

Research Paper

Value Chain Analysis of Arabica Coffee in Karnataka

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ABSTRACT

The present study conducted a value chain assessment to estimate the cost incurred at each stage of the value chain, along with the margins made and the price realized, for pure Arabica and 80:20 Arabica coffee: chicory blend in Chikkamagaluru and Hassan districts of Karnataka. Descriptive statistics, value chain framework, price spread analysis were used to analyze the data. Results revealed that the highest value addition took place at curers and roasters level (downstream actors) and accordingly margins made by these down steam actors were higher than the coffee growers (upstream actors). It was observed that coffee value chains in Chikkamagaluru and Hassan districts are fragmented and largely uncoordinated, with lack of innovative upgrading strategies among the majority of small coffee growers due to lack of capital. This suggest that formation of Farmer Producers Organizations would enable the small coffee growers to take up value addition activities through infrastructure sharing thereby higher value realization through economies of scale. Likewise, it is critical to bring efficiencies and transparency in buying and selling activities across the coffee value chain by implementing blockchain based marketplace.

HIGHLIGHTS

- The study results indicates higher margins on the processing side (downstream) and lower margins for coffee growers on the other side (upstream) of value chain.

Keywords: Value Chain, Arabica Coffee, Price Spread, Mapping, Upgrading Strategies

Coffee is the world's favourite beverage, with an estimated 3 billion cups relished every day- either alone or with family, friends or colleagues (ICO, 2019a) and on the other hand, coffee provides livelihoods for at least 100 million people, across coffee producing countries (ICO, 2019a). Coffee distributes economic benefits at each step of the value chain that links small growers in the developing countries (global south) to discerning consumers in the developed countries (global north).

The global coffee production since 1990 has expanded significantly from 93.31 million bags of 60 kg each (56 Lakh MT) in 1990-91 to 175.35 million bags (105 lakh MT) during 2020-21 (ICO Database, 2021) which is an increase of about 88 per cent. The main drivers of growth are increase in coffee

consumption in emerging economies, surge in demand for coffee in traditional markets, growing demand for specialty and sustainable coffees and product inventions that provide new flavours and more convenience to consumers (International Coffee Organization, 2021). The study reported that a coffee bean may change hands as many as 150 times from producer to consumer (Milford, 2004). Further, the coffee is the growth market creating significant economic opportunities for both upstream value chain actors like growers and downstream actors *viz.*, curers, roasters and retailers *etc.* (Samper *et al.* 2017; ICO, 2019a).

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However, coffee production growth is challenged by weather uncertainties and buyer-driven supply chain. The coffee production responds to weather conditions and can vary greatly from year to year due to highly variable yields. Further, the coffee production is also highly sensitive to climate change. Climate change is likely to impact the area suitable for coffee production in the long-term. The research studies predicted that, global warming and rising temperatures will reduce the area suitable for growing coffee by up to 50 percent by 2050 either directly due to heat and moisture loss, or indirectly through an increase in pests and diseases associated with climatic change. Another study predicted that, in case of Robusta coffee, for every one Degree Celsius increase over the optimal range (20.5 degree Celsius), yields decrease by 14 per cent¹. India is no exception to it, during the last five years in a row (2016-17 to 2020-21), the coffee production in traditional coffee growing areas has been affected by unfavourable weather conditions like erratic blossom showers, drought and abnormally heavy rainfall (Coffee Board, 2021). The coffee growing areas of Karnataka and Kerala were hit by heavy downpour, floods and landslides with an excess rainfall leading to significant losses to standing coffee crop and floods/ landslides uprooted coffee plantations resulting in significant damage to the standing crop in the form of premature fruit and fungal diseases. Added to this the coffee prices are highly volatile (Coffee Board, 2021). As per the International Coffee organization, the annual average of the International Coffee Organization composite indicator price declined by 52 percent to 100.52 US cents/lb in 2020 compared to annual average composite indicator price of 210.39 US cents/lb during 2011. The International Coffee Organization (2020) reported that, market disequilibrium due to surplus production during the last five years is main driver contributing to the low prices. Further, the COVID-19 pandemic continues to put pressure on the global economy and greatly limits out-of-home coffee consumption. On the other hand, the profitability of the coffee sector and its growth potential have led to consolidation among the downstream actors of the value chain especially among the roasters and retailers. Total

¹<https://www.beanscenemag.com.au/robusta-coffee-sensitive-climate-change/>

coffee industry revenues are valued at USD 220 billion annually (ICO, 2020), but, the producing countries earn just USD 20 billion through exports annually which is less than 10 percent of the total retail value of the coffee industry (USD 220 billion). Thus, it is evident that, substantial value in the coffee value chain is captured by the downstream actors which is the main cause of concerns about the distribution of gains and inclusiveness in the coffee value chain. Earlier studies (Achoth, 2005; Bhavya, 2011; Chengappa *et al.* 2014; Pradeepa *et al.* 2019) have revealed the problems of lengthy value chains with large number of intermediaries that have resulted in lower prices received by the coffee growers in Karnataka State. Added to this, Indian Arabica coffee farmers suffered due to high incidence of pests and diseases such as white stem borer and leaf rust. Further, the volatile coffee prices exacerbated farmers' problems and making the future of the Arabica coffee production more uncertain in the state. Against this backdrop, the present study was undertaken to examine the share of each actor in the Arabica coffee value chain and to identify the potential strategy of up-gradation for small coffee growers.

MATERIALS AND METHODS

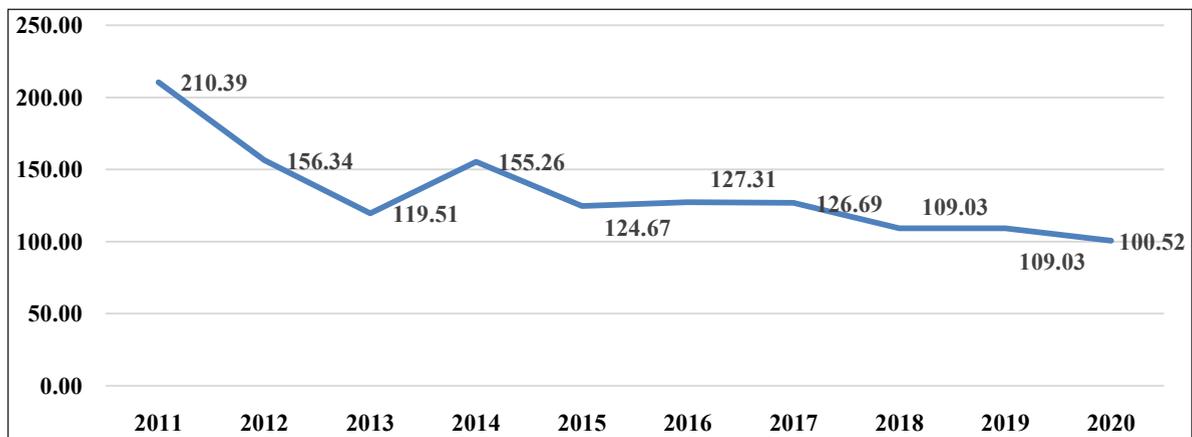
Data and sampling design

The study used quantitative data pertaining to cost of production, processing and marketing practices collected for Chikkamagaluru and Hassan districts of Karnataka with a total sample size of 75 comprising with 60 coffee growers, five curers, five roasters and five retailers.

The value chain framework helps in understanding the various actors involved in the value chain and relationship between them and which also demonstrates how coffee moves from production, processing, retailing and to final consumer. However, the present study is limited to four major actors *viz.*, growers, curers, domestic roasters and retailers.

Analysis of the data

The data collected from coffee growers subjected for simple descriptive statistics like averages and percentages. The technical aspects include the cost of production, marketing costs and price spread.



Source: International Coffee Organization

Fig. 1: ICO Composite Indicator Price during 2011 to 2020

$$\text{Price spread} = P_c - P_p$$

Where,

P_c - Price paid by the consumer

P_p - Price received by the producer

Value chain framework

The identification of the actors and mapping of the actors in Arabica coffee value chain is carried out based on field survey and same has been prepared and presented below. Arabica coffee at the estate level is processed either by wet or dry method. The coffee processed by dry method is called cherry coffee and the coffee processed by wet method is known as parchment coffee. In India wet processing method is largely employed for Arabica coffee, about 80 percent of Arabica coffees is wet processed. Hence, Arabica parchment is considered for value chain analysis. The coffee value chain mainly constitutes of growers, curers, roasters, exporters and retailers. Farmers harvest coffee beans and hours after being harvested from the estate, primary processing is done immediately. Coffee farmers then sell coffee to curers or agents of curers either as cherry or parchment at farm gate. At curing works, peeler cum polisher is used to mill the Arabica parchment coffee. The peeler is used to peel the dried parchment layer of parchment coffee and polisher removes silver skin. Further, the coffee beans are sorted based on the size, shape, density, and colour which will enable to carry out the most uniform roasting and better cup. Then the curers

will sell the clean and graded coffee beans either to coffee roasters for domestic consumption or to exporters for the overseas market. The roasters roast and grind the beans and sell coffee powder and roasted beans to retailers in the domestic market.

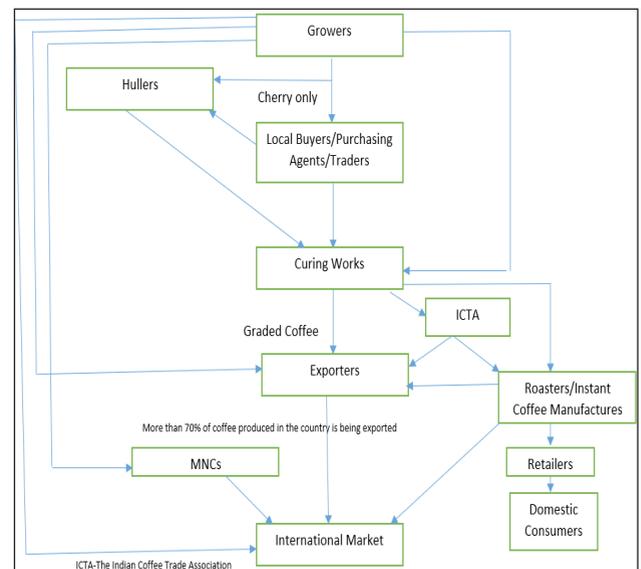


Fig. 2: Domestic Coffee Value Chain

RESULTS AND DISCUSSION

Estimated Cost of Production for Arabica coffee

The average cost incurred on various items to maintain the Arabica coffee plantation in a year is worked out. The variable cost includes cost incurred on fertilizers including FYM, shade regulation, weeding, bush management, soil management

(cradle pits renovation lime application), supply planting, pest/ disease management, harvesting, processing and irrigation etc., most of these costs are incurred annually.

The average total variable cost incurred by Arabica coffee growers is ₹ 80,179 per acre (Table 1). Out the total variable costs, labour cost accounted for the maximum share of ₹ 57,460 (around 72%) which is mainly due to the labour cost incurred on shade regulation, bush management, harvesting, soil management, fencing which were usually do not demand any material inputs. The major components of labour costs were bush management cost (including removal of the loose scaly bark of the main stem & stem swabbing) and harvesting cost, which was worked out to be ₹ 10,540 and ₹ 10,200, respectively.

The share of input cost in the total variable cost is about 28 per cent (₹ 22,719). Cost incurred on fertilizers (including FYM) is the major expenditure among the input cost which is estimated to be ₹ 11,629 followed by cost incurred on pest/disease management ₹ 4,772 as incidence of pest and disease being higher in Arabica plantations. Growers are increasingly irrigating for blossom and backing showers even in case of Arabica, as rainfall is erratic which again adds to the cost. The estimated cost of production was ₹ 186/kg (₹ 80,179/acre at an average Arabica Parchment yield of about 432 kg/ acre).

Arabica Coffee Value Chain Analysis

Two major cases have been taken to examine the

price spread across the major actors in the value chain. The cost incurred by each actor a each stage of the Arabica coffee value chain, along with the price realized and the margins made, for pure Arabica coffee and Arabica: chicory blend (80:20) were estimated. The estimated cost incurred by the producer for Arabica parchment coffee is ₹ 186/kg and the selling price is that of parchment is ₹ 202/kg. Margin made by the coffee grower is estimated at ₹ 16/kg of parchment. Since, the out turn from Arabica Parchment to clean coffee is 80 percent, the Curer needs to procure 1.20 kg of parchment coffee in order to get one kilogram of clean coffee. Accordingly, the procurement cost of ₹ 202/kg of parchment coffee and out turn losses of ₹ 40/kg has been considered for the analysis at the curers level.

In addition, curers are incurring a cost of ₹ 4/kg and ₹ 3/kg toward value addition and logistics, respectively. Thus, the total costs of the Curer include procurement cost (₹ 202/kg), Out turn losses (₹ 40/kg), cost of value addition (₹ 4/kg) and the logistic costs (₹ 3/kg), which makes the total cost ₹ 249/kg. The Curer then sells the clean Arabica coffee at an average price of ₹ 273/kg. The estimated margin at curer level is ₹ 24/kg of clean coffee.

Similarly, in order to get one kilogram of roast and ground coffee, roasters need to procure about 1.20 kg of green coffee, thus cost of procurement is ₹ 273/kg of green coffee and out turn losses of ₹ 55/kg. The additional cost incurred towards value addition is ₹ 16/kg and cost of logistics, packing and branding is ₹ 38/kg. The total cost incurred by roaster is

Table 1: Cost of Cultivation of Arabica coffee (₹/Acre)

| Particulars | Labour | Labour cost (₹/acre) | Input cost (₹/Acre) | Total cost (₹/Acre) |
|--|------------|-------------------------|------------------------|------------------------|
| | (Man Days) | | | |
| Fertilizer including FYM | 12 | 4080 | 11629 | 15709 |
| Shade regulation | 23 | 7820 | | 7820 |
| Weeding | 24 | 8160 | | 8160 |
| Bush management (pruning + desukering) | 31 | 10540 | | 10540 |
| Soil Management (Cradle pits renovation + lime application) + supply planting) | 17 | 5780 | 1136 | 6916 |
| Pest/ disease management | 20 | 6800 | 4772 | 11572 |
| Harvesting | 30 | 10200 | | 10200 |
| Processing | 4 | 1360 | 1409 | 2769 |
| Irrigation | 5 | 1700 | 2230 | 3930 |
| Miscellaneous | 3 | 1020 | 1543 | 2563 |
| Total variable cost | 169 | 57,460 | 22,719 | 80,179 |
| % share in total cost | | 72 | 28 | 100 |

Note: 1. For the purpose of above calculation, wage rate of ₹ 340/man day is considered.

₹ 382/kg and the roaster sells roast and ground coffee at an average price of ₹ 570/kg. At the Roasters level, the estimated margin is ₹ 188/kg of pure roast & ground coffee.

The retailer procurement price is considered as the roaster's selling price and GST which is estimated at ₹ 600/kg of Roast & ground coffee. Other variable costs *viz.*, milk, sugar, labour etc, is estimated at ₹ 9/kg. Further, it has been assumed that, a cup of coffee (120 ml) requires 12.5 grams of coffee powder. The average cost per cup of pure coffee is estimated at ₹ 16.50 and its selling price is ₹ 25/cup, accordingly, the total estimated margin at the retailer level is ₹ 850/kg of pure coffee.

In the case of coffee-chicory blend (80:20-coffee:chicory), it has been assumed that, a cup of coffee (120 ml) has 10 grams of coffee powder and two grams of chicory. The average procurement cost of chicory for roasters is ₹ 70/kg. The cost of procurement of coffee for the roaster is ₹ 273/kg including out turn losses as one kilogram of green coffee gives 800 grams of roast and ground coffee. Average selling price of an 80:20 coffee: chicory blend is ₹ 540/kg. Thus, the cost of procurement of coffee-chicory blend is ₹ 570/kg including GST. The estimated cost per cup of coffee-chicory blend (80:20) is estimated at ₹ 14.70 and its selling price ₹ 25/cup, accordingly, the total estimated margin at the retailer level is ₹ 1,030/kg of coffee-chicory

blend (80:20). Table 2 and Table 3, shows that, margins made by roasters in case of Coffee -Chicory blend (₹ 199/kg) is higher than the pure coffee (₹ 188/kg). It is also noted that, Coffee -Chicory blend will give more profits to the retailers (₹ 1,030/kg) than the pure coffee (₹ 850/kg) considering the cost of milk, sugar, labour and other variable costs remains same (₹ 9/kg). Chicory is a low-cost additive that is mixed with coffee by roasters to increase the profit margin and it further helps in costs reduction and improve the cup economics at retailer level.

The Arabica coffee value chain analysis showed that there is huge difference in the prices obtained from the producer at the farm gate level to the retail prices at the consuming centres. It is clear from the Table 2 and 3, as the coffee moves from grower to each level of actor, there is certain amount of value added to it and the margin received also increases. However, the profit margin received by the coffee grower is very low. Hence, there is scope for the coffee farmer to move up in the value chain to realize better returns.

Upgrading strategies for improving the coffee farmers share in consumer rupee

Upgrading refers to the joint improvement of value chain by private enterprises and their associations (Andreas Springer-Heinze, 2008). The upgrading

Table 2: Price Spread in the Value Chain -Pure Coffee (Arabica Plantation)

| Value chain actor | Cost components | Cost (₹/kg) | Selling price (₹/kg) | Margins (₹/kg) |
|-------------------|---|-------------|----------------------------|-----------------------------|
| Grower | Cost of production | 186 | | |
| | Purchase cost | 202 | | |
| Curer | Value addition (curing) | 4 | | |
| | Transportation + storage | 3 | 273 | 24 |
| | Out turn losses | 40 | | |
| | Total cost | 249 | | |
| Roaster | Purchase cost | 273 | | |
| | Value addition cost (Roasting and grinding) | 16 | | |
| | Transportation + storage + packaging + branding | 38 | 570 | 188 |
| | Out turn losses | 55 | | |
| | Total cost | 382 | | |
| Retailer | Purchase cost (including GST) | 600 | | |
| | Cost of coffee cup (1.25 kg gives 100 Cups of 120 ml, 1 cup of coffee contains approx. 12.5 grams of coffee powder) | 7.50 | | |
| | Cost of milk + sugar + labour + others | 9.00 | ₹ 25/cup for 100 cups 2500 | ₹ 8.50 per cup ₹ 850 per kg |
| | Total Cost per cup of coffee (120 ml) | 16.50 | | |
| | For 100 cups | 1650 | | |

Table 3: Price Spread in the Value Chain -Coffee-Chicory blend (Arabica Plantation)

| Value Chain Actor | Cost Components | Cost (₹/kg) | Selling Price (₹/kg) | Margins (₹/kg) |
|-------------------|---|-------------|----------------------------|---------------------------|
| Grower | Cost of Production | 186 | 202 | 16 |
| | Purchase cost | 202 | | |
| | Value addition | 4 | | |
| Curer | Transportation + Storage | 3 | 273 | 24 |
| | Out turn losses | 40 | | |
| | Total Cost | 249 | | |
| | Purchase cost | 273 | | |
| Roaster | Value addition Cost+ Cost of Chicory (₹ 70/kg) | 30 | 540 | 199 |
| | Transportation + Storage + Packaging + Branding | 38 | | |
| | Total Cost | 341 | | |
| | Purchase cost (including GST) | 570 | | |
| Retailer | Cost of coffee cup (1 kg of coffee and 200 grams of Chicory gives 100 Cups of 120 ml coffee, 1 cup of coffee contains approx. 10 grams of coffee powder and 2 grams of Chicory). Cost of Chicory per kg is ₹ 70 | 5.70 | ₹ 25/cup for 100 cups 2500 | ₹ 10.30 per cup ₹ 1030/Kg |
| | Cost of Milk + Sugar + miscellaneous including labour | 9 | | |
| | Total Cost per cup of coffee (120 ml) | 14.70 | | |
| | For 100 cups | 1470 | | |
| | | | | |

strategy involves specifying ways and means of improving the participating actors so that there is an overall improvement in efficiency, efficacy, competitiveness of value chain. The present study is focussing on upgrading strategies for the coffee farmers as the value chain analysis indicates coffee farmer share in the consumer rupee is too low. Upgrading can be defined as coffee farmers moving to higher value activities to increase value addition, capabilities and benefit from the production (ICO, 2020). In coffee value chain common upgrading activities are: (1) *Product upgrading*, which refers to quality enhancements that enable the coffee farmers to tap into the Gourmet or premium, specialty coffee segment (Moyer-lee and Prowse, 2012); (2) *Process upgrading*, which means increasing productivity (improved varieties, Mechanization, good agricultural practices) and minimizing the per unit cost of production (Tian, Dietzenbacher, and Jong-A-Pin, 2019); (3) *Functional upgrading*, which requires assuming new roles, such as production of value added coffees viz., Roast & Ground coffee, Instant coffee and ready-to drink coffee products (Li, Frederick, and Gereffi, 2019).

The study found ample opportunities for the coffee farmers to move up in the value chain and most of these efforts are individually motivated. Small number of the sample farmers (04) were found to engage in specialty coffee production by estate branding based on the place of origin, different

methods of processing (e.g. honey processed coffee) etc. It was also witnessed that a couple of sample respondents were involved in production and marketing of organic coffee.

Few sample respondents (09) in the study area certified their farms with Voluntary Sustainable Standards viz., UTZ, Rainforest Alliance and Fairtrade etc. During the survey, sample respondents were informed that, they are getting premiums for these differentiated coffees. Further, it was found that, one large coffee farmer was exporting their coffee directly without any intermediaries. However, all these efforts are specific to few farmers, with the majority of the farmers involved in the production of coffee for conventional commodity markets. During the survey, it was recorded that, although many smaller farmers interested in taking up specialty/differentiated coffee production and exporting their coffees directly but they do not have the capital to install Eco-pulper, curing unit and roasting machines, which is a challenge for small coffee growers.

Since, it is a challenge for individual small coffee grower to take up value addition activities on their own, a group of small growers can come together and organize themselves to form Farmer Producers Organization (FPO's) for benefitting from several governmental programmes, reduce cost through infrastructure sharing and increase profitability

through collective bargaining power in input and output markets thereby moving up in the value chain by taking up value addition activities (roasting & grinding), differentiated coffee production (specialty and certified) and direct marketing. Further, it is imperative to bring the transparency and efficiency in coffee value chain with wider buyer network by implementing integrated digital platform like Block Chain based marketplace for all the stakeholders involved in the coffee value chain.

CONCLUSION

Coffee from bean to cup undergoes various processing stages. At each stage the value added to it and net returns realized increases. The study results indicate starkly contrasting situations of higher margins on the processing side (downstream) and lower margins for small coffee growers on the other side (upstream) of value chain. Thus, small coffee growers are getting a smaller share in the profit of the value addition process. Hence, there exist an opportunity for the coffee growers to capture more of the final retail price by moving up in the value chain by taking up value addition activities and direct marketing to consumers.

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