

2. Value chain of fish and fishery products: Global status, issues and opportunities

A. Suresh

Extension, Information & Statistics Division
ICAR-Central Institute of Fisheries Technology, Cochin-682029, India
sureshcswri@gmail.com

The concept of value chain has attracted the attention of academician and management professionals, such that its usage has transcended from the level of a marketing management tool to that of a policy analysis one. A value chain describes the full range of activities which are required to bring a product or a service from conception, through the different phases of production and delivery to final consumers (Porter, 1980). Often the concept of value chain is interchangeably used to notate a market chain, but there are very critical differences between them. While the market chain analysis intends to provide information on profitability for various agents along the market chain (Ferris *et al.*, 2001), a value chain analysis describes the range of activities required to bring a product to the final consumer and, the extent to which intermediaries/agents gain from participating in the chain (Jacinto, 2004). In that context, a value chain describes the distribution of the benefits or value addition to different economic agents, and touches the realms of development economics. In the initial days of the development of the concept, it was used for analyzing a single company, a sector, an organization or a product; however, later it was developed to analyze single or multiple sectors and to develop policies.

Kaplinsky and Morris (2000) identify three sets of reasons for the importance of value chain analysis. With the globalisation of labour and capital, and emergence of division of labour, achieving efficiency of production has gained greater policy focus. The corporate world try to attain systematic competitiveness in the context of growing division of labour and global dispersion of production components so as to achieve efficiency in production to penetrate global markets. Value chain analysis is also done to understand the dynamic factors that plays, so as to make the best out of globalisation. This approach essentially focuses on markets, with the aim of achieving overall efficiency in terms of increasing productivity and reducing cost. However, the attainment of efficiency needs to factor in the opportunity cost of the resources and optimise the benefits over a long period of time. The trade-off between efficiency attainment and equity in distribution of the benefits for the stakeholders has also attained significance. Development of a win-win situation calls for imparting efficiency in attaining targets while generating maximum benefits to the actors along the value chain. In that context, sustainability of the value chain emerges as an important consideration.

Porter's value chain concept

The concept of value chain has its origins from the commodity chain approach, which focused on the physical product flow from the producer to final consumer. Michael Porter (1985) put forwarded value chain as the value addition in competitive markets. It is the core element in the

production-to-consumption chain of activities, within an organisation framework. The value added should be more than the marginal cost of that activity, for the particular intervention to be sustainable. However, the concept doesn't address the larger concern of economic development of the sector, but was limiting itself to the organisational management. Porter's VC concept in that way deals essentially with firm-level strategy and not with broader economic development.

In Porter's concept, the activities of the firm can be broadly split into 'primary activities' and 'support activities', depending on the whole functioning (Figure 1). The primary activities include inbound logistics, which include sourcing of the raw material; operations which include conversion of the raw material into final products; outbound logistics which include system of distribution centres, wholesalers, retailers and consumers; services including trainings. The primary activities, either alone or in combination of them are essential for the firm to develop the competitive advantage for the value chain to be economically successful. On the other hand, the support activities assist the primary activities in helping the organisation achieve its competitive advantage. They involve procurement including quality management; technology development to obtain competitive advantage with in the organisation including development of online facility; human resource management which includes recruitment, trainings, motivation, competitive advantage etc.; and, managing firm infrastructure, including managing finances, legal structure, and management structure. A co-ordination of all the activities are necessary for successful value chain development.

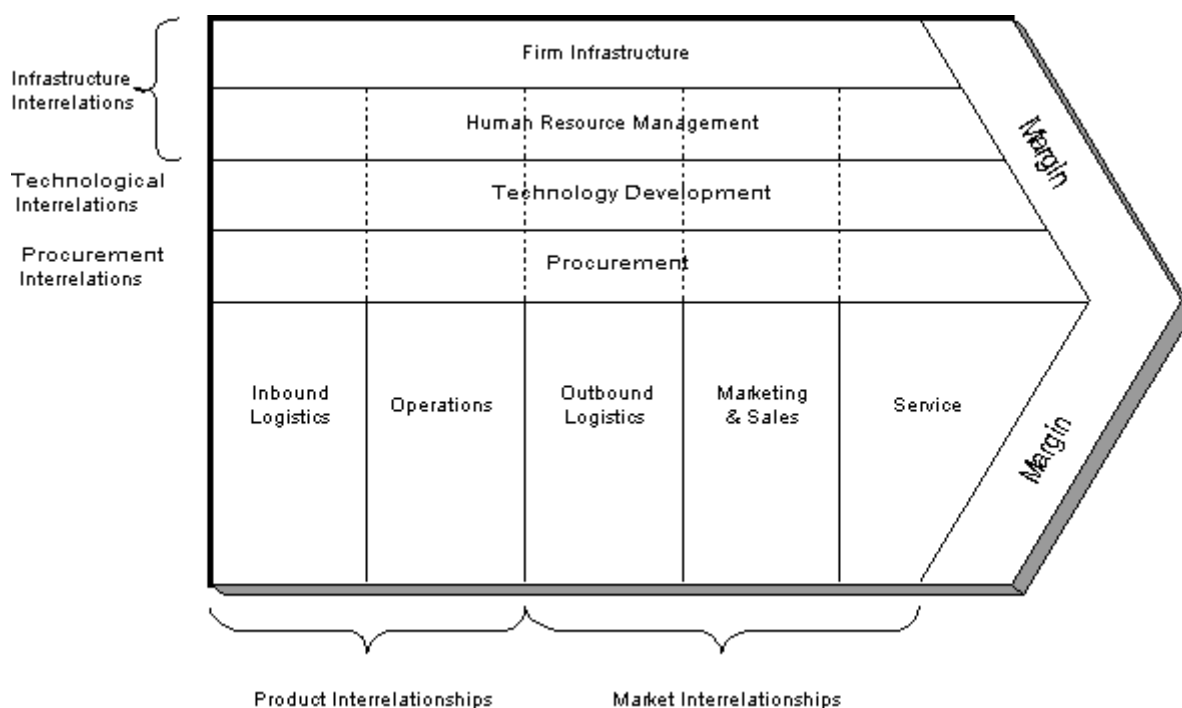


Figure 1: Michael Porter's value chain concept

Global Commodity Value Chain

On the other hand, the global commodity value chain (GCV), as introduced by Gereffi and Korzeniewicz (1994), provides a developmental dimension, by introducing chain governance. The element of chain governance envisages how various firms across the entire chain are coordinated (or strategically linked) in order to be more competitive and add more value. Under this framework, the value chains are derived by the nature of demand from the final consumers and the process of globalisation.

The concept of global commodity value chain (GVC) shifts the focus of the analytical framework to demand side factors, compared to the supply side factors that are seen in case of Porter's value chain concept (Gereffi, 1994; Kaplinsky, 2000). This shift in the orientation of the value chain has been a result of the substantial influence that the global retailers wield over the food systems of the developing countries. The control is more forceful in those food commodities that undergo relatively low level of processing and therefore flexible. As the demand consideration varies across markets of different countries, primarily on account of different quality standards emphasised, the producing nation needs to take into account the cost of compliance. For example, the quality criteria prescribed by export markets like US is considerably different from that of Europe. This creates redefinition of markets according to quality criteria, and leads to an association which mutually reinforces quality and demand driven value chains. In such circumstances, the capability of the supplier to adhere to the quality prescriptions ceases to be a major consideration for the hegemonic retailers, and the sunk cost turns irrelevant. One prime contribution of the global commodity value chain is the recognition of globalisation as a powerful economic phenomenon in determining food system performance and retailer hegemony as a prime factor that affect the value chain.

Global fisheries value chain

Perhaps, fish happens to be one of the few commodities that have witnessed globalisation through trade. The globalisation of fish value chain involves participation of multiples countries and partners, as fish harvested/ produced in one country is processed and exported though other countries to the consumers located in remotely located places. Globally fish production has increased steadily over a period of time (Table 1). With the growth in per capita income and changes in taste and preferences of the consumers towards marine products, the demand for fish has also increased. Consequently, the trade in fish has increased steadily over a period of time. The research and developments in fishing, aquaculture, fish processing and value addition, packaging, quality assurance and financing has served the purpose of catalysts in global fish value chain.

Table 1: World Fisheries Aquaculture Production, Utilisation and Trade

	1986–1995	1996–2005	2006–2015	2016	2017	2018
	Average per year					
	<i>(million tonnes, live weight)</i>					
Production						
Capture						
Inland	6.4	8.3	10.6	11.4	11.9	12.0
Marine	80.5	83.0	79.3	78.3	81.2	84.4
Total capture	86.9	91.4	89.8	89.6	93.1	96.4
Aquaculture						
Inland	8.6	19.8	36.8	48.0	49.6	51.3
Marine	6.3	14.4	22.8	28.5	30.0	30.8
Total aquaculture	14.9	34.2	59.7	76.5	79.5	82.1
Total world fisheries and aquaculture	101.8	125.6	149.5	166.1	172.7	178.5
Utilization²						
Human consumption	71.8	98.5	129.2	148.2	152.9	156.4
Non-food uses	29.9	27.1	20.3	17.9	19.7	22.2
Population (<i>billions</i>) ³	5.4	6.2	7.0	7.5	7.5	7.6
Per capita apparent consumption (kg)	13.4	15.9	18.4	19.9	20.3	20.5
Trade						
Fish exports – in quantity	34.9	46.7	56.7	59.5	64.9	67.1
<i>Share of exports in total production</i>	<i>34.3%</i>	<i>37.2%</i>	<i>37.9%</i>	<i>35.8%</i>	<i>37.6%</i>	<i>37.6%</i>
Fish exports – in value (<i>USD billions</i>)	37.0	59.6	117.1	142.6	156.0	164.1

¹ Excludes aquatic mammals, crocodiles, alligators and caimans, seaweeds and other aquatic plants. Totals may not match due to rounding.

² Utilization data for 2014–2018 are provisional estimates.

³ Source of population figures: UN DESA, 2019.

Source: Adapted from FAO (2020)

One critical step that resulted in fish value chain is globalisation in fish trade, particularly through World Trade Organisation, where the developing countries in general could gain significantly by upgrading the value chain. Ensuring fish quality and safety by following the stringent sanitary and phyto-sanitary conditions was the most significant technical upgradation that helped out. The globalisation has opened up new areas to realise value by upgrading diversifying the value chain in terms of 4 “p”s, namely product, place, price and promotions as is usually seen in case of supply chain management literature. However, globally greater focus is being accorded to sustainable value chain while bringing about an upgradation in the entire value chain process and elements. This particularly so in the context of unsustainability issues in global fish production in terms of over-exploitation of resources in the capture fisheries, mainly marine fisheries. This has the potential to affect the life and livelihood of millions of people and in term of poverty, labour usage and food and nutritional security.

Who gains from the global fisheries value chain development?

Who gains and who losses in the value chain development is one among the key questions confronting the fishery value chain development? The major concerns are that what is the share of additional benefits that has accrued in the value chain development that is passed on to the producers. Also, of significance is how the value chain development translates in to sustainable outcomes in terms of fish resources. Addressing these questions needs a proper analysis of the value chain, delving deep into the major actors, activities and the flow of economic benefits along the value chain. Value chain analysis forms the starting point in an effort to upgrade the value chain and harness benefits out of the value chain development.

Value chain analysis

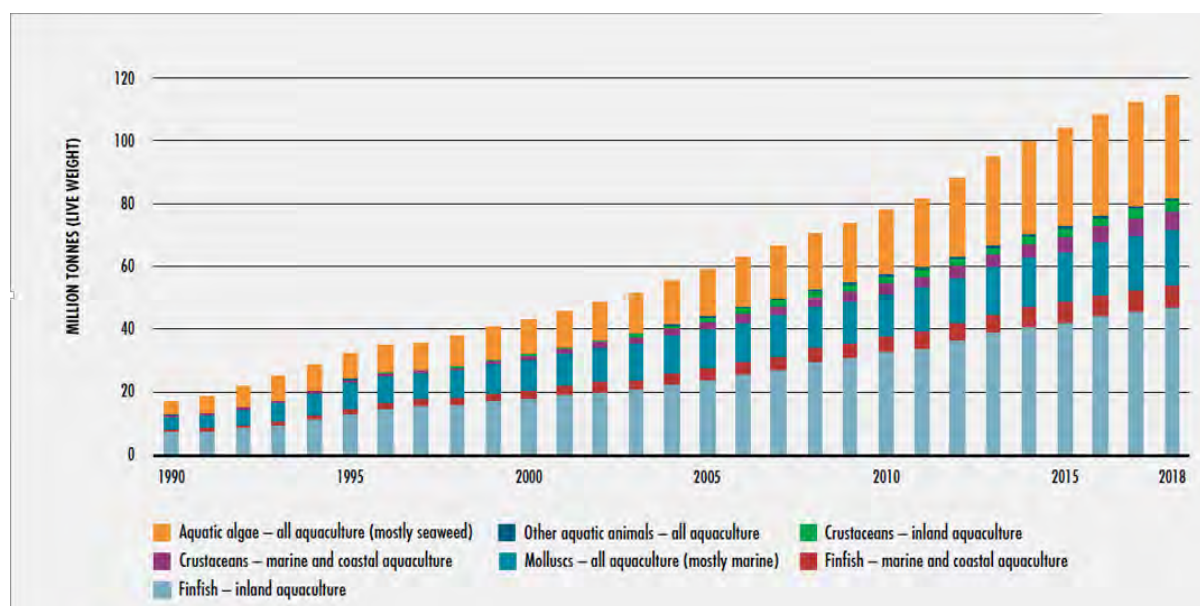
A Value Chain analysis assesses whether the value chain is effective at maximising the opportunities for adding value in the eyes of the consumer; and efficient in adding value, producing, processing and distributing at the least cost (CRFM, 2014). Value is getting added at every step or node in the value chain. The major constraints faced in the value chain development at every stage is subjected to the approach. The concept when applied to fisheries and aquaculture simply refers to all the activities and services —from input supply to production (capture fisheries and aquaculture farming), processing, imports, wholesale and finally, retail. In reality, the total value chain takes into account the input suppliers, support services providers including regulatory, financial, technology transfer and all the other actors who comprise the enabling business environment in which the industry operates. In the concept of value chain, the starting point of analysis is the consumer, rather than the producer as is usually done in a supply chain analysis. The value chain changes as the consumer turns more aware and conscious about issues of concern including environmental pollution, quality and safety concerns. The value chain changes with globalization and changes in the taste and preferences of the consumers.

For fishers, managers of organisations involving in fisheries, and policy makers, the value chain approach provides a useful and practical tool for assessing the development status of the fisheries and aquaculture sector. and in analysing the opportunities and constraints for its future development. The process of Value Chain analysis is done in accordance with a number of sequential steps as: mapping the value chain, selecting and prioritizing value chains; analysing the value chain, formulating and upgrading strategies for value enhancing in the, implementing the upgrading strategy; and monitoring and impact assessment.

1. Issues and prospects in global fisheries value chain: A snapshot

Fish and fish products has a critical role in meeting food and nutritional security, reduce poverty and help in leading a healthy and active life. In that sense, the fisheries economy contributes to the Sustainable Development Goals (SDGs) as envisioned by the United Nations. The demand for fish is more elastic, and therefore with an increase in per capita disposable income, the aggregate demand would be rising. The increased demand is to be met by domestic production and/or import.

The fish production is driven mainly by aquaculture. The marine capture fisheries is stagnating in most part of the world. Forecasts suggest that it would continue be so in the medium term (FAO, 2020). The aquaculture would be dominated by Asian countries, especially China. Further, aquaculture is also witnessing a qualitative change in terms of diversification- towards production of sea weeds (algae) (Figure 1). These changes are sufficient enough to alter the value chain, by providing new challenges and opportunities. The increasing dominance of aquaculture in the fish production implies greater influence on fish prices by price swings of farmed fish and the variability in the supply chain of inputs and services for farm fish.



Source: Adapted from FAO (2020)

The fish trade, on the other hand, is highly developed in terms of product diversification and value chain complexities. However, the participation to the high-end value chain is limited for small scale fish producers. Therefore, much of the fish consumption is in fresh form without undergoing value addition of high order. The global south gains through fish trade in terms of revenue gains, but there are concerns on the trade-off between domestic nutritional security and revenue out of fish trade. This points to the need to shift towards advanced value addition system. The utilisation as prepared or processed fish products are on gradual increase (Figure 2). It would create opportunities for income and employment generation.

The changes in the trade system are poised to alter the value chain. The strict sanitary and phytosanitary conditions that characterise the international requirement for fish trade warrants investment by the global south in establishing technologies and institutions for ensuring safety and quality compliance in accordance with acceptable global standards. Further, the development in ICTs in terms of online delivery inputs, services and outputs (fish) has brought a paradigm shift in the way the fisheries value chains are organised. The development in ICTs in terms of advisories, extension systems, quality management, traceability and automation are forces sufficient to challenge the existing value chain and effect a qualitative change. An exhaustive, but not an exclusive list of forces that could challenge the value chain in fisheries is provided below:

Drivers of changes in value chain and some examples

	Dimensions/ factors	Remarks
I	Demographic changes	
A	Ethnicity and race	Example: Preference to meat over fish in some societies Generally, Countries in East has high demand for variety of fish Some commodities have demand in certain regions - Eg. Sea cucumber and shark fins are luxury for some Chinese markets
B	Geographic distribution	Eg. Fish harvest and post-harvest depends on the availability of fish species. Tropical regions are dominated with multi-species fishery. Culinary style varies depends on regions and fish species commonly available.
C	Extent of travel	Eg. Global village lead to change the traditional habits. Wide travels expand the horizons of demand, and the market needs new products.
D	Literacy	Literacy and awareness have impacts on demand for food safety, quality, sustainability of fishing practices, adoption of responsible fishery, climate change, and pollution.
E	Retailer promotion	The important variables could be retailer competition, promotion, kind of social networks.
II	Consumer preferences	
a	Price	Critical element of product demand.
b	Quality	Maintaining quality add extra cost, countries all over the world upgrade and revise the quality standards. Examples are: EU directives food safety and sanitation, USA-USFDA, Japan- Food and Sanitation Law.
c	Convenience	Generally high demand for clean, cut and ready to cook or ready to eat forms of fish and consumers are willing to pay extra premiums.
d	Year-round availability	Aquaculture makes fish available year-round compared with capture fisheries, and this affects the value chain planning and operations. Processing helps to overcome seasonality, and wastage.
e	Variety and nutritional content	Nutrition is the major attribute considered in purchasing decisions. For example, fish is rich in Omega 3 fatty acid having several health benefits.
f	Safety	Food safety is emerging as a major attribute with regulations on quality parameters. Strict quality

		and safety guidelines are in vogue in several countries- EU, Japan and the United States have strict regulations. Further, the developing countries follow the suit, in domestic markets also
g	Greenness	Sustainability is the main concern of the green or environmental friendliness, and extra for the conservation measures, eco-labels, organics, WTP
h	Fairtrade	Fair trade label attracts premium prices
III	Buyer specification	
a	Volume	The volume varies with the type / class of buyers, for example, individual buyer and institutional buyers. Variables like seasonality, economic status, cultural aspects and purchasing power of the consumers affects the trade volume
b	Presentation	Presentation style appeals and attracts consumers. Good packaging materials gains importance in this context. Clean cut ready to cook or eat fishery products attracts more consumers
c	Labelling	Intended to provide information on product composition and safety. EU adopted Traceability for all fisheries and aquaculture products.
c	Certification	Certification and labelling of certified products aim to identify products that follow certain minimum standards or regulations, such as standards for quality, organic production, fair trade, or sustainability
IV	Technology	
a	Marketing information systems (MIS)	Developments in MIS provide information required for value chain adjustments. Developments in mobile telephony and spreading of internet facilitate this. Traders and non-governmental Organizations (NGOs) are also contribute for information flow.
b	Category management methods	The fish products and supplies category are extremely diverse.
c	Progress in supply chain management	Involves a large number of stakeholders between the fisherman/fish farmer and the final consumer. There are several possible routes (harvesting and processing sector) in fish value addition in terms of geography and actors. Importing fish to a second country, value addition in that country and re-export is also emerging a value chain.
d	Harvest and processing technology	Development of new products which are ready to eat (RTE) and ready to serve (RTS) have promoted newer value chain. Further, ethnic fish

		preparations are gaining currency. Harvest technologies in accordance with sustainability concerns. For example, non-polluting and energy efficient fish harvesting vessels, usage of turtle excluder devices etc.
d	Transport and handling advances	Advances in transport facilities has facilitated emergence of live fish transportation and emergence newer value chain.
V	Regulatory change	
a	Official standards and associated certification	Standards and certifications aim to protect consumers, environment, sustainable resource utilization, fishers and trade relations, and led to emergence of several agencies who undertake these operations.
b	Labelling (nutrition, country of origin labelling, allergens)	Labels on nutrition, country of origin, allergens. Regulatory systems have responded with new product and production standards, approval processes, risk-assessment processes and labelling requirements.
c	Environmental protection	Laws on environmental protection has emerged at international level (Eg UN). The examples are: <u>United Nations Convention on the Law of the Sea (UNCLOS)</u> to promote sustainable fishing. <u>Code of Conduct for Responsible Fisheries</u> (1995) in a non-binding commitment on the part of all signatory states to adhere fishing practices that promote responsible fishing.
d	Labour and animal rights	Targeted for minimal harm to or exploitation of humans, animals and/or the natural environment. For example, ethical consumerism is gaining currency and is changing the value chain. <u>ILO</u> - with fundamental workers' rights
VI	Other factors	
a	Market access	Quarantine requirements and non-tariff trade barriers restrict the fish trade, but provide opportunities for value chain development that facilitate addressing these concerns. Value-added fish and fishery products require substantial investment. However, compliance with the guidelines, like HACCP has occurred in several processing units of developing countries, and have given rise to development of newer value chain activities.

b	Distribution and retailing	Major changes in distribution and retailing are energy, transport and labour. Poor infrastructure, logistics and weak policy hinders the success of the fish industry.
c	Economic growth trends	The major factors that affect the demand for fish products are per capita disposable income, availability of alternate nutrient sources, urbanisation, and population growth. Further development of online delivery mechanism, financing and distribution of wealth are key factors.

Source: Compiled from De Silva (2011), with inputs by the author

Some of the factors that provide challenges and provide newer opportunities for value chain development are provided in the above table. In recent times, sustainable food value chains have emerged currency all over the world. However, it requires substantial investment, from both public and private sector, to develop capital sufficient enough to harness the productivity (Suresh and Parappurathu, 2018).

2. Sustainable food value chain

While the development economics has been focusing more towards the sustainability issues, value chain development literature has not addressed the issue of sustainability as the bottom line of developmental thinking (FAO, 2014). Of particular importance is how the value chain analysis addresses the issues of environment, economics and society at large. The sustainable food value chain (SFVC) concept, as used by FAO, visualises an element of sustainability and applies it to specific nature of food production, value addition and distribution. However, many services used in a single commodity approach are common to many agricultural products- for example, marketing, financing, information etc are used by many commodities, and therefore a more holistic approach would gain currency in the times to come. However, for analytical purpose, the concept of SFVC has to look into commodity chains, so as to delineate the broader trends, identify intervention points and estimate the impacts. The concept of SFVC is relatively newer one, and is largely developed by FAO. Consequently, this session largely relies on the concepts as provided by FAO (2014).

Interaction of economic, social and environmental elements

The sustainability of the value chain is determined by the economic, social and environmental elements. A value chain is considered economically sustainable if the required activities at the level are economically viable and or profitable. However, the outcome of the economic activity needs to be socially and culturally acceptable to characterise it to be socially sustainable. The environmental sustainability is attained largely if the value chain activities doesn't impact the environment adversely and maintains a non-declining natural capital stock.

Principles of sustainable food value chains

Though each food value chain is unique, the sustainable food value chain is characterised by 10 interrelated principles, as noted below:

- a. Economically sustainable: Commercial viability, competitiveness, growth etc. The upgraded VC should provide higher profits, income etc.
- b. Socially sustainable: Inclusiveness, equitability, social norms, social institutions and organizations. Generation of greater share of value (profit and wage income) to the poor, broad-based, and equitable distribution along the VC, with no adverse effect on the poor.
- c. Environmentally sustainable: Non-declining natural capital stock, for inter-and intra-generational equity. Minimise environmental footprint (water footprint, carbon footprint etc) is an issue.
- d. Dynamic and system based: VC is dynamic due to changes in market demand, technology, available services, profitability, risk, barriers to entry, large-firm behaviour, input supply and policy etc. VC needs to be adapted to changes. Sub-systems are linked, and identifying root cause in the system is the solution to improve.
- e. Governance centred: Needs to analyse how value chain actors of different typology transact vertically and how they collaborate horizontally. The governance needs to bring in win-win solutions, and impart element of trust among the value chain actors.
- f. End-market driven: The value is ultimately determined in the end-market when consumers purchase the product/service; and therefore, consumer analysis needs to be the starting point for the VC improvement.
- g. Vision/strategy driven: to be successful, the actors have to carefully target development goals and stakeholders. The strategies need to revolve around a vision which is realistic, quantifiable (as far as possible) and targeting (as far as possible) selected stakeholders. The improvement of VC should focus on that area where largest impact is possible.
- h. Upgrading focused: It requires carefully assessed and innovative upgrading activities to translate a vision and strategy into an effective plan. The upgradation can be in the form of technology, organisation, institution, network etc.
- i. Scalable: The VC upgrade allow replication process that is based on realistic assumptions.
- j. Multilateral: It requires that the driver of the process of VC upgradation is private sector as driver and the other agencies (public sector and civil society organisations) as facilitators.

References

- Coronado, E., Salas, S., Cepeda-Gonzalez, M. F., and Chuenpagdee, R. (2020). Who's who in the value chain for the Mexican octopus fishery: mapping the production chain. *Marine Policy* 118:104013. doi: 10.1016/j.marpol.2020.104013
- CRFM (2014) Value Chain Approaches In Fisheries Planning. Policy Brief No. 4, September 2014.
- De Silva, D.A.M. (2011) Value chain of fish and fishery products: origin, functions and application in developed and developing country markets. FAO
- Donovan, J., Cunha, M., Franzel, S., Gyau, A. & Mithöfer, D. 2013. Guides for Value Chain Development – A Comparative Review, CTA & World Agroforestry Centre, Wageningen, The Netherlands.

- FAO (2014). *Developing Sustainable Food Value Chains- Guiding Principles*, Rome
- FAO. 2020. *The State of World Fisheries and Aquaculture 2020. Sustainability in action*. Rome.
<https://doi.org/10.4060/ca9229en>
- Humphrey, John and Memedovic, V (2006) *Global value chain in agri-food sector*, UNIDO, Vienna
- Porras I., Mohammed E.Y., Ali L., Ali M., Hossain M.B. Power, profits and payments for ecosystem services in Hilsa fisheries in Bangladesh: a value chain analysis. *Mar. Policy*. 2017; 84:60–68.
- Purcell, S.W., B.I. Crona, W. Lalavanua, H. Eriksson Distribution of economic returns in small-scale fisheries for international markets: a value-chain analysis *Mar. Policy*, 86 (2017), pp. 9-16.
- Sumaila, U. Rashid, Christophe Bellmann, and Alice Tipping. *Fishing for the Future: Trends and Issues in Global Fisheries Trade*. E15Initiative. Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum, 2014.
www.e15initiative.org/
- Suresh. A. (2018) *Towards development of sustainable food value chain: Concepts and its application in marine capture fisheries in India*. Compendium of lectures: ICAR sponsored Winter School on ‘Enhancing farm income through entrepreneurship development in fishing and fish processing’, ICAR-CIFT, Cochin, 05-25, January, 2018
- Suresh, A, and Parappurathu, S. (2018) *Capital formation in fisheries sector in India: trends, compositional changes and potential implications for sustainable development*, *Agricultural Economics Research Review*, 31 (conference issue): 222-122.