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## Whether an Effective Innovation System is Inevitable for Sectoral Value Chain Development? Evidence from Coconut Sector in Kerala<sup>§</sup>

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### Abstract

The study has integrated the concept of sectoral system of innovation and value chain theory to find the regional dynamics of an evolving commodity chain. It has captured the reflections of tender coconut sector from the comprehensive study conducted in the Kasaragod district of Kerala. The coconut innovation system in India lacks strategic collaboration among various stakeholders and therefore is characterized by an array of actors/agencies operating at various levels without channelizing their efforts for the enhancement of the sector. The characteristics of this weak sectoral system are apparently reflected in tender coconut sector. The tender coconut value chain of Kerala has been found middleman-driven, which offers only a meager value share to the producer/farmer. For upgradation of position in the chain, the producers should proactively function in a group mode and should integrate the domestic value chain. According to the study, for ensuring a bargaining position for the producer, the chain should be restructured from the middleman-driven one to producer-driven. The study has argued that the support of an effective sectoral system of innovation is inevitable for the development of the sub-sectoral commodity chains.

**Key words:** Sectoral system of innovation, value chain governance, coconut sector, tender coconut, Kerala

**JEL Classification:** P3, Q13, Q18

### Introduction

The coconut economy of India<sup>1</sup> is facing one of the most awful crises on account of price stagnation, low productivity, low demand and less profitability. Despite significant contribution of coconut to economy, nutritional security and health care, coconut farming in India has become unremunerative<sup>2</sup>. The coconut farmers are confronted more with market-related problems rather than the technological challenges which resulted in low productivity in the farm. The

failure to move up the global value chain and thereby resisting the market pressure on domestic prices in an open economy environment is arguably one of the major causes of price rigidity of coconut in India (Lathika and Ajithkumar, 2009; Harilal, 2010). The

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§ The paper is part of the project titled 'Policy oriented research on palms and cocoa' funded by Central Plantation Crops Research Institute, Kasaragod during 2012-13.

<sup>1</sup> India ranks first in coconut productivity with an annual production of 8300 nuts per ha. Globally, India is the second largest producer of coconuts and has the third largest area under coconut. The coconut palm exerts a profound influence on the rural economy of many states of India where it is grown extensively and provides sustenance to more than 10 million people.

<sup>2</sup> While the prices of coconut and coconut oil have remained high in India since 1995, a sharp drop has been witnessed since 2000. Hence, it is difficult for a farmer, who is entirely dependent on coconut mono cropping, to support livelihood of the family.

significance of tender coconut<sup>3</sup> production and marketing, which is otherwise an inconspicuous element in the coconut product basket, arises exactly at this context. Although tender coconut has been a delicacy for Indians from time immemorial, it was never a commercial proposition and there was no lucrative market for it. Earlier, there was an emerging market for tender coconuts in tourist centres and nearby places. However, in recent times the market for tender coconuts has spread to most of the urban centres in India and it is slowly entering the food and beverage baskets of the people. The annual demand for tender coconut in the country is around 2300 million nuts, which is approximately 15 per cent of its total production in the country. In this context, it is relevant to study the tender coconut markets in India for two reasons: (i) lack of genuine statistics on the tender coconut market, and (ii) it is another form of demand for coconut, and the study would be useful for policy framework on coconut and its products.

In this study, we have hypothesized that the tender coconut sector is experiencing an evolving market regime, and it is appropriate to view the sector in the value chain framework<sup>4</sup>. The value chain provides more insights on relationships among stakeholders, the pricing mechanisms, value-sharing pattern and power relations (Dolan and Humphry, 2004). In this respect, important barriers for producers in a developing country are the lack of an enabling environment offering institutional and infrastructural support and effective co-ordination in value chains. In particular, the small-scale producers are at a disadvantage because they have little capital to invest, use traditional techniques and lack contacts with market players (De Janvry and Sadoulet, 2005; Daviron and Gibbon, 2002; Reardon and Barret, 2000).

Essentially, the tender coconut sector has been viewed as a sub-sector of the innovation system of

coconuts, and therefore to fix the operating environment appropriately and nuances of the sub-sectoral relationships between different agents, we first tried to understand the sectoral system of innovation (SSI)<sup>5</sup> of the coconuts in India. Malerba and Mani (2009) have referred networks to the market and non-market relationships between firms and actors within any sectoral system and have stressed that in an uncertain and changing environment, formal as well as informal networks emerge. It has significant importance in the case of coconuts in general and tender coconuts in particular, because the tender coconut sub-sector in India is in the early stages of development and therefore, uncertainty and changing environment prevail in this sub-sector.

In this backdrop, this study has been conducted at the district level (Kasaragod in Kerala) with two objectives (i) to look at the marketing pattern, market structure and behaviour of the tender coconut supply chain, and (ii) to analyze the value chain relations, constraints, and governance structure in the domestic tender coconut chain and provide policy suggestions. Kerala was selected for the study as it is the leading coconut producer in the country with an annual production of 5800 million nuts (45 % of the total production of India). Moreover, the coconuts are inextricably linked with the regional economy of the state wherein more than 20 per cent of the agrarian revenue is derived from the coconut and allied activities.

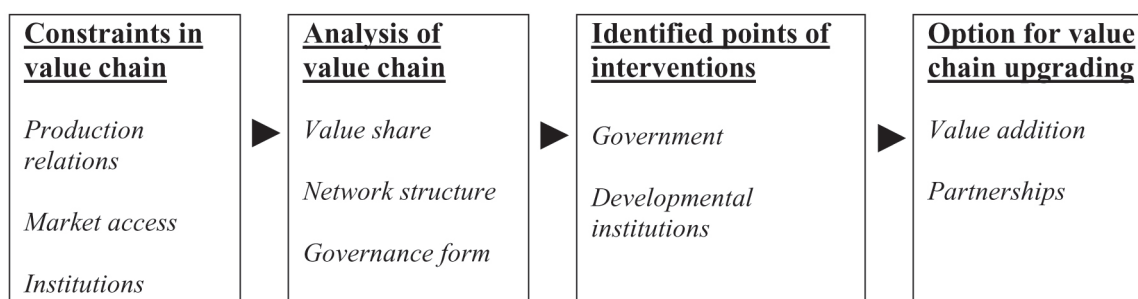
## Data and Methodology

In the study, sectoral system of innovation framework has been used to explain the technology generation-diffusion mechanism of the coconut sector in India. Six major components which constitute the coconuts innovation system of India, were delineated and attempt has been made to understand the existing

<sup>3</sup> Five to seven months old coconuts can be categorized as tender coconuts. The water of tender coconut, technically the liquid endosperm, is the most nutritious wholesome beverage that the nature has provided to the people of the tropics to fight the sultry heat. It has calorific value of 17.4 per 100 grams.

<sup>4</sup> Value chain is conceptualized as a network of horizontally and vertically related actors/firms that jointly aims at/works toward providing products or services to a market. Value chain analysis originates from the commodity chain approach (Gereffi, 1994) and investigates relationships between the participants in the chain. In this theoretical stream, power relationships and information asymmetry are the key concepts (Gereffi, 1999; Gibbon *et al.*, 2008).

<sup>5</sup> Sectoral Innovation System approach was proposed by Malerba (2002, 2005). He defines a sectoral system of innovation and production is a set of new and established products of specific uses and the set of agents carrying out market and non-market interactions for creation, production and sale of these products.



**Figure 1. Framework for value chain analysis of tender coconut in Kerala**

innovations process, relationships between various actors and the bottlenecks in the technology delivery mechanism. The micro level study on the tender coconut value chain was fixed in the operating environment of coconuts innovation system. A complete enumeration of tender coconut outlets in the Kasaragod district was done with the assumption that all the tender coconut outlets are exclusively located on the road sides. We surveyed the national highway passing through the district, state highways (including interstate roads), all important by-roads, municipal corporations, towns and places surrounding hospitals to avoid any omission. The study was conducted in four phases. In the first phase, basic information regarding the distribution and sales pattern of tender coconut was collected and in the second phase, complete enumeration was carried out. In the third phase, an error-correction survey was done in some pockets to correct any omission/additions and in the fourth phase, the key personnel/stakeholders were interviewed.

The study was conducted during three seasons (summer/winter and rainy) in the year 2011-12 to capture the seasonal variations as well as to learn the accurate estimation of annual selling pattern of the tender coconut. Major respondents of the study were tender coconut vendors/shop owners. The procurement pattern was studied and the immediate suppliers/middlemen/agents constituted another group of respondents. The coconut Farmers were the third group of respondents. For value chain analysis, the theoretical frame proposed by Jacques (2011) was adopted wherein

the value chain was characterized by its network structure, governance pattern and the way value is added. Firstly, the vertical and horizontal dimensions<sup>6</sup> of the flow of tender coconut in the chain were studied. Then constraints were identified encompassed production relations, market access, infrastructural and institutional facilities, and other related issues hampering the smooth functioning of the chain. Thereafter, value chain analysis was carried out to understand the flow of product, the value added, governance structure and price discovery mechanisms. Lastly, some possible options of interventions were drawn for the better functioning of the chain and also identified the value chain upgrading options. It has been depicted in Figure 1.

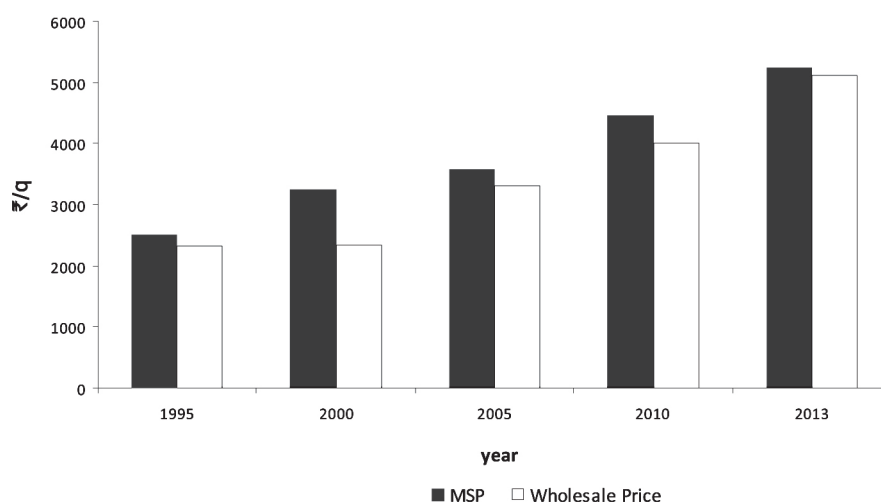
## Results and Discussion

### Sectoral System of Innovation in Coconuts

The innovation system for coconuts in India is unique wherein several governmental agencies/institutes undertake the research and development for the commodity, with evidently lacking collaborative efforts. Six components delineated in the sectoral innovation system of coconut were: (i) Central Plantation Crops Research Institute (CPCRI) is the spearhead of technology generation for coconut production. The Agricultural universities of Kerala and Tamil Nadu<sup>7</sup> have also been working on coconuts for a long time. (ii) At the policy level, Coconut Development Board (CDB) is the key organization, which is a statutory body under the Government of

<sup>6</sup> Vertical dimension reflects the flow of produce and services from primary producer to end consumer and the horizontal dimension reflects relationship between actors in the same chain link (between farmers, traders, etc.)

<sup>7</sup> For instance, Kerala Agricultural University has released five coconut hybrids (keraganga, lakshaganga, anandaganga, kerasree and kerasoubhaga) and Tamil Nadu Agricultural University has released three coconut hybrids (VHC-1, VHC-2, VHC-3).



**Figure 2. A comparison of MSP and market prices of copra in India, 1995-2013**

India for the integrated development of coconut production and utilization in the country. The thrust areas of CDB include increasing production of quality planting material, creating production potential by bringing more area under coconut, improving productivity of the existing coconut holdings, and undertaking integrated management of major pests and diseases. (iii) For marketing aspects of coconuts, National Agricultural Cooperative Marketing Federation of India Ltd (NAFED), established in 1958, has been entrusted to procure the copra from market at the minimum support price (MSP) in the event of market price crash. However, the procurement system of copra in India has been ineffective, and it has never elevated the market prices (Figure 2). From the NAFED's point of view, the agency, though could procure large quantum of copra and has the capacity to convert the copra into coconut, never finds the market to push their product with at least a minimum margin. (iv) The unorganized producers with small and marginal holdings constitute the fourth component of the coconut innovation system. (v) The intermediaries in the coconut sector operate in a very large grey area forming syndicates, lobbies and also practise the copra/coconut oil hoarding which causes continuous price fluctuations in the market (Jayasekhar *et al.*, 2014; Jnanadevan and Jayasekhar, 2011). (vi) The consumers of coconut and coconut products, these include a large number of households as well as industrial consumers.

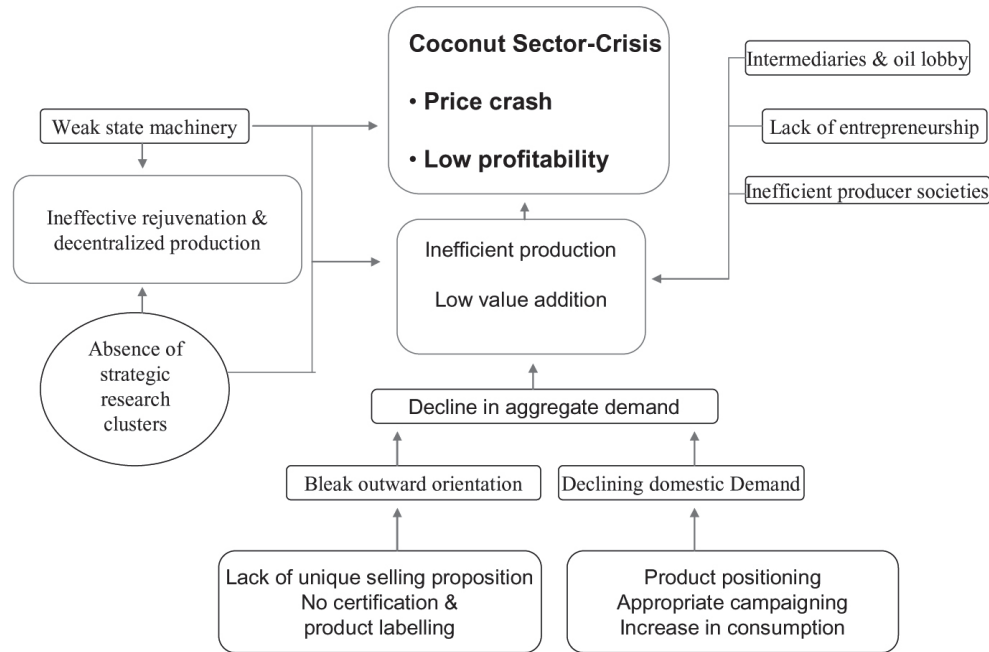
In an earlier study, Mani and Santhakumar (2011) have observed that there is no direct link between activities of different stakeholders in the coconut sector.

They have also noted that co-ordination across research agencies and concerted effort of developmental agencies are the missing links in the coconut sector of India. This has apparently reflected in the technology channelization and technology adoption in many ways. It has also been reported that coconut hybrid adoption in Kerala is meager 12 per cent and the adoption rate of technology is low (Radhika *et al.*, 2012).

The current sectoral innovation system of coconuts in India is depicted in Figure 3. India has huge strengths on the research front of coconut, but unilateral increase in productivity is not the sole solution for the sectoral crisis. The lack of price stability, inadequate price support mechanism and marketing facilitation are the other factors detrimental to the functioning of coconut value chain. The lack of effective group coherence and professional approach (among different stakeholders) are still the problematic facets. An effective monitoring and management of value chain system with appropriate horizontal and vertical linkages along with price support system would play a crucial role in the formation of a vibrant coconut sector in the country.

### Market Structure and Marketing Pattern

In the Kasaragod district, 129 retail outlets of tender coconut were observed. The majority of vendors (54 %) sold around 100-200 nuts per day; they were categorized as medium-scale vendors (Table 1). About 37 per cent of the vendors sold less than 100 nuts per day and they were categorized as small-scale vendors. Those who sold more than 200 nuts per day were put



**Figure 3. The sectoral innovation system of coconuts in India — A schematic depiction**

**Table 1. Classification of tender coconut vendors**

Category	Nuts sold/day	No. of vendors
Small	Less than 100	48
Medium	100-200	70
Large	200 and above	11

under the large-scale vendor category and they constituted 8.6 per cent of the total retail outlets. It is worthwhile to note that the different categories of vendors have distinguished attitudes towards the tender coconut business. For instance, the small vendors mostly own a small retail shop and keep 50-60 tender coconuts for sale. It was observed that most of the small vendors were not particular about the regular procurement of nuts for sale. They lacked the permanent/long-term association with the supplier. The tender coconuts were being procured from any supplier on cost basis without considering quality and variety of coconut.

The medium-scale vendors had a more serious outlook and exhibited enterprising attitude towards the tender coconut business. They had regular suppliers and were cognizant about the quality of tender coconuts. They also provided a regular supply of nuts to the customers. The large-scale vendors earned their

livelihood exclusively from the tender coconut. They had regular suppliers (single supplier in most of the cases) and had excellent rapport with the supplier. They had understanding with the suppliers to provide nuts on short-term credit. They did believe that they had the responsibility to supply good quality nuts to the customers. The analysis revealed that as the sales turnover increased, the vendor tended to stick to regular suppliers and the enterprising attitude of the vendors was directly related with the volume of sale.

In the study, the survey was conducted during three seasons, viz. peak season (April-May), normal season (October-March) and lean season (June-September). The weighted average according to the months of sale was computed to arrive at the estimated average figure. The approximate per day consumption of tender coconuts in the district was estimated to be 10066, with high of 13728 in peak season, 10082 in normal season and 5156 in lean season.

The distribution of tender coconut sales in the district was found to be skewed with Kasaragod municipality (town) accounting for 38 per cent of the district sales (Figure 4). Surprisingly, in some of the important townships in the district we could hardly find any retail outlet.

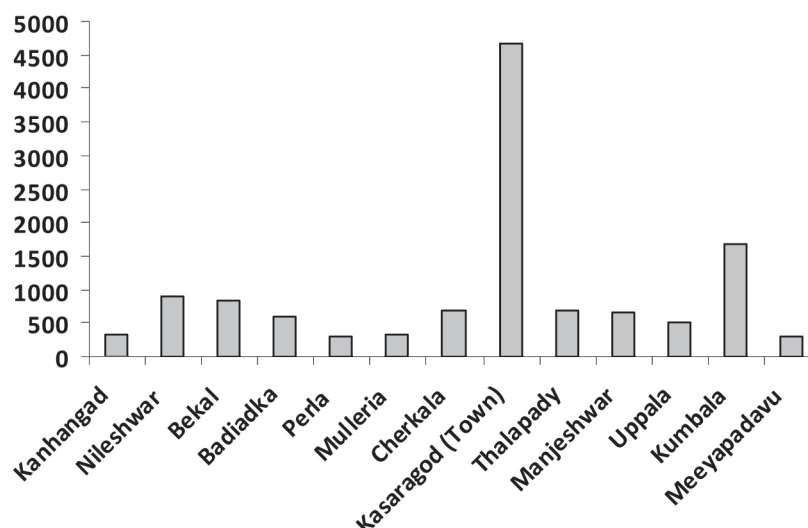


Figure 4. Tender coconut marketing pattern in Kasaragod district (nuts sold/day)

A question therefore arose why the sales in the district was so skewed? The study revealed that availability (supply) of the nuts on a continuous basis was the most decisive factor affecting the sales at least in the short-run. In the Kasaragod township, the major share of the total supply of tender coconuts was provided by a single supplier whose supply chain could be traced back to the far off coconut gardens in Karnataka state. Moreover, he had excellent logistics and provided assured year round supply to the vendors.

On the other hand, in a small township 'Kumbala', a tough competition was observed among suppliers and the vendors had a choice and better bargaining power. In this place, there were numerous suppliers and if the nuts were not supplied in time, the vendor switched over to another supplier. In contrast to this, in many other small places in the district, there existed a relationship marketing in which the vendors shared socially embedded relation with the local supplier and would never switch over to other suppliers even if the nuts were not supplied for days together. It was quite interesting to observe such multiple modes of procurement pattern in the district, which literally refuted all the conventional theoretical paradigms. On one side, a complete domination of a single supplier and on the other side, a trust-based relationship with the suppliers. Besides, some semi-integrated value chains were also observed, in which a vendor himself takes care of the forward and backward linkages of the supply chain. In some exceptional cases, the producer himself shapes a fully integrated supply chain where

he harvests the nuts employing his own permanent labourers and assumes the role of an intermediary by transporting the nuts to the markets where the product fetches the best price. Excellent examples of arm's length transaction<sup>8</sup> business pattern were also observed, especially among small vendors who hardly concerned for the continuous supply of tender coconuts.

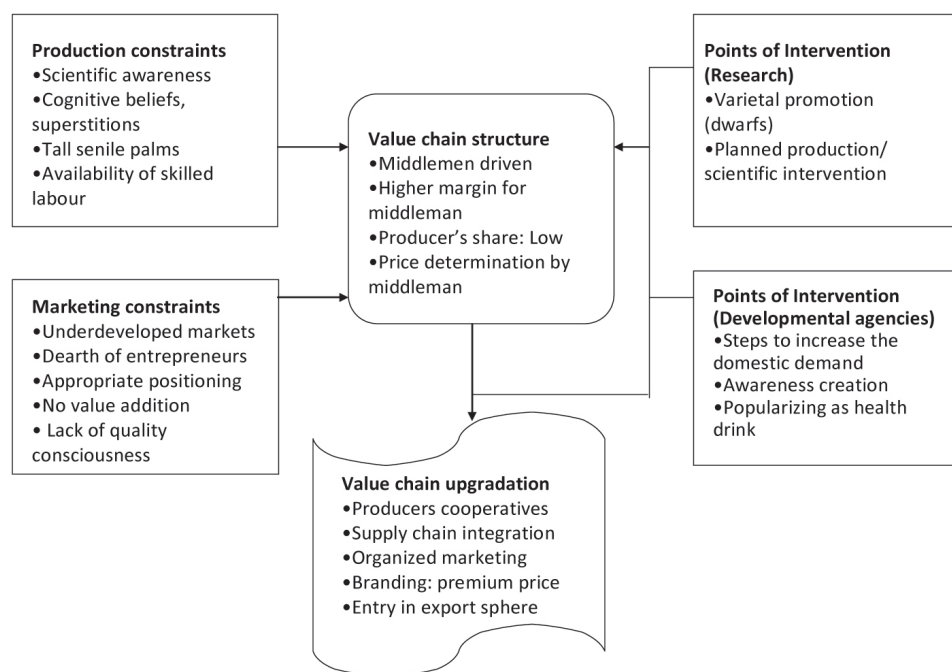
While examining the spread of market margin and distribution of value share (Table 2), the producer's share in the consumer rupee was found 47 per cent. Evidently, it was not an appreciable value share, especially when there was hardly any value addition. But, certainly the components like skill (climbing), labour availability, and knowledge of market network are the factors on which most of the farmers have very little control. Due to these factors, middlemen could exploit and earned a good value share of the domestic chain. The poor awareness of producers about the distribution network act as a constraint to market access and upgradation in the value chain (Giuliano *et al.*, 2005).

Evidently, the tender coconut market of the district is in the nascent stage with not much value chain upgradation among the actors (stakeholders). Weak infrastructure hampers efficient product and market information across the chain. Several institutional voids were observed in terms of market access, value

<sup>8</sup> A transaction in which the buyers and sellers of a product act independently and have no relationship to each other.

**Table 2. Distribution of value share in the tender coconut market chain**

Stakeholder	(₹/nut)			
	Selling price	Marketing cost	Margin	Share (%)
Farmer	7	-	-	46.67
Middleman	12	2.50	2.50	33.33
Vendor	15	0.75	2.25	20.00

**Figure 5. A schematic representation of tender coconut value chain analysis**

upgradation and organized marketing system for tender coconuts. The regulative government institutions have a big role in the tender coconut market systems, especially when both coconut prices and demand are on decline. The leverage points as well as the weaknesses of the domestic value chain of tender coconut should be thoroughly scrutinized to formulate the necessary policy regulations in this regard.

### Value Chain Analysis

In the tender coconut value chain, there was no entry or exit barrier at the vendor level. Conversely, at the middlemen level, entry barriers existed in different forms like skilled activity (climbing), market network knowledge, negotiation skill, logistics support, liquidity in hand, etc. On examining the horizontal linkages in the value chain, no cooperative movement was observed at any node, and the lack of institutional

support hampered the value upgradation of actors in the chain.

The difference in market power and dependency relationships has depicted a clear impact on the governance regime in trade relations. In this respect, small-scale producers depended mostly on the downstream parties of the chain, such as intermediaries, transporters, etc. for credits and market access (Kaplinsky, 2000; Bacon, 2005; Schmitz, 1999). The large suppliers (big middle men) in the sector were the price leaders of the market, who could influence the pricing pattern to dictate terms due to their better bargaining position in the market chain. The local suppliers (small-scale intermediaries) were the price takers.

The main features of the tender coconut value chain have been depicted in Figure 5. It was observed that there were no scientifically laid out gardens exclusively

for tender coconut production. As a matter of fact, the Central Plantation Crops Research Institute had released improved varieties<sup>9</sup> for tender coconut production. It was observed that more than 70 per cent of the nuts sold in the Kasargod town were sourced from Karnataka. Most of the coconut palms in the district were senile and tall which made the harvesting difficult. Therefore, lack of planned production as well as looming disinterest among the producers were the key hindrances in the production relations. During interaction, many farmers opined that plucking a tender coconut was a sin. There were several apprehensions also among the farmers regarding detrimental effects of tender coconut harvesting.

### Conclusions and Policy Implications

The study has concluded that the sectoral innovation system of coconut in India is functioning at sub-optimal levels. The tender coconut market scenario in India has been examined through the case study of Kasaragod district, Kerala. The study has examined marketing pattern, market structure and marketing efficiency in the tender coconut chain. It was initiated with the hypothesis that the tender coconut sector is in the nascent stage and experiencing an evolving market regime and the results of analysis have validated this hypothesis. However, the perceived consumption trend of the tender coconut in the district is on an augmented growth trajectory.

The study has identified important value chain constraints at production and marketing levels. The producer (farmer) enjoys very little bargaining position in the chain. Although multiple modes of governance and power relations were observed in the chain, it is predominantly a middleman driven chain. Direct deliveries from farmers to the retail outlets will reduce the transaction cost and will improve the market intelligence in terms of pricing and consumer demand. Contracts combined with transparent and formal credit facilitation between vendors and retailers may be the best guarantee for a sustainable tender coconut sector in the state. For this, the marketing should be a group activity and the government (institutions) should play a much stronger role in enforcement of legislation that supports this development. There is a huge potential

for the organized development of the tender coconut sector in the Kasaragod district, which has been declared as the first organic district of the Kerala state. There is a need to initiate a large-scale scientifically planned production programme in the district. It is also important to restructure the chain governance from middleman-driven to producer-driven, thereby improving the value share of the producer in the chain. Efforts should also be made to upgrade the activities from the domestic chain mode to the global value chain by introducing appropriate export orientation.

### Acknowledgements

The authors are grateful to the reviewer for valuable comments that helped to significantly improve the manuscript.

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<sup>9</sup> Among the dwarf varieties, 'Chowghat Orange Dwarf' (COD) has very good quality of tender coconut water and is suitable for cultivation in all states

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