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Value chain analysis of marine fish in Puducherry

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Abstract
India is the second largest fish producing country next to china. Among the various food, fish is a crucial source of nutrition for people because it may significantly meet the body's needs for animal protein and also marine fishes plays a major role in Indian exports. This study was conducted in Puducherry to find out the cost and returns at each stage in marketing as well as value chain mapping in marine fish. Convenient sampling method was adopted for this study where primary data has been collected from 100 sample fishermen and 40 sample intermediaries. The calculated benefit cost ratio is 1.26 which shows that marine fishing is a economically profitable in Puducherry. Seven value chains were found while mapping in both domestic and export market. In the seven value chain, only six value which are found to more common are taken for price spread analysis. The result shows that among the six value chain, the value chain III, namely Fishermen – Wholesalers – Retailers – Consumers was found to be more efficient with the highest value chain efficiency of 2.84.

Keywords: Marine fish, value chain, price spread, mapping

Introduction
Fish is a crucial source of nutrition for people because it may significantly meet the body's needs for animal protein. In nations like China and Japan, the only source of animal protein is fish. Fish is the easiest sea food for humans to digest and is high in the nutrients that human bodies need, including protein, lipids, iodine, and vitamins.

Over a billion people worldwide get most of their nourishment from fish. The primary source of income for more than 100 million individuals who directly participate is fishing. The fishing industry, as well as allied businesses employ a sizable section of the population.

India provides enormous potential for the development of fisheries because to its long 8129 km of coastline, two million sq. km of Exclusive Economic Zone, and 1.2 million hectares of brackish water bodies. The majority of fishing activity is focused on inshore seas in the artisanal, conventional, and mechanised sectors. Puducherry with a coastline of 45 km and a continental shelf area of roughly 1000 sq. km. It is bordered on the East by the Bay of Bengal.

The notion of a value chain includes the two fundamental concepts of chain and value. Value chain is a supply chain in which the product gains value as it travels down the chain. The series of actions and participants in the supply chain serve to describe it. Value-chain analysis, in other words, shows where, how, and why value is created and contributed along the chain. Its goal is to comprehend the reasons behind the value chain's current structure and how it might be used to effect change.

Objectives of the study
The Objectives of the study are,
- To map the value chain of fish and prawn in Puducherry and to calculate cost and returns at each stage in value chain.

Research Methodology
This study was conducted in Puducherry. Among the 18 Fishing villages in Puducherry, major fishing areas of 10 villages are selected for taking samples. The selected ten villages namely Vaithikuppam, Vambakeerapalayam, Poornakuppam, Ariyankuppam, Nallavaadu, Veerampattinam, Pillaisavady, Kalapet, Narambai and Panithittu.

Ten villages with ten fishermen from each village were selected for taking samples. Samples were taken based on the convenience sampling technique. The intermediaries involved in marketing of marine fish in which 10 wholesalers, 10 retailers, 10 commission agents, 5 processors and 5 exporters were selected conveniently to carry out the research.

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Tools for analysis
Value chain mapping
The value chain's central process was first determined. Second, attempts were made to identify and map the main players and their involvement in these operations. The third phase was grouping performers into different categories based on their professions.

The value chain was geographically dispersed between locations, therefore processes that were unique to each location were incorporated. Step four involved mapping the product flows through the value chain. Fifth, mapping the value at various levels of the value chain using cost and margin measurements gave a picture of the profits at various points.

Price spread analysis
Individual fishermen and traders provided information that was gathered. The charges for marketing the produce would also cover the costs of shipping, weighing, loading and unloading, packing, storing, and other related costs.

The "Price Spread" in marketing is the distinction between the price the consumer pays and the price the producer receives for a comparable quantity. It was kept track of the profits made by the many market middlemen who helped move the product from its originating point of manufacture to the final consumer. The profits of the many market actors who moved the produce from its initial site of production to its final customer were tracked.

Marketing efficiency
The level of market performance is referred to as marketing efficiency.

Acharya and Agarwal's method
According to Acharya and Agarwal's, an ideal measure of marketing efficiency, particularly for comparing the efficiency of alternate market channels should take into account.

The following measure was used to estimate marketing efficiency,

$$E = \frac{O}{I} \times 100$$

Where,
E-Marketing efficiency O – Output of the Marketing system
I - Total marketing cost

Results and Discussion
Cost and returns of Fishing
The Cost and return of fishing for one day trip were presented in the table 1.

Table 1: Cost and return of fishing for one day trip

S. No	Particulars		Amount (in Rupees)	Percentage
	Average fixed cost			
1.	Boat		5,00,000	79.3%
2.	Net		80,000	12.6%
3.	Engine		1,10,000	17.4%
4.	Depreciation		60,000	9.5%
	Average Total fixed cost (for 5 year)		6,30,000	100%
	Average Total fixed cost per year		1,26,000	20%
	Average Total fixed cost per trip (120 trip/year)		1,050	0.16%
	Average variable costs per voyage			
1.	Fuel charges		4000	17.2%
2.	Cost of Ice		800	3.4%
3.	Salaries of crew	Boat crew (4)	8000	34.4%
		Loading and Unloading charges	400	1.7%
4.	Cost of food, water		2000	8.6%
5.	Cost of repairs		1000	4.3%
6.	Baits		500	2.1%
7.	Hooks		600	2.5%
8.	Others		500	2.1%
	Average Total variable cost		23,207	100%
	Average Total variable cost per year (120 trips/year)		27,84,840	
	Average total cost (fixed cost per year + variable cost per year)		29,10,840	
	Returns			
1.	Average Catches per trip		155 Kg	
2.	Value of Fish at average price of Rs. 205 (per trip)		31,775	
3.	Total cost spent per trip		24,257	
4.	Net income per trip		7,518	
5.	Average income per year (120 trips)		38,13,000	
6.	Net income per year		9,02,160	
7.	BC ratio		1.30	
8.	Fishing cost per kg of fish		156.4	

It could be inferred form the above table 1, that the total cost spent for fishing was estimated to be Rs. 24,257 per trip. The total income obtained is Rs. 31,775 per trip, wherein the net income is Rs. 7,518 per trip. The result clearly indicates that fuel charges, salaries of crew, cost of food and water were the major component of variable cost incurred in marine fishing. And the boat, fishing net and engine were the major component of fixed cost incurred in marine fishing. Cost incurred to catch per kg of fish was calculated as Rs.156.4.

The average catching of fish per trip was 155 kg, with an

average of 120 fishing trip per year. The maximum profit obtained by the fishermen per annum is Rs. 9.02 lakhs. Since, the calculated benefit cost ratio is 1.3 which is economically profitable business in Puducherry.
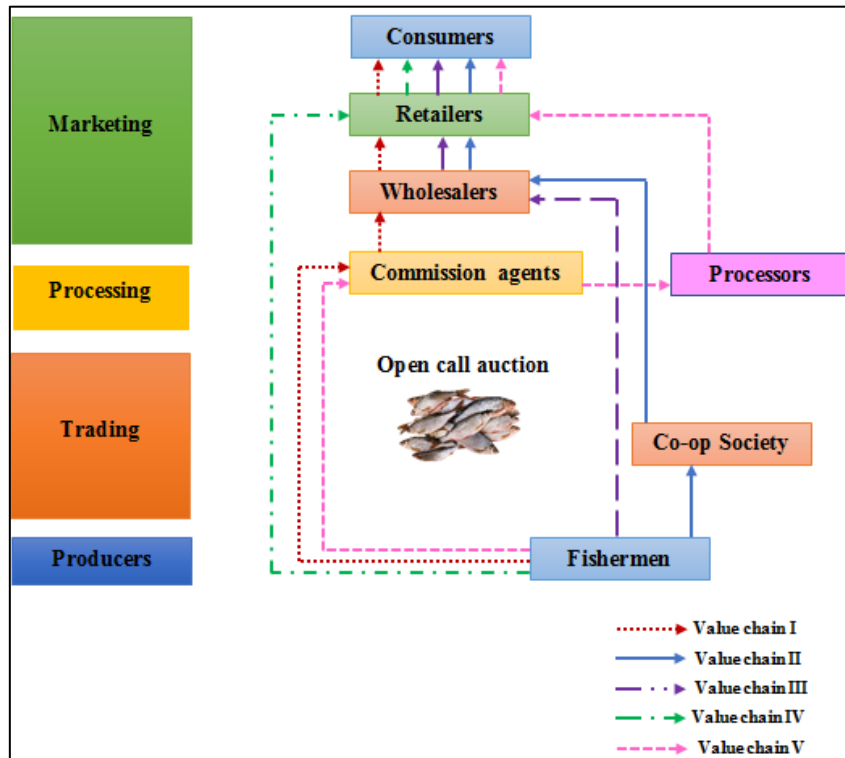
Mapping of marine fish value chain
Mapping activity helped to identify links in the chain where exchanges are made. Different value chains adopted by sample fishermen are discussed hereunder:

Domestic value chain
The domestic value chain has more efficiency among all this value chain. This is due to convenient marketing and additional revenue made among the local traders. This domestic value chain helps to trace out the actors involved in marketing of marine fishes from fishermen to consumer.

Fig 1: Domestic value chain of marine fish

Fig.1 shows how marine fish were flows via several alternative value chain paths from fishermen to various end market consumers in domestic market. Five primary channel operates within Puducherry are,

Value chain I
Fishermen ⟶ Commission agent ⟶ Wholesaler ⟶ Retailer ⟶ Consumer

In the first channel, fishermen sells the fish directly to commission agents. Wholesaler get it from Commission agent and distributes it to retailers.

Value chain II
Fishermen ⟶ Co-operative society ⟶ Wholesaler ⟶ Retailer ⟶ Consumer

In the second channel, fishermen sells the fish to their co – op society, which sells it to wholesalers. Wholesalers distributes it directly to the retailers.

Value chain III
Fishermen ⟶ Wholesaler ⟶ Retailer ⟶ Consumer

In the third channel, fishermen sells the fish directly to wholesalers who distributes it to retailers.

Value chain IV
Fishermen ⟶ Retailer ⟶ Consumer

In the fourth channel, fishermen sells the fish directly to retailers during auction or direct selling.

Value chain V
Fishermen ⟶ Commission agent ⟶ Processor ⟶ Retailer ⟶ Consumer

In the fifth channel, fishermen sells the fish to commission agents who sell it to processors, which is then processed and sold to retailers.

Export value chain
Due to continuous supply and adequate availability of fishes, there are wide opportunity for foreign traders to export fishes. Due to availability of superior quality fishes with high nutritional value Indian marine fishes have good welcome in foreign countries especially in USA and China. This export value chain helps to trace out the actors involved in export marketing of marine fishes.
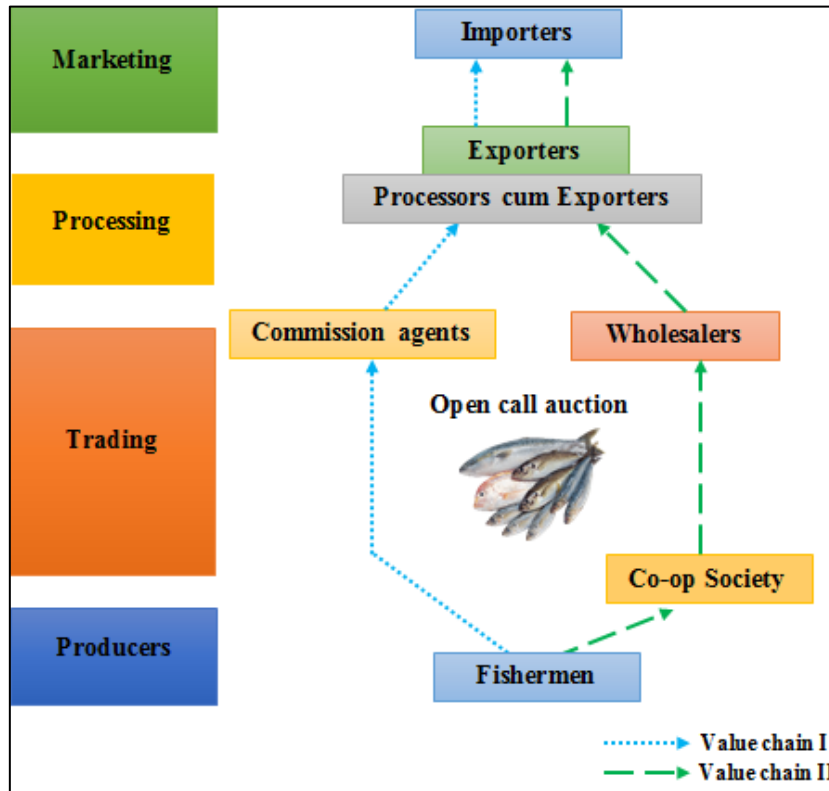
Fig 2: Export value chain of marine fish

Fig.2 shows how marine fish were flows via several alternative value chain paths from fishermen to various end market consumers in export market. The two primary channel functioning for exporting marine fishes from Puducherry which includes,

Value chain I

Fishermen ⟶ Commission agent ⟶ Exporter ⟶ Importer

In the first channel, fishermen sells the fish directly to commission agents. Exporters get it from Commission agent and distributes it to fish importers in other country.

Value chain II

Fishermen ⟶ Co-operative society ⟶ Wholesaler ⟶ Exporter ⟶ Importer

In the second channel, fishermen sells the fish to their co – op society, which are bought by wholesaler which is procured by processor cum exporters and distributed to importers at various countries.

Cost and returns of stakeholders

Price spread, marketing cost, marketing margin are presented in table 2.

Table 2: Price spread of marine fish value chain I, II, III, IV, V and VI (in Rs. /kg)

Particulars	Value chain I		Value chain II		Value chain III		Value chain IV		Value chain V		Value chain VI	
	Price	Percent	Price	Percent	Price	Percent	Price	Percent	Price	Percent	Price	Percent
	Fishermen		**Fishermen**		**Fishermen**		**Fishermen**		**Fishermen**		**Fishermen**	
Gross price received	205	69.2%	205	70.6%	205	73.4%	205	42.4%	205	45.05%	205	58.07%
Fishing cost	156.4	52.8%	156.4	53.9%	156.4	56.05%	156.4	32.3%	156.4	34.3%	156.4	44.3%
Net price received	48.6	16.4%	48.6	16.7%	48.6	17.4%	48.6	10.06%	48.6	10.6%	48.6	13.7%
	Commission agent		**Co - op society**		**Wholesaler**		**Commission agent**		**Co - op society**		**Commission agent**	
Purchase price	205	69.2%	205	70.6%	205	73.4%	205	42.4%	205	45.05%	205	58.07%
Marketing cost	15	5.06%	8	2.7%	12	4.3%	15	3.1%	8	1.7%	15	4.2%
Marketing margin	23	7.7%	6	2.06%	31	11.1%	23	4.7%	6	1.31%	23	6.5%
Sale price	243	82.09%	229	78.9%	248	88.8%	243	50.3%	219	58.1%	243	68.8%
	Wholesaler		**Wholesaler**		**-**		**Wholesaler**		**Wholesaler**		**Processor**	
Purchase price	243	82.09%	229	78.9%	-	-	243	50.3%	219	48.1%	243	68.8%
Marketing cost	10	3.3%	13	4.4%	-	-	10	2.07%	11	2.4%	30	8.4%
Marketing margin	12	3.7%	17	5.8%	-	-	12	2.4%	17	3.7%	38	10.7%
Sale price	265	89.5%	259	89.3%	-	-	265	54.8%	247	54.2%	311	88.1%
	Retailer		**Retailer**		**Retailer**		**Exporter**		**Exporter**		**Retailer**	
Purchase price	265	89.5%	259	89.3%	248	88.8%	265	54.8%	247	54.2%	311	88.1%
Marketing cost	12	3.7%	12	4.1%	12	4.3%	74	15.3%	74	16.2%	12	3.3%
Marketing margin	19	6.4%	19	6.5%	19	6.8%	134	27.7%	134	29.4%	30	8.4%
Sale price	296	100%	290	100%	279	100%	483	100%	455	100%	353	100%
Consumer price	296	100%	290	100%	279	100%	483	100%	455	100%	353	100%
Price spread	91	30.7%	85	29.3%	74	26.5%	277	57.3%	250	54.9%	148	44.2%

Value chain I
In value chain I, the average price received by the fishermen was Rs.205 per kg. The average price received by the commission agent, wholesaler and retailer were Rs.205, Rs.243 and Rs.265 per kg respectively. The marketing cost incurred by commission agent, wholesaler and retailer were 5.06, 3.3 and 3.7 percent in price paid by consumer whereas the marketing margin were 2.06, 5.8 and 6.4 percent in price paid by consumer respectively.

Value chain II
In value chain II, the average price received by co-operative society, wholesaler and retailer were Rs.205, Rs.229 and Rs.259 per kg respectively. The marketing cost incurred by co-op society, wholesaler and retailer were 2.7, 4.4 and 4.1 percent in price paid by consumer whereas the marketing margin were 7.7, 3.7 and 6.5 percent in price paid by consumer respectively.

Value chain III
In value chain III, the average price received by wholesaler and retailer were Rs. 205 and Rs.248 per kg respectively. The marketing cost incurred by wholesaler and retailer were 4.3 and 4.3 percent in price paid by consumer whereas the marketing margin were 11.1 and 6.8 percent in price paid by consumer respectively.

Value chain IV
In value chain IV, the average price received by the commission agent, wholesaler, processor cum exporter and consumer were Rs.205, Rs.243, Rs.265 and Rs.483 per kg respectively. The marketing cost incurred by commission agent, wholesaler and processor cum exporter were 3.1, 2.07 and 15.3 percent in price paid by consumer whereas the marketing margin were 4.7, 2.4 and 27.7 percent in price paid by consumer respectively.

Value chain V
In value chain V, the average price received by co-operative society, wholesaler, processor cum exporter and consumer were Rs.205, Rs.219, Rs.247 and Rs.455 per kg respectively. The marketing cost incurred by co-op society, wholesaler and processor cum exporter were 1.7, 2.4 and 16.2 percent in price paid by consumer whereas the marketing margin were 1.31, 3.7 and 29.4 percent in price paid by consumer respectively.

Value chain VI
In value chain VI, the average price received by commission agent, processor and retailer were Rs.205, Rs.243 and Rs.311 respectively. The marketing cost incurred by commission agent, processor and retailer were 4.2, 8.4 and 3.3 percent in price paid by consumer whereas the marketing margin were 6.5, 10.7 and 8.4 percent in price paid by consumer respectively.

Marketing efficiency
Marketing efficiency analysis using Acharya and Agarwal's method was worked out and furnished in Table 3.

Table 3: Marketing efficiency analysis using Acharya and Agarwal's method

Particulars	Value chain I	Value chain II	Value chain III	Value chain IV	Value chain V	Value chain VI
Total market cost (I)	37	33	26	99	93	57
Value added (O) (consumer's price – producer's price)	91	85	74	277	250	148
Marketing efficiency ME=(O/I)	2.45	2.57	2.84	2.79	2.68	2.59

It could be inferred from the above table 4, that the marketing efficiency of Value chain I, II, III, IV, V and VI was 2.45, 2.57, 2.84, 2.79, 2.68 and 2.59 respectively. The marketing efficiency of value chain III was higher compared to other value chains. Hence, the result indicated that among the six value chain, value chain III was found to be more efficient.

Conclusion
Cost and returns
The maximum profit obtained by the fishermen per annum is Rs. 9.02 lakhs. Since, the calculated benefit cost ratio is 1.3 which is economically profitable business in Puducherry.

Value chain mapping
Commission agent, co-op society, wholesalers, processors, exporters and retailers were identified as the important actors involved in marine fish value chain. Five value chains are found in domestic market and two value chains are found in export market.

Price spread analysis
In the price spread analysis, the costs and returns at each stages were identified and price spread was also calculated. It is also concluded that price spread of Value chain I, II, III, IV, V and VI was found to be 30.7, 29.3, 26.5,57.3, 54.9 and 44.2 percent in the price paid by consumer respectively. Price spread in value chain III was found to less than other value chains.

Marketing efficiency
Among the six value chain, the value chain III, namely Fishermen – Wholesalers – Retailers – Consumers was found to be more efficient with the highest value chain efficiency of 2.84 because it had fewer intermediaries than the other value chains.

Application of Research: Helps the fishermen, intermediaries (Wholesalers, Retailers, Exporters, Processors) and Consumers to select the suitable value chain which helps to gain profit.

Research Category: Marketing (Value chain)

Abbreviations: Nil

made success this program.

Principal Investigator or Research Guide or Chairperson of research: Dr. K. Uma

University: Tamil Nadu Agricultural University

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Study area / Sample Collection: Puducherry

Cultivar / Variety / Breed name: nil

Conflict of Interest: None declared

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