Opportunities for Inclusive Fisheries Business through Value Chain Management (VCM) Approach

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&

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EDITED BY

Dr. T. Umamaheswari

Dr. N.V. Sujathkumar

Dr. B. Ahilan

Dr. Shahaji Phand

Dr. Sushirekha Das

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Editors: Dr. T. Umamaheswari, Dr. N.V. Sujathkumar, Dr. B. Ahilan, Dr. Shahaji Phand and Dr. Sushrirekha Das

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This e-book is a compilation of resource text obtained from various subject experts in Fisheries sector on "Opportunities for Inclusive Fisheries Business through Value Chain Management (VCM) Approach". This e-book is designed to educate extension workers, students, research scholars, academicians related to Fisheries Science about the Value chain management approaches for inclusive fisheries business. Neither the publisher nor the contributors, authors and editors assume any liability for any damage or injury to persons or property from any use of methods, instructions, or ideas contained in the e-book. No part of this publication may be reproduced or transmitted without prior permission of the publisher/editors/authors. Publisher and editors do not give warranty for any error or omissions regarding the materials in this e-book.

Published for Dr.P.Chandra Shekara, Director General, National Institute of Agricultural Extension Management (MANAGE), Hyderabad, India by Dr. Srinivasacharyulu Attaluri, Program Officer, MANAGE and printed at MANAGE, Hyderabad as e-publication.

MESSAGE

National Institute of Agricultural Extension Management (MANAGE), Hyderabad is an autonomous organization under the Ministry of Agriculture & Farmers Welfare, Government of India. The policies of liberalization and globalization of the economy and the level of agricultural technology becoming more sophisticated and complex, calls for major initiatives towards reorientation and modernization of the agricultural extension system. Effective ways of managing the extension system needed to be evolved and extension organizations enabled to transform the existing set up through professional guidance and training of critical manpower. MANAGE is the response to this imperative need. Agricultural extension to be effective, demands sound technological knowledge to the extension functionaries and therefore MANAGE has focused on training program on technological aspect in collaboration with ICAR institutions and state agriculture/veterinary universities, having expertise and facilities to organize technical training program for extension functionaries of state department.

A value chain approach to evaluate the common challenges faced by underprivileged farmers in these chains and the ways inclusive business models try to address these challenges. Business models function in multifunctional value chains and market systems with a variety of arrangements that include exchanges of products and services and rely on norms developed by diverse stakeholders. Therefore, it is crucial to evaluate the interactions, lines of communication, and information flows between participants. Equally significant is who benefits from being a part of a value chain.

It is a pleasure to note that, TNJFU- Fisheries College and Research Institute, Thoothukudi, Tamil Nadu and MANAGE, Hyderabad, Telangana is organizing a collaborative training program on "Opportunities for Inclusive Fisheries Business through Value Chain Management (VCM) Approach" from 28-30 September, 2022 and coming up with a joint publication as e-book on "**Opportunities for Inclusive Fisheries Business through Value Chain Management (VCM) Approach**" as immediate outcome of the training program.

I wish the program be very purposeful and meaningful to the participants and also the e-book will be useful for stakeholders across the country. I extend my best wishes for success of the program and also I wish TNJFU- Fisheries College and Research Institute, Thoothukudi, Tamil Nadu many more glorious years in service of Indian agriculture and allied sector ultimately benefitting the farmers. I would like to compliment the efforts of Dr. Shahaji Phand, Center Head-EAAS, MANAGE and Dr. B. Ahilan, Dean, Fisheries College and Research Institute, Thoothukudi for this valuable publication.

Dr. P. Chandra Shekara
Director General, MANAGE

PREFACE

This e-book is an outcome of collaborative online training program on **"Opportunities for Inclusive Fisheries Business through Value Chain Management (VCM) Approach"** conducted from 28-30 September, 2022. This e- book is intended is to provide insights to all extension workers, faculties, researchers and students about the value chain approaches for inclusive business in fisheries sector.

The value chain in the fishery sector can be defined as the movements of the fish from the production centres to the final consumer taking consideration the entire gamut of service providers at the various levels of the chain, the value addition done, the service provided or the subsequent value added to the product before consumption in lieu of the profit from the operations undertaken by them. Fisheries sector is still considered as an unorganized sector, the practices and processes of trade are performed in an unorganized manner.

This training shall provide the knowledge to the fishers and stakeholders in adopting modern management tools and strategies, performing scientific and statistical calculations in finding out different value addition processes in fisheries along with its cost to arrive at cost effective value chains. In addition to, differentiate value added processes from non-value added processes to offer great value with minimum cost. The information will help in developing entrepreneurial skills among youth.

The editors' heart fully record their sincere gratitude and appreciation to the resource persons for sparing their valuable time to develop this resource material. Additional thanks to MANAGE, Hyderabad for providing the financial assistance to conduct the training program. The editors are very much thankful to Dr. G. Sugumar, Honorable Vice-Chancellor, TNJFU, Nagapattinam and Dr. M. Rajakumar, Director of Extension Education, TNJFU, Nagapattinam for the consistent support and encouragement extended for the successful conduct of this training program and e-book creation for the participants. The editors hope that this e-book will help the participants as well as other extension people across the country to gain valuable information on value chain management for inclusive fisheries business.

The valuable suggestions for future improvements are always welcome.

Dr. T. Umamaheswari
Dr. N.V. Sujathkumar
Dr. B. Ahilan
Dr. Shahaji Phand
Dr. Sushrirekha Das

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Chapter 1

INTRODUCTION TO FISHERIES SECTOR

B. Ahilan

Fisheries College and Research Institute, Thoothukudi

Introduction

India is the 3rd largest fish producing and 2nd largest aquaculture nation in the world after China. The Blue Revolution in India demonstrated importance of Fisheries and Aquaculture sector. The sector is considered as a sunrise sector and is poised to play a significant role in the Indian economy in near future. In the recent past, Indian fisheries has witnessed a paradigm shift from marine dominated fisheries to inland fisheries, with the latter emerging as a major contributor of fish production from 36% in the mid-1980 to 70% in the recent past. Within inland fisheries, a shift from capture to culture-based fisheries has paved the way for sustained blue economy.

Marine Fisheries

The Indian fisheries sector incorporates a unique and diverse set of resources ranging from the pristine waters of the Himalayas to the sprawling Indian Ocean. The fisheries biodiversity of the country encompasses a spectrum of biological components that are consumed on a large scale. Fisheries' resources are set in several ecosystems. With the growing population and therefore the increasing demand for fish protein, the necessity for sustainable development of aquatic resources is now felt far more than ever before. The sector provides livelihoods to about 16 million fishers and fish farmers at the local level and almost twice the number along the value chain. Fish being an affordable and rich source of animal protein is one of the healthiest options to alleviate hunger and malnutrition. The total fisheries potential of India has been estimated at 22.31 million metric tons (in 2018), of this, the marine fisheries potential stands at an estimated 5.31 million metric tons. Furthermore, the inland fisheries potential has been estimated at 17 million metric tons. Within recent years, fish production in India has registered an average annual growth rate of quite 7%.

Inland Fisheries

Although inland fisheries and aquaculture have grown in absolute terms, the development in terms of its potential is yet to be realized. The unutilized and underutilized vast and varied resources, in the form of 191,024 km of rivers and canals, 1.2 million Ha of floodplain lakes, 2.36 million Ha of ponds and tanks, 3.54 million Ha of reservoirs and 1.24 million Ha of brackish water resources offer great opportunities for enhanced production along with livelihood development and ushering economic prosperity.

PMMSY

Recognizing the importance and potential of the fisheries sector, the Government of India approved the flagship scheme, Pradhan Mantri Matsya Sampada Yojana (PMMSY), in May 2020 under the Aatmanirbhar Bharat COVID-19 relief package with a vision to bring about Blue Revolution through sustainable and responsible development of fisheries sector. It includes Rs. 18,330 crores under centrally sponsored component (CSS) and Rs. 1720 crores under central sector component (CS). The Centrally Sponsored Scheme (CSS) Component is further segregated into non-beneficiary oriented and beneficiary orientated sub-components/activities under the following three broad heads, namely,

1. Enhancement of production and productivity
2. Infrastructure and post-harvest management
3. Fisheries management and regulatory framework

In an endeavor to consolidate the Fisheries' sectoral gains and boost economic growth, PMMSY sets out ambitious goals for FY 2025 which include additional fish production by 70 lakh MT increasing aquaculture productivity from the current national average of 3 tons to 5 tons per Ha, doubling exports from Rs. 46,589 crores to Rs. 1, 00,000 crores, generating 55 lakh additional employment opportunities and doubling fishers and fish farmers' incomes.

Inland Aquaculture

Fish production in India has witnessed a tremendous growth by showcasing a production increase from 0.75 million MT during 1950-51 to the current production of 14.1 million MT. Till 2000, marine fish production dominated India's total fish production. However due to practice of science-based fisheries, Inland fisheries in India have seen a turnaround and presently contribute ~70 % of total fish production. Therefore, through the holistic approach adopted under PMMSY, inland fisheries offer immense opportunity and potential to enhance production through optimal utilization of fisheries, technology infusion and capacity building.

Tanks & Ponds

India has around 2.36 million Ha of Tanks & Ponds areas where culture-based fishery is predominant and contributes to the maximum share in total fish production. The current production from tanks and pond is 8.5 million MT. As a major contributor towards production, the Department has prioritized to expand the horizontal area under tanks and ponds to achieve a target production of 13.5 million MT. It is estimated that to achieve the goal of 13.5 million MT, 28,390 million fingerling and 202.3 lakhs ton of feed will be required annually. To ensure availability and access to good quality seed, during the course of implementing PMMSY, 9 sanctioned brood banks will be established while evaluations are ongoing for establishing more units through cluster-based approach across the country. Additionally, to mitigate the risk of monocropping, species diversification and shifting carp-based culture to scampi, pangasius, tilapia and murrels based production is being promoted. The Department targets to make further sanctions to achieve expansion of 8100 Ha each of new rearing pond, new grow-out pond area and inputs for freshwater aquaculture supplemented by increasing technology infusion and adoption of good aquaculture practices. Such strategic investments will boost overall productivity from 3 Ton/Ha to 5 Ton/Ha as per the PMMSY targets.

Brackish & Saline Aquaculture

Brackish water aquaculture offers huge potential as the country has around 1.42 million Ha of brackish/saline area, of which only ~13% is utilized. With the aim to harness its potential, the Department has focused on increasing current fish production of 0.7 million MT to 1.10 million MT by FY 2024-25. With a goal to achieve a production of 15 lakh MT, total of 45 thousand Ha of brackish water area will be incorporated by FY2024-25 boosting current productivity from ~4 ton/Ha to 8 ton/Ha. This will entail utilization of 3.9 million Ha of estuaries and 0.5 million Ha coastal mangrove areas available in the country for both finfish and shellfish culture. Additionally, Saline water aquaculture is being promoted to transform ‘Waste land to Wet-lands’ by increasing aquaculture area from 13 thousand Ha to 58 thousand Ha by FY2024-25. This is to boost the current annual production of 4331 ton to 1.04 lakh ton while boosting current productivity from ~6 ton/Ha to 8 ton/Ha States of Haryana, Punjab, Rajasthan and Uttar Pradesh that have high soil salinity are thus being promoted. In FY20-21 an investment of Rs 3,024 lakhs was done for following sanctions in four inland States including Maharashtra. At present, shrimp farming has been promoted in 493 Ha areas in Haryana with a production of ~3,120 ton with an average productivity of 6.32 ton/Ha. Action plan for Haryana and other states has been formulated to bring in more

saline affected area under aquaculture for increasing production and thus productivity. Through engagement with ICAR-CIBA, the Department along with the States/UTs is also exploring sustainable ways for species diversification in brackish water aquaculture by promoting shrimps, oysters, mussels, crabs, lobsters, sea bass, groupers, mullets, milk fish, cobia, and silver pompano to be cultivated.

Cold water fisheries

India is bestowed with vast and varied cold water resources with valuable indigenous fish germ plasm and pristine water with a range of thermal regimes. Hence the Himalayan states offer a unique value proposition in Cold Water Fisheries. With the aim to harness its potential, the Department has focused on increasing current cold water fish production of 52,084 MT to 90 thousand MT by FY 2024-25 boosting current productivity from ~1 ton/Ha to 3 ton/Ha. It is estimated that to achieve the goal, 18.6 lakh fingerling and 5.16 lakhs MT of feed will be required during the course of implementation of PMMSY. Cold water fisheries have also been instrumental in creating 40 thousand employment opportunities and targets at doubling the engagement across the focus States/UTs. Additionally, cold water fisheries are being promoted as a niche market by promotion of omega-packed trouts in all Himalayan States/UTs by targeting 10 thousand MT of Trout productions. An investment of Rs 48.46 crores was made in FY 20-21.

Ornamental Fisheries

Ornamental fisheries have immense export potential; it is a multibillion industry spread across more than 125 countries with trade at retail level worth US $10 billion. For putting India in the forefront for ornamental fisheries, the Department is making efforts for holistic development of the sector through creation of ornamental fish clusters in selected inland and marine areas. Focus is also being given on promoting public private partnerships for establishment of various fish production units to make the sector vibrant and remunerative.

The scheme has already started demonstrating tangible benefits by adopting a participatory approach. In line with that, following sanctions were made for an investment of Rs. 15.3 crores in FY 20-21 on backyard ornamental fish rearing units, integrated ornamental fish units and medium scale ornamental fish rearing units.

Cage culture in reservoirs

Reservoirs are generally referred to as ‘sleeping giants’ as in spite of large area covered it cage culture contributes to ~3.81% of the total inland fish production. Hence the Department aims at harnessing the potentiality of 3.54 million Ha of reservoirs under

PMMSY. Many measures have been taken for promotion of cage culture in reservoirs in a sustainable manner for optimizing production through culture-based fisheries in small and medium reservoirs. With the aim to harness its potential, the Department has focused on increasing current fish production through cage culture of 2.44 lakh MT to 6.29 lakh MT by FY 2024-25 by tapping minimum 60% of the reservoirs and boosting productivity of all types of cages (small/medium and large). It is estimated that to achieve that goal, 750 crore fingerlings will be required annually.

Riverine Fisheries

India is bestowed with 14 major, 44 medium, and numerous minor rivers that run through 2.52 lakh Kms contributes to current production of 1 Lakh ton. For optimally harnessing the potential of riverine fisheries, the Department is focusing on conservation of indigenous fisheries resources and restoration of natural productivity by practice of river ranching and 41 Conservation and Awareness in Riverine Fisheries programme sanctioned under Blue Revolution in 9 States /UTs.

Production of native species in the rivers by seed ranching of native stock, upgradation of riverine landing centers and instruments to provide financial assistance for fishermen wellbeing are being targeted. Planning is also ongoing for implementing river ranching, as a pilot-based activity under central sector scheme, in six states in two phases with total budget outlay of Rs. 2.81 crores to ranch 1.40 crores fingerling.

Natural wetlands

The natural wetlands of the country are being developed by keeping ecological integrity of important natural wetlands through promotion of sustainable fishing practices thus contributing to the current production of 2.03 lakh ton through 5.5. lakh Ha available area. For optimally harnessing the potential of natural wetlands, the Department is targeting at a production of 5.61 lakh ton. It is estimated that to achieve the production target, 11 billion fingerling and 8.41 lakh ton of feed will be annually required.

National Fisheries Policy

The National Fisheries Policy was announced by the Fisheries Department in the September of 2020 to integrate the assorted existing policies associated with fisheries in India. A state-level Inter-departmental Coordination Committee for Fisheries had been planned to be shaped. The Agriculture Production Commissioner shall take the role of the to be the chairman of the committee. The GOI will formulate ‘Fisheries Management Plans’ (FMPs) for the scientific regulation & management of marine fisheries resources. The state governments will formulate Fisheries Abstraction Plans in conjunction with the Central

Government for information management, analysis, modelling of the structure. The government can develop an Associate in Nursing Integrated Fisheries Development set up, particularly for the islands to boost their share within the economy.

Conclusion

The fisheries sector has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries and is a source of cheap and nutritious food, at the same time it is an instrument of livelihood for a large section of economically backward population of the country. Fishery sector occupies an important place in the socio-economic development of the country. "Fisheries is a fast-growing sector in India, which provides nutrition and food security to a large population of the country besides providing income and employment to more than 28 million people. Fisheries sector has been recognized as a 'Sunrise Sector' and has demonstrated an outstanding double-digit average annual growth of 10.87% since 2014-15.

Export earnings from the Fisheries sector has been Rs.46, 662.85 crores during 2019-20. The sector provides livelihood support to about 280 lakh people at the primary level and almost twice the number along the value chain and the annual average growth rate in the Fisheries sector has been 7% over the last few years. Fish being an affordable and rich source of animal protein, is one of the healthiest options to mitigate hunger and nutrient deficiency. The sector has immense potential to double its exports, it is essential that sustained and focused attention is given to the fisheries sector through policy and financial support to accelerate its development in a sustainable, responsible, inclusive and equitable manner.

Chapter 2

VALUE CHAIN MANAGEMENT FOR INCLUSIVE FISHERIES BUSINESS: AN OVERVIEW

Dr. T. Umamaheswari[1] and Sushrirekha Das[2]

[1]Department of Fisheries Extension, Economics and Statistics, FC&RI, Thoothukudi
[2]National Institute of Agricultural Extension Management, MANAGE, Hyderabad

Food basket has become more diversified in both rural and urban areas with a significantly higher share of milk, fruits, vegetables, meat and fish (Kumar *et al*. 2016; Chopra 2015; Halder and Pati 2012). Demand for processed food items are also increasing in India over the years (Birthal *et al*. 2005). Globalization of Agriculture and allied sectors food markets also provides an opportunity for the Indian producers (farmers/fishers/processors) to participate in the global food supply chains by increasing exports (Birthal *et al.* 2007). To tap the market potential, innovative institutional models are emerging in agriculture and allied business for developing more efficient and value-added supply chains (Joshi *et al*. 2007)

Why Value Chain?

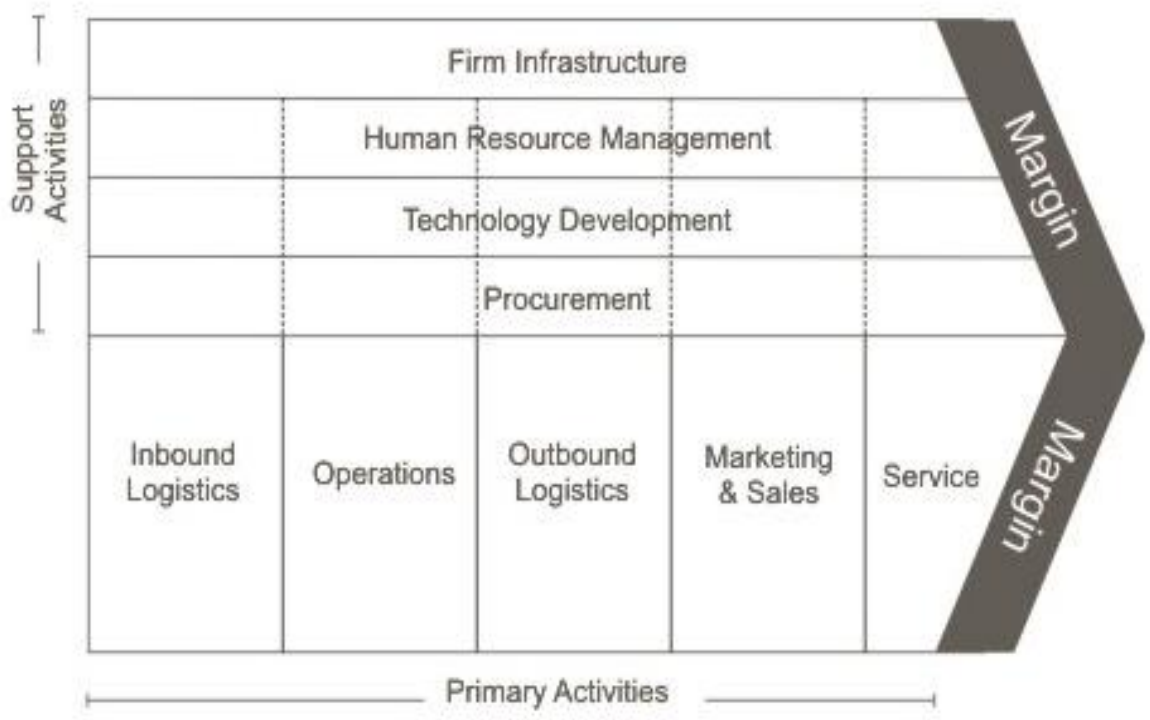
- To understand the *relationship* between markets and farm level decisions in utilizing the resources/inputs
- To have better understanding on the *decisions* the farmers make out what to be grown
- Also to know the *availability* of inputs in formal/informal markets, whether the inputs on offer genuinely reflect *farmers' needs*, the extent to which the *output markets* influence over the produce that farmers grow

To estimate the value chain, the information on the approach (qualitative/quantitative) and where to start with. The place to start with is "Map the market" to build up an understanding of different players or actors in the chain of input and product and the relationships between them, along with the factors that determine how well or badly the

chains are working. The value chains could be mapped and analysed through value chain analysis by using quantitative and/or Qualitative tools.

Value Chain

Value chain comprises of *full range of activities* required to bring a product or service from the stage of conception, production and distribution to consumers (Kaplinsky and Morris, 2001). *Value Chain analysis* is the process of documenting and analyzing the operation of a value chain, and usually involves mapping the chain actors and calculating the value added along its different links. Value chain management is a *strategic planning tool* used in analyzing the value chain of a company or sector or a product. Includes the managerial strategies that can reduce the various costs associated with processing and can improve the quality and productivity/processing of the product, also reduces distribution cost.



Porter's Generic Value Chain

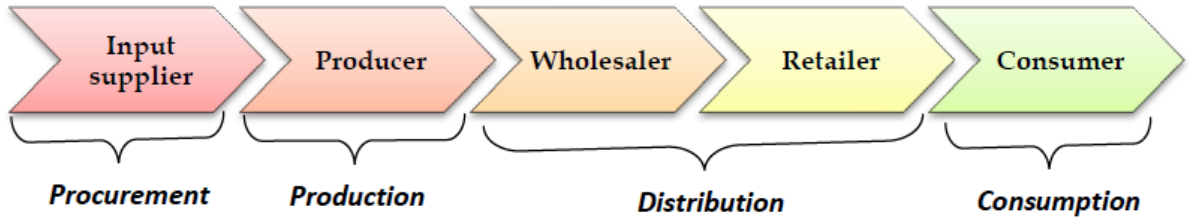
Value chain in India

Value chains are specific to location and commodity. Domestic value chains are well developed in India, in case of milk, coffee, and few food grain crops (Ranganth 2011;

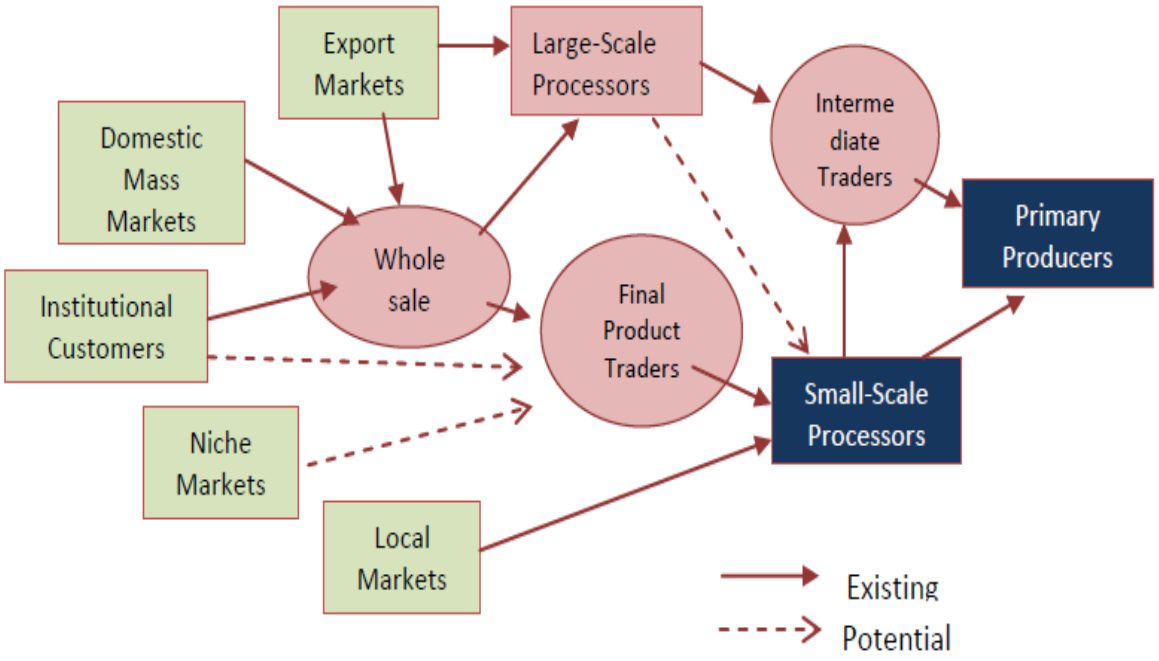
Srinivasan 2012). When it comes to livestock value chains, often it's well organised. Lack of coordination, elongated supply chains, lower profit margins and lack of incentives for harnessing 'upgrading potential' are the major roadblocks. In case of fisheries, international fish/shrimp value chain created new market opportunities but, benefit of this largely went to traders not the fishers (Kumar, Shinoj, 2008). Profit oriented value chains ignore the welfare of fishers, biodiversity and environmental sustainability. Problems in certification, low literacy of fisherman and perishability offers greater challenge for inclusion of fisherman in the chain (Lindhal, 2006).

Types of Value chain

Value chains are of simple and complex. Simple value chain comprises of input supplier, producer, wholesaler, retailer and consumer with single channel only (Jeyanthi and Chandrasekhar, 2017). Complex value chain comprise of two or more chains with many actors involved in variety of activities that shows the flow of income from the market along the chain to primary producers (John Hellin and Madelon Meijer, 2006).



Simple value chain



Complex value chain

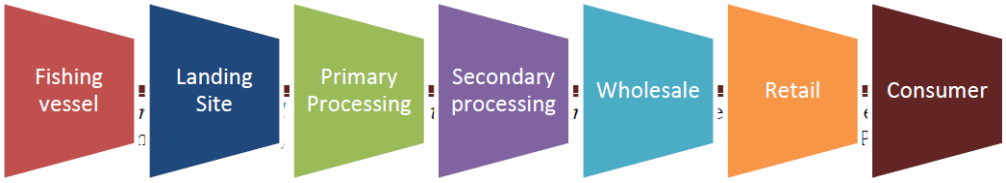
Value chain analysis

Value chain analysis (VCA) encompasses mapping of the actors in value chain, understanding the geometry of information flow between the actors in chain and identify the key links in the chain, estimation of the 'value co-creation', and the impact of value chain participation (John *et al.*, 2016). VCA is the holistic and integrated approach with inter connections of all dimensions viz., social, economical, behavioural and institutional (Jeyanthi and Chandrasekar, 2017).

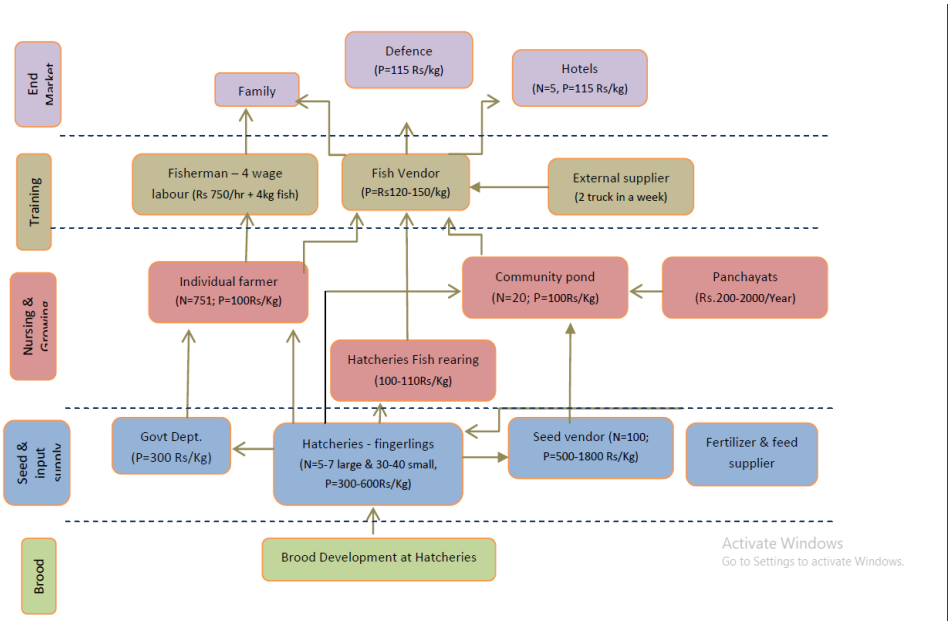
The advantages of VCA are to increase the producers' share, reduce process cost, increase the efficiency and effectiveness of the actors, eliminate the non-value added processes, and ensure the quality assurance in product development and finally the consumer satisfaction.

Value chain in fisheries and aquaculture

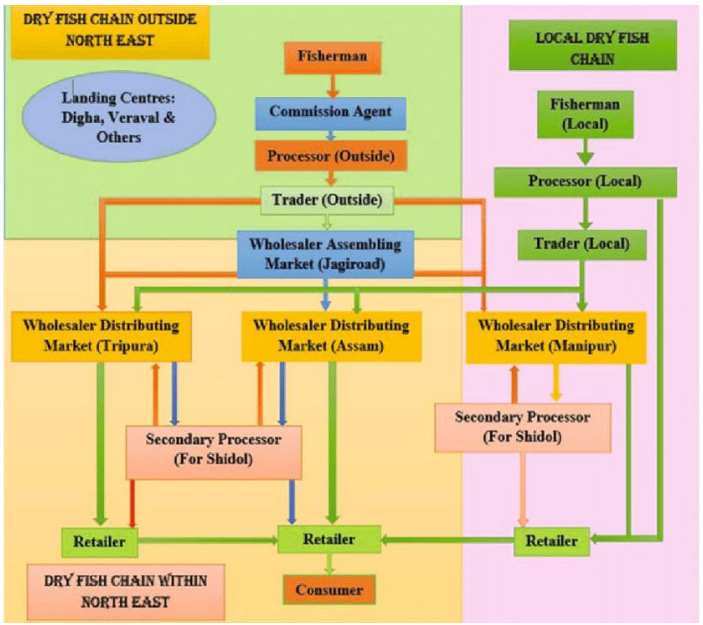
Value chain finds application in culture and capture fisheries which are as follows.



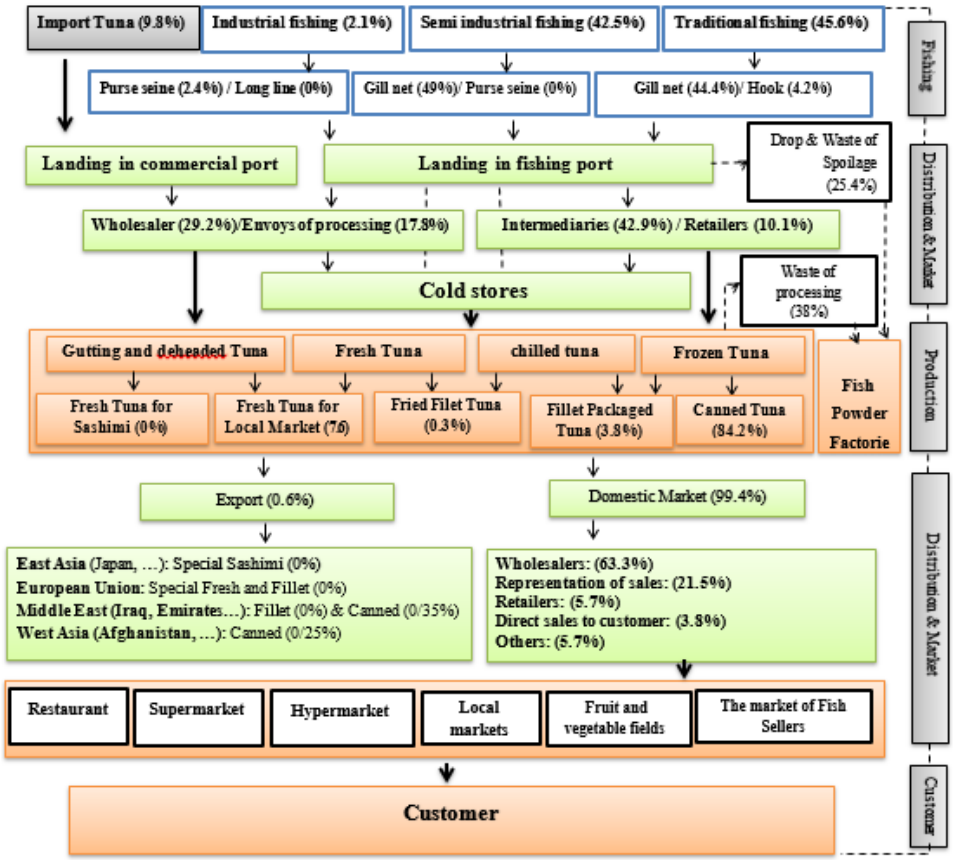
Marine fisheries value chain



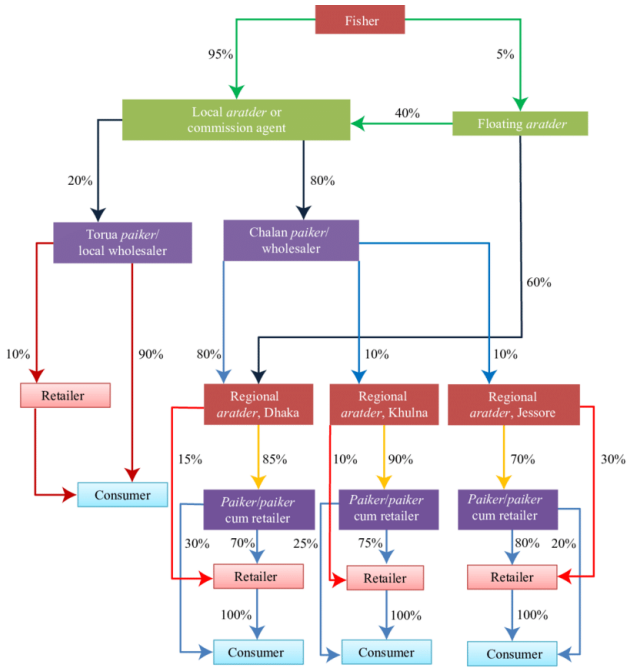
Inland fisheries value chain



Dry fish value chain



Value chain of Tuna and Tuna-like species



Value chain mapping of Hilsa fish

Inclusive business models

Inclusive value chain describes the approaches to enhance farmers, traders and consumers access to markets, and improving productivity and efficiency in ways that have positive effects on livelihoods, food security, climate resilience and gender equality (Haggblade et al., 2012; Thorpe et al., 2017; Ros-Tonen et al., 2019). Inclusive business integrates smallholders and poor (local VC) actors into aquaculture value chains through IBMs and are touted as more sustainable and ethical way of doing business and trade to generate development outcomes. Inclusive business model refers to the Pro-poor, equitable and profitable business activities that integrate poor producers, processors, retailers, distributors and consumers in the VC whilst generating broader positive development outcomes (Kaminski et al., 2020).

Inclusive Business Models (IBMs) are Producer-driven by farmers (collective groups and clusters) for e.g., *farming cooperatives, sharecropping and tenant farming,* Buyer-driven by suppliers for e.g., contract farming, microfranchising, joint ventures and Intermediary-driven for e.g., public-private partnerships (Govt. & NGOs) (Vorley et al., 2009, Vermeulen and Cotula, 2010 and Kelly et al., 2015). Inclusive relationships should offer various

incentives that will benefit all parties' position and performance in the chain. For example, in a contract farming scenario, large wholesalers can offer smallholder farmers various inputs (e.g. feed and seed) on credit and then buy back the harvest at the end of the farming cycle. Smallholder farmers get access to high quality inputs which increase their yields and they can pay back the credit with the sale of the harvest to the wholesaler who has more fish to sell.

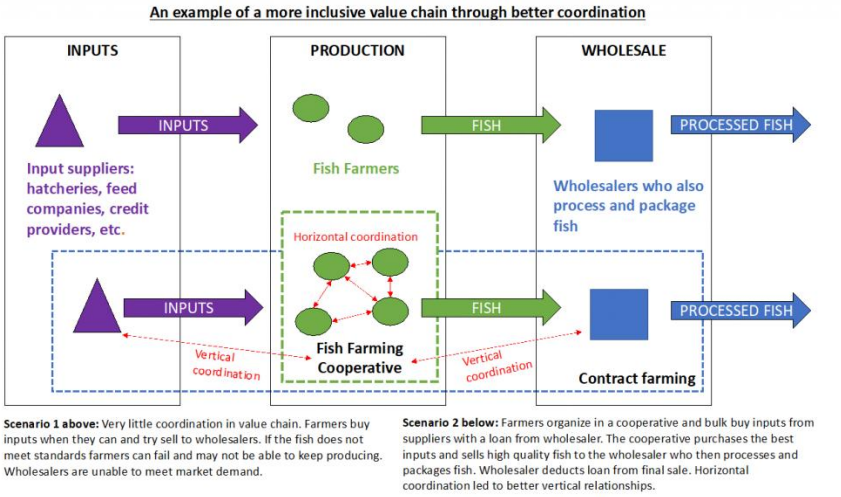
A GVC analysis unpacks the economic and social upgrading objectives of the different IBMs as well as the types of relational coordination used between actors in the chain to achieve development outcomes. Majority of the models focused on economic upgrading over social upgrading but providing opportunities for the social upgrading is the key to achieve the inclusive objectives of IBMs. Economic upgrading includes process upgrading, product upgrading, functional upgrading, chain upgrading that increases competitiveness in VC processes. Social upgrading on the other hand encompasses women rights, land ownership, freedom of association and Collective bargaining.

IBMs and barriers to participation in VC

- Access to inputs, technical assistance and services
- Access to finance
- Poor infrastructure and inefficient institutions
- Challenges in coordination *(e.g. high transaction costs)* between smallholder farmers and other value chain actors
- Excessive individual risk related to commercialization
- Constraining sociocultural factors

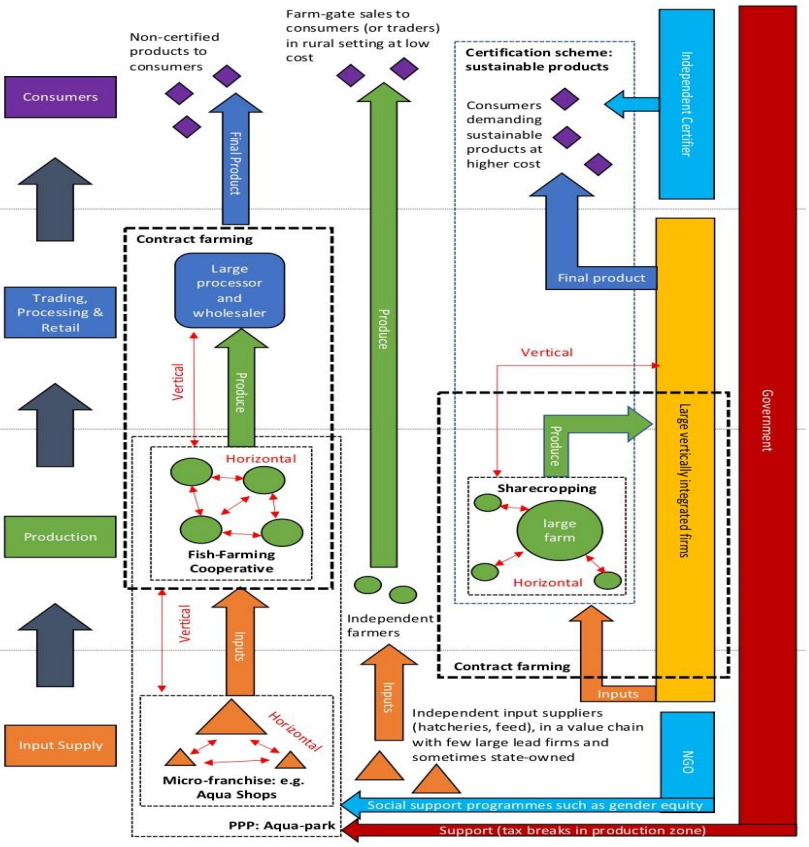
The relations and forms of coordination enable actors to upgrade their position and performance in a value chain and IBMs help to overcome barriers by enabling economic and social upgrading and where they still pose risks to inclusiveness.

Examples for IBM



Scenario 1 above: Very little coordination in value chain. Farmers buy inputs when they can and try sell to wholesalers. If the fish does not meet standards farmers can fail and may not be able to keep producing. Wholesalers are unable to meet market demand.

Scenario 2 below: Farmers organize in a cooperative and bulk buy inputs from suppliers with a loan from wholesaler. The cooperative purchases the best inputs and sells high quality fish to the wholesaler who then processes and packages fish. Wholesaler deducts loan from final sale. Horizontal coordination led to better vertical relationships.



Conclusion

Value chain analysis approach is a powerful tool for analyzing and explains how existing chains are structured and operate and also the impact that the chains have on production/processing level decisions on utilizing the resources. Identifies the leverage points in the chain that would maintain or enhance the output. Aquaculture production systems are so broad and varied in different contexts around the world that may be better suited for IBMs and variety of available models consider the socio-economic (including gender) and cultural contexts, as well as existing market realities and institutional frameworks.

To reach the objectives of Sustainable Development Goals (SDGs),

VCs will have to be more inclusive of poor people

References

Jon Hellin and Madelon Meijer, 2006. Guidelines for value chain analysis.

Jeyanthi, P. and Chandrasekhar, V., 2017. Value chain management in fisheries. Recent trends in harvest and post harvest technologies in fisheries, CIFT, Kochi, India, pp: 456-465.

Alexander M. Kaminski, Froukje Kruijssen, Steven M. Cole, Malcolm C.M. Beveridge, Clarie Dawson, Chadag V. Mohan, Sharon Suri, Manjurul Karim, Oai Li Chen, Michael J. Phillips, William Downing, Fred Weirowski, Sven Genschick, Nhuong Tran, Wayne Rogers and David C. Little, 2020. A review of inclusive business models and their application in aquaculture development. Reviews in Aquaculture, pp: 1881-1902.

Kaplinsky, R. and Morris, M., 2000. A Handbook for value chain analysis. Institute for Development Studies: Brighton, UK, (September), pp.4–7.

Kumar B.G. and Shinoj P. (2008). Changed scenario of traded ship in India: needed policy measures, National Centre for Agricultural Economics and Policy Research, Pusa, New. Accessed 23rd September 2010.

www.crida.ernet.in/agrl_martng/ISAM/PDF FILES/T-I/Ganesh Kumar.pdf

https://www.marketing91.com/value-chain-porter/

https://www.worldfishcenter.org/blog/inclusive-business-models-making-aquaculture-value-chains-work-poor.

Chapter 3

GAUGING FISH CONSUMPTION DIVERSITY AND INNOVATIVE INTERVENTIONS TOWARDS AN INCLUSIVE VALUE CHAIN MANAGEMENT FRAMEWORK

Shyam S Salim and Athira, N.R

ICAR- Central marine Fisheries Research Institute, Cochin-682018

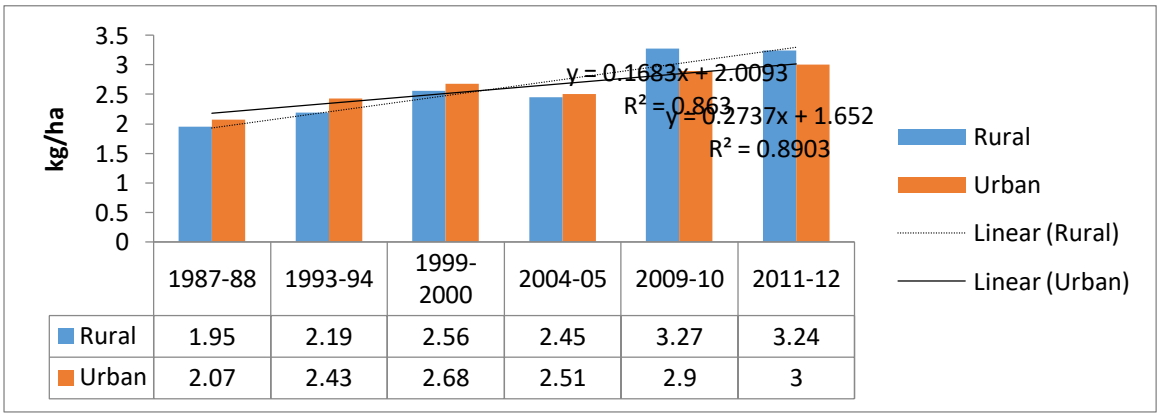
Setting

Fisheries is a fast-growing sector in India, which provides nutrition and food security to a large population of the country as well as providing income and employment to fishermen and fish farmers The fisheries sector registered a sustainable growth rate of over 10 per cent and contributed over one per cent of India's annual gross domestic product during the last decade. India is the third-largest fish producer in the world. Overall fish production has increased from 0.75 million tonnes in 1950-51 to 14.5 million tonnes in 2021-2022. Marine fish landings in India were estimated as 3.05 million tonnes during the year 2021-22.There has been a gradual increase in India's contribution towards global fish production over the years. The growth rate in marine fisheries was about 5.65 percent, whereas the growth rate of 33.64 percent has been achieved in inland fisheries in the country during the last decade. The country has an estimate of the value of marine fish landings during 2021 at landing centre (LC)level of Rs 53,647 crores, (14.24% increase over 2020) and at retail centre(RC) of Rs. 76,640 crores (14.06 % increase). The unit price per kg of fish at LC was Rs.176.04 (2.19 % increase over 2020) and at RC was Rs.251.48 (2.03 % increase). The average annual growth rate of fish and fish products exported from India in terms of quantity and value for the last decade (2010-11 to 2019-20) was 6.13 per cent and 15.47per cent respectively (CMFRI Annual Report, 2021).

Currently, about 80 per cent of the fish produced globally is consumed by people as food. This proportion is not expected to change till 2030. Given that the production is expected to grow by 23.6 per cent during the 2010 to 2030 period and the world population is projected to grow at 20.2 per cent over the same period, the world will likely manage to increase the fish consumption level, on average. At the global level, annual per capita fish consumption is projected to increase from 17.2 kilograms in 2010 to 18.2 kilograms in 2030.

The trend in per capita consumption, however, is diverse across regions. In general, per capita, fish consumption is expected to grow fast in the regions with the highest projected income growth (China, India, South East Asia). However, the highest growth in fish consumption is expected in South Asian Region (SAR), where per capita fish consumption is expected to grow at 1.8 per cent per year over the 2010–30 periods. In all of these regions, however, the growth in per capita fish consumption is expected to slow relative to the 2000–06 period. Adding together all its regions (CHN, EAP, JAP, SEA, IND, and SAR), Asia is expected to represent 70 per cent of global fish consumption by 2030.Though a major producer and consumer of fish globally and a net exporter, consumption per capita in India is well below the world average.

Fish is less expensive than other animal protein sources and is inexpensive in terms of nutrition value in comparison to even vegetables and grains. Food security policies in India are by and large obsessed with cereals. Given our vulnerability to inflation in pulses, a large part of which is imported, India would do well to seriously think about fishing its way out of protein deficits. A preliminary examination of the average annual per capita fish consumption in India indicate that Tripura, Kerala, Manipur, Odisha and Assam are the top fish consuming states (Department of fisheries, 2019)



	1987-88	1993-94	1999-2000	2004-05	2009-10	2011-12
Rural	1.95	2.19	2.56	2.45	3.27	3.24
Urban	2.07	2.43	2.68	2.51	2.9	3

Fig: 1 Average per capita fish consumption in India (kg/ha)

Fisheries sector and fish consumption of India

Fish has become an integral constituent in the food basket of the Indians as it is considered to be a healthy food with a high level of edible protein. Globally, fish provided 6.7 per cent of all protein consumed by humans and offered a rich source of long-chain omega-3 fatty acids, vitamins, calcium, zinc, and iron. One of the major advantages of including fish in the consumption basket is the availability of wide range of products across a huge price range and geographical spread across different states. On one side, fish could be

poor man's protein (low-value fishes) ensuring food security, and on the other, a delicacy offered at a huge price and comparable with other protein sources (high-value species like shrimps, pomfrets and seer fishes etc.).It has been estimated that around 60 per cent of the Indian populace consumes fish and the consumption pattern varies spatiotemporally and across the different social fabrics. The annual per capita consumption of fish for the entire population is estimated at 5-6 kg whereas for the fish-eating population it is found to be 8 -9 kilogram, which is a poor 50 per cent of the global rates. Moreover, the *Pradhan Mantri Matsya Sampada Yojana* (PMMSY) - the flagship scheme of the Government of India in the fisheries front- emphasizes on augmenting domestic fish consumption from 5 kg to 12 kg per capita is a step taken in the right direction.

The existing per capita availability of fish is 6.5 kg and is expected to reach 9.0 kg by 2030.The Indian Council of Medical Research recommends per capita fish consumption be 12 kg per annum. The regional tastes and preferences of the fish-eating population of the country and the frequency of fish consumption also exert substantial influence on the market. It is estimated that the Indian population will reach 1.5 billion by 2030 and cross 1.6 billion by 2050 (The UN Department of Economics and Social Affairs, 2020). The increasing population necessitates identifying and harnessing cheaper protein sources like fish. The fish produced in the country exhibits competing use /users within domestic and international markets. Due to their ease of access to marine fisheries, coastal states/Union Territories (UTs) are likely to be higher consumers of fish compared to the non-coastal states/union territories. However, higher access alone may not lead to higher fish consumption and cultural and religious factors play an important role in state-wise patterns of fish consumption. The species diversification in the export basket indicated that almost all the varieties including sardine and mackerel which are often the most consumed fish in the domestic market are exported. The non-availability of fish in the domestic fish market will lead to a situation where the domestic consumers are devoid of fish in the market at affordable prices. The domestic fish food security is questioned because the export prices are lower than the domestic prices coupled with umpteen trade restricting means and measures by the buyer countries (Paradox of export).

The Indian government is striving to provide food security to all its citizens through various policies and programmes. The National Food Security Act and Pradhan Mantri Garib Kalyan Anna Yojana are important steps in this direction, which aims to give adequate quantities of cheap cereals (predominantly wheat and rice) to the most vulnerable segment of the rural and urban population. Although this effort is laudable, food strategies must not

merely be directed at ensuring just food security for all, but must also address providing adequate quantities of nutritious, safe and good quality foods that could address the makeup of a healthy diet.

Despite rapid economic growth during the past decades, India's average per capita calorie and protein intake have grown only modestly, although the per capita fat consumption has registered higher growth. Calorie and protein source in the Indian diet is diversifying with fruit/vegetable and animal-based food share increasing and cereal and pulses declining. The implication is that the implementation of the cereal-based National Food Security Act will have only a limited impact in achieving the goal of providing nutritional security to the vulnerable section of the population. This necessitates the need to enhance fish consumption.

The Pradhan Mantri Matsya Sampada Yojana (PMMSY)- the flagship scheme of the Government of India in the fisheries front- emphasizes on augmenting domestic fish consumption from 5 kg to 12 kg per capita is a step taken in the right direction. It is important to note that fish consumption is restricted mostly within the near vicinity of less than 50 km of the production centres. Nevertheless, the demand pattern has not improved much and the increased fish consumption was found mostly among the existing fish consumers rather than adding new consumers into the fish consuming population.

India's per capita calorie, protein, and fat consumption remain significantly below that of more developed countries such as China and the United States. The implication is that in the coming years, with rising per capita income and urbanization, India's demand for various superior food products will continue to increase necessitating a possible change in the food production system and agricultural trade. Deliberations on the potential of the food and agriculture sector to meet the demands and challenges posed by this analysis and, its implications for all components in the food chain would be useful.

Summarising a 1966 survey of possibilities of increasing food production to meet India's nutritional requirements, Kent (1987) notes that, "fish is one item in our requirements of food that has the largest potential for increased production causing, at the same time, no strain on India's limited land resources. For a country with such low levels, qualitatively of food consumption, like India, fish ought to command high priority in the solution of India's long term food problem". With excessive dependence on cereals, the Indian diet is often characterised by both energy as well as protein deficiency, which can be met through fish consumption. In comparison to vegetables and grains, fish is relatively expensive based on weight but it is quite inexpensive in terms of nutritional value.

Assessing fish consumption paradigms across coastal states India)

The major advantages of including fish in the consumption basket are its availability of wide range of products across a huge price range and geographical spread across the different states. On one side, fish could be a poor man's protein (low-value fishes) ensuring food security, and on the other, a delicacy offered at huge prices and comparable with other protein sources (high-value species like shrimps, pomfrets and seer fishes. It's been estimated that around 60 per cent of the Indian populace consumes fish and the consumption pattern varies spatiotemporally and across the different social fabrics. The annual per capita consumption of fish for the entire population is estimated at 5-6 kg whereas for the fish-eating population it is found to be 8 -9 kilogram, which is a poor 50 per cent of the global rates. The per capita consumption of other meats such as chicken (2.7 kg), beef (1.3 kg) and mutton (0.6 kg) are less compared to fish. India has a higher part of fish protein in total animal protein consumption than the developed countries.The share of meat, fish and egg in protein intake was only 7% in rural India and 9% in urban India. The share was 26% in both rural and urban Kerala and was 10% or more in only 5 other major States: West Bengal, Assam, Andhra Pradesh, Tamil Nadu, and Karnataka.The Indian Council of Medical Research recommends per capita fish consumption be 12 kg per annum. Moreover, the fish consumption will also be influenced by the availability and price of its immediate substitutes. Ghee, butter, and eggs could act as substitutes for fish in Indian diets.The demand and supply of fish in the years 2017, 2020, 2025 and 2030 were calculated assuming the population of India to be 1.28 billion,1.36 billion,1.45 billion and 1.53 billion, respectively with 60 per cent population consuming fish @ 12 kg/capita. The result shows that the supply-demand gap would be 1.75 Million tonnes by 2017 and would double by 2030.

Fish preferences can vary based on several factors such as place of residence (rural and urban) as well as income level (poor and non-poor households). The fish trade is also differentiated based on market destinations like domestic and international channels. Increasing wealth and urbanization have a strong influence on the consumption of fish and fishery products. About 8 to 21 per cent of the consumers belonging to the higher income group spent their income more on fish compared with the lower-income groups (5 -16 per cent). Similarly, the part of the budget spent on fish is more in the urban areas (6-32 %) compared to rural areas (3-15%). Freshwater species appeared to dominate the household fish consumption especially for those living in the deltaic countries with rich inland waters like India, China, Vietnam, Bangladesh and Thailand which imply that the geographical factors also determine the fish consumption.

A comprehensive understanding of the fish consumption patterns across different coastal and non-coastal regions of the country is the need of the hour given its nutritional security implications. In this context ICAR – CMFRI has done numerous studies on fish consumption paradigms across the different coastal states on India**.** The study identified varied results like the quality, good taste and cheap rate may as the prime reasons to be acknowledged as the effective factors in the consumer's decision in the preference of the buying place. The results indicates that drivers for buying fish have the highest part worth value for all the selected study areas of Andhra Pradesh (36.43), West Bengal (56.00) , Kerala (52.00) expect for Odisha (32.44). Quality, nutrition and taste and preference are the major drivers for buying fish for the consumers. The results also indicates that fish vendors at doorstep, way side markets etc. and even the landing center and supermarkets have considerable importance in choosing the purchase place by the consumers for fish consumption. The quality, good taste and cheap rate may the reasons behind the consumers' decision in the preference of the buying place. Due to the increase in the fish consumption the meat consumption is decreased. People are willing to travel to about 1-2 km to buy good quality fish. The Garrette ranking technique for constraints in fish consumption found that the main constraint in the consumption of fish was observed to be the lack of fresh fish, followed by irregular supply, wide fluctuations in price, and consumption restricted due to high price. The per capita annual fish consumption of the respective states are given below (Table 1) and the results indicates that the state Kerala has got the highest per capita fish consumption followed by West Bengal and Andhra Pradesh.

Table 1. Percapita fish consumption of the Coastal states of India

State	District	Location	Per capita Annual fish consumption (kg)	Year
West Bengal	Purba Medinapur	Coastal Rural	21.84	2019
Andhra Pradesh	Ananthpur	Non- Coastal Rural	5.80	2018
Andhra Pradesh	Visakhapatnam	Coastal Urban	10.98	2018
Andhra Pradesh	Vizianagaram	Coastal Rural	9.52	2018
Andhra Pradesh	Kurnool	Non Coastal Urban	7.96	2018
Gujarat	Somnath Gir	Coastal Rural	16.08	2019
Odisha	Puri	Coastal Urban	10.97	2019
Odisha	Balasore	Coastal Rural	6.78	2019
Odisha	Cuttack	Non Coastal Urban	8.52	2019
Odisha	Mayurbhanj	Non- Coastal Rural	5.15	2019
Kerala	Palakkad	Non- Coastal Rural	20.63	2019
Kerala	Alappuzha	Coastal Rural	31.94	2019
Kerala	Trivandrum	Coastal Urban	34.83	2019

Kerala	Kottayam	Non Coastal Urban	23.96	2019
Karnataka	Mangalore	Coastal Urban	9.50	2018
Maharashtra	Mumbai	Coastal Urban	9.43	2017
Tamil Nadu	Chennai	Coastal Urban	9.47	2017

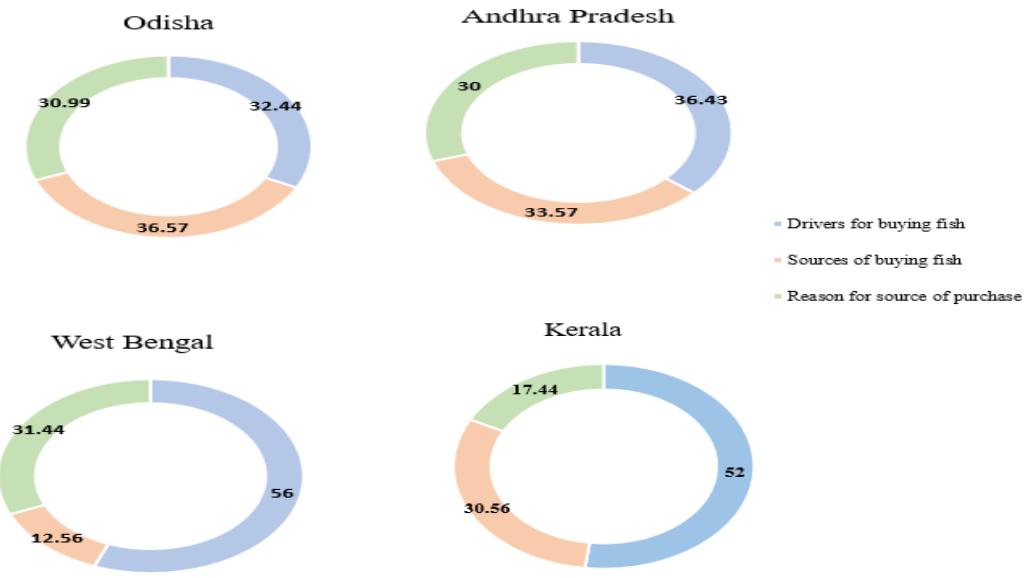


Fig 2: Major drivers for fish consumption

Consumption of fish during COVID:

The COVID-19 pandemic induced stringent stress all over the food supply chain in the country causing changes in people's food consumption pattern. The spread of Corona virus has created bottlenecks in the production, processing, transportation and logistics leading to momentous shifts in fish consumption pattern as well as demand and supply of fish. Efficiency and effectiveness of fish supply chain is a major aspect determining fish consumption across the country. The fish supply chain has undergone rapid changes in consonance with the evolving technology and demand pattern. The COVID 19 pandemic and associated lifestyle changes have also triggered this evolution. Online trading of commodities and services has captured considerable market space and share in India and world over targeting this opportunity. Online fish trade is gaining traction in this digital age where people prefer everything delivered at their doorstep. However, a thorough understanding of the innovative marketing models in fish supply chain using modern/digital technologies in India is required. The online fish trading assists in protecting the interests of both producer and consumers. A recent study indicated that most of the online fish trading firms in Kerala

are of recent origin and firms with strong backward and forward linkages realize higher returns The Online fish marketing in India is gaining momentum with focus on quality and convenience rather than price advantage .Presence of limited literature in this area necessitates a thorough understanding of the innovative marketing models in fish supply chain using modern technologies in India. A rapid impact assessment by A Rapid impact assessment by CMFRI on the COVID pandemic in the marine fisheries sector estimated a total loss of Rs.10, 000 crores for a period of 21 days across the marine fish value chain constituents in India. The fishing operations get disrupted and continued to impose unabated serious threat to the fisher livelihood, fisher income thereby registering a decreasing revenue trend in the fishing sector. These created alterations in the fish consumption – trend and pattern. The unavailability of fish due to the restrictions by the pandemic and hygiene issues in the fear of attack of COVID are one of the two major reasons for the alterations in the fish consumption pattern. As fish is a perishable item, there is high demand for packaged and frozen products due to panic buyers but the processing and canning industry will not be able to cater to this demand due to non-availability of man power. The high-end fresh products which are transported by air are also directly affected due to cancellation of flights, thus directly affecting the trade. Overall, a sharp decline in demand resulted in price drop of many species, particularly those which were served as delicacy in restaurants.

Changing fish basket of Consumers

The fish demand and supply pattern drastically varied during COVID times, the fish consumption analysis across during COVID times indicated that the fish consumption decreased by 48 per cent due to the unavailability as well as increased price. In addition the per capita consumption of fish recorded highest during pre Covid season (27.96 kg). It became lowest during lock down / COVID down (17.76 kg) and spiraled to 23.52kg during 2021.

Table 2: Preference Index of Species during Pre- Post COVID

Species	Pre Covid	Species	Lock Down	Species	Post Covid
Sardine	0.53	Prawns/ Shrimp	0.23	Sardine	0.48
Mackerel	0.28	Tilapia	0.23	Prawns/ Shrimp	0.18
Anchovies	0.22	Others	0.21	Others	0.18
Prawns/ Shrimp	0.17	Mackerel	0.12	Mackerel	0.15
Others	0.16	Sardine	0.12	Tilapia	0.15
Thread fin	0.15	Anchovies	0.10	Ribbon fishes	0.13

breams					
Tuna	0.14	Clam/ Mussel/ Oyster	0.10	Anchovies	0.12
Tilapia	0.10	Seabass/ Milk fish/ Mullet	0.07	Cephalopods	0.12
Cephalopods	0.09	Carps	0.06	Seer fish	0.08
Pomfret	0.09	Crab	0.06	Clam/ Mussel/ Oyster	0.08

The species composition during pre covid, covid and post covid were investigated and the preference indices for the species during the three time periods were computed. Among the species during the Pre Covid period sardine (0.53 kg) was the most preferred fish followed by anchovies (0.22 kg) and mackerel (0.28 kg) in the selected areas of study. During Covid period Prawns/shrimp (0.23 kg) and Tilapia (0.23 kg) registered as the most preferred fish species as these were the most available fish during the Covid time. Sardine resumed being the most preferred fish during the post Covid time however the streaks of Covid retained the preference of Tilapia as the most common fish in the long run. The availability and the consumer preferences are remarked as the major reasons for the highest utilization rate.

Factors determining changing consumption

The consumption basket got diverse due to the availability of inland fishes like tilapias, farmed shrimp, seabass, milk fish, mullet, carps, mussel, oysters and clam Among the different factor which lead to changing fish consumption it was found that non availability of the fish is the main factor that determining the change in consumption followed by the increased stress/ anxiety/ boredom of the quarantine situation. The significant limitation in the consumption of fish was found to be the unavailability of favoured fishes in the state while absence of fresh fish is the second important constraint in the study regions. The purchase and demand of the fish have not been yet reduced due to these reasons and their fish consumption has only increased fairly in despite of the high prices. Yet, the irregular supply, as well as the poor access and different reasons, have also affected in the consumption pattern of the consumers. Due to which they have to rely upon the different hotspots for the utilization of fish.

Fig 3. Factors determining changing consumption

Changing consumer preferences

The seafood industry of India has gone drastic changes over the years in suiting the eating habits and consumer preferences toward the fish products. India is gearing up to produce and supply value added products in convenience packs by adopting the latest technologies and by tapping the unexploited and under exploited fishery resources. There has been considerable structural change in the seafood processing and export industry for the last few years. Large quantities of fish/shellfish are discarded at sea because it is currently uneconomic to preserve and bring them ashore It has been estimated that the global amount of discard of by-catches is in the range of 17-39 million tons/year with an average of 27 million tons/year. Factors discouraging the landing of the by-catch are the low market value of the material, the size and species composition, the lack of suitable refrigerated storage space on-board and over-exploitation of most the available species in the inshore areas. The rapid development of the value addition of fish products over the last four decades made a major contribution to the increased exploitation of these deep sea varieties and the by-catches. It has been found that consumption of fish may be greatly increased by making better use of the existing catch. Due to lack of infrastructural facilities like ice plants, landing facilities etc. the quality of the fish is downgraded particularly in developing countries leading to their use as aquaculture feed. Through improvement in infrastructure facilities, the quality of the landings can be upgraded for direct human consumption. The up gradation of these species may be achieved by use of improved handling and processing techniques on one hand and developing different products on the other preparation of value added product using a species in glut it is sure way of better utilization and distribution of the species when the

landing is scanty.

The linkage between Production- Distribution and Consumption (PDC) - FMPIS

Amidst the technological innovations, improvements in the infrastructure over the years the domestic fish marketing is grappled with numerous bottlenecks at the production, distribution and consumption centers. This can be owed to the inelastic nature of supply and distress sale, seasonality of landings during peak and lean seasons in marine fisheries systems and lack of staggered harvesting in the case of inland fisheries sector, huge amount of by catch/ discards due to less-efficient marketing systems and latent markets, distress sales due to the geographical differentiation of the production and consumption centre, indebtedness to the middlemen (traders) , lack of institutional and policy support, inadequate cold chain facilities, lack of value addition, poor marketing infrastructure, improper fish handling, seasonal variations in demand and supply, unhygienic handling and poor quality control, unethical trade practices and highly localized preferences. However the export sector is better organized with minimal marketing, informed constituents and price spread. The consumers' perspectives also includes huge concern about the unhygienic handling and practices in the market and thus are reluctant to buy the fishes, thereby leading to a situation where the retailers and vendors do sizeable business in the domestic fish marketing channel with huge price spread. This translates to an unhealthy market.

The domestic fish markets are geographically characterized through various marketing systems namely, landing centers related market, wholesale market, retail market and terminal markets. All these markets are characterized by the number of buyers or sellers, the number of products, entry or exist, market information. The market structure information namely, location, access, timings, buyers-sellers profile, product disposal, price stability attributes, arrivals, storage, quality check, infrastructural adequacy, intra- state and inter-state transportation and quantum of sales, species traded, the taxes levied, are often inaccessible to the different stakeholders. The marketing channel for fish in the country isn't organized much in the domestic sector whereas the marketing channel for the export sector is more organized with minimal marketing and constituents and price spread and mostly relying on forward markets and registering the market economies of scale thereby ensuring competitive markets and assured quality. The case is different with the domestic marketing system with grappling issues in the market infrastructure and marketing efficiency levels. The markets are devoid of adequate infrastructure and forward integration facilities. There aren't facilities for the cold storage or any improve interventions available for value addition. The consumers are hugely concerned with the unhygienic handling and practices in the market and are reluctant to buy

the fishes from the markets as noticed from the fact that the retailers and vendor do sizeable business in the fish marketing channel. The prospect of improved information flow in the fisheries sector is important as the fish production and the consumption is on the high across the rural and urban areas a cheap source of protein when compared to other non-vegetarian protein supplement. However the geographical separation of the fish between the production and consumption centres coupled with quality constraints etc necessitates the need for developing e- marketing interventions in the fish distribution across the sector.

Fish marketing system in India has traditionally been highly unorganized and unregulated, which is the prime cause of inefficiency in the whole process, which starts with transporting fish from farmers and finally received by consumers. In fact markets are devoid of adequate infrastructure and forward integration facilities. Lack of value addition, inadequate cold chain facilities, improper fish handling, unhygienic handling and poor quality control, lack of institutional and policy support, indebtedness to the middlemen (traders), unethical trade practices, and consumption is on the high across the rural and urban areas a cheap source of protein when compared to other non-vegetarian protein supplement. Under this background developing e-marketing interventions in the fish distribution across the sector can be used to transfer information and knowledge to the fishing community and provide all necessary fisheries information about various fishing activities. CMFRI has initiated a project titled Supply chain management of marine fisheries sector in India which aims to analyze the market structure and marketing efficiency along the fish supply chain, estimate the demand pattern, supply constraints and market potential for fish and fish products. The build out of India Fish Market Grid / Fish market and price information system (FMPIS) provides fish price Information in markets integrated with fish availability and the nearest fish market navigation. Various functionalities that form the fish market structure is meticulously conceived and optimized in India Fish Market Grid. In connection with a project was implemented jointly by National Fisheries Development Board (NFDB) and ICAR- Central Marine Fisheries Research Institute (CMFRI).

The intend of the project includes development a fish market information system (FMIS) across the country, price information system (FPIS) for the traded commercially important fish species across the country and a trade facilitating platform leading to added fish distribution and consumption utilities. In the first instance CMFRI has developed the state fish marketing (SFM) schedules which helps to identify the different markets (Landing centre / production centre/ wholesale market and retail markets).These schedules will provide the details of all the fish markets including its location ,geographic coordinates, year of

construction – operations. The NFDB funded project "Development of fish Marketing Price Information System (FMPIS) plan initially was to cover 1500 fish markets (landing centre/ production centre / wholesale and retail markets) however was decided to downsize the same to 100 markets on a pilot basis across selected states. The build out of India Fish Market Grid / Fish market and price information system (FMPIS) transmits market information flows across the stakeholders ensuring affordability and availability of fishes. In addition a manual inclusive of inland/marine species across the country was developed across different size ranges. Several outreach activities such as Stakeholders meeting with State representatives at NFDB at different locations were organized and identifies state-level co-ordinator, engaging enumerators for the different identified markets The meetings were a suite of training selected enumerators for data entry in the tablets for the different species indicated in the market price schedule.

The "Development of Fish Marketing Price Information System (FMPIS) is in a huge transformation with newer markets added, geographical spread over the country, novel changes in the data collection, the gadget uses. The FMPIS has provided an opportunity platform wherein the price signals arrive at a single focal point where we will be able to make policy decisions and understand the price dynamics across the different markets. It provides a decision support system for the different stakeholder in taking rational decision in fish trade. Thus an e-auction system will be developed. Through E-auction it provides analysis to increase the marketing decisions in giving prices, product benefits, and consumer benefits, among various other functions and can provide fast and accurate information in order to help provide information on changing needs so that decisions can be made more quickly and accurately. The e-auction system will act as a bridge connecting the geographically separated buyers and sellers. It is a platform where trading, auctioning and marketing can be done surpassing all the existing physical barriers. The market functionaries will thus be directly engaged in auctioning and trading benefiting them in terms of unfiltered information of daily price, demand and supply data. Elimination of these marketing middlemen from the frame ensures to helps the producers to get benefits and reducing costs and also provide an idea to the fishers in finding the best target market, marketers in determining arrivals/ disposal and consumers in making rational decision which further increases the marketing efficiency. This pioneering study has evolved linkages with the different markets across rural and urban, across wholesale and retail, across inland and marine, species areas across the different parts.

Many research works has been carried out during these years across the different markets to identify the different market attributes, constraints experienced by the fish

markets. Price behaviour of fishes and diversity assessment across the different markets also provide an innate idea about the diversity of fish traded within a market and across markets. The FMPIS study target to develop an integrated fish market and price information system for India through mapping the markets on a ten dimensional market structure. The different dimension includes location, access, timing, conduct, species, arrivals, disposals, infrastructural adequacy, regulations and intelligence. The expected outcome includes development of a spatial fish market data base for Indian fisheries sector, identification of innovative commodity specific fish value chains and an integrated fish market grid incorporating species, markets and prices developed. It leads to develop efficient domestic fish marketing in India. Hence, it can be concluded that the Fish market and price information system in fish marketing presents a piece of better information regarding the clear view of prices, demand and trends of fish product. Furthermore, Consumers will be able to obtain pieces of information regarding fish product, fishery tools, equipment, and accessories, helps to reduce the role of intermediaries (marketing middlemen).Therefore, E-auction platform can be used to help marketers to determine the precise price and cheaper for fish products.

Moreover the FMPIS initiatives suggest the need for an E-auction platform for actively engaging the market functionaries so that the intervention of intermediaries can be eliminated. The market functionaries will thus be directly engaged in auctioning and trading benefiting them in terms of unfiltered information of daily price, demand and supply data. They will also act as information sources. The e-auction platform will act as a bridge connecting the geographically separated buyers and sellers. It will act a single window platform where trading, auctioning and marketing can be done surpassing all the existing physical barriers. Aforementioned improvisations and recommendations by this E- auction platform with combined production and marketing systems, consumption levels are a welcoming factor by marine-dependent coastal communities, which indeed will be effectively perceived and adapted for their better sustenance and development in the future.

Chapter 4

MODERN MANAGEMENT TOOLS AND APPROACHES IN FISHERIES VALUE CHAIN

Chandrasekar V and Geethalakshmi V

EIS Division, ICAR-Central Institute of Fisheries Technology, Kochi

Introduction:

The concept of "value chain" was introduced by *Porter (1985)* to describe the full range of activities, which are required to bring a product or service from conception, through the different phases of production, distribution to consumers, and final disposal after use. As the product moves from one player in the chain to another, it is assumed to gain value *(Hellin and Meijer, 2006).* Value chain can be used as a tool to disaggregate a business into major activities, thereby allowing the identification of sources of competitive advantage *(Brown, 1997).* Value chain analysis focuses on the dynamics of complex linkages within a network, wherein both value creation and value capture occur in a value system that includes suppliers, distributors, partners, and collaborators, thus extending the firm's access to resources and opportunities *(Zott, Amit and Massa, 2011).* As a framework for analysis of both firm-level and industry-level competitive strengths and weaknesses, the value chain needs to be disaggregated into its strategic components for better understanding of each component's impact on cost and value Stabell and Fjeldstad (1998). One of the most important tasks for businesses is to work together to satisfy customers' demand for goods and services. Therefore, you need a value chain to transform your ideas into a valuable product for the market. When a value chain is well planned, you can increase the value and lower the cost of a product. Ultimate goals in performing value chain analysis are to maximize value creation while also monitoring and minimizing costs.

The marine fisheries sector plays an important role, providing direct and indirect livelihoods for millions of fishermen and generating income and employment for the social and economic development of fishermen in the country. Over 60% of her population eats fish to meet their protein needs. There was a great demand for seafood in the international market. India has huge, protected fish stocks, covering 8129 km of coastline. 2 million km² of EEZ and 1.2 million hectares of brackish water. According to the 2019-20 estimates, marine fish production contributes 3.72 million tonnes, and still, about 90% of fish production is provided by the artisanal, traditional and mechanized sectors of fisheries, with the rest

coming from deep-sea fishing areas. The fisheries sector has greatly developed infrastructure facilities such as landing centers, ice-making schemes, cold storage facilities, fish markets and fish processing industries. The Indian fishing sector is still regarded as an unorganized sector and carries out various activities in an unorganized manner. This chapter has discussed various modern management tools and techniques to improve the value creation process of the marine fisheries sector to achieve a cost-effective value chain process.

The Value Chain Framework is used as a powerful analytical tool for various control strategies to reduce processing-related overhead, improve product quality, productivity and processability, and reduce logistics costs. Every organization consists of activities that are linked to developing the company's values, and together these activities form the organization's value chain. Such activities may include purchasing activities, manufacturing of products, distribution and marketing of company products and activities (Lynch, 2003). Links can be a significant source of competitive advantage if the system is carefully managed (Pathania-Jain, 2001). Porter (1985) gave his definition of value in his 1985 book Competitive Advantage. he said: “The basic tool for diagnosing competitive advantage and finding ways to improve it is the value chain, which divides a company into the individual activities it performs in developing, manufacturing, marketing, and distributing its products.” (Porter, 1985, p.26). “Value chains segment companies into strategically relevant activities to understand cost behaviour and existing and potential differentiators. To understand how companies and countries participate in the global economy (Kaplinsky and Morris 2007). The main aim of this study is to apply Michael Porter's (1985) value chain model to the processing of marine fisheries, thereby proposing a cost-effective value chain from fishermen to consumers. Value chain management in fisheries helps fishermen add significant value at a minimal cost. Using the methodology, they can analyze the cost of value-adding processes added by fishermen along the coast, placing greater emphasis on those that add value over those that add no value at all. The identified Value Chain Management procedures in the Marine Fisheries sector are summarised in Table 1 based on the field survey and interviews.

Porter’s value chain helps to maximize a company’s profit margin by managing value chain activities, in which each activity can be changed to reduce cost and to improve the value. There are two types of activities, namely primary value chain activities and support value chain activities. Cost effective Value Chain to the fishermen to get good price and offer great value to the customer. Figure 1 proposes an adapted value chain model for fisheries based on Michael Porter Value Chain model. The attributes of Primary Activities and Secondary Activities are proposed based on observations during the fieldwork. If the

Government bodies and policy makers are able to implement in the proposed model, the fishermen can get good profit margin for their fish catch. The underperforming fisheries sector can perform rightly and can contribute to the GDP of the state as well as the country. With minor modifications, according to the conditions of the other fishing activities, this model can be adopted by the fishing community across the country and all over the world.

Table 1: Identification of Value Chain Management processes

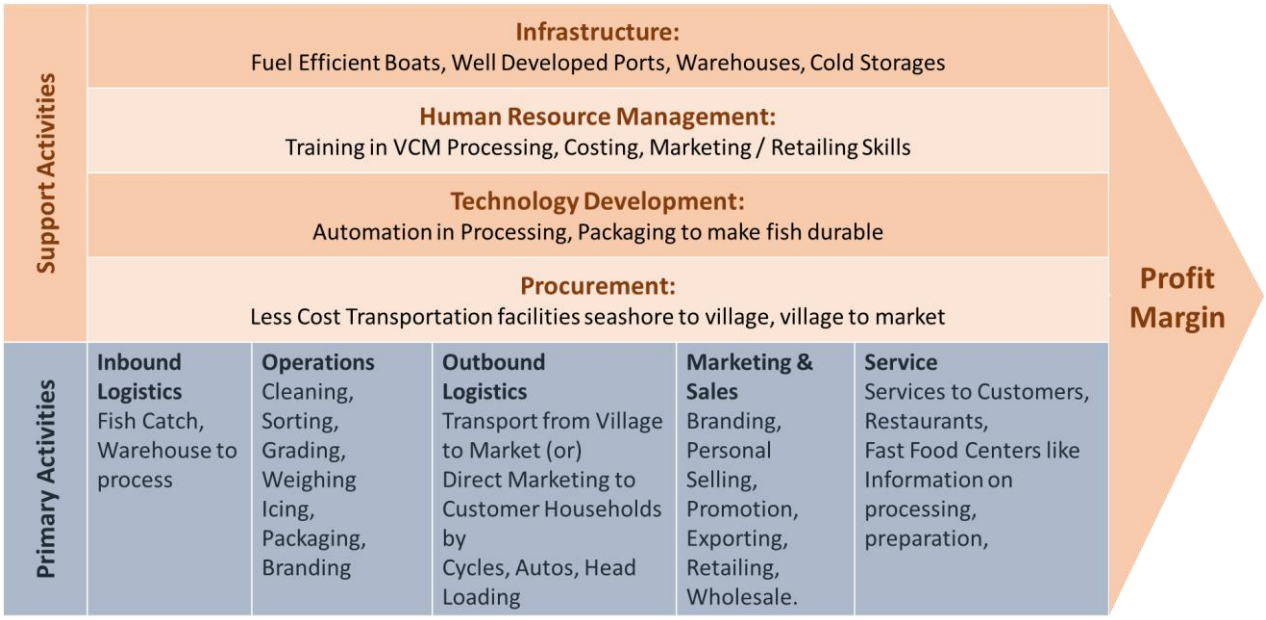
VCM Process	Description
Cleaning	After Catching fish from the sea, the fish catch will be cleaned with clean water at the seashore/village.
Sorting	After cleaning, the fish catch will be sorted according to the size into groups.
Grading	After Sorting, the groups are regrouped according to the type of species. The grade will be given to the species according to the demand in the market.
Weighing	The Graded fish will be weighed for packing.
De-heading	In market place/sea shore/warehouse, the retailer/processor will process the fish for convenience purposes. The head part of the fish will be removed to cook.
Removal of Slime	The Slime of the fish will be removed.
Cutting fins	The fins of the fish will be removed.
Meat Bone Separation	To make the fish boneless, this separation will take place.
Icing	After the fish is fully processed, the pieces are mixed with ice for storage purposes.
Packaging	The mixture of fish pieces is packaged in thermo-cool packages.
Branding	The fish produced will finally be given brand names along with commercialization tools.

Primary Value Chain Activities

1. **Inbound logistics** transportation and receiving of raw materials from suppliers. This activity also involves managing and sourcing materials.

2. **Operations** This process includes activities of changing raw materials and inputs into finished products
3. **Outbound Logistics** It is the step of delivering and distributing the finished products to your customers. This encompasses order processing, packaging products, as well as shipping orders.
4. **Marketing and sales:** These involve making decisions about distribution channels, pricing, promotions, etc
5. **Service:** After-sales services are the activities of maintaining the value of your products. Customer service, installation training, maintenance, refund, and exchange.

Figure 1 Michael Porter based Value chain model for fisheries



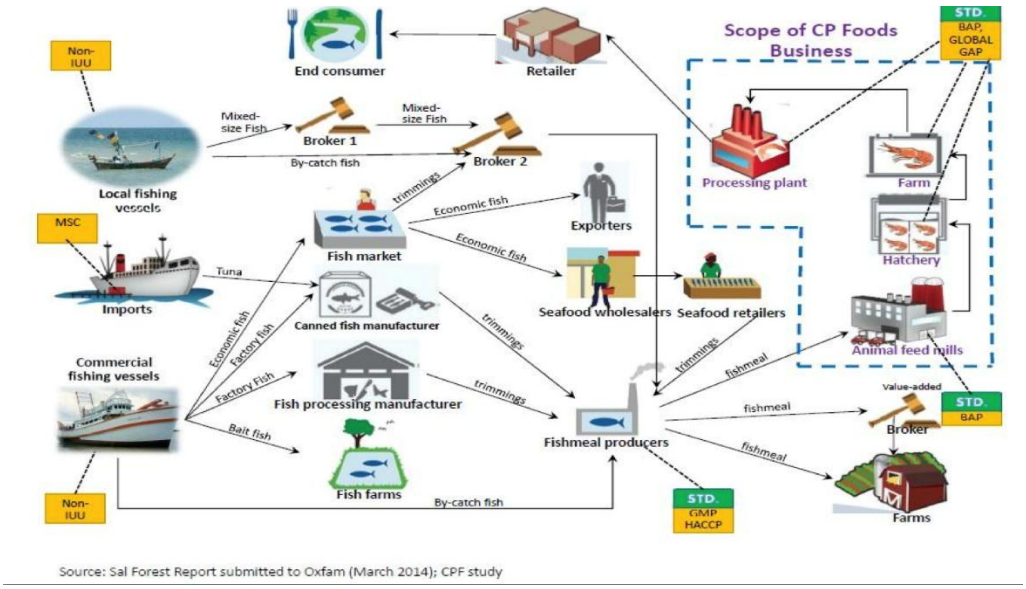
Support Value Chain Activities

Support activities are managing activities within the value chain model. They aim at assisting the primary value chain activities.

1. **Firm Infrastructure:** company's organizational structure and daily operations for all the value chain activities, both primary and support. The infrastructure consists of management, planning, finance, and quality control, to name a few.
2. **Human resources management:** HR department in charge of recruiting, training, motivating, rewarding, and retaining the company's employees. Since workers are one of the most important resources, HR practices should be done effectively
3. **Technology development:** This is the process of managing technical information and innovating technology. The company will minimize the cost needed for research and development, maintain technical excellence, and keep an eye on new technology.

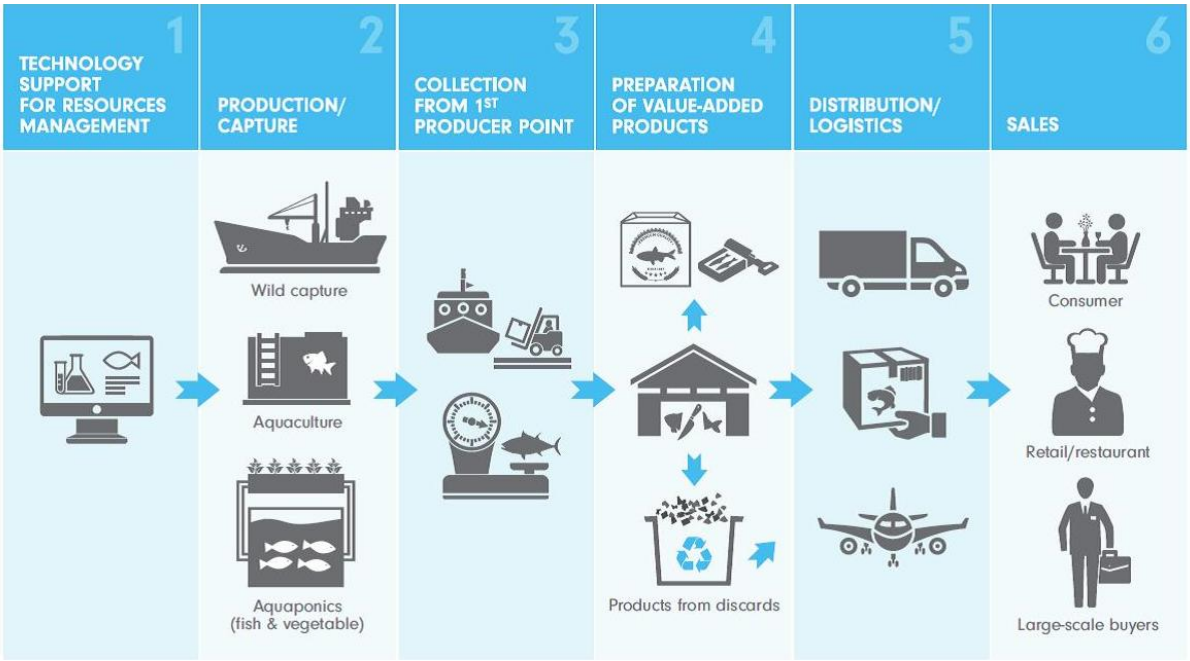
4. **Procurement:** Procurement is the stage of purchasing that supports all the operations and primary activities. For instance, buying inputs and delivery vans for inbound and outbound logistics, respectively. The purchase of marketing materials for the sales department is also part of this step. Procurement determines the total cost being used, and greatly affects the profit margin.

VALUE CHAIN Mapping



Source: Sal Forest Report submitted to Oxfam (March 2014); CPF study

- Value Stream Mapping
- Value in Lean is creating more value for customers while optimizing resources
- Just-in-Time Manufacturing: The Path to Efficiency
- Continuous Improvement
- 5 Whys: The Ultimate Root Cause Analysis Tool
- What is Plan-Do-Check-Act (PDCA) Cycle



Marketing channels of marine fish

1. Fishermen-auctioneer-agents of freezing plants-exporters

2. Fishermen-auctioneer-processor (dry fish)-wholesaler-retailer-consumer

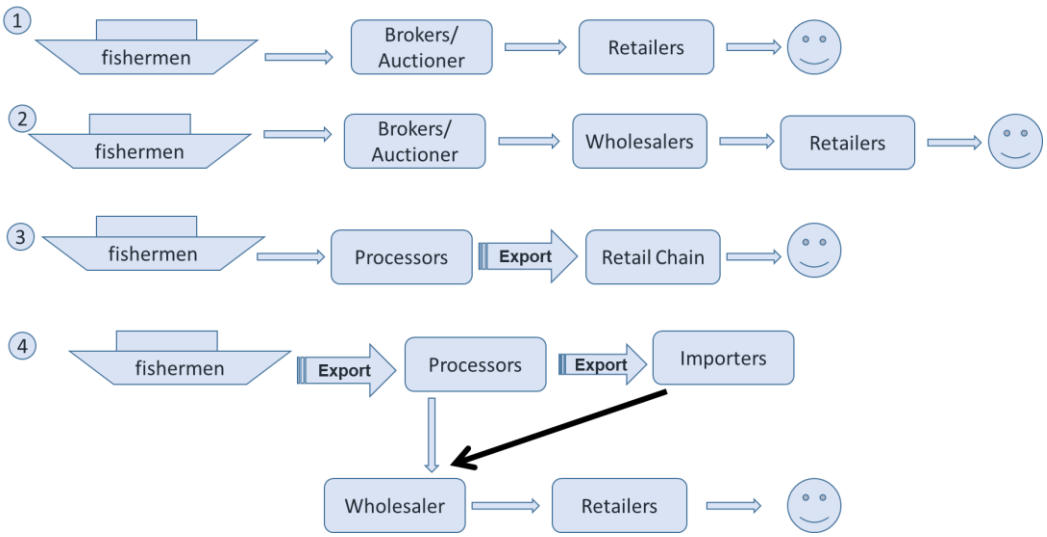
3. Fishermen-auctioneer-wholesaler (primary market)-wholesaler (retail market) - retailer-consumer

4. Fishermen-auctioneer-commission agents-wholesaler-retailer-consumer

5. Fishermen-auctioneer-retailer-consumer

6.Fishermen-auctioneer- consumer

(Sathiadhas *et al*, 2012)



Modern econometric tools to apply for value chain analysis in fisheries:

A suitable sample collection techniques framework to collect the samples which

represent various activities involved in the value addition processes entire fisher's population. To perform the value chain management process is performed using the following tools using the data to analyze empirically

Means, Proportions and Ranks: Most of the VCM analyses were carried out using simple average, difference, and percentage analyses.

Regression Analysis: Regression analysis is a set of statistical methods used for the estimation of relationships between a dependent variable and one or more independent variables. It can be utilized to assess the strength of the relationship between variables and for modeling the future relationship between them. To map a cost-effective value chain and track any correlations between the cost of value-adding operations and the final price, the cost of each value-adding process was treated as a dependent variable and the final price of the fish was treated as an independent variable. The influence of each value-added procedure on the growth or decrease in the final price of fresh fish is also examined with the aid of this regression analysis. The statistical software programmes available are used to do factor analysis, regression analysis, and other data calculations. software were used to determine the various Value Chain Management procedures that fishermen in the marine fishing sector use. The operations carried out by value chain participants (such as fishermen, intermediaries, warehousers, wholesalers, retailers, etc.) to make fish storable, easy to cook, eatable, etc. are referred to as value chain management processes in the fishing industry. Fish is a perishable good, therefore there are a few things that need to be done to make it more valuable in terms of quality and cost.

Factor Analysis

Factor analysis is a technique in mathematics that we use to reduce a larger number into a smaller number. Moreover, in this topic, we will talk about it and its various aspects. It refers to a method that reduces a large variable into a smaller variable factor. Furthermore, this technique takes out maximum ordinary variance from all the variables and put them in common score. In order to determine the VCM processes that the fisherman executes more frequently and less frequently depending on the factor loadings, factor analysis was done on the data of the frequency of VCM processes. The correlation coefficients between the variables and factors are the factor loadings. The foundation for imputing a label to several factors is factor loadings. The squared factor loading measures the proportion of a variable's variance that may be explained by a factor, much like Pearson's correlation coefficient "r."

Eigen Values: It is otherwise called Latent root. Moreover, it explains the variance shown by that particular factor out of the total variance. Furthermore, the commonality column helps to

know how much variance the first factor explained out of total variance. The variance in all the variables that are accounted for by a given factor is shown by the Eigenvalue for that factor. The total of a factor's squared factor loadings for all the variables can be used to get a factor's Eigenvalue. The explanatory relevance of the factors with regard to the variables is expressed as a ratio of the Eigenvalues. The sum of the squared values of a factor's loadings is known as the Eigen Value. (Krishnaswami and Ranganatham 2007).

C***hi-Square Test:*** The chi-squared test is done to check if there is any difference between the observed value and the expected value. The formula for chi-square can be written as;

$\chi^2 = \sum(O_i - E_i)^2/E_i$, if the calculated Chi-square value is determined to be significant (if it is higher than the table value).

KMO Measure: The Kaiser-Meyer-Olkin (KMO) Test is a measure of how suited your data is for Factor Analysis. The test measures sampling adequacy for each variable in the model and for the complete model. The statistic is a measure of the proportion of variance among variables that might be common variance. The lower the proportion, the more suited your data is to Factor Analysis. KMO returns values between 0 and 1. A rule of thumb for interpreting the statistic. The factor alone should be taken into consideration for further analysis if the KMO measure is larger than the threshold value of 0.5 (Hair et al. 1998).

Forecasting - Value chain encompasses all business resources and activities needed to bring a product from conception through completion and beyond, including design, manufacture, promotion, distribution and customer support. Businesses use forecasting techniques to make predictions about future scenarios within their fisheries value chain. By forecasting the future, fisheries businesses can shape activities in the present to best meet expected needs. Forecasting methods usually involve statistical models, which constitute quantitative analysis; opinion polls, which are qualitative analysis; or a combination of both, in trend and graphical analyses.

Trend analysis – Trend Analysis is a statistical tool that helps to determine the future movements of a variable on the basis of its historical trends. In simple words, it predicts future behavior on the basis of past data.

Market efficiency – Marketing cost, marketing margin, price spread & price share in consumer rupee

Reducing cost of individual value chain activities, Reconfiguring the value chain

- Primary market
- Purchase price (PP) = -------

- Marketing costs (MC) = ------
- Sales price (SP) = ------
- (SP-PP) = ------- (---%)
- Marketing profit (MP=MM-MC)=-----

Price Elasticity of Demand $[(Q_1 – Q_0) / (Q_1 + Q_0)] / [(P_1 – P_0) / (P_1 + P_0)]$

Where Q_0 = Initial quantity, Q_1 = Final quantity, P_0 = Initial price and P_1 = Final price

Marketing margin:

- It refers to the difference between the price paid and price received by the specific marketing agency such as a retailer or wholesaler and other intermediaries etc. or a combination of marketing agencies
- Market margins are the actual amounts received by the marketing agencies in the marketing process
- Margin received by different stakeholders involved to reach the fish to the ultimate consumer.

This is the difference between the total payment (Cost + Purchase price) and receipts (sale price) of the middleman

Suppose we have to calculate a market margin of Cm1

MM of Cm1 = Receipts *(Sales price)* – Cost *(Cost incurred by Cm1 + Purchase price)*

Price spread:

It refers to the difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of farm produce.

Price Spread (PS) = Price paid by consumer – Price received by producer

Producer share in consumer Rupee

This is the price received by the farmer expressed as a percentage of the retail price (i.e. the price paid by the consumer)

Marginal analysis

Eg: Price elasticity of demand is the measure of elasticity of demand based on price, which is calculated by dividing the percentage change in quantity (ΔQ/Q) by the percentage change in price (ΔP/P) which is represented mathematically as

Price Elasticity of Demand = Percentage Change in Quantity (Δq/q) / Percentage Change in Price (Δp/p)

Further, the equation for price elasticity of demand can be elaborated into

Reference:

Krishnaswami O R, Ranganatham M. (2007). Methodology of Research in Social Sciences, Hyderabad: Himalaya Publishing House, 338-339.

Hair J F, Anderson R E, Tatham R L, Black W C. (1998). Multivariate data analysis. 5th ed, New Jersey: Prentice Hall, Inc.

Akansha Anchaliya, Ekta Chitnis, Ira Bapna, Gitanjali Shrivastava. (2012). Job Satisfaction of bank employees – A comparative study of Public and private sector. In Ritu Sinha, R.S.Ghosh, Svetlana Tatuskar, Shweta Maheswari (Eds.). Ensisage 2020: Emerging Business Practices: 103-116, Excel: New Delhi.

Bernardi R A.(1994). Validating research results when Cronbach's Alpha is below .70: A Methodological procedure. Educational and Psychological Measurement. Vol.54. No.3. 766-775.

Harshna Maheshwari, Shiji Lyndon, Shamira Malekar. (2012). Job Satisfaction of bank employees – A comparative study of Public and private sector. In Ritu Sinha, R.S.Ghosh, Svetlana Tatuskar, Shweta Maheswari (Eds.). Ensisage 2020: Emerging Business Practices: 103-116, Excel: New Delhi.

Porter M. E (1985). Competitive Advantage: Creating and Sustaining Superior Performance, New York: The Free Press.

Lynch, R. (2003). Corporate Strategy, 3rd ed., Prentice Hall Financial Times.

Pathania-Jain, G. (2001). Global parents, local partners: A value-chain analysis of collaborative strategies of media firms in India. Journal of Media Economics, Vol. 14, No. 3, 169-187.

Kaplinsky, Raphael and Morris, Mike. (2007). A Handbook for Value Chain Research, International Development Research Centre.

Chapter 5

BUSINESS OPPORTUNITIES IN VALUE CHAIN MANAGEMENT OF SEAWEED CULTURE, PRODUCT DEVELOPMENT AND MARKETS

M Krishnan[1] and Ramasubramanian V[2]

[1] *State Level Project Advisory Committee for Marine Resources, Andhra Pradesh AND Principal Scientist & Head (Rtd.), ICAR – CIFE, Mumbai*
&
[2]*ICAR – Indian Agriculture Statistics Research Institute, New Delhi*

Introduction:

Seaweed farming is a viable alternative livelihood for the struggling marine fishers in locations suitable for its culture. One of the best environments in Tamil Nadu that supports seaweed farming is available in the Mandapam bay area in Ramanathapuram district of Tamil Nadu.

One of the latest in the scene for helping out seaweed farmers in this region, is Grow-Trees, who provide expertise and equipment in seaweed cultivation in key areas in Ramanathapuram coastal villages that include Munaikkadu near Mandapam Camp. This outreach activity is expected to benefit at least 750 people in this area. The objective of this reach out is to enhance the fisher's income and self reliance. This initiative will be replicated by this, not for profit organisation, Grow-Trees, in other parts of India also. The Grow-Trees in their baseline survey have documented that only 15 families in this village had information and equipment for seaweed culture. Local families are grateful to this organisation for the training and equipment that have been made available to them in the first round of assistance. Education is a priority area for these villagers and they are grateful to the new initiative that helps them to send their children to school.

A seaweed culture raft worth Rs. 2000 can be planted with 70 Kgs of seaweed saplings which would yield 230 Kgs of seaweed after 45 days. Each kilo of seaweed is worth Rs. 60 to 75 per Kg. Therefore if a family has 40-45 rafts in operation, the daily take is estimated to be as much as Rs. 800 per day.

The seaweed global output is expected to reach USD 26 billion by 2025. Under the

[1] mkrishnan57@gmail.com

Pradhan Mantri Matsay Sampada Yojana (PMMSY), the government of India has thrown in Rs. 640 crores into seaweed business with the hope that production could be enhanced to 10 crore tonnes by 2025. AquAgri Private Limited, New Delhi is the pioneer in *Kappaphycus alvarezii* seaweed culture along the Palk Bay. They started their operations after buying off this business from PepsiCo who entered the seaweed culture business in early 2000's with a hired labour model that failed. AqaAgri started operations in 2008 in a network model comprising Self Help Groups of fishers of Mandapam villages, The Department of Fisheries, Tamil Nadu (DoFTN), the local nationalised banks and a leading not for profit organisation, Aquaculture Foundation of India (AFI), Chennai. The seedlings and equipment were given to the seaweed farmers in the first round and the output was bought off the SHGs by the company directly after crediting their accounts with their payouts. The banks had no second thoughts in financing the SHGs for inputs and equipment in the subsequent rounds as payments for the EMI were deducted from the accounts of the seaweed farmers. The DoF TN and AFI played a magnificent role in providing extension service, technology updates and training. This network worked too well and fed the input needs of the carageenan manufacturing factory of AquAgri in Manamadurai, Tamil Nadu. Fishers and fisher families belonging to more than 18 fish landing villages in Mandapam area directly benefitted from this initiative. This seaweed movement that started as a women SHG activity flourished and attracted their men folk, who then took over the offshore raft seeding and management and the women took care of in shore seaweed drying activities.

In addition to products that need seaweed as base resource for manufacturing, the Make in India movement also drives the look within India. Seaweed is raw material that is much in demand for manufacturers of agar, agarose, carrageenan and alginates. The hospitality industry is one among newbies in the forefront. The chefs in star hotels in the metros including the Taj Mumbai are experimenting with dry seaweed in their kitchens. Seaweed lends piquancy to their dishes as salad or soup garnishing and bringing the unique umami flavour to their vegetarian offerings. Chefs are discovering that normal butter spliced with seaweed brings in flavours yet un-savoured. Chicken nuggets are spliced with Alginate seaweed extract , to help keep the meat remain moist and fresh.

Seaweed has always served as a food stabilising agent. When processed into agar, it can withstand high temperatures hence it is a favourite medium for stabilising and thickening ice creams, pies, cakes, icings and meringues. The bland tasting seaweed helps inhibit crystallisation of ice. Agar-agar is the main ingredient in falooda and in Tamil Nadu's famous Jigarthanda. Seaweed cultured in a controlled environment could result in a horizontal

expansion of the market with its properties rich in vitamins and minerals.

Seaweed has now been certified by ICRISAT, Hyderabad as a safe bio fertilizer. The seaweed sap has been tested on cotton and has been found to lead to faster germination of the seeds. The Indian Farmers Fertilizer Cooperative (IFFCO) insights into the potentiality of seaweed as a bio fertilizer, has led AquAgri to manufacture the seaweed sap of the red and brown algae as a fertilizer. With organic farming gaining rapid grounds, seaweed sap as fertilizer is bound to break new grounds in enhancing agricultural production and productivity. Seaweed is also active ingredient in anti-obesity, anti arthritic and anti-diabetic tablets. Dissolvable bio-film dressings from seaweed extracts are on the anvil. Seaweed wine, sushi in seaweed wraps are other products that are exciting expected new arrivals in the Indian market.

Active containment of market forces that break the smoothly functioning seaweed farming network is essential. Natural calamities have wrought havoc on seaweed farming in Mandapam region of Ramanathapuram district most regularly. Seed banks need scientific approach in development, safe keeping off shore and distribution to enable restoration of farming activities quickly after a cyclonic cycle. Private investments in seaweed farming and identification of sites suitable for seaweed farming besides Mandapam, Porbundar and Kakinada needs serious examination and quick action. Volume needs of the market need to met on a war footing to retain market interest, product development efforts and market expansion.

Chapter 6

BUSINESS OPPORTUNITIES IN DRY FISH VALUE CHAIN IN INDIA

Anil Dutt Upadhyay

College of Fisheries, Central Agricultural University, Lembucherra, Tripura

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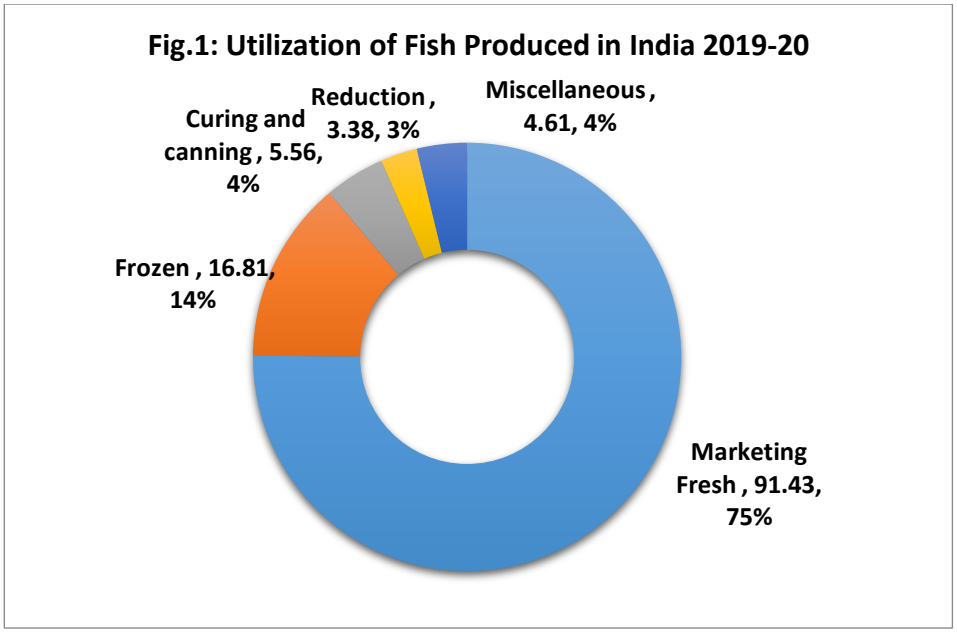
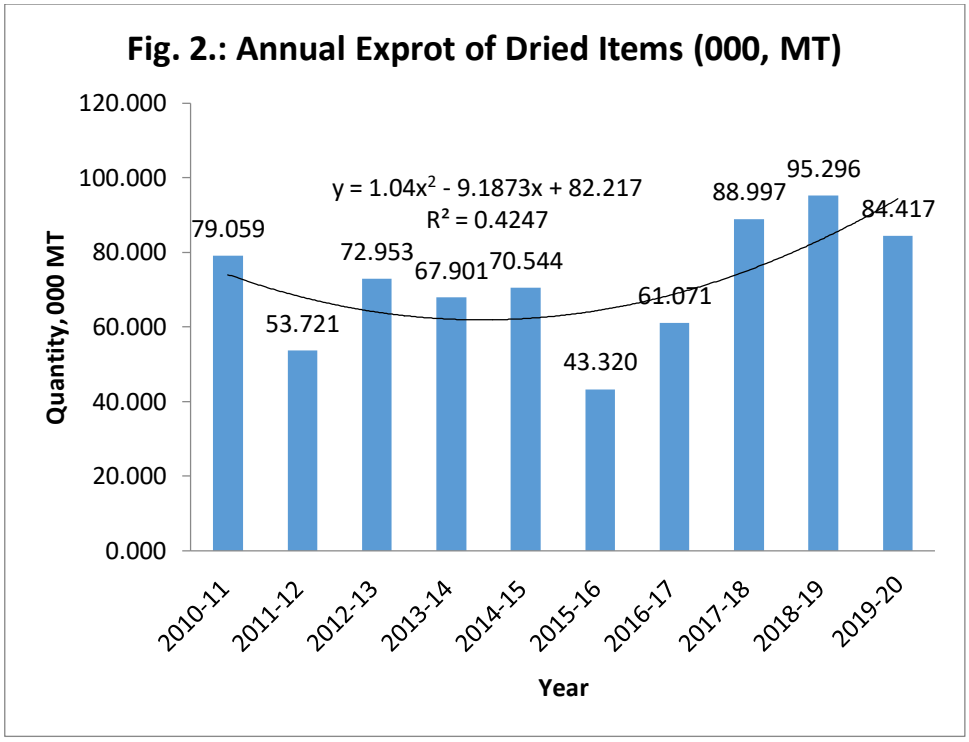
Introduction:

Around 178.0 million metric tonnes of fish are harvested as human food from the seas, oceans, lakes, and rivers every year globally (FAO, 2021), making it the largest extractive use of wildlife by humans on this planet. About 94% of all freshwater fisheries occur in developing countries, where they provide food and a livelihood for millions of people and also contribute to the overall economic wellbeing by means of export commodity trade, tourism, and recreation. According to this recent data, about 75 per cent of the 12.179 million metric tonnes total fish produced in India in 2019-20, is consumed in fresh form, about 14 % utilized in frozen form, around 4% in form of curing and canning and 3% used for reduction (mainly drying and smoking) and remaining 4 % used for misc purposes (Fig-1). Hence on an average around 3 percent of total fish production in the country is utilized for drying. The drying is an old age practice of processing and preservation of fish adopted by fishing communities nearby production point or landing centres. It is a subsidiary economic activities undertaken by fishing and non fishing families staying near landing centres. Dried fish is a much-loved alternative to fresh fish across the country (Hindu, 25 August, 2020). In this article and attempt has been made to discuss status of existing dry fish value chain in the country and possible business opportunities in dry fish value chain the country.



Status of dry fish production and trade in the Country:

In the country annually about 2.64 lakh tonnes of fish dried and unsalted, 2.14 lakh tones of fish dried and sated or smoked and about 0.61 lakh tones other type of dried fishes are produced in the country during 2019-20 (Hand book of Fisheries Statistics 2020) in the country. In case of marine catch ribbonfish, lizard fish, sliver bellies, anchovies, crocker ray finned fish, goatfish, sardines and other pelagic fish etc utilized for drying. These fishes have less demand for fresh consumption at landing centers and had low price. Out of total production of dried fishes in the country, the Gujarat state alone contributes about 3.56 Lakh tones (66.05%). In addition to domestic market demand for these products, there is also export demand for dried and smoked fish items and during 2019-20, India's export of dried fish (marine) was 84,417 metric tonnes. The trends of export of dried items shows that baring financial year 2015-16 and 2016-17, export of these items gradually increasing over the years (Fig. 2).



***Value chain analysis*:**

Value chain analysis sheds light on the size of the firms participating in each link the manner and possibilities of participating in the chain, and opportunities to facilitate or improve those linkages. Understanding and analyzing the value chain helps in facilitating additional value creation, innovation, product development, and marketing etc.

Value chain map of dry fish in India:

The value chain of dry fish has been mapped using functional analysis. Functional analysis provide complete structure of the value chain and in this value chain was mapped by defining value chain boundaries, identifying core activities, identifying economic agents involved at different stages and related functions, interrelationship and linkages between the economic agents, depicting flow of the commodity and bottlenecks. Value chain of dry fish comprises a large network of distributional channels and it connect the production and processing centre that confined in coastal belt(marine fishes) and in northern States(fresh water fishes) to the consumption points distributed to whole North East Region of the country. The core processes and activities undertaken at the different stages of value chain are represented through flow diagram in Figure 3.

Fig. 3: Specific activities performed in core process of dry fish value chain

A. Core Activities

Drying:

The drying of fishes is an age old processing practice, which adds the value in terms of increasing its storage life and avoids spoilage of fishes. It also reduces volume and quantity of fish that makes the handling easier. Most of the medium and low value species form bulk of the landings is utilized for drying. The fishermen catch the fishes and bring it to the landing centres. Then dry fish processor purchase fishes through commission agents at landing centres and transport it to processing units. At processing centre fishes are cleaned, salted, washed, placed for drying either on bamboo made framed structure or cemented floor or plastic carpet, regular monitoring, aggregation, packaging in gunny bags or cartons. Then it sold to the traders. It was found that sorting of processed products is negligible and that too restricted to segregation of different species in case of only large size fishes. Many times traders provide bags and even advance money to purchase fish, hire labours, or to meet out family needs. This practice reduces bargaining power of the dry fish processors. It was also find that sometimes traders were enjoying monopoly power in terms of buying of dry fishes at nearby landing centre.

Trading: Assembling and trading was identified as one of the most important activity in dry fish value chain in the country as it connects producing markets to the consuming markets. The traders are being functioning at the dry fish processing centers. Trading involves range of activities like supply of packaging material to the processors, procurement of processed products, sorting and grading, storage of products and transportation of dry fish produce to

distant markets as per demand of wholesale markets. Traders are highly specialized in business, as they are well informed about the demand and prices of the dry fishes in the different wholesale markets of distant places. They further provide links between processors and wholesalers and disseminate information on required quantity and quality of processed products in different markets and also about the prevailing prices for different types of dry fishes.

Wholesaling and retailing:

The wholesaling and retailing are important activities of dry fish value chain and at this stage value chain activities like sorting, grading, packaging, marking, storage, transportation and selling etc were performed. In north eastern region besides these activities they were also found to involve in secondary processing of dry fish for preparation of *matka shidal* which if highly demanded ferment product.

B. ***Supporting activities***:

In addition to core activities there are number of service support to the value chain of dry fish such as input suppliers at processing centre including, fishermen who supplies wet fishes to the processors, suppliers of salt, ice, packaging materials, plastics, bags, bamboo, rubbers, medicines etc. The labourers, transporters, insurance companies providng insurance during transit, financial institutions and communication services. These service supports are crucial to all stages of the value chain of dry fish.

At each level of these core process, precision of sorting and grading were found to be increased as a results in retail market large varieties of dry fishes including different species, different sizes, appearance, colour, moisture contents, salted, unsalted and many more traits that determines the prices in the retail market. Hence, in the dry fish value chain, those chain actors are earning more who are functional near consuming end as compared to those who are functional nearby producing end. More than 39 varieties of dry fish products including both the sources marine as well as inland fisheries were found traded in dry fish value chain during survey. The varieties of dry fish products included fish species namely Indian Mackerel(*Rastrelliger kanagurta),* Gar Fish *(Xenentodon cancila)*, Ribbon Fish (*Trichurus lepturus),* Bombay Duck (*Harpodon nehereus),* Crockers (*Scianeids),* Rainbow Sardine(*Dussumeria acuta),* Cat fish(*Mysteus and Arius species),* Glass fish (*Chanda ranga),*Tardoore (*Opisthopterus tardoore),* Chapra (*Gudusia chapra),* Large razor belly minnow (Salmostoma bacaila), Prawns (*Acetes species),*Big Crockers (*Scianeids),* Golden scad (Carax para), Golden Anchovey (Coilia dussumieri), Corica (*Corica soborna),* Oil

sardine (*Sardinella longiceps)*, Mola (*Amblypharyngodon mola),Butter catfish (Ompak species)*, Puntius (*Puntius species)*, lesser sardine (Sardinella species) and Flying fish (*Exocoetus species etc).*

Dry fish value chain map:

A value chain map of dry fish that reflects the interrelationship and linkages among the chain actors are represented through diagram in Figure 4. The dry fish value chain of NE region included flows of dry fish and other processed products, produced and processed in Coastal states(outside fishes) as well as in NE region(local fishes) into value chain of NE region. The outside fish value chain further comprises two types of fishes, marine fishes that imported from costal states and inland fresh water fishes which are imported from land locked states. The important states from where the dry fish are imported in NE region are Gujarat, A.P, Tamilnadu, Orissa, W.B, UP, and Bihar etc. In addition to this some of the processed products like *matka shidal* and n*ona ilish* are imported from adjoining countries like Bangladesh and Mayanmar. Value chain map of Dry fish comprises two sub value chain one outside fishes (sub value chain-I) and for locally produced and processed fishes(sub value chain II). The traders collect the processed products from the processors and transport it to their establishments where they do sorting, grading, packaging, storing, marking etc. and based on demand in distant markets they arrange for transportation and sale to wholesalers of the distant markets. The traders were selling their products to wholesalers of Jagiraod Dry fish market which is the Asia' s biggest dry fish market located at Assam. Only in few cases it was found that traders were also directly transporting to different states and sale it to the wholesalers. From the Jagiroad, wholesalers of different states of NE region were purchase the dry fishes and sale it to the retailers at subsequent level of the value chain. Finally the retailers were responsible to cater the need of dry fish consumers. In sub value chain II fishermen he himself or small scale processors process the local fishes and sale it either to traders, wholesalers or also to retailers as per their convenience. However major portion of the produce converse with wholesalers of the state and it move with sub value chain I.

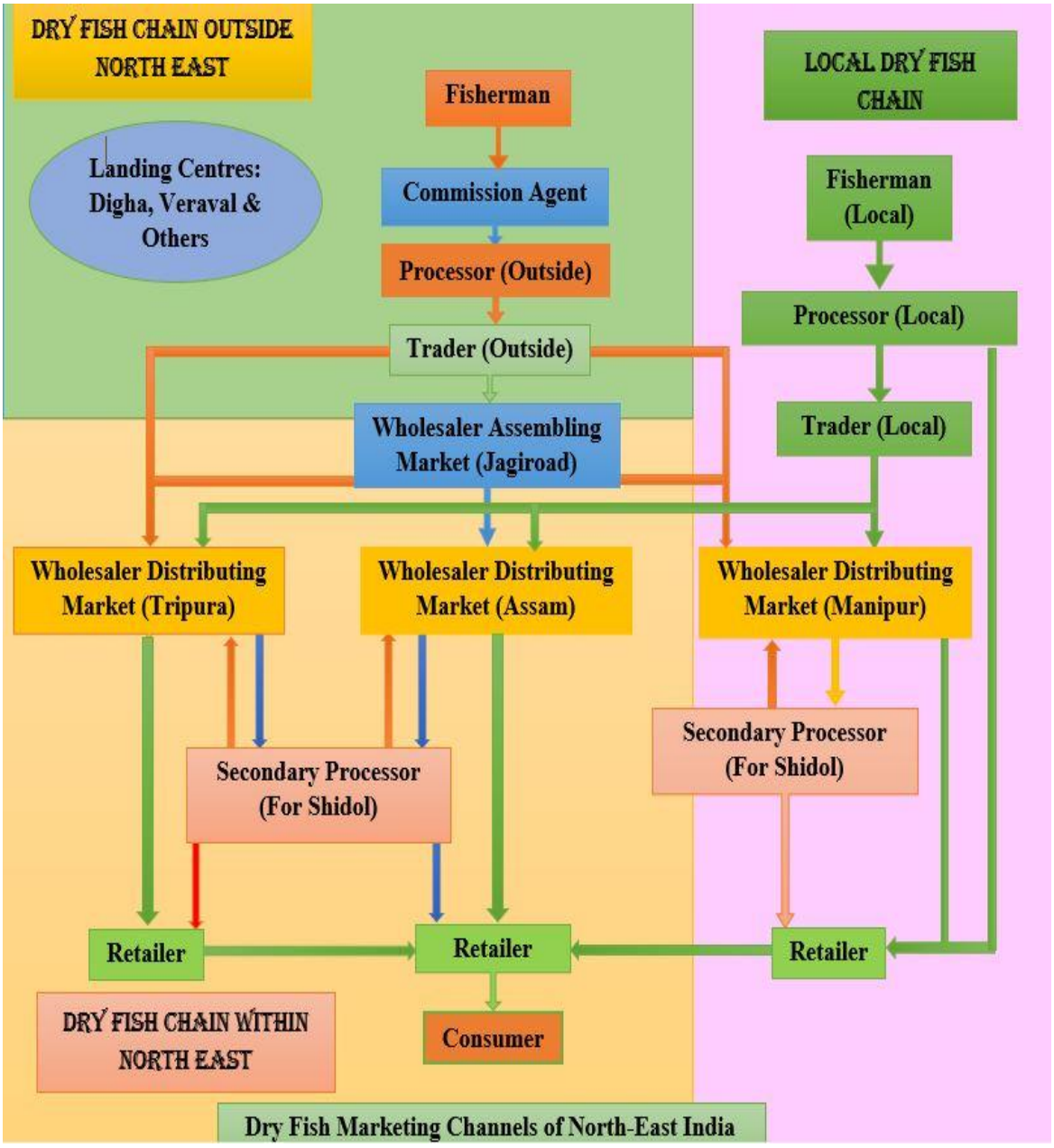


Fig 4: The Value chain map of Dry Fish showing relationship and linkages

Business opportunities in dry fish value chain some case study

***Stella Maris Institute of Developmental Studies (SMIDS)*:**

Production and Marketing of Hygienic Dry Fish is an initiative of Stella Maris Institute of Developmental Studies *(*SMIDS), Kanyakumari, with the support of CARE India to economically empower women in 10 Coastal Villages of Kanyakumari. Through this project skills development of vulnerable women to value addition to their products; support them to have hygienic condition for fish drying; to register the product with a brand name and good packing and to establish good market tie-up for the product. The beneficiaries were given entrepreneurs development programme (EDP) training and training on quality control and

marketing. Container for storing fishes was issued to the groups. The project also helped the women to form Common Interest Group (CIG) federation; establishing linkages with the local markets and Networking with wholesale dealers all around the state. This initiative promote quality production of dry fish on one hand and better realization of prices of produces, raised income and employments of fisherwomen.

***Packaging, branding and online marketing of the dry fish products*:**

It was noticed that some initiatives on packaging of value added fish products like packaging of fermented fish product Singjamei has been initiated by the processors and traders in Manipur. Similarly, packagings of dry fishes (Nagri) were also observed from the Manipur markets. Therefore there is immense potential of packaging, branding and online marketing of the dry fish products. It needs small investment to establish grading, standardization, quality control and packaging units. Since dried fish and smoked fish items have high demand in both domestic as well as in internal market, hence these opportunities can be tapped by youth entrepreneurs.

Packaging of fermented fish product(Singjamei)

Customer purchasing packaging fermented fish

Packaged Nagri (A dry fish product) at dry fish retail shop

References:

Govt. Of India. 2020. Handbook on fisheries statistics 2020. Published by Dept of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India, New Delhi. Pp 166.

Hindu (2020) Dried fish is a much-loved alternative to fresh fish across the country. Hindu New Delhi, 25 August, 2020.

Karthikeyan, M., Bahni Dhar and Kakati, Bipul Kumar. 2012. Quality evaluation of smoked fish products from the Markets of Manipurj. Inland Fish. Soc. India, 44 (1): 37-46.

Jallow, A. M. 1995. Contribution of improved chokoroven to artisanal fish smoking in the

Gambia.Workshop on Seeking Improvements in Fish Technology in West

Gopakumar, K. 1997. Tropical Fishery Products, Oxford and IBH Publishing Co, Pvt. Ltd. New Delhi, India. 1-10p.

Lilabati, H. and Vishwanath, W. 2001. Biochemical and microbiological changes during storage of smoked Puntius sophoreobtained from market. J. Food Sci. Technol.38 (3) : 281-282

Singh, M. B., Sarojnalini, C. and Vishwanath, W. 1990. Nutritive value of sun dried Esomus danricus and smoked Lipidocephalus guntea. Food Chem. 36 : 86-89.

Chapter 7

COST EFFECTIVE VALUE CHAIN MANAGEMENT APPROACHES IN CULTURE / CAPTURE FISHERIES

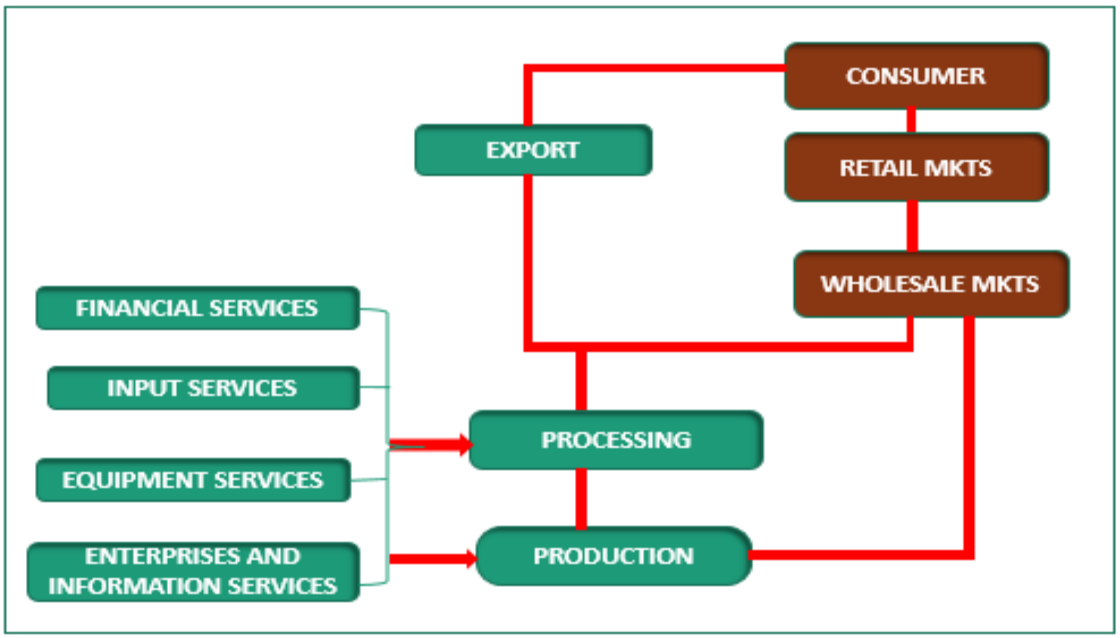
T. Umamaheswari

Department of Fisheries Extension, Economics and Statistics, FC&RI, Thoothukudi

Value Chain It is a linked set of activities and enterprises that brings a product from conception through disposal. Value Chain analysis is the process of documenting and analyzing the operation of a value chain, and usually involves mapping the chain actors and calculating the value added along its different links. Includes the managerial strategies that can reduce the various costs associated with processing and can improve the quality and productivity/processing of the product, also reduces distribution cost.

Fish / Shrimp value chain

The value chain for fish/shrimp is depicted below wherein different services *viz.*, financial, input, equipment, enterprises and information are found essential to take up the fish / shrimp processing/production activities which in turn diverting either to export market or domestic market.



Fish / Shrimp Value Chain

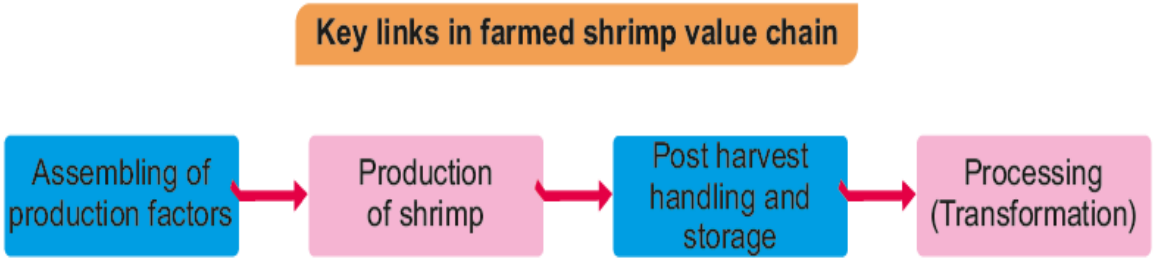
Value chain analysis in shrimp culture and processing

A research was carried out in estimating the shrimp (*P. vannamei*) value chain by

selecting 200 CAA registered shrimp farms and their respective processing plants in Tamil Nadu (Umamaheswari *et al*., 2020) for which the results are depicted as follows:

The identified value addition processes in shrimp farming were pre-investment, pond preparation, manuring and fertilization, biosecurity measures, seed and seed stocking, feed and feeding management, check tray monitoring, sampling, application of probiotics, chemicals and minerals, water quality management, disease management, disinfection management, farm hygiene management, waste water management, labour management, power and fuel, harvesting, grading and packing and farmers' profit margin.

Similarly, in processing line, value chain was estimated for four different products viz., Block frozen – Treated (BF – T), Block frozen – Non-Treated (BF – NT), IQF – Treated (IQF – T) and IQF – Non-Treated (IQF – NT).



Estimation of value chain

The shrimp value chain was estimated by calculating capital cost (prime/initial costs required for farming/processing such as land value/lease value, pond/plant construction, buildings, infrastructures, machinery and equipment and miscellaneous items); fixed cost / pre-investment (for farm: Depreciation, interest on capital cost, repairs & maintenance and consultant charges; Processing plant: Depreciation, interest on capital cost, repairs & maintenance, taxes, insurance (employees, plant, machinery, equipment and vehicle), salary to permanent staff, charges towards instrument calibration, sample and water quality analyses depending upon buyer specification, power and fuel); variable cost (cost of operation for farming / processing activity).

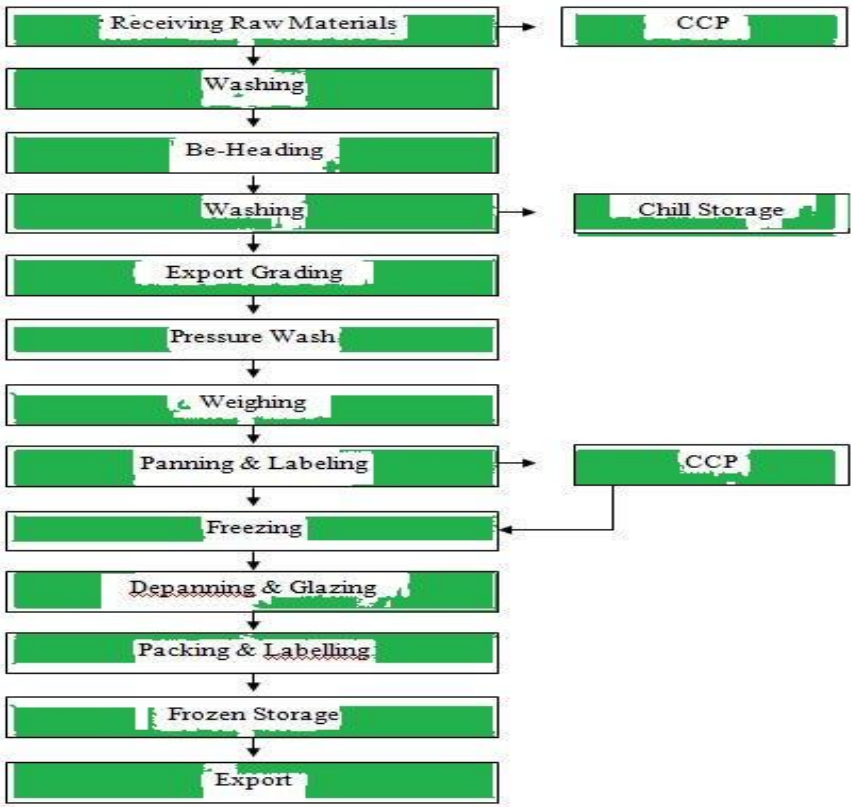
When estimating the cost contribution of the identified value addition management practices to the final farm gate price (40 counts / kg, on an average), it was found that feed and feeding management (42.98%), power and fuel (10.33%), application of probiotics, chemicals and minerals (4.73%) and pre-investment (4.55%) were the major cost contributors to the final farm gate price (FGP) in shrimp farming. While finding out the association and contribution of VCM processes to FGP through multiple regression analysis, the model was

found fit and the significant cost contributors were pre-investment, feed & feeding management, application of probiotics, chemicals and minerals, labour management and power and fuel.

Factor analysis was performed on the frequency of identified VCM processes (13 nos.) in shrimp farms using principal component extraction method with varimax rotation and the factor score matrix was obtained.

Finally, when the results of regression analysis and factor analysis were compared, it was found that during demand feeding, both check tray monitoring and sampling are to be coupled for better feed and animal health management which eventually yield more output and better FGP. Also, recommended to strictly and properly adopt the disinfection process in addition to the prompt and regular adoption of waste water disposal for quality produce. Furthermore, if market price is good, farmers could opt for partial harvest to arrive at a break-even point with a returns share in the middle and besides, the earnings could also be diverted for business expansion.

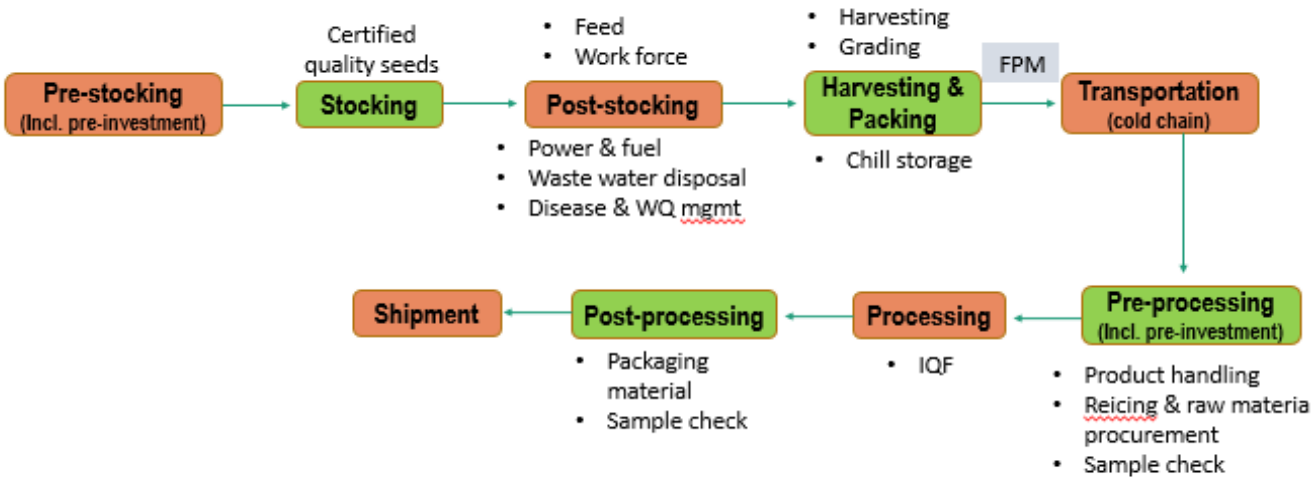
VCM in Processing Plants – (Frozen Shrimp)



As mentioned in the value chain analysis of shrimp farming, the same methodology was also adopted for the four identified frozen products in processing sector. It was found that, though the cost of production was found higher for IQF – Treated, the profit was also seen to be on higher

side when compared to all other products. Moreover, demand for IQF-T is showing upward trend. Hence, it is highly recommended to choose the line of producing IQF treated products for more profitability and sustainable business.

Cost effective value chain for farmed frozen vannamei



Despite profitability, certain measures are imperative as expressed by the shrimp farmers and seafood processors of Tamil Nadu which are as follows:

Shrimp farmers

- Lack of quality shrimp seed
- Delay in farm registration and renewal
- Lobbying of processors in price fixation
- High cost for power and fuel
- Inadequate supply of certified inputs
- Lack of technical personnel, cold storage facilities and insurance coverage
- Issues in collateral security
- Less awareness on export market information and international policies

Processors

- Price fluctuation at International market
- Irregular supply of shrimp from local farmers
- Inadequate availability of raw material as per buyer specification

Few policy recommendations include

- Integration of government level efforts in extending generous financial assistance especially for neo entrepreneurs in terms of soft loans, interest holidays etc. to cover the venture capital
- Establishment of shrimp business incubation centres for start-ups should be established with prominent working model to attract unemployed youth and women into business entrepreneurs
- Conversion of the unsold output/output with low quote of price into high value commodity through the establishment of e-auction and chill stores at convenient locations
- Establishment of proper linkage among shrimp farmers, processors, researchers and Government organisations through robust and active framework at Central level in coordinating/facilitating healthy interactions
- To strengthen the farming sector, Contract farming, Co-operative farming, Farmer Producer Organisation (FPO) could be established
- Adaptive and affordable innovative farming/processing techniques like automation/software programmes, use of ICT tools in forming Farmer/Processor-Trader user groups, mobile apps, e-auction could be thought of
- Establishment of well-developed feed mill, chill storage, well equipped PCR labs, seed, sample and water quality testing labs in production hubs could boost up the production
- Branded domestic retail shrimp chain should be strengthened to ensure the price stability that benefits the shrimp farmers directly

Value chain analysis in fishery product development

Kotni (2012) conducted the VCA of dry fish in Andhra Pradesh. As given in the below table, 43% increase in overall price was observed when fishes were subjected to different value added operations like cleaning, washing, salt mixing, preservative mixing, sun drying and packaging.

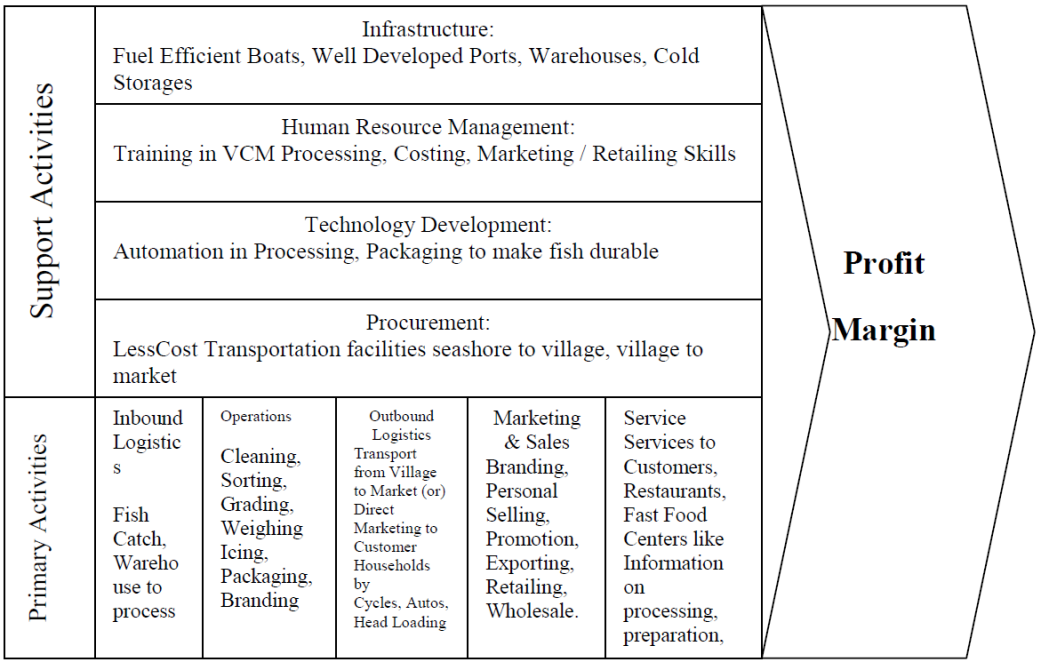
Fishermen cost of fish at sea shore	18
Transportation charges	0.08
VA operations	
Cleaning	1.50
Washing	1.89
Salt mixing	0.79
Preservatives mixing	2.84
Sun drying	3.89
Packaging	2.20
Final value	31.91
Overall increase in price	**13.91 (43%)**

VCA in marine capture fisheries

Kotni (2016) identified a total of 11 value chain management processes *viz.*, cleaning, sorting, grading, weighing, deheading, removal of slime, cutting fins, meat bone separation, in marine fisheries sector and estimated the value added at each level and its contribution to the final price of fresh fish. When the data were subjected to multiple regression and factor analysis, it was observed that packaging, branding, icing, removal of slime, correct weighing and sorting to be performed regularly to realise better final price. Fresh fish value chain and cost effective value chain model for fishermen were also developed.

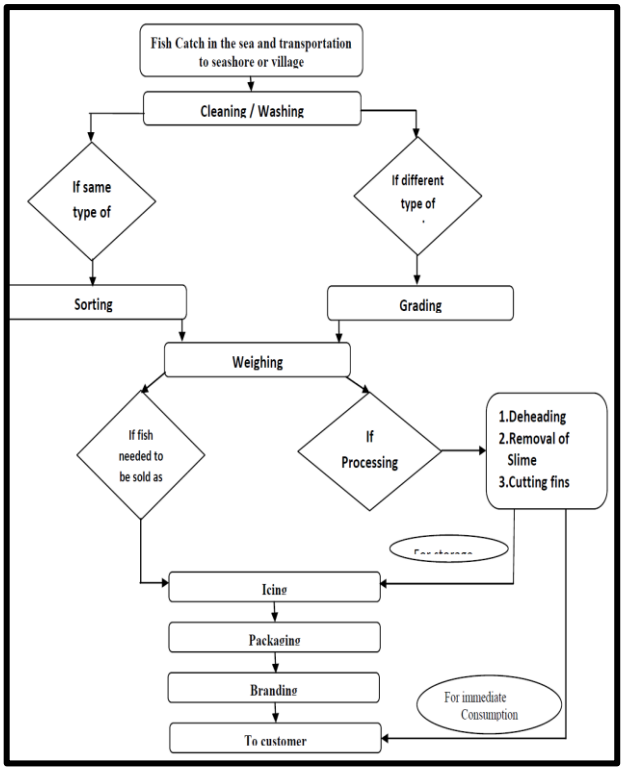
Particulars of Item	Avg. Price Rs. / Kg	Contribution to final price (Rs.74.66/-)
Fisherman Price at Seashore	41.98	56%
Cost of Catching	8.02	11%
HR Cost	1.38	2%
Transportation cost to Village	1.62	2%
Price without Value Addition	**53**	**71%**
Value Addition Operations by fisherman		
Cleaning	0.59	1%
Sorting	1.29	2%
Grading	1.88	3%
Weighing	1.43	2%
Deheading	0.92	1%
Removal of Slime	1.53	2%
Cutting fins	1.23	2%
Meat Bone Separation	2.98	4%
Icing	2.44	3%
Packaging	2.84	4%
Branding	4.53	6%
Price with Value Addition	**74.66**	**100%**
Source: Date collection through questionnaire		

Fresh fish value chain



Fresh Fish Value Chain

Cost effective value chain model for fishermen



Conclusion

- Inclusive value chains are needed to match the changing demand pattern
- There exists ample scope for using research tools in facilitating in development of sustainable value chain or in identifying 'upgrading potential'
- Impact of value chains need to be quantified that guides the policy making

References

Devi Prasad Kotni, V.V., 2012. A study on dry fish value chain management practices in Indian marine fisheries, *South Asian Journal of Social and Political Studies*, 13(1): 78 – 83.

Devi Prasad Kotni, V.V., 2016. Value chain management in marine fisheries: A case study of Andhra Pradesh, *International Journal of Managing Value and Supply Chains*, 7(2): 9 – 19.

Umamaheswari, T, M. Rajakumar, G. Sugumar and R. Santhakumar, 2020. Value chain analysis of farmed shrimp sector in Tamil Nadu, South India. *Indian Journal of Fisheries*, 67 (3), pp: 127-134.

Chapter 8

ENTREPRENEURSHIP OPPORTUNITIES IN MARINE PRODUCTS

Dr. P. Ganesan

Department of Fish Processing Technology, FC&RI, Thoothukudi

EDII-Marine Products Business Incubation Forum is established under the funding support of Entrepreneurship Development and Innovation Institute, Govt. of Tamil Nadu, Chennai and which is being operated at Department of Fish Processing Technology, Fisheries College and Research Institute, Thoothukudi. This college is a constituent unit of Tamil Nadu Dr.J.Jayalalithaa Fisheries University, Nagapattinam and located in the city of Thoothukudi which is accessible through the harbor bypass road, Thothukudi is located almost at the south eastern part of the State and is well known for Fisheries and Industrial development. The additional benefit of takeoff the finished products to Far East countries is a well known fact because of its connectivity by oversees by air and sea. Thus, it is having huge opportunities for doping export oriented businesses.

Objectives

- Transferring indigenous technologies for commercialization in the areas of marine products towards establishment of at least 15 start-ups in 3 year period.
- Developing innovating products
- Incubation and mentoring support to existing entrepreneurs.
- Building small business opportunities to fishing community through S&T intervention.

Vision

Enhancing the holistic entrepreneurial ecosystem development in the sphere of marine product business of Tamil Nadu encourage innovation and achieving sustainability

Mission

To nurture, promote, network, mentor, handhold and develop the entrepreneurs in the domain of marine product business and augment the income of stakeholders in marine product business viz., new and existing entrepreneurs, fisherfolk, unemployed youth, self-help group, school dropouts, startups, students, etc.

Functions of EDII-MPBIF

- Technology Mentoring

- Capacity Building and Training
- Incubation services
- Innovation of value added fishery products
- Product prototype development and product refinement
- Analytical services
- Support to get funding facilities
- Commercial scale production, IP Management and Business Development Support

Process of Incubation at EDII-MPBIF

- Admission of incubatees
- Technology services
- Mentoring facility services
- Product prototype development
- Product refinement
- Commercial scale production
- Best marketing of product through EDII-MPBIF facilities
- IP protection Management

Technologies offered

- Fish based battered & breaded products
- Fish / seaweed based bakery products
- Fish based extruded products
- Seaweed edible products
- Fish / shrimp based pickle products
- Fish based dried / smoked products
- Fish based retorted products
- Seaweed fertilizers
- Seaweed based cosmetics

Chapter 9

MARKET LED FISHERIES EXTENSION

Dr. N.V.Sujathkumar

Department of Fisheries Extension, Economics and Statistics, FC&RI, Thoothukudi

India, an agrarian nation, relied heavily on agriculture and related industries to feed its expanding population. By giving the appropriate information to the right people at the right time and place, agriculture's growth can be tapped. Nothing can stop from moving forward in the global economy if all these things take place in unison. One of the essential ingredients in the development of fisheries technology is the speedy dissemination of technological knowledge from the fisheries research system to the fishers and fish farmers in the field and the reporting of their feedback to the research system. In this instance, information dissemination and extension assistance have primarily followed standard practises throughout the past five to six decades. As a result, the question of "What is and what ought to be" has always been a top priority for the extension system, for which many strategies have been used.

The timely, cost-effective and high-quality supply of necessary inputs is still a dream for majority of Indian fishers and fish farmers. They are unable to profitably sell their excess produce and the fishers and fish farmers frequently arrange distress sales. The same could be explained in large part by the growing focus on enhancing production through more advanced technologies. As a result, extension activities were focused on sharing production technology, with little or no attention being made to raising the price at which fishers and fish farmers could sell their produce. Over many years, this has had little to no effect on rising farm incomes. However, the initiation of globalisation and the advent of new market mechanisms have given the fishers and fish farmer’s new chances. This necessitates the adoption of new extension strategies that focus on productivity to profitability, subsistence to commercial production, commodity-oriented to farming systems-oriented, local market to export market, monocropping to integrated farming and so on.

In the current context, market-led extension is the ideal strategy for getting to fishers’ and fish farmers' doors. Fish farmers and fishers must change their roles from being only producers-sellers in the domestic market to producers-cum-sellers in a wider market in order to maximise the returns on their investments and efforts in the face of market globalisation. Along with production technology, extension workers now need to prepare themselves with

market knowledge, which necessitates teaching them new training skills.

The extension worker must broaden his or her focus beyond production. Fishers and fish farmers need to be made aware of diverse quality, consumer preference, market intelligence, processing, value addition and other marketing information. The fishers and fish farming communities will benefit from this since it will lower production costs, increase product value and enhance marketability. The following aspects are the main emphasis of this article.

1. Focus on fisheries extension and advisory services to fishers and fish farmers levels
2. Progressive transition of extension and advisory services
3. Emergence of market-led extension
4. Demand-driven or farmer-led, market-led extension
5. Factors governing new innovations
6. Enhanced roles of extension workers in market-led extension
7. Learning from market-led extension approach

1. Focus on fisheries extension and advisory services to fishers and fish farmer's levels

The focus on fisheries extension and advisory services to fishers and fish farmer's levels can be achieved through the following aspects.

- Improving the livelihoods to reduce poverty and food insecurity
- Sustainable use of natural resources
- Decentralization of fisheries extension systems
- Technology transfer
- Human Capital Development – technical and management skills
- Building social capital - getting fish farmers and fishers organized into producer groups /farm organizations/SHGs
- Educating fishers and fish farmers for sustainable use of natural resources to adopt new innovations

2. Progressive transition of extension and advisory services

- Farming System Research and Extension
- Farmer to Farmer extension
- Market –Led Extension approach
  - Comparative effectiveness of alternative approach in terms of clarity of objectives, services offered, process of service delivery, extension strategies used, stakeholders' involvement, beneficiaries' satisfaction, practical

difficulties in implementation in terms of logistic support and capabilities of extension workers

3. Emergence of market-led extension

- The market-driven strategy was created as a result of the public fisheries extension systems' lack of effectiveness.
- A variety of models using both public and private sector firms to provide essential extension services.
- More attention is being paid to the idea of fisheries innovation systems (FISs)
- Most fisheries innovation systems are market-driven
- Markets, not technology, have increasingly taken the lead in driving development and as a result, the idea of fisheries innovation systems is receiving more attention (FISs)
- Market forces dominate most fisheries innovation systems.
- Extension workers' role in identifying new innovations.

4. Demand-driven or farmer-led, market-led extension

- Organize fishers and fish farmers into groups or organisations.
- Transform a top-down extension system into one that is "farmer-cantered" and "demand-driven."
- Training in PRA is necessary for farmer-centred and demand-driven extension services.
- Market-led extension will make it easier to generate a high return, reduce production costs, value addition and market accessibility.
- Market-led extension considers several economic variables.
- Fishers and fish farmers are taught new management techniques using a market-driven approach.
- It will identify all possible markets for various items and commodities.

5. Factors governing new innovations

- The level of education of fishers and fish farmers, both men and women
- Household resources, including land, labour and capital
- The ecological conditions
- Access to various markets
- Availability of local producer organizations
- The producers' willingness to work with new producer groups

6. Enhanced roles of extension workers in market-led extension

- Establishment of a fishers and fish farmer's club or interest group
- Improving the communication skills
- Establishing various marketing linkages
- Advice on produce planning
- Promoting direct marketing and use of information technology
- SWOT Analysis

7. Learning from market-led extension approach

- There are many examples of market-led extension experimentation in the agricultural sector.
- Organizational innovations
- Technological innovations, technical knowledge and R&D
- Strengthening capacities for knowledge and innovations
- Policy innovations

THE CONCEPT OF EXTENSION

1. Old concept - production oriented

- It put pressure only on production aspects.
- The idea is that marketing consists solely of the physical distribution of commodities.
- It is assumed on the idea that marketing begins after products are manufactured and stops after they are sold.
- It does not cover any marketing-related ancillary activity, such as financing or insurance.
- The goal of marketing is to increase sales while maximising profitability.
- There are no marketing researches.

2. Change in marketing concepts

- Exchange concept
  - exchange of goods between the customer and the seller
- Production concept
  - customers choose things that are inexpensive and easily accessible
- Product concept
  - favours quality and innovation
  - invests time, effort and money in research

- Selling concept
  - aggressive price cuts and Public Relation (PR) campaigns for selling and promoting products
- Marketing concept
  - Begins with the needs of the customer and ends with his satisfaction

3. Customer oriented – new concept

- Because the consumer is king, their satisfaction needs to be the main goal.
- Prior to beginning production, the needs and desires of the customers must be accurately and thoroughly identified.
- Production must reflect these requirements and desires.
- In order to reduce production costs, all available resources must be fully used possible.
- Profits cannot be enhanced by raising the selling price, only by lowering the cost of production or the cost of sales.
- The customer must be at the centre of every economic activity and must be satisfied in the end.
- Places an emphasis on marketing research

4. Change in situation

- Globalization of market
- Producer-cum-seller in domestic market to Producer-cum-seller in wider market
- Fishers and fish farmers need to know answers to questions like
  - what to produce
  - when to produce
  - the quantity to create
  - the time and place to sell
  - how much it costs and
  - How to present his produce for sale (value addition)
  - Production technology - knowledge creation focused on the current market

PARADIGM SHIFT IN FISHERIES EXTENSION

- Productivity to profitability
- Commodity oriented to farming systems orientation
- Local market to export oriented market
- Subsistence to commercial fisheries

- Monoculture to crop diversification
- Exploitative to sustainable fisheries

Challenges to market-led extension

1. Size of extension system
2. Market information technology
3. Market intelligence
4. Reorganization of extension system

1. Size of public extension system

- Heavily overwhelmed by several frantic activities.
- Liaison between researcher and fishers and fish farmers.
- The addition of a new dimension to "marketing" could place an even greater load on them.
- Already receiving harsh criticism for service delivery.
- How to encourage them to acquire new marketing knowledge and abilities before giving them marketing extension roles

2. Market information technology

The use of information technology should be able to address issues like what and how much to produce, when to produce it, what form to sell it in, how much to charge, when to sell it, and where to sell it. Fishers and fish farmers can access these kinds of information by pressing a button on a computer on a continuous basis. The much-discussed IT revolution would help fishers and fish farmers only when that happened.

i) Sources of marketing information

- Newspaper
- Magazine
- Periodicals
- Special bulletins
- Radio
- Television
- Email
- Websites

ii) Mass media in market-led extension

Both in terms of reach and technological advancement, the country's mass media has experienced extraordinary expansion in recent years. For the objective of increasing fish production, this medium has not been utilised to its fullest potential. It is now necessary

to make a concentrated and well-coordinated effort to use the mass media in the extension strategy by improving infrastructure, developing the skills of programme creators and expanding the range and number of fisheries programmes. Here are some of the major perceived constraints.

- There is no specific television channel for fisheries.
- Lack of collaboration and resource sharing between public, private and non-profit sectors in mass media and ICT efforts in fisheries.
- Private TV channel programme makers lack fisheries orientation
- Lack of focus of fisheries in print, ICT professionals
- Real-time information is not digitalized
- There is not much time for fisheries programmes

iii) Criteria for good market information / intelligence

- Comprehensive
- Accuracy
- Relevance
- Trustworthiness
- Timeliness

3. Market intelligence

- Market intelligence is information on everything a person should need to know about their business, risks, markets, clients, prospective issues, competitors, etc., and information that might be helpful in many ways.
    - Product
    - Competitors
    - Market practices
    - Customers

i) Source of market intelligence

- **Primary - direct collection**
    - Market research
    - Industry meeting
    - Market visits
    - Company executives
    - Government: Central / State
    - Department officials

- **Secondary - published data in public domain**
  - Industry publications
  - Department statistics
  - Commercial publications
  - Periodicals, monthly, annual reports
  - Newsletters
  - Annual report of companies
  - Websites
  - Specialized publications
  - Government sources

ii) Areas of marketing problems for market intelligence

- Packaging
- Transportation
- Storage
- Processing of products/ value addition
- Marketable and marketed surplus
- Marketing efficiency
- Marketing cost and margins price spread
- Market regulation programmes
- Demand supply position
- Prices

The creation of market intelligence data would be a massive undertaking itself. Consequently, the establishment of linkages between line departments will support the market-led extension.

iii) Paradigm shift from Production-led extension to Market-led extension

Aspects	Production-led extension	Market-led extension
Purpose/objective	Transfer of production technologies	Enabling fishers and fish farmers to get optimum returns out of the enterprise
Expected end results	Delivery of messages Adoption of package of practices by most of the farmers	High returns
Fishers and fish farmers seen as	Progressive fishers and fish farmer High producer	Fishers and fish farmers as an entrepreneur
Focus	Production / yields	Whole process as an enterprise /

		High returns
Technology	Fixed package recommended covering very huge area irrespective of different fishing and fish farming situations	Diverse baskets of package of practices suitable to local situations/ fishing and fish farming systems
Extension workers' interactions	Messages Training Motivating Recommendations	Joint analysis of the issues Varied choices for adoption Consultancy
Linkages/ liaison	Research-extension- fishers and fish farmers	Research-Extension-fishers and fish farmers extended by market linkages
Extension workers' role	Limited to delivery mode and feedback to research system	Enriched with market intelligence besides the TOT function Establishment of marketing and fish processing linkages between fishers and fish farmer groups, markets and processors
Contact with fishers and farmers	Individual	Fishers and fish farmers' interest groups Commodity interest groups
Maintenance of Records	Not much importance as the focus was on production	Very important as fisheries viewed as an enterprise to understand the cost benefit ratio and the profits generated
Information Technology support	Emphasis on production technologies	Market intelligence including likely price trends, demand position, current prices, market practices, communication network, etc., besides production technologies

FUTURE RESEARCH AND POLICY ISSUES

- To draw general conclusions about the efficacy of various market-led extension models, it is important to conduct more in-depth comparative policy research on various market-led extension models in various ecological and societal contexts.
- Such research initiatives may give us insightful information on institutional performance that will help us discern between strong, fragile and unsuccessful institutional arrangements and innovations.
- Detailed research studies are needed to understand what leads people's participation and improves their standard of living.
- Create extension and economist posts at various levels, including Ministry of Fisheries, Department of Agriculture, Department of Fisheries, etc.



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