et al. 2020). This enabled the FMFO industry to have continuous supply of small pelagics. This induced the entrepreneurs to establish the plants in the western and southern coasts considering the advantage of location, cheaper inputs, and profitability. While such literature has conveniently put the supply drivers of growth of fish meal industry, in recent years, there has been growing emphasis on the demand drivers such as shrimp culture in the growth of fish meal industry. Along with these factors, the additional income generated especially to the large-scale fishing gear owners caused the rapid growth of this industry. The domestic fish feed mills in India had capacity of 2.88 million metric tonnes in 2017 and was valued at US\$ 1.2 billion. This capacity of fish

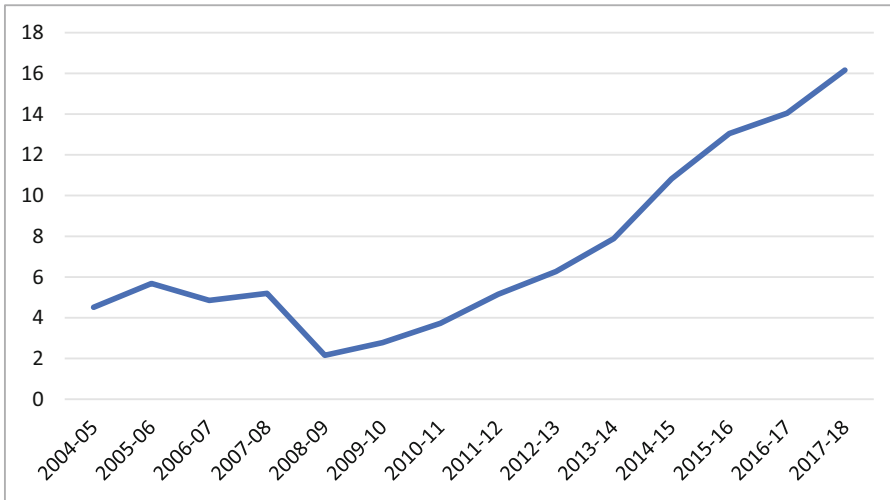
meal industries drives the procurement and demand for fish. Such demand drive prompts indiscriminate capturing of fish disrupting the ecological balance of the ocean ecosystem as pointed out by a report *Fishing for Catastrophe* in the year 2019. The FMFO industry is criticized for being exploitative of fishery resources and good quality fish that are apt for human consumption. There seems to be a vicious relationship between shrimp farming that demands aquafeed of which fish meal and fish oil are important ingredients. This not only promotes FMFO industry but also reflects in unsustainable fishing practices especially by large-scale fisheries. Shrimp culture is criticized for its socioeconomic consequences on privatization of mangroves, water salination, and soil salination, affecting food and nutrition security.

How Much Marine Fish Is Fed to Aquaculture Shrimp in India?

Over the years, whiteleg shrimp has grown exponentially, especially from the year 2010. From a meager 1731 tonnes of production in 2010, it has grown to nearly 6.5 lakh tonnes in recent years. A majority of these are produced in the Andhra Pradesh coast. Almost 90% of these are exported earning nearly five billion dollars of foreign exchange.

We used the indirect method to estimate the marine fish catch utilized to produce shrimp feed. Based on several scientific research, we assumed that the feed conversion ratio (FCR) of 1.35 kg feed/kg of shrimp output. Approximately 15% of this feed consists of fish meal. Production of 1 kg of fish meal requires 4–5 kg of marine fish. With this set of information, it was easier to arrive at the volume of marine fish required to produce shrimp. Therefore, shrimp production data helped us in estimating the marine fish utilization for shrimp feed via FMFO industry.

Figure 1 shows that the percentage of marine catches used for shrimp feed production was inconsistent and majorly declining until 2009. After 2010, this percentage of utilization witnessed a sharp upsurge causing a major shift



Fish for Food or Fish for Feed: New Populism and Blue Economy Perspective, Fig. 1 Trend line of the percentage of fish utilized for shrimp feed from the total marine catches

in the utility of marine catches towards FMFO industry.

Implication of the Utilization Shift

Fish for food in general has a frugal value chain. Significant engagement of women in the processing and trading, and undervaluation of labor that keeps its process affordable. To cite an example from our recent field observation in Karnataka, we found that 1 kg of anchovy dried fish can be produced from 3.33 kg of fresh fish. The average landing center price of fresh anchovies was Rs. 30/kg. Thus, to procure fresh fish of 3.33 kg will approximately cost Rs. 100. The processor must spend on water, salt, hired labor, transport, lease amount for storage, and physical losses during the supply chain. A selling price of Rs. 130–170/kg of anchovy shows huge discount to the personal labor cost. This keeps the dried fish producers at a subsistence level. At the same time, it makes the dried fish affordable for the low-income consumers. On the other hand, a study shows that the net profit earned by the fish meal producer per tonne of raw fish was Rs. 69,210, where the value of the final products is almost ten times the value of raw material.

Increasing competition from FMFO industry due to the demand from shrimp culture; demand from FMFO industry leading to indiscriminate catching of fish in the sea; and, near stagnant catch over the years – all these factors have been contributing to the declining growth rate of fish for food. Such decline corresponds with the growth of shrimp culture, especially the whiteleg shrimp culture. This correspondence is not arbitrary as fish for food and FMFO (for shrimp feed) players compete for the same fishery resources for their raw material supplies. The increasing demand for feed due to rapid growth of area and intensity of shrimp farming corresponds with increase in the demand for fish meal as feed. Further, numerically larger numbers of small-scale fishers using relatively less advanced technology operate in a fragmented manner. On the other hand, the fish meal sector procures fish of any type, size, and quality at a very large scale. Thus, the market-clearing price and demand from the fish meal procurer have led to assured market for deep sea fishing vessels encouraging them to indiscriminate harvesting of any fish. This has significant bearing on the marine ecosystem and the biodiversity.

Although the marine fish for food sector contributes significantly to the food and nutrition security, this sector remained stagnant over the

decades. The shrimp feed that fuels FMFO industry is growing at the cost of the fish for food sector. A study conducted by the Central Institute of Brackish Aquaculture (CIBA), Chennai, revealed that the FMFO is an important ingredient of the shrimp feed production. Therefore, a hike in the production of the whiteleg shrimp (*Vannamei*) justifies the shift. When the production of *Vannamei* grew at a rate of 342% in 2011–2012, the FMFO industry started flourishing. This shift can be understood through the export patterns of the dried fish and FMFO. After 2010, the export of FMFO has been higher than the dried fish export consistently. Moreover, the income generated from shrimp is much higher generating nearly five billion USD of foreign exchange. Therefore, altering this trend requires altering the policies based on blue economic-new populism models that focuses on capital intensity, large-scale operations, and export-led growth, undermining the importance of food, livelihoods, and ecosystem services.

In the long run, the existence of fisheries becomes questionable. In a study conducted by Fishing for Catastrophe in the year 2019 in the Karwar–Mangalore belt and the Vishakhapatnam region suggests that the indigenous fishermen have expressed concerns over the sustainability of the fisheries, and they cite the growing FMFO industry as the primary factor for this. This utilization shift of marine fish can have significant impact on food and nutrition security of the mass as well as livelihood people especially women engaged in post-harvesting activities. At the same time, the traditional and small-scale fishing communities are unable to compete with the mass production for these industries. The vicious circle of circumstances has crippled the fisher community both socially and economically.

The small and affordable fish which satiate the nutrient needs of the poor is now contributing to the shrimp production through FMFO. This is threatening the domestic nutritional security of a country having highest number of malnourished people. Therefore, the nutrition security of the poor is traded off for the production of shrimp largely consumed by the elites in the rich countries.

The FMFO plants are using several pelagic species like sardines, mackerels, and squid lizard

fish. Even, some of these species used in the FMFO industry are on the verge of extinction. Overfishing of the juveniles is considered as the primary reason behind this wiping out of certain species. Oil sardine is such a species that has witnessed a rapid drop in the past few years. The production of oil sardines has grown since 1994. Even though the growth rate was not persistent, the demand for oil sardines kept the production moving upwards. It reached the peak of its production in 2012 and fell sharply afterwards. This is one of those species that is traditionally used in the FMFO industry, especially because of its high oil content, that fetches a better price in the market. Along with the climatic factors, the over usage of oil sardines in the FMFO industry is one of the responsible factors for its production crash.

To summarize, this study estimated the fish used for shrimp feed over a period of time. Since 2010, the growth of whiteleg shrimp production has led to increased utilization of marine fish towards shrimp feed. This has led to reduced availability of fish for food resulting in food and nutrition insecurity among the low-income households in the coast and hinterlands. Such utilization shift has three important fallouts. First, this utilization shift has tremendous implication on the domestic nutrition security of the country. Given the dismal performance of India on addressing undernourishment, small marine fish becomes an important and affordable source of nutrition. On the other hand, shrimp production, though it earns significant foreign exchange, caters mostly to the elite of the domestic and export markets. Secondly, a large number of small-scale actors including women are engaged in the fish catching, processing, and trading activities. The heavy discounting of their labor and efforts has kept the dried fish prices affordable. Thirdly, the shrimp feed-driven demand for FMFO sector has ecological repercussions. On the one hand, it drives indiscriminate fishing in the sea adversely impacting the sustainable fish catch and marine biodiversity. On the other hand, shrimp culture also notoriously associated with degradation of soil due to salinity ingress that affects the most fertile delta land used for paddy and other cultivations.

Conclusion

In this entry, our attempt was to estimate the utilization of marine fish going as shrimp feed. This estimate over two decades period suggested a clear utilization tilt towards shrimp feed. This utilization tilt has a strong repercussion on three fronts, viz., nutrition security, livelihood of the people engaged in dried fish processing and marketing, and marine ecosystem. The blue economy model coupled with the new populism ideas of large scale, capital intensive, export-led growth models seriously undermine the importance of marine fishes, especially the small fish in food and livelihoods. At the same time, such large scale, export-driven shrimp culture that fuels the fish meal industry encourages indiscriminate fishing undermining the marine ecosystem. In addition, shrimp culture is also notoriously associated with the increasing land degradation, especially in the fertile deltas, used for rice and other food commodities production. Overall, this new populist blue economy models need to be arrested if food and nutrition security, livelihoods, and ecosystems are to be prioritized.

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References

- CMFRI, Kochi (2012) Marine fisheries census 2010
- Faruque M, Nazrul KM, Tonny US, Islam KR, Dey S, Mona SJ, Saha D (2012) Status of an ideal dry fish market of Bangladesh: a study on Asadganj dry fish market, Chitragong. *Int J Life Sci Biotechnol Pharm Res* 1(3):12
- Global Nutrition Report (2018) <https://globalnutritionreport.org/reports/global-nutrition-report-2018/>. Accessed 4 Apr 2020
- Joshi KK, Varghese M, Kaladharan P, Sreenath KR, Pillai SL, Sanil NK, ... Jayakumar CV (2020) Marine Ecosystem Challenges & Opportunities (MECOS 3)
- Malcorps W, Kok B, van't Land M, Fritz M, van Doren D, Servin K, ... Davies SJ (2019) The sustainability conundrum of fishmeal substitution by plant ingredients in shrimp feeds. *Sustainability* 11(4):1212. <https://www.mdpi.com/2071-1050/11/4/1212>
- Scholtens J, Jyotishi A, Subramanina K (2020) A twisted trajectory: fishing for feed in India. *Samudra* 83:38–42
- Stankus A (2021) State of world aquaculture 2020 and regional reviews: FAO webinar series. *FAO Aquaculture Newsletter* 63:17–18
- Torstensen BE et al (2008) Novel production of Atlantic salmon (*Salmo salar*) protein based on combined replacement of fish meal and fish oil with plant meal and vegetable oil blends. *Aquaculture* 285:193–200