



Supply Chain Analysis of Farmed Exotic Carps in Jammu and Kashmir, India

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Abstract

The study was conducted in the state of Jammu and Kashmir where the major fish marketing stakeholders like fish farmers, pre-harvesting contractors, wholesalers, retailers and fish vendors were interviewed. In Jammu and Kashmir the culture of exotic carps like grass carp (*Ctenopharyngodon idella*) (Steindachner, 1866), silver carp (*Hypophthalmichthys molitrix*) (Valenciennes, 1844) and common carp (*Cyprinus carpio*) (Linnaeus, 1758) is carried out and the culture has proved to be economical. The disposal pattern of the exotic carp revealed that the overall local consumption of the fish by the farmers in the state was less around 3.79% only as it was a source of livelihood, so farmers preferred to sell rather than consuming themselves. The most significant effect on the marketing costs of the locally cultured exotic fishes was observed by the use of excess casual labours and water charges. There were three major Supply Chains (SC) prevailing in the state (SC I, SC II and SC III) and amongst them the marketing channel III was most efficient (17.82) with highest producers share in consumer's rupee (94.69) where the farmers were directly selling the production to the consumers. The state was not self-sufficient in meeting the demands of the people so fishes produced in other states were also marketed.

Keywords: Disposal pattern, fish supply chain, marketing efficiency, price spread, producer's share in consumer's rupee

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Introduction

In India, a number of supply chain intermediaries exist between producer and consumer thereby reducing the producers share in consumer's rupee. The domestic fish marketing system in India is neither efficient nor modern and is usually carried out by traders with a large number of intermediaries' between producer and consumer (FAO, 2001). The domestic fish market has high potential but highly unorganized and unregulated (Ganeshkumar et al., 2008; Gopal et al., 2001). Supply chain can be defined as a set of reliant agents that carry fish to the ultimate consumer by working together consciously or unconsciously (Thorpe & Bennett, 2004).

In India, marketing channel of fresh fish involves certain intermediaries with different functions such as auctioneer, commission agent, wholesaler, retailer and fish vendor. The number of intermediaries and channel of distribution vary from region to region, state to state and district to district within a state. A price for fresh fish depends upon the quality and season in fresh fish market and there is a positive correlation between prices, demand and unsteady supply (Trodson, 1997). Some of the major problems in fish marketing in India include high perishability and bulkiness of materials, high cost of storage and transportation, no guarantee of quality and quantity of commodity and high price spread (Ravindranath, 2008). Fish marketing in India has received little attention from public agencies and is mainly handled by the private sector. As a result, there are a large number of intermediaries in the marketing channels, especially in the freshwater fish sub-sector; thus reducing the share of fishermen/aquaculturists in consumer rupee and contributing to the high retail prices (Ravindranath, 2008) Compared to the achievements in fish production, the fish marketing system is very poor and highly inefficient in India (Ganeshkumar et al., 2008). Unlike conven-

tional marketing systems of agricultural products, fish marketing is characterized by the heterogeneous nature of the products with respect to species, size, weight, taste, keeping quality and price. Market price of fish is determined by freshness, species and availability of fish in the market (Sabater et al., 2008).

The study was designed to have a picture of prevailing fish marketing scenario and supply chains in the state. The consumption pattern on farms, role of market intermediaries, major marketing channels, wholesale and retail fish markets and fish retail outlets have been analyzed. The study is expected to provide useful information on the efficiency of different marketing channels, producers share in consumer's rupee and role of intermediaries in supply chain of exotic carps which is of great help in analyzing present marketing practices to suggest suitable measures for improving fish marketing system in the state.

Materials and Methods

The study was conducted in the state of Jammu and Kashmir. The primary data for the study was collected from farmers, pre-harvest contractor, wholesalers, retailers and consumers. The farmers have been further classified into marginal farmers (<1 ha) and small farmers (1-2 ha) as per their land holdings. The respondents were selected using multistage stratified simple random sampling and snowball technique. The primary data for the study was collected by personal interview method with the help of pre-tested questionnaire specially designed for the study. The sampling was carried out at different stages of supply chain starting from production to consumption. For study of supply chain of carps, sample farmers, pre-harvest contractors, wholesalers and retailers were interviewed from Jammu and Kashmir as shown in Table 1. Information on fish prices, quantities traded,

marketing functions and others were collected and price spread and marketing costs were estimated using average and percentage analyses. The share of fishermen/producers in the final consumer price was obtained from the fish price spread. Marketing efficiency was estimated as the ratio of consumer's price to total marketing costs and margins (Shepherd, 1972).

The marketable surplus is the residual left with the farmers after meeting his requirements for family consumptions, farm needs, payment of labour in kind, to landlords as rents and social and religious payments in kind (Acharya & Agarwal, 2002).

It is expressed as:

$$M_s = T_p - (C_h + C_k)$$

Where,

M_s = Marketable surplus

T_p = Total production

C_h = Home consumption

C_k = Gifts and in kind payments

Marketing cost

The costs involved in the marketing of a produce from the point of production to ultimate consumption (Acharya & Agarwal, 2002)

$$MC = CF + C_{m1} + C_{m2} + \dots + C_{mn}$$

Where,

MC = Marketing cost

CF = Cost borne by the farmer in marketing of his produce as in direct marketing (supply chain III)

C_{mi} to C_{mn} = Cost incurred by the i^{th} middlemen in the process of buying and selling the products where i varies from 1 to n .

Table 1. Major Stakeholders selected for the supply chain analysis

Key stake holders	Jammu region	Kashmir Region	Total
Farmers	40	40	80
Pre-harvest Contractors	0	3	3
Wholesalers	5	5	10
Retailers	10	10	20
Sub total	55	58	113

Margin refers to the difference between the price paid and received by a specific marketing agency, such as a single retailer or by any type of marketing agency such as retailers or assemblers or by any combination of marketing agencies such as the marketing system as a whole (Acharya & Agarwal, 2002)

$$MM = P_r - (P_p + C_m)$$

Where,

MM = Marketing margin

P_r = Total value of receipts (sale price)

P_p = Total purchase value of goods (purchase price)

C_m = Cost incurred in marketing

The ratio of the total value of goods marketed to the marketing cost is used as a measure of marketing efficiency (Acharya & Agarwal, 2002).

$$ME = FP / (MC + MM)$$

Where,

ME = Marketing efficiency

FP = Price received by farmers

MC = Marketing cost

MM = Marketing margin

Price spread connotes gross margin or mark up in the marketing of farm commodities and is measured as absolute or percentage differences in the price paid by the consumer (retail price) and price received by the farmer (Acharya & Agarwal, 2002).

$$TPS = P_r - P_f$$

Where,

TPS = Total price spread

P_r = Price at retailer level

P_f = Price received by farmers

It may be defined as a percentage share of price received by the farmers from the retail price paid by the consumers (Acharya & Agarwal, 2002).

$$Ps = (P_f / P_r) * 100$$

Where,

Ps = Producers share

P_f = Price received by farmers

P_r = Retail price paid by consumer

Results and Discussion

The category-wise fish production and disposal is presented in Table 2. On an average 618.02 kg of carps was produced per sample farm in Kashmir region out of which about 4.66% was consumed at household and 2.95% was distributed as gift to friends and relatives and remaining 68.62% was sold at their farm itself and 23.76% in the nearest area directly at door step services. Fish being a highly perishable commodity the marketable and surplus has been shown in the table.

The average marketable surplus for farmers in Kashmir valley was 570.95 kg (92.38%). Almost similar pattern in production and consumption was observed at marginal and small farms in the Jammu region. It was observed that overall production was 658.28 kg, out of around 64% of produce was sold at farms and 31.32% in nearby markets. The marketable surplus for the farmers in Jammu region was 627.65 kg which constitutes about 95.35% of total fish produced. The production was highest at small farms in comparison to marginal farms which is obvious as it depends upon the area under culture and inputs used. Also, the consumption of carps at household was small owing to the fact that consumption of fish was restricted only during special occasions. Carp being a source of income they sell more rather than consuming at home. The overall picture revealed that on an average 638.15 kg of fish was produced by the farmer out of which 93.91% was sold and the rest was either consumed at households or gifted to family and friends

To make fish available to consumers at the right time and place requires an effective marketing system. Marketing of fish in India is dominated by a large number of intermediaries and highly unorganized and unregulated (FAO, 2001). Fish farmers in Kashmir are scattered in remote villages while consumers are spread everywhere starting from rural areas to semi-urban and urban areas. The produce has to reach consumers for its final consumption. There are different agencies and functionaries through which the produce passes and reaches to consumers. The supply chain can be defined as a pipeline through which product flows from the point of production to the ultimate consumption. Supply chains prevalent for marketing of exotic carp in the state of Jammu Kashmir are depicted in Table 3 and reveals that there are three major fish supply chains prevailing in the state.

Table 2. Disposal pattern of carp at sample farms (kg)

Farm size category	Total production	Total retention		Marketable/ Marketed surplus		
		Consumption at household	Family relatives & friends	Sold At farm	Sold At market	Total
Kashmir						
Marginal	577.81 (100.00)	23.27 (4.03)	9.52 (1.65)	447.65 (77.47)	97.37 (16.85)	545.01 (94.32)
Small	647.74 (100.00)	32.86 (5.07)	24.71 (3.81)	406.71 (62.79)	183.40 (28.31)	590.11 (91.10)
Overall	618.02 (100.00)	28.78 (4.66)	18.25 (2.95)	424.11 (68.62)	146.84 (23.76)	570.95 (92.38)
Jammu						
Marginal	634.44 (100.00)	18.63 (2.94)	10.45 (1.65)	376.52 (59.35)	228.79 (36.06)	605.31 (95.41)
Small	669.76 (100.00)	20.13 (3.01)	11.38 (1.70)	452.02 (67.49)	186.21 (27.80)	638.23 (95.29)
Overall	658.28 (100.00)	19.64 (2.98)	11.08 (1.68)	421.48 (64.03)	206.17 (31.32)	627.65 (95.35)
Jammu & Kashmir						
Marginal	602.35 (100.00)	21.26 (3.53)	9.92 (1.65)	421.73 (70.01)	149.45 (24.81)	571.18 (94.83)
Small	659.63 (100.00)	25.99 (3.94)	17.51 (2.65)	431.31 (65.39)	184.90 (28.03)	616.21 (93.42)
Overall	638.15 (100.00)	24.21 (3.79)	14.67 (2.30)	426.70 (66.87)	172.57 (27.04)	599.27 (93.91)

Note: The figures in parenthesis indicate their percentages

There were 3 major supply chains operating for marketing of exotic carp in the state, in the first chain farmers were selling their produce to the pre-harvest contractors and then it passes through wholesalers and retailers to the consumers. Also, in the third chain farmers themselves take the fish in the nearby market or provide fish at door level to consumer. The supply chains I and III were operating for marketing of exotic carp produced by farmers in Kashmir valley where as in Jammu region, supply chains II and III were operating for marketing of exotic carp. In the supply chain-II, the farmers in Jammu were selling their produce to wholesalers at their farms. Wholesalers arrange harvest of produce on their own and sell it in the local markets to retailers who finally sell to consumers. In the second chain, farmers directly sell their produce to consumers in the local market or

at farm depending on the availability of consumer. It was observed that the total percentage of farmers selling through SC-I, SC-II and SC-III was 75, 65 and 34.5% respectively.

The chain I was prevalent in Kashmir valley where farmers were selling their produce to the pre-harvest contractor. This type of supply chain was observed in the areas away from the city. The farmers contact pre-harvest contractors who visit villages well before the harvest of the produce every year and enter into informal contract for the purchase of fish in ponds after negotiating price of the same with farmers. During month of November – December, they harvest the fish and transport it to wholesale market after paying the price fixed as per contract. All the costs like harvesting charges, labour charges, icing and transportation were borne by contractors.

Table 3. Supply chains for exotic carp in the state

Supply chain (SC)-I (75%)	Farmer → Pre-harvest contractor → Wholesaler → Retailer → Consumer
Supply chain (SC)-II (65%)	Farmer → Wholesaler → Retailer → Consumer
Supply chain (SC)-III (34.5%)	Farmer → Consumer

It was observed that the contractors were harvesting only fish weighing more than 650 g to take advantage of better price in the market. After harvesting, the fishes were iced and packed in bags for transportation to the wholesale market. It was also observed that 75% of sample farmers preferred this type of supply chain. The main reason for preferring this particular chain was lack of wholesale market in nearby area and also lack of proper transport which is uneconomical.

In this type of supply chain, risk and uncertainty for farmers regarding the price and sell of produce get reduced due to agreement with contractors for sale of produce at agreed price. Another reason for the use of this supply chain by majority of farmers was that the farmers were satisfied with the practice of selling their fish on farm instead of going to market and selling their produce which was more tedious and time consuming. They had to devote most of their time for crop farming and animal husbandry rather than aquaculture which was a supplementary enterprise for them.

The supply chain II was observed in Jammu district where farmers sell their produce to the wholesalers who supply to retailers and finally retailers sell to consumers. It was observed that farmers contact wholesalers as soon as his/her produce attain marketable size and he wishes to sell. After negotiating price with farmers, wholesaler sends his harvesting team for harvesting the produce. All the expenses of harvesting, icing, packing, transport and marketing etc. were incurred by the wholesaler. Another important thing noticed in Jammu but not in Kashmir valley was that partial harvesting was practised in Jammu which means that all the produce was not harvested once but harvesting was done from time to time for fishes weighing more than 800 g only. Therefore, wholesalers visit the farms to check the size of stock in the ponds by using cast nets. Upon ensuring the sufficient quantity of fish approximately 80-90 kg per pond

the farmer arranges for harvesting of the produce. The wholesaler sold them to retailers who in turn supply to consumers. (Bisnoi, 2005) observed that wholesalers are well aware of the demand for a particular fish species in the market. So, wholesalers purchase the fishes from farmers in bulk and sell it to retailers. Some value additions like sorting, grading, cleaning, icing and packing is done before selling. Thus farmed fish reaches the consumers through wholesalers and retailers in this supply chain. It was also observed that 65% of sample farmers adopted this supply chain for selling their produce.

The supply chain III was prevalent in both the Jammu and Kashmir regions of the state. This is the simplest supply chain, where farmers sell their produce to consumers directly without any intermediaries in between. This sort of marketing is called direct marketing where all the marketing costs are incurred by producer and hence the share of producer in consumer's rupee is 100% and the marketing efficiency is highest. Around 34.5 % of sample farmers in Jammu and 26% in Kashmir valley were following this channel as they were getting better price for their produce by direct marketing. This channel was most beneficial for both farmers and consumers as farmers were getting

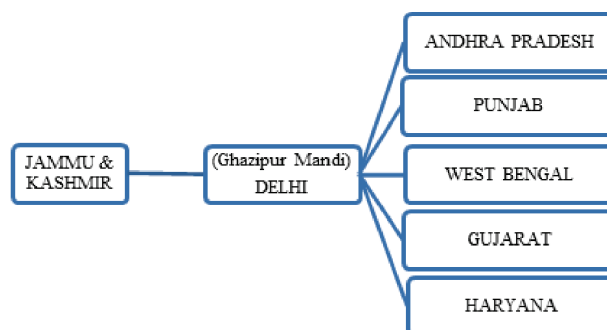


Fig. 1. Diagrammatic representation of fish supply chain from other states.

better price and consumers were getting fresh produce at their door steps and the farmers were also not dependent on any other market player for selling their produce. One of the major disadvantages of this chain was that the price fluctuation and bargaining was more in comparison to other supply chains.

Jammu and Kashmir was not self-sufficient in fish production and hence fish produced outside were also marketed in the state. The data has been collected from the same wholesalers and retailers involved in marketing of locally produced exotic fishes. It was observed that the wholesalers were engaged more often in marketing of fishes supplied from outside state than the locally cultured fishes. In most of the cases outside fishes were supplied from Ghazipur market in Delhi which is a hub for fish marketing in north India. The Ghazipur mandi of Delhi gets the supply from various states like Andhra Pradesh, West Bengal and then supplies to other regions (Fig. 1). Usually the fishes are

transported in a truck from Delhi to various wholesalers in Jammu and Kashmir. On an average each wholesaler purchases 2850 kg of fish daily and the same was sold to retailers. While taking into considerations the costs in marketing, wholesalers had to incur various costs like transportation cost, loading and unloading charges, labour charges, cost of thermocol boxes, icing etc.

To identify the most efficient supply chain, price spread, marketing efficiency, various marketing costs and margins at each intermediary level were estimated for each of the supply chains and are presented in Table 5. It can be viewed from the table that the supply chain-III was the most efficient supply chain as the estimated marketing efficiency (17.82) was highest and the producers share in consumer's rupee (94.69%) was maximum. Similar result was reported by (Taliat, 1991), who studied domestic marketing of fish and found that fishermen share in consumer's rupee was maximum (95%) in one member channel and lowest (27.9%) in

Table 4. Price spread and marketing efficiency in carp marketing under different supply chains

Particulars	Supply Chain-I	Supply Chain-II	Supply Chain-III
Price received by fish farmer (₹/kg)	187.46	142.24	206.48
Marketing cost of fish farmer (₹/kg)	0	0	10.97
Net price received by farmer (₹/kg)	187.46	142.24	195.52
Price paid by Pre- harvest contractor (₹/kg)	187.46	--	
Price paid by Wholesalers (₹/kg)	--	142.24	
Pre -harvest contractor			
Marketing cost (₹/kg)	4.28	0	
Marketing margin (₹/kg)	17.07	0	
Price received by wholesaler (₹/kg)	208.81	0	
Wholesaler			
Marketing costs (₹/kg)	4.98	3.85	
Marketing margin (₹/kg)	10.60	12.44	
Price paid by retailer (₹/kg)	224.39	158.53	
Retailer			
Marketing cost (₹/kg)	2.92	2.21	
Marketing margin (₹/kg)	29.00	26.28	
Price paid by consumer (₹/kg)	256.31	187.02	206.48
Producers share in consumer's rupee (%)	73.13	76.05	94.69
Total price spread (₹/kg)	68.85	44.78	10.96
Marketing efficiency	2.72	3.17	17.82

channel where more middlemen were involved. The marketing efficiency was 2.72 and 3.17 for supply chain-I and supply Chain-II, respectively and producer share in consumer's rupee was 73.13 and 76.05% in supply chain I and Supply Chain II, respectively. (Zynudheen et al., 2003) studied marketing channels and marketing intermediaries in fish trade in Gujarat and concluded that the retailers and wholesalers bagged largest share in the consumer's rupee.

It was revealed that per kg of marketing cost and marketing margin in fish supply chain-I was ₹ 12.18 and ₹ 56.67, whereas in case of Supply chain-II it was ₹ 6.06 and ₹ 38.72, respectively. The similar result was obtained by (Kashyap et al., 2012) and (Omar et al., 2014) where total marketing margin for dry fish was about ₹ 77.25 kg⁻¹. The reason for high marketing margins was more number of intermediaries between the producer and the consumer. The highest margin among the market intermediaries was kept by retailers (₹ 29 for supply chain-I and ₹ 26.28 for supply chain-II). The similar pattern was observed in the marketing of tilapia by (Omar, 2014) where retailers earned the highest net marketing margin. The total price spread and producers share in consumer's rupee was estimated to be ₹ 68.85 kg⁻¹ and 73.13 %, respectively in Supply chain I and ₹ 44.78 kg⁻¹ and 76.05%, respectively in supply chain-II. This indicates that supply chain-II was more efficient than supply chain-I. It is mainly due to existence of additional intermediaries (pre-harvest contractor) in supply chain-I which has reduced the producers share in consumer's rupee and also reduced the efficiency of the supply chain.

The supply chain-III was beneficial for both the producer as well as consumer because producers were getting the better price for their produce and at the same time the consumers were paying less for quality produce. The price paid by consumer in supply chain-III seems to be higher than that in supply chain-II but in fact supply chain-III was in operation in both the Jammu and Kashmir region where as supply chain-II was in operation in Jammu region only where price of fish was low in comparison to Kashmir region. However, the price paid by consumer was low in supply chain-II in comparison to both the supply chains in both the Kashmir and Jammu regions.

Casual labour charges, loading unloading charges, electricity charges, icing charges and water charges significantly affect the marketing cost of the locally cultured fishes. The multiple linear regression analysis for standardized beta coefficient revealed that casual labour charges (0.475) was the most important factor which influenced the marketing cost of the fish followed by water charges (0.416) as depicted in Table 5. The results clearly indicate that in order to reduce the marketing cost of locally cultured exotic fishes, it is necessary to reduce expenses on casual labour and water charges by providing appropriate and effective logistic systems to farmer and intermediaries.

The carp farming is a profitable venture in the state of Jammu and Kashmir and must be promoted for gainful employment of the youth. The study has estimated the disposal pattern of the carps and indicated that out of the total production about

Table 5. Multiple regression results to explain the effect of logistics on marketing cost of exotic fishes in different marketing supply chains

Model	Coefficients ^a Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
1 (Constant)	6.898	3.610		1.911	0.071
Casual labour charges	0.421	0.172	0.475	2.441	0.025*
Loading & unloading charges	-0.705	0.637	-0.096	-1.107	0.282
Electricity charges	0.332	0.396	0.112	0.837	0.413
Icing charges	-0.004	0.187	-0.003	-0.024	0.981
Water charges	1.322	0.560	0.416	2.361	0.029*

a. Dependent Variable: **Total marketing cost**

93.91% was sold either at farms or in the market. It was found that there were three major marketing channels operating in the state out of which supply chain III was the most efficient with the marketing efficiency and producer's share in consumer's rupee of 17.82 and 94.69% respectively. The most significant effect on the marketing costs of the locally cultured exotic fishes was by the use of excess casual labours and water charges. So in order to reduce the expenses there is a need to optimize the above mentioned factors so that there is least price spread from the farmer to ultimate consumer. One of the major lacunae found in the state was the absence of the proper fish market where exclusively fish could be sold and purchased. The fishes were either sold in the general Gonikhan market or on Amira Kadel Bridge in Srinagar which is not only unhygienic but illegal also. The department of fisheries is planning to construct two fish markets one in Srinagar district and another in Jammu district which will not only help the farmers in direct marketing of their produce but will also increase the producers share in consumer's rupee increasing the efficiency of marketing. Credit availability to new entrepreneur in fish marketing can play major role in encouraging new entrepreneurs in fish marketing which will go a long way in improving and generating income and employment opportunity in the state.

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