

ECONOMIC ESTIMATION OF FISH VALUE CHAIN: A CASE STUDY OF SARDARYAB DISTRICT CHARSADE, KHYBER PAKHTUNKHWA, PAKISTAN

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Abstract

The current study identifies marketing channels and analyses the value chain of fish manifested at the Sardaryab fish market/business places in District Charsadda. To this end, primary data were collected in 2022 using a structured questionnaire. Eighty market participants were purposefully interviewed, including thirty intermediates, twenty wholesalers, and thirty processors/retailers. To meet the study's goals, the benefit-cost ratio, marketing margin, absolute margin, consumer rupee breakdown, marketing cost, and net margin were used. According to the findings of the analysis, longer-distance phenomena of the source were responsible for the high marketing costs and consumer price of fried fish. Since Sakkar was the distant supplier, Silver Carp and Malay's consumption prices are Rs. 300 (per kg) and Rs. 290 (per kg). It is found that retail price of Malay and Silver Carp drops to Rs. 280 and Rs. 283 (per kg), respectively, since the source distance from Sakkar to Charsadda decreases. It is also confirmed that as the distance from the source decreases, transportation costs reduce from Rs. 31 to Rs. 25 per kg and marketing costs reduce from Rs. 93.1 to Rs. 47.80. As a result, it is suggested that the expansion of local fish production benefits both Sardaryab stockholders and consumers. To serve local fish farmers, fish seed stocking centres will be created in the district of Charsadda.

Keywords: Value Chain, Fisheries, BCR

1. INTRODUCTION

The fishing business is a source of income for Pakistan's dispersed economy. Inland fishing, which includes rivers, lakes, ponds, dams, and other bodies of water, is also a popular activity across the country. The contribution of GDP is roughly 1%, with export revenues accounting for the majority of the amount (FAO, 2008). In 2021-22, a total of 133,226 metric tonnes of fisheries products and fish were sold to Thailand, the Middle East, China, Sri Lanka, Malaysia, and Japan, among other countries, resulting in a revenue of Rs 49,528 million (July-March). Out of 501,000 million tonnes of fish caught, 368,000 million tonnes come from the sea, while the rest comes from inland fisheries

(Wasim, 2007). The fishing industry adds 2.17% to the added value for agriculture at a growth rate of 3.25% (GoP, 2021). In the years 1975-76 and 2021-22, fish intake in Pakistan's Khyber Pakhtunkhwa province was estimated to be 1.25 kilogramme per capita. (GoP, 2021). Fish intake by Khyber Pakhtunkhwa residents is currently significantly lower (about 70%) than the country's average per capita per year consumption level. Given the rising population density of 265 people per square km (GoP, 2021), the inadequate protein resources available from plants and animal compared to meet the bare minimum of protein needs on a daily basis, fish intake is more enrich amongst all (Hassan et al., 2007). Charsadda has a population of 1,616,198 people spread in 996 square km, with 49 percent men and 51 percent females. The population of the area has expanded by over 78 percent in the last 19 years. At present market pricing, aquaculture is a more profitable venture than other ventures (Dey et al., 2010; Khushk and Sheikh, 2004). For all factors involved in fish production, a hectare of land utilised for aquaculture may generate at least a 43 percent increase in revenue, whether directly or indirectly, than a hectare of land utilized for agriculture (GoKP, 2021). There were 6.50 million hectares of uncultivated land in Khyber Pakhtunkhwa including 1.24 million hectare of cultivable waste, 3.94 million hectare not suitable for agriculture (Fida et al., 2020). This is a possibility to supplement income by selling fish and fish products to local vendors. The region has a lot of potential, especially in the research area, the Sardaryab market in the Charsadda district. Fish is a protein treasure trove, with each fish containing roughly 7 grammes of protein (GoP, 2021). The fishing industry contribution to the national economy is around 1% of total GDP alongwith labour force 1% in the sector (GoP, 2021). The fisheries sector has enormous potential for expansion, but its performance has been unpredictable from year to year. Sardaryab's economic activity and marketing of fish and fishery products have remained static, despite the district's population rise. Land in the study area used for some specific crops due to flow of three rivers. Aquaculture, in this environment, possesses considerable potential and growth potential. Currently, the supply potency of fish in Sardaryab market is only 10 percent whereas the remaining portion supplied from Sakkar, Rawal Dam, Rawalpindi, etc. Sardaryab market is very impulsive in term ventures other than aquaculture due to the value chain and marketing obstacles as well. The purpose of this study is to identify marketing channels for fish and fish products in the study area, as well as to assess the value chain.

2. LITERATURE REVIEW

In any research work, literature acts as a backbone through which we know the different types of research work that other people have done in other places at different times and in different ways related to our research question. Fish accounts for more than 10% of the overall worldwide intake of animal protein (Ghafoor et al., 2010). *Labeo calbasu*, often known as black rohu, is a little-studied fish that is widely aquacultured in India and has the potential to produce surimi. As a result of the washing, total soluble protein was decreased by 27% (Yathavamoorhi et al., 2010). In another study Khan and Manzoor (2014) investigated the economic viability of carp fishing and its implications for the living standards of its inhabitants in Khyber Pakhtunkhwa's. Seafood, inland fish, and

aquaculture are in great demand in Bangladesh. The demand for and revenue from fish from all sources is increasing (Toufique et al., 2018). The diet for fish eaters and fisheries throughout Africa and Asia is an important part of dried fish products. The magnitude and importance of dried fish in production, commerce, and consumption are underappreciated (Belton et al., 2018). Aqaba and Boateng (2018) study shows how to deal with fishers in central Ghana and the consequences of climate change. Increased risk and unpredictability in fishing include negative implications for fisheries firms. The summary of above discussion is that the sector of fisheries has multidimensional significance. It solves several economic and non-economic concerns with regard to income, jobs, food security and dietary nutrition.

3. MATERIALS AND METHODS

This study was carried out in 2022 at the Sardaryab fish market in the Charsadda region of Khyber Pakhtunkhwa to estimate economic value chain of fish and fish products. The study relied on primary data, which was gathered via the use of structured questionnaires from various stakeholders such as commission agents, middlemen, shopkeepers, processors, customers. A total of 80 samples were gathered by a purposive sampling strategy. The sample size consists of 30 intermediates, 20 wholesalers and 30 retailers from population of Sardaryab market. Species like surmi, Shermahi, Malay, Silver, Jumodar etc. are available in the market but due to time and financial constraints Silver and Malay will be considered for estimation.

3.1 The Benefit/Cost Ratio

When it comes to choosing the right decision, the benefit/cost analysis is the most appropriate and common way. It assists the planning authority in making the best decisions possible. This method may be used to calculate profit margins at each level. The advantage/cost ratio is usually quantified using discounted variables. B/C represents the present value of a discounted benefit versus the present value of a discounted cost (Khan and Manzoor, 2014). It may be expressed mathematically as

$$\frac{B}{C} = \frac{B_t / (1+r)^t}{C_t / (1+r)^t} \quad \text{where } t = 1, 2, 3 \dots$$

However, in the event of short intervals, the discounted benefit/cost will be secreted, and will be examined without such factor. The value of B/C shows the neutral, profitable and losses in the business activities, i.e. 1, greater than 1 and less than one, respectively. Khushk and Sheikh (2004) employed the following analytical methodologies and the same method was reutilized to address the study's stated goals.

3.2 Marketing Margin

The distinction between pricing at two levels of the market is known as marketing margin. Data on pricing at various stages of the marketing chain was used to investigate marketing margins. The price spread is the difference between the amount received and

paid by each unique marketing firm, was used to determine marketing margins (Modugu and Edward, 2011). The percentage-marketing margins obtained by market intermediaries in the marketing of farm goods were calculated using the methodology below.

$$Mm = (Ps \times 100) / Sp$$

Where 'Mm' represents a specific agency's marketing margin, 'Ps' represents the agency's pricing spread, and 'Sp' represents the same agency's sale price for the same product.

3.3 Absolute Margin

The distinction between two or more businesses offering the same quantity of a certain item represent absolute margin. To compute absolute margins, the following formula was employed.

$Am = S - Pp$ where Am represent absolute margin, Sp is selling price, Pp is Purchasing price.

3.4 Consumer's Rupee Breakdown

The process by which a consumer's spend on a product is divided is called rupee downgrading which can be calculated by taking percentage of relevant agency net margin as a percentage of its retail price.

$Bd = Ps / Rp$ where 'Bd' signifies the consumer rupee breakdown which he/she disbursed on certain goods, 'Ps' denotes price spread, 'Rp' is retail price.

3.5 Marketing cost

Amount collected by various marketing companies for supplying their services is referred to as the marketing margin. Marketing is the ratio of actual amount spend and the quantity handled except for commission charges, all marketing expenditures were determined in this manner. The following formula was used to compute commission charges:

$Cc = (Sp * Rc) / Qm$ where 'Cc' implies commission charges, 'Sp' signifies the sale revenues of the marketed product, 'Rc' represents the commission rate, and 'Qm' defines the quantity marketed.

3.6 Net Margin

The difference between the price spread obtained by a specific agency and the marketing costs incurred by the same agency is the net margin of the same agency.

4. RESULT & DISCUSSION

In Sardaryab, two species i.e. Malay Silver Carp is selected amongst the available species due to their effectiveness and time constraints.

4.1 Value Chain Analysis: Sakkar Channel

The production cost of selected species are given as under:

Table 1: Cost/Revenue for 8000 selected species

Description	Malay (Sheet Fish)				Silver Carp		
	Item	Qty	Rs. per Qty	Worth in Rs. (000)	Qty	Rs. per Qty	Worth in Rs. (000)
a) Variable Cost				99.37			99.37
1) Fingerling	No.	8000	0.006	48	8000	0.006	48
2) Handling				2.29			2.29
i) Chemical	Kg.	1.2	0.125	0.15	1.2	0.125	0.15
ii) Bag	No.	160	0.001	0.16	160	0.001	0.16
iii) Transport	Km.	30	0.066	1.98	30	0.066	1.98
3) Feeding				49.08			49.08
i) Fertilizer	Kg.	12	0.09	1.08	12	0.09	1.08
ii) Rice bran	Bag	60	0.6	36	60	0.6	36
iii) Harvesting	L	8	0.15	1.2	8	0.15	1.2
iv) Grass	Kg	1800	0.006	10.8	1800	0.006	10.8
b) Fixed Cost				354.248			354.248
1) Pond (Rental Value)	Acre	3	26.666	79.998	3	26.666	79.998
2) Permanent labor cost	No.	1	108	108	1	108	108
3) Electricity	Year	1	85	85	1	85	85
4) Management	L	1	80	80	1	80	80
5) Net	No.	0.5	2.5	1.25	0.5	2.5	1.25
c) Revenue				873.084			850.817
Harvest (1 st)	Kg	2250	0.129	290.25	2250	0.126	283.5
Harvest (2 nd)	Kg	2283	0.13	296.79	2283	0.127	289.941
Harvest (3 rd)	Kg	2167	0.132	286.044	2167	0.128	277.376
Total Harvest	Kg	6700			6700		

Source: Author own calculations

4.1.1 Cost and Revenue of Silver Carp (Cost and Profit mentioned in “000”)

Total Cost (6700 kg) = TFC + TVC

Total Cost (6700 kg) = 354.248 + 99.37 = Rs. 453.618

Total Revenue (6700 kg) = Rs. 850.817/- || Cost/Kg = Rs. 0.067

Revenue / Kg = Rs. 0.127 || Benefit Cost Ratio (BCR) = 1.92

Producer Profit = 850.817 – 453.618 = Rs. 399.19 || Producer Profit/Kg = 0.059

4.1.2 Cost and Revenue of Malay (Cost and Profit mentioned in “000”)

Total Cost (6700 kg) = TFC + TVC

Total Cost (6700 kg) = 354.248 + 99.37 = Rs. 453.618

Total Revenue (6700 kg) = Rs. 873.084 || Cost Per kg = Rs. 0.067

Revenue / Kg = Rs. 0.130 || Benefit Cost Ratio (BCR) = 1.94

Producer Profit = 873.084 – 453.618 = 419.46/- || Producer Profit/Kg = 0.062

The profit of a Malay producer is higher than that of a Silver producer, at 0.062 and 0.059 per kg, respectively. The BCR of Malay is likewise higher than that of silver carp. The consumption of Malay fisheries product over silver carp is shown by the positive value of benefit cost ratio (Toufique et al., 2018; Ludicello et al., 2012).

4.1.3 Intermediaries

A total of 30 intermediaries are purposefully chosen in order to collect data on the cost, revenue, and profit of intermediaries, and mean estimations are utilized to calculate intermediary cost revenue channels.

4.1.3.1 Silver Carp Cost & Price/Kg

Purchasing price = 130.31 || Packing cost = 1.8

Ice cost = 1.2 || Load/Unload Cost = 1.3

Transport Cost = 31

Intermediary cost = 1.2+1.3+1.8+31 = 35.3

Middleman Sale price = 176

Middleman Profit = 176 – (130.31 + 35.3) = 10.39

Benefit/Cost of Middleman = 176/165.61 = 1.06

4.1.3.2 Malay Cost & Price/Kg

Purchase price = 127.25 || Packing = 1.8

Ice = 1.2 || Load/Unload = 1.3

Transport = 31

Intermediary = 1.2+1.8+1.3+31 = 35.3

Sale = 172 || Profit = 172 – 162.55 = 9.45

Benefit/Cost = 172 / 162.55 = 1.05

Sakkar channel middlemen profit is Rs. 10.39 per kg for Silver Carp whereas 9.45/Kg for Malay. Both Silver Carp and Malay's intermediates cost (transport cost, ice cost, packaging cost) is unique for both species. Silver Carp's benefit cost ratio exhibits more earnings than Malay. BCR's positive value shows that Silver carp benefits 1.06 times more than Malay (Thurstan & Roberts, 2014).

4.1.4 Wholesaler

Intermediary supplies some of the raw fish directly to Sardaryab fish retailers and processors while supplying some fish through Charsadda wholesalers. Twenty wholesalers are selected to obtain the correct information. We discussed analyzing wholesalers here.

4.1.4.1 Silver Carp Cost & Price/Kg

Purchase = 176 || Storage = 1 || Ice = 0.50

Load/Unload = 0.50 || Transport = 0.80

Total cost = 1 + 0.50 + 0.50 + 0.80) = 2.80

Sale price = 182 || Profit = 182 – 178.80 = 3.20

BCR = 182/178.80 = 1.018

4.1.4.2 Malay Cost & Price/Kg

Purchase price = 172 || Storage = 1 || Ice = 0.50/

Load/Unload = 0.50 || Transport = 0.80

Total cost = 1 + 0.50 + 0.50 + 0.80 = 2.80

Sale price = 178 || Profit = 178 – 174.80 = 3.20

BCR = 178/174.80 = 1.018

The analysis of wholesaler demonstrates positive wholesaler-level profit for both species. The wholesale cost (per kilogram) is unique for both species i.e. Rs. 2.80. At the wholesale level, profit of both species demonstrate equal desirability for wholesalers. Silver carp and Malay's benefit cost ratio is the same for wholesalers as the wholesaler incurred the same costs and transmit both species to the next agent at the same price (Aswathy et al., 2014).

4.2 Sakkar Channel (Direct link)

Intermediaries also serve as whole sellers on occasion, delivering raw fish from the manufacturing site to shops and processors. The study also computed the revenue and cost stream for this channel as follows:

4.2.1 Silver Carp / Kg

Purchase price = Rs. 130.31/- || Total cost = 1.8 + 1.2 + 1.3 + 31 = Rs. 35.3/-

Wholesale cost middleman = 2.80/- || Total cost (middleman) = 35.3+2.80 = 38.1/-

Sale price of middleman (including wholesale cost and margin) = Rs. 182/-

Middleman Profit (including wholesaling profit) = 182 – (130.31+35.3+2.80) = Rs. 13.56/-

Benefit/Cost of Middleman = 182 / 168.44 = 1.08/-

4.2.2 Malay / Kg

Purchase price = Rs. 127.25/- || Total cost = $1.8 + 1.2 + 1.3 + 31 = 35.3$ /-

Wholesale cost (middleman) = 2.80/- || Total cost (middleman) = $35.3 + 2.80 = 38.1$

Sale price of middleman (including wholesale cost and margin) = Rs. 178/-

Middleman Profit (including wholesaling profit) = $178 - (127.25 + 35.3 + 2.80) = \text{Rs. } 12.65$ /-

Benefit/Cost of Middleman = $178 / 165.35 = 1.07$

Some intermediaries delivered the species directly to retailers and processors to get wholesaler margins also. Here the intermediary's total cost is Rs.38.1, comprising Rs. 35.3 intermediate and Rs. 2.80 per kg wholesale cost. Intermediary profit for Silver Carp and Malay is Rs. 13.56 and Rs. 12.65, respectively. The middleman's profit is bigger than indirect since the intermediary gains its own profit and the wholesaler's margin. (Aswathy et al., 2014).

4.2.3 Retailer and Processor (Last Destination)

This is the Sakkar's final stage value chain of both species. The retailer also performs Sardaryab market processing role. Thirty retailers are targeted to acquire the proper information on retailer and processor economic analysis. Three ultimate fish processing shape. Revenue and cost streams are as follows:

4.2.3.1 Fish kabab / Kg

Silver Carp is better to use in fish kabab. Around ten percent of Silver Carp processed in fish kabab. The economic analysis given as under:

Purchase price of Silver Carp at disposal of retailer = Rs. 182/-

Processed estimated Cost including (vinegar, spicy, gram-flour, burning fuel, oil, labor and rental value of fixed instruments) = Rs. 62/-

Total Cost = $182 + 62 = \text{Rs. } 244$ /-

Sale price of (at gross weight) of processor is Rs. 310/-

Processor Profit = $\text{Rs. } 310 - (182 + 62) = \text{Rs. } 66$ /-

Benefit/ Cost for fish kabab = $310/244 = 1.27$

From the estimated figure above, it is inferred that fish processors processing Silver Carp get positive margin by using it Fish kabab.

4.2.3.2 Fish Bar B.Q / Kg

In Sardaryab market, around twenty percent of Silver Carp is processing for Bar B-Q purpose.

Purchase price of Silver Carp at disposal of retailer = Rs. 182/-

Processed estimated Cost including (vinegar, spicy, burning fuel, oil, labor and rental value of fixed instruments) = Rs. 71/-

Sale price of (at gross weight) of processor = Rs. 320/-

Processor Profit = Rs. 320 – (182 + 73) = Rs. 65/-

Benefit/ Cost for fish Bar B.Q = $320/255 = 1.25$

Summarize Fish Bar B.Q's economic analysis. It is concluded that the processor earned Rs. 65 per kg. Bar B.Q's selling price is 320 /Kg and cost is Rs. 73. The positive BCR value indicate that Fish Bar B-Q is acceptable to processors.

4.2.3.3 Roast Fish / Kg

Silver Carp is also used for roasting (Asiedu et al., 2018; Atta et al., 2015). Based on collected information, Malay used only for roasted purpose whereas about seventy percent of Silver Carp processed for roasted.

Silver Carp Purchase price at disposal of retailer = Rs. 182/-

Malay Purchase price at disposal of retailer = Rs. 178/-

Processed estimated Cost including (vinegar, spicy, burning fuel, oil, labor and rental value of fixed instruments) for Malay or Silver Carp = Rs. 55/-

Silver Carp Sale price (at gross weight) of processor = Rs. 300/-

Malay Sale price (at gross weight) of processor = Rs. 290/-

Silver Carp Processor Profit = $300 - (182 + 55) = Rs. 63/-$

Malay Processor Profit = $290 - (178 + 55) = Rs. 57/-$

Benefit/ Cost for roasting Silver Carp = $300/237 = 1.26$

Benefit/ Cost for roasting Malay = $290/233 = 1.24$

We know that roasted fish processes 70% of Silver Carp and 100% of Malay. The BCR for both species is appropriate. It is added that in the case of Silver Carp, the Fish Bar B.Q is generated Rs. 67, Fish Kabab Rs. 66 and roasted fish Rs. 63 profit (per kg) for processor.

4.3 Rawalpindi Channel: (Original source)

The cost of both the species are kept equal to other channels regarding Sakkar Channel due to time and financial constraints. The following are the cost flows for the other intermediaries, transportation, and storage.

4.3.1 Intermediaries Cost of Silver Carp and Malay

4.3.1.1 Silver Carp /Kg

Purchase price = Rs. 130.31/- || Packing cost = Rs. 1.6/-
Ice cost = Rs. 1/- || Load/Unload cost = Rs. 1.3/-
Transport Cost = Rs. 25/- || Total cost = 1.6 + 1 + 1.3 + 25 = Rs. 28.9/-
Sale price (middleman) = Rs. 173/-
Middleman Profit = Rs. 173 – (130.31 + 28.9) = Rs. 13.79/-

4.3.1.2 Malay / Kg

Purchase price = Rs. 127.25/- || Packing = Rs. 1.8/-
Ice = Rs 1.2/- || Load/Unload = Rs. 1.3/-
Transport = Rs. 25/- || Total cost = 1.8 + 1.2 + 1.3 + 25 = Rs. 28.9/-
Sale price (middleman) = Rs. 168/-
Middleman's Profit = Rs.168 – 156.15 = Rs. 11.85/-
BCR of Middleman = 168/156.15 = 1.08

These values illustrates that when the remoteness of the initial source drops i.e. from Sakkar to Rawalpindi, cost of transportation also reduce from 31 to 25 per kg and it enhances Middleman's net profit for both Silver Carp and Malay. Silver Carp's sale price (per kilogram) shrink from Rs. 176 to 173.

4.3.2 Wholesaler

Intermediate provides sometimes directly to Sardaryab fish retailers and processors however some were supplied by Charsadda wholesalers.

4.3.2.1 Silver Carp / Kg

Purchase price = Rs. 173/- || Storage Cost (Rental Value) = Rs. 1/-
Ice cost = Rs 0.50/- || Load/Unload cost = Rs. 0.50/-
Transport Cost = Rs 0.80/- || Total cost = 1+0.50+0.50+0.80 = Rs. 2.80/-
Sale price = Rs. 180
Wholesaler Profit = Rs. 180 – (173 + 2.80) = 180 – 175.80 = Rs. 4.20/-
Benefit/Cost of Wholesaler = 180/175.80 = 1.02

4.3.2.2 Malay / Kg

Purchase price = Rs.168/- || Storage Cost (Rental Value) = Rs. 1/-
Ice cost = Rs. 0.50/- || Load/Unload cost = Rs. 0.50/-
Transport Cost = Rs 0.80/- || Total cost = 1+0.50+0.50+0.80 = Rs. 2.80/-
Sale price = Rs. 176/-

Wholesaler Profit = 176 – 170.80 = Rs. 5.20/-

BCR of Wholesaler = 176/170.80 = 1.03

The distance and wholesaler margin negatively related i.e. reduction in distance reduce the transportation cost and increase margin of wholesaler (Salim et al., 2018; Obayelu et al., 2016) from rupees 3.20/Kg to 4.20/kg. It will ultimately reduce the selling price of both species.

4.3.3 Rawalpindi: Direct link

The intermediates typically conduct wholesaler functions and supply from the manufacturing site to merchants and processors (Agyei et al., 2018).

4.3.3.1 Silver Carp / Kg

Purchase price = Rs. 130.31/-

Total Intermediary cost = 1.6 + 1 + 1.3 + 25 = Rs. 28.9/-

Wholesaling cost of middleman = Rs. 2.80/-

Total cost of middleman = 28.9 + 2.80 = Rs. 31.7/-

Sale price of middleman (including wholesale cost and margin) = Rs 180/-

Middleman Profit (including wholesaling profit) = 180 – (130.31 + 28.9 + 2.80) = 17.99/-

Benefit/Cost of Middleman through direct link = 180/162.01 = 1.11

4.3.3.2 Malay / Kg

Purchase price = Rs. 127.25/-

Total Intermediary cost = 1.6 + 1 + 1.3 + 25 = Rs. 28.9/-

Wholesaling cost of middleman = Rs 2.80/-

Total cost of middleman = 28.9 + 2.80 = Rs. 31.7/-

Sale price of middleman (including wholesale cost and margin) = Rs. 176/-

Middleman Profit (including wholesaling profit) = 176 – (127.25 + 28.9 + 2.80) = 17.05/-

Benefit/Cost of Middleman through direct link = 178 / 158.95 = 1.1

From the intermediary's direct relation, it is determined that the intermediary acts as a wholesaler and also get the margin of wholesaler (Manea, 2017; Agrawal et al., 2016; Adida et al., 2016). Intermediate profit for both species rise upto rupees 17.99 and

17.05/Kg for Silver Carp and Malay, respectively. The consumer price remains the same in both species through direct and indirect linkage therefor no consumer surplus accord.

4.3.4 Retailer and Processor (Last destiny)

This is the penultimate level of the Rawalpindi fish chain. The retailer also performs Sardaryab market processing role. Three ultimate fish processing form. Revenue and expense streams are as follows:

4.3.4.1 Fish kabab / Kg

Silver Carp is the finest to prepare fish kabab. Based on collected information only ten percent Silver Carp used for fish kabab:

Purchase price of Silver Carp at disposal of retailer = Rs. 180/-

Processed estimated Cost including (vinegar, spicy, gram-flour, burning fuel, oil, labor and rental value of fixed instruments) = Rs. 57/-

Sale price (at gross weight) of processor = Rs. 305/-

Processor Profit = $305 - (180 + 57) = \text{Rs. } 68/-$

Benefit/ Cost for fish kabab = $305/237=1.28$

The customer benefits from reduced prices of local fish species (Porrás et al., 2017; Genschick et al., 2018; Supartini et al., 2018; Tran et al., 2017). Retail price decreases from rupees 310 to 305 which increase consumer surplus of Rs. 5/kg.

4.3.4.2 Fish Bar B.Q / Kg

Silver Carp is also one of the greatest fish varieties for barbecuing. Based on sample survey, 20% of Silver Carp fish used as fish Bar B.Q:

Purchase price of Silver Carp at disposal of retailer = Rs. 180/-

Processed estimated Cost including (vinegar, spicy, burning fuel, oil, labor and rental value of fixed instruments) = Rs. 69/-

Sale price (at gross weight) of processor = Rs. 315/-

Processor Profit = $315 - (180 + 69) = \text{Rs. } 66/-$

Benefit/ Cost for fish Bar B.Q = $315/249 = 1.26$

Because Rawalpindi source fish is relatively fresh compared to Sakkar source fish, the processing cost drops from rupees 73 to 69 (per kg). While the consumer price (per kg) for fish Bar B.Q decreased from Rs. 320 to Rs. 315/kg, resulting in a Rs. 5 per kg rise in consumer surplus.

4.3.4.3 Roast Fish (Silver Carp and Malay)

Both the species are using for roasting purpose. Accordingly, 70% of Silver Carp fish is processed as roasted fish, while 100% of Malay fish is processed as roasted fish, as shown below:

Purchase price of Silver Carp at disposal of retailer = Rs. 180/-

Purchase price of Malay at disposal of retailer = Rs. 176/-

Processed estimated Cost including (vinegar, spicy, burning fuel, oil, labor and rental value of fixed instruments) for Malay or Silver Carp = Rs. 50/-

Sale price (at gross weight) of processor for Silver Carp = Rs. 295/-

Sale price (at gross weight) of processor for Malay = Rs. 280/-

Processor Profit for Silver Carp = $295 - (180 + 50) = \text{Rs. } 65/-$

Processor Profit for Malay = $290 - (176 + 50) = \text{Rs. } 64/-$

Benefit/ Cost for roasting Silver Carp = $295/230=1.28$

Benefit/ Cost for roasting Malay = $290/226=1.28$

The processor's profit from Malay has increased from Rs. 57 to Rs. 64. Because Rawalpindi source fish is relatively fresher than Sakkar source fish, the processing cost decreases from Rs. 55 to Rs. 50 (per kg) for both species. In terms of roast fish, the consumer price of Silver Carp fell from Rs. 300 to Rs. 295 per kg whereas for Malay it fell from rupees 295 to 290, resulting in a Rs. 5 per kg rise in consumer surplus (Tran et al., 2017; Alkaya & Demirer, 2016).

4.4 Torbela Dam: (Original source)

The cost of both the species are kept equal to other channels as per cost of Sakkar Channel due to time and financial constraints. The following are the cost flows for the other intermediaries, transportation, and storage.

4.4.1 Intermediaries Cost of Silver Carp and Malay (Intermediary)

4.4.1.1 Silver Carp / Kg

Purchase price = Rs. 130.31/- || Packing cost = Rs. 0

Ice cost = Rs. 1/- || Load/Unload cost = Rs. 1.3/-

Transport Cost = Rs. 11/- || Total cost = $0 + 1 + 1.3 + 11 = \text{Rs. } 13.3/-$

Sale price for Intermediary (middleman) = Rs. 168/-

Middleman Profit = $168 - (130.31 + 13.3) = 168 - 143.1 = \text{Rs. } 24.39/-$

Benefit/Cost of Middleman = $168/143.1 = 1.17$

4.4.1.2 Malay /Kg

Purchase price = Rs. 127.25/- || Packing cost = Rs. 0

Ice cost = Rs. 1/- || Load/Unload cost = Rs. 1.3/-

Transport Cost = Rs. 11/ || Total cost = $0 + 1 + 1.3 + 11 = \text{Rs. } 13.3/-$

Sale price (middleman) = Rs. 165/-|| Middleman Profit = $165 - (127.25 + 13) = 24.75/-$

Benefit/Cost of Middleman = $165/140.25 = 1.18$

As the distance from the original source diminishes, the purchasing price (per kilogram) of Silver Carp and Malay for wholesalers lowers (Tran et al., 2017).

4.4.2 Wholesaler

Sometime intermediaries provide raw fish directly to Sardaryab fish retailers and processors while some part is supplied through wholesalers of Charsadda.

4.4.2.1 Silver Carp / Kg

Purchase price = Rs. 168/-		Storage Cost (Rental Value) = Rs. 1/-
Ice cost = Rs. 0.50/-		Load/Unload cost = Rs. 0.50/-
Rs. 0.80/-		Transport Cost = Rs. 0.80/-
		Total cost = $1 + 0.50 + 0.50 + 0.80 =$ Rs. 2.80/-
Sale price = Rs. 178/-		Profit = $178 - 170.80 =$ Rs. 7.20/-

BCR of Wholesaler = $180/170.8 = 1.05$

4.4.2.2 Malay / Kg

Purchase price = Rs. 165/-		Storage Cost (Rental Value) = Rs. 1/-
Ice cost = Rs. 0.50/-		Load/Unload cost = Rs. 0.50/-
Transport Cost = Rs. 0.80/-		Total cost = $1 + 0.50 + 0.50 + 0.80 =$ 2.80/-
Sale price = Rs. 174/-		Profit = $174 - 167.80 =$ Rs. 6.20/-

BCR of Wholesaler = $174/167.8 = 1.04$

The wholesaler's margin jumped to rupees 6.20 per kg from rupees 4.20 per kg in the case of Malay and to rupees 5.20/kg from rupees 5.20/kg in the case of Silver carp when the delivery destination changed from Rawalpindi to Torbela, Furthermore, when the distance between Rawalpindi and Torbela dam diminishes, the retailer's buying price drops.

4.5 Direct link of Torbela dam channel

In other cases, middlemen can serve as entire sellers, delivering raw fish from the manufacturing site to shops and processors.

4.5.1 Silver Carp

Purchase price = Rs. 130.31/-

Total Intermediary cost = Rs. $(0 + 1 + 1.3 + 11) =$ Rs.13.3/-

Wholesaling cost of middleman = Rs. 2.80/-

Total cost of middleman through direct link = $13.3 + 2.80 =$ Rs. 16.1/-

Sale price of middleman (including wholesale cost and margin) = Rs. 178/-

Middleman Profit (including wholesaling profit) = $178 - (130.31 + 13.3 + 2.80) =$ 31.59/-

Benefit/Cost of Middleman through direct link = $178/146.41 = 1.22$

4.5.2 Malay /Kg

Purchase price = Rs. 127.25/-

Total Intermediary cost = Rs. $(0 + 1 + 1.3 + 11) =$ Rs. 13.3/-

Wholesaling cost of middleman = Rs 2.80/-

Total cost of middleman through direct link = $13.3 + 2.80 =$ Rs. 16.1/-

Sale price of middleman (including wholesale cost and margin) = Rs. 174/-

Middleman Profit (including wholesaling profit) = $174 - (127.25 + 13.3 + 2.80) = 30.65$

Benefit/Cost of Middleman through direct link = $174/143.35 = 1.21$

The intermediate profit increases from Rs. 17.99 to 31.9 per kg in the case of Silver Carp while Malay increase to 30.65 /kg from rupees 17.05 /kg due to Torbela's direct route, which also serves as a wholesaler.

4.5.3 Retailer and Processor (Last Destiny)

This is Torbela dam's final stage value chain of fish. The retailer also performs Sardaryab market processing role. There are three final fish processing shapes under:

4.5.3.1 Fish kabab / Kg

Silver Carp is the finest to prepare fish kabab. According to the survey, very rare portion i.e. ten percent of silver carp is used for fish kabab.

Purchase price of Silver Carp at disposal of retailer = Rs. 178/-

Processed estimated Cost including (vinegar, spicy, gram-flour, burning fuel, oil, labor and rental value of fixed instruments) = Rs. 50/-

Sale price (at gross weight) of processor = Rs. 300/-

Processor Profit = $300 - (178 + 50) =$ Rs. 70/-

Benefit/ Cost for fish kabab = $300/228 = 1.31$

From the Fish kabab data, it is concluded that the profit of the processors increases when the distance of original source changed from Torbela to Rawalpindi as Rawalpindi point is most accessible to Sardaryab fish point.

4.5.3.2 Fish Bar B.Q / Kg

In Sardaryab fish point Silver carp is used for fish Bar-B-Q i.e. approximately twenty percent of silver carp used for Bar-B-Q.

Silver Carp Purchase price at disposal of retailer = Rs. 178/-

Processed estimated Cost including (vinegar, spicy, burning fuel, oil, labor and rental value of fixed instruments) = Rs. 65/-

Sale price (at gross weight) of processor = Rs. 310/-

Processor Profit = $310 - (178 + 65) = 310 - 243 = \text{Rs. } 67$

Benefit/ Cost for fish Bar B.Q = $310/243 = 1.27$

From the Fish kabab data, it is concluded that the profit of the processors increases when the distance of original source changed from Torbela to Rawalpindi as Rawalpindi point is most accessible to Sardaryab fish point.

4.5.3.3 Roast Fish: (Silver Carp and Malay)

Both the species are using for roasting purpose. Accordingly, 70% of Silver Carp fish is processed as roasted fish, while 100% of Malay fish is processed as roasted fish, as shown below:

Purchase price of Silver Carp at disposal of retailer = Rs. 178/-

Purchase price of Malay at disposal of retailer = Rs 174/-

Processed estimated Cost including (vinegar, spicy, burning fuel, oil, labor and rental value of fixed instruments) for Malay or Silver Carp = Rs. 50/-

Sale price (at gross weight) of processor for Silver Carp = Rs. 290/-

Sale price (at gross weight) of processor for Malay = Rs. 275/-

Processor Profit for Silver Carp = $290 - (178 + 50) = 290 - 178 = \text{Rs. } 62$

Processor Profit for Malay = $275 - (174 + 50) = 275 - 224 = \text{Rs. } 51$

Benefit/ Cost for roasting Silver Carp = $290/178 + 50 = 1.27$

Benefit/ Cost for roasting Malay = $275/224 = 1.22$

From the above estimated calculation, it is shown that with the decrease in the original source difference, each stakeholder's profit grew and the consumer price decreased in the instance of roast fish due to reduced transport and processing costs.

4.6 Fish Value Chain Process of Charsadda Ponds Channel (Original source)

Due to the student limited time and expense limitations, cost of both species are considered the same as for Sakkar.

4.6.1 Intermediaries Cost of Silver Carp and Malay (Intermediary)

4.6.1.1 Silver Carp /Kg

Purchase price = Rs. 130.31/-

|| Packing cost = Rs. 0

Ice cost of = Rs. 0.50/-

|| Load/Unload cost = Rs. 1/-

Transport Cost = Rs. 3.5/-

|| Total cost = $0 + 0.50 + 1 + 3.5 = \text{Rs. } 5/-$

Sale price (middleman) = Rs. 162/-

|| Profit = $162 - (130.31 + 3.5) = \text{Rs. } 28.19$

Benefit/Cost of Middleman = $162/135.31 = 1.19$

4.6.1.2 Malay /Kg

Purchase price = Rs. 127.25		Packing cost = Rs. 0
Ice cost = Rs. 0.50/-		Load/Unload cost = Rs. 1
Transport Cost = Rs. 3.5/-		Total cost = 0 + 0.50 + 1 + 3.5 = Rs. 5/-
Sale price of middleman = Rs. 160/-		Profit = 160 – (127.25 + 5) = Rs. 27.75
Benefit/Cost of Middleman = 160/132.25 = 1.20		

This indicates that when the distance from the original Torbela dam source decreases to Charsadda ponds, the middleman profit increases. Transport costs reduce to rupees 3.5 from 11 which boosts net profit of Middleman for both species.

4.6.2 Wholesaler

In supply, sometime intermediary act the role of wholesaler to provide fish directly Sardaryab fish point.

4.6.2.1 Silver Carp/Kg

Purchase price = Rs. 162/-		Storage Cost (Rental Value) = Rs. 1/-
Ice cost = Rs. 0.50/-		Load/Unload cost = Rs. 0.50/-
Transport Cost = Rs. 0.80/-		Total cost = 1 + 0.50 + 0.50 + 0.80 = 2.80/-
Sale price = Rs. 175/-		Profit = 175 – (162 + 2.80) = Rs. 10.2/-
Benefit/Cost = 175/164.80 = 1.06		

4.6.2.2 Malay /Kg

Purchase price = Rs. 160/-		Storage Cost (Rental Value) = Rs. 1/-
Ice cost = Rs. 0.50/-		Load/Unload cost = Rs. 0.50/-
Transport Cost = Rs. 0.80/-		Total cost = 1 + 0.50 + 0.50 + 0.80 = 2.80/-
Sale price = Rs. 173/-		Profit = 173 – (160 + 2.80) = Rs. 10.20/-
Benefit/Cost of Wholesaler = 176/162.8 = 1.08		

Charsadda ponds analysis is economically optimum for all investors and consumers. Locally, Malay and Silver Carp provide cheap shipping costs with no fish losses. Purchase price of silver carp reduce to 162 from 168 whereas 160 from 165 in Malay.

4.6.3 Charsadda: (Direct link)

Intermediates also execute the job of the entire seller and supply to retailers and processors with the raw fish from the manufacturing site. This channel's revenue and expense stream is also calculated are as under:

4.6.3.1 Silver Carp / Kg

Purchase price = Rs. 130.31/- || Total cost = $0+1+1.3+3.5 = 5$

Wholesaling cost of middleman = Rs. 2.80/-

Total cost of middleman through direct link = Rs.5 + Rs. 2.80 = Rs. 7.80

Sale price of middleman (including wholesale cost and margin) = Rs. 175/-

Middleman Profit (including wholesaling profit) = $175 - (130.31 + 5 + 2.80) = \text{Rs. } 36.89/-$

Benefit/Cost of Middleman through direct link = $180/162.01 = 1.31$

4.6.3.2 Malay /Kg

Purchase price = Rs. 127.25 || Total cost = $0+1+1.3+3.5 = 5$

Wholesaling cost of middleman = Rs 2.80/-

Total cost of middleman through direct link = $5 + 2.80 = \text{Rs. } 7.80/-$

Sale price of middleman (including wholesale cost and margin) = Rs. 173/-

Middleman Profit (including wholesaling profit) = $173 - (127.25 + 5 + 2.80) = \text{Rs. } 37.95$

Benefit/Cost of Middleman through direct link = $173/135.05 = 1.28$

From the above estimated facts, it is inferred that the intermediary also fulfilled the job of wholesaler with direct link and increased its profit by gaining wholesaler profit. Intermediaries gain upto 37.95 rupees in both species i.e. Silver Carp and Malay through direct link.

4.6.4 Retailer and Processor (Last Destiny)

This is Charsadda's ultimate pond value chain of fish. The retailer also performs Sardaryab market processing role. Revenue and expense streams are as follows:

4.6.4.1 Fish kabab

Silver Carp is the finest to prepare fish kabab. As per the collected information, approximately ten percent of silver carp is used for Fish kabab.

Purchase price of Silver Carp at disposal of retailer = Rs. 175/-

Processed estimated Cost including (vinegar, spicy, gram-flour, burning fuel, oil, labor and rental value of fixed instruments) = Rs. 53/-

Sale price (at gross weight) of processor = Rs. 300/-

Processor Profit = $\text{Rs. } 300 - (175 + 53) = 300 - 228 = \text{Rs. } 72/-$

Benefit/ Cost for fish kabab = $300/228 = 1.31$

Processor profit further increased from Rs. 70 to 72 when the original source supply from Charsadda pond instead of Torbela dam dropped from Rs. 305 to 300.

4.6.4.2 Fish Bar B.Q / Kg

Also, Silver Carp is finest fish variety to prepare Bar B.Q. Based on sample survey, 20% of Silver Carp fish processed in fish Bar B.Q. The economic analysis is calculated as follows:

Purchase price of Silver Carp at disposal of retailer = Rs. 175/-

Processed estimated Cost including (vinegar, spicy, burning fuel, oil, labor and rental value of fixed instruments) = Rs. 60/-

Sale price (at gross weight) of processor = Rs. 305/-

Processor Profit = $305 - (175 + 60) = 305 - 235 = \text{Rs. } 70/-$

Benefit/ Cost for fish Bar B.Q = $305/235 = 1.29$

Processor profit further increased from Rs. 67 to 70 when the original source supply changed from Torbela to Charsadda pond.

4.6.4.3 Roast Fish (Silver Carp and Malay) / Kg

Silver Carp can also be prepared for roasting purposes along with Bar-B-Q. As per survey detail, Malay specie is used only in roasted form whereas approximately seventy percent of silver carp is used for roasting purpose.

Purchase price of Silver Carp at disposal of retailer = Rs. 175/-

Purchase price of Malay at disposal of retailer = Rs. 173/-

Processed estimated Cost including (vinegar, spicy, burning fuel, oil, labor and rental value of fixed instruments) for Malay or Silver Carp = Rs. 40/-

Sale price (at gross weight) of processor for Silver Carp = Rs. 283/-

Sale price (at gross weight) of processor for Malay = Rs. 280/-

Processor Profit for Silver Carp = $283 - (175 + 40) = 283 - 215 = \text{Rs. } 68/-$

Processor Profit for Malay = $280 - (173 + 40) = 280 - 213 = \text{Rs. } 67/-$

Benefit/ Cost for roasting Silver Carp = $283/215 = 1.31$

Benefit/ Cost for roasting Malay = $280/213 = 1.31$

Malay's price as well as silver carp reduce and all stockholder's profit influenced favorably when Charsadda pond's original source supplies. It is also crucial to produce fish locally, as consumers pay less than they spend for other distant sources of supply.

4.7 River fish Channel

Finger fish, Malay, Gulfam and Shermahi species are channelized from local river flow however in the current research we can only analysis the channel of Malay.

4.7.1 Analysis of Fisherman: (River Catchment)

Table 2: Malay Estimated Cost

Description of Cost	Unit	Qty	Rs. Per Qty	Worth in (Rs.) (000)
1) Variable				0.4046
(i) Travel	Km/day	2	0.01	0.02
(ii) Maintenance net	Time/day	0.067	0.07	0.004667
(iii) Labor	Hour	8	0.04	0.32
(iv) Food	Time/day	1	0.06	0.06
2) Fixed				0.382
(i) Net cost	Hour	8	0.01	0.08
(ii) Tube cost	Hour	8	0.007	0.056
(iii) Boat cost	Hour	8	0.02	0.16
(iv) Bamboo cost	Hour	8	0.002	0.016
(v) Other cost	Hour	8		0.07
3) Total catch Fish/8 hour	Kg	6.5	0.2	1.3

Source: Author's own calculations

Here the fisherman is conduct the activities and fisherman directly sale raw fish to Sardaryab processor and retailer without involving the wholesaler.

Total Cost (per day) in thousand = TFC + TVC

Total Cost (per day) in thousand = 0.382 + 0.404 = 0.786

Total Revenue (per day) in thousand = 1.3/-

Cost of Shermahi (per kg) in thousand = 0.786/0.0065 = 120.92/-

Sale price of Shermahi (per kg) in thousand = Rs. 200/-

Revenue (per kg) in thousand = Rs. 200/-

Profit of fisherman (per kg) in thousand = Sale price – Purchase price

Profit of fisherman (per kg) in thousand = 200 – 120.92 = Rs. 79.08/-

Benefit Cost Ratio (BCR) = 200/120.92 = 1.65

4.7.2 Processor Analysis

As per discussion earlier, Malay fish is 100 percent used for roast purpose so in this portion analysis of river catchment are discussed.

Purchase price of Malay at disposal of retailer (per kg) = Rs 200

Processed estimated Cost including (vinegar, spicy, burning fuel, oil, labor and rental value of fixed instruments) for Malay or Silver Carp (per kg) = Rs. 40/-

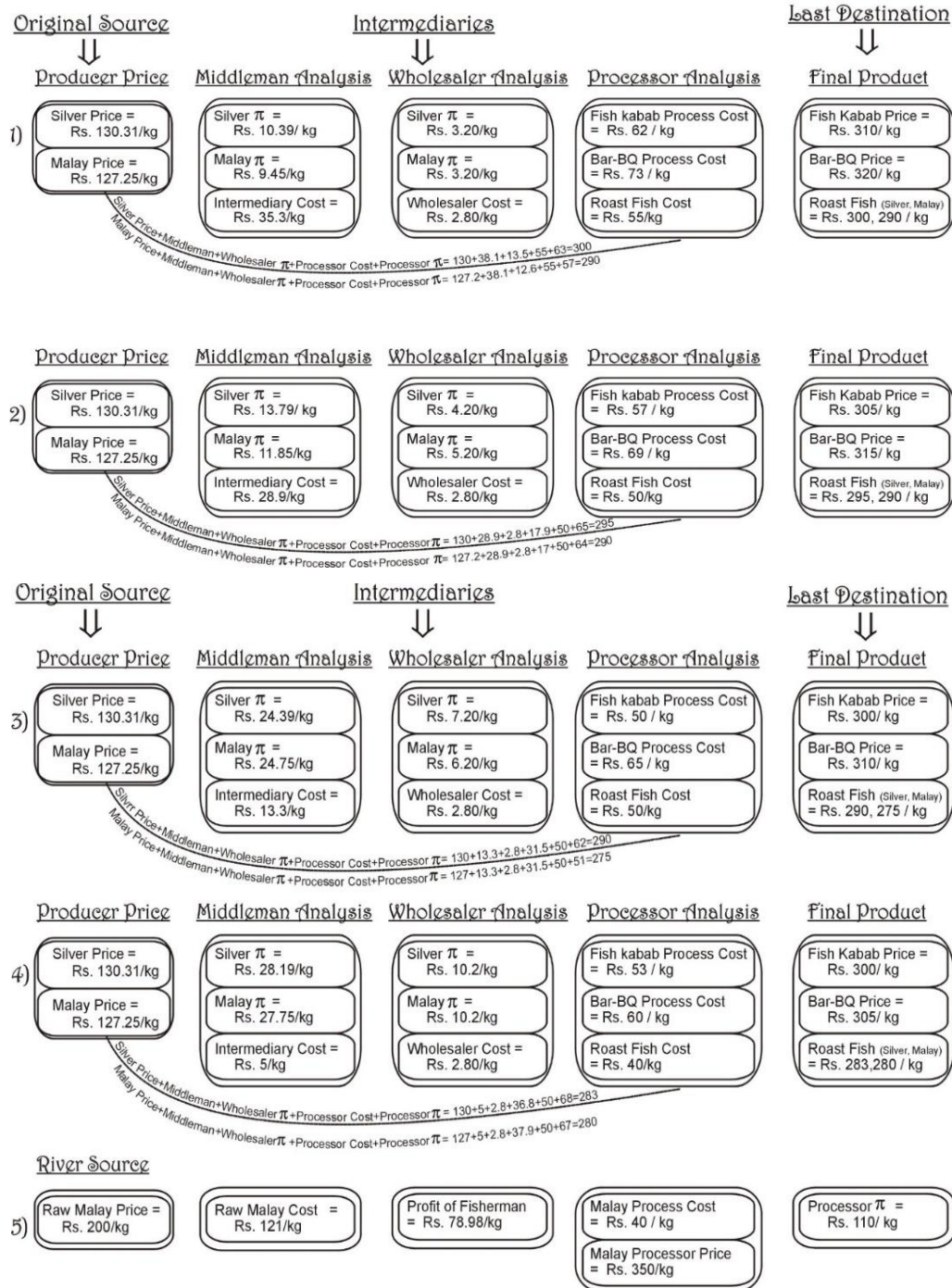
Sale price (at gross weight) of processor for Malay (per kg) = Rs. 350/-

Processor Profit for Malay (per kg) = 350 – (200 + 40) = 350 – 240 = Rs. 110/-

Benefit/Cost of Processors in terms of river Malay = 350/240= 1.45

Malay's high price at each stage is due to Malay's freshness because it's a river-source fish that's relatively good and fresh compared to non-river-fish.

Fig1: Graphical Value Chain Analysis
Graphical Value Chain Model



The above figure indicate the five channels / pathways that supply raw fish and add value. The figure illustrates cost/revenue and stakeholder profit, which clearly illustrates that as the distance from the original source decreases stakeholder profit and last destination selling price decreases.

5. FINDINGS & RECOMMENDATIONS

Fish marketing and value chain economic analysis study will be conducted in 2022 at Sardaryab fish/picnic site in Charsadda district. It also aimed to measure income, employment and land use. Analytical results demonstrate that longer distant original source phenomena are positively associated to marketing cost, and fried fish consumer pricing. Transport expenses reduce from Rs. 31 to 25 per kilogram along with marketing charges. The study concludes that locally produced fish benefits all Sardaryab stakeholders, market players, and consumers. Local source fish is preferable route for Sardaryab stakeholders because to fish freshness and reduced transit costs. Sardaryab is also determined as a key market/picnic site and has to be regenerated for future utilization. The study revealed that local fish had minimal transportation costs and freshness. The author offered following suggestions to develop Sardaryab market/picnic place and enhance revenue, employment, private investment and future land use.

- Fish producers and fish departments are advised to establish fish ponds in Charsadda district since it has a favorable profit for all shareholders. Aquaculture generates more than 44 percent of the income generated by any other crop on a hectare of land.
- Fish fishing during breeding months should be forbidden.
- Sardaryab fish market/picnic site needs government investment.
- Proper security is essential to protect guests and boost Sardaryab tourism.
- Fish research centers will also be created in Charsadda District to assist local fishermen.
- Fish hatchery provision from Agriculture Directorate is necessary in the study area as the transportation cost considerably decrease the sale point comparable to far producer points.

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