International Journal of Innovative Horticulture. 8(1):72-80, 2019 **Original Research Article**

Upgrading a Coconut Value Chain: Empirical Evidence from North Kerala

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ABSTRACT

There is a need to empower the coconut farmers to overcome structural constraints of the sector in terms of fragmented holdings, non-uniform levels of knowledge, skill and resources, and prevalence of non-transparent and multi-node marketing channels, to become globally competitive. Utility of a value chain framework in this regard was tested under World Bank assisted National Agricultural Innovation Project on 'Value Chain in Coconut' which was implemented in Kasaragod district of Kerala. Baseline survey was conducted to benchmark and to identify the constraints preventing better value realization in the value chain segments (production, post-harvest handling, processing, and marketing). Upgrading of coconut value chain was achieved through (i) horizontal coordination of important nodes as well as management of human capital, (ii) process upgrading to improve operational productivity; and (iii) product upgrading to improve strategic productivity. In the first instance, 10 Community Based Organizations of farmers were formed that covered 250 ha area and 534 farmers. For increasing the operational productivity, appropriate production technology-interventions such as (a) cultivation of intercrops, (b) growing of leguminous green manure crops in the coconut basin and its incorporation, (c) integrated nutrient management including organic recycling, and (d) need based plant protection measures, were implemented. Average net returns due to enhanced operation al productivity of value chain was Rs.200,201 per ha against the baseline value of Rs.44,981. Product upgrading was achieved through development of 14 protocols for value added products and conducting marketing studies: Four Women Self Help Groups were formed to produce coconut value added products. Value addition through product diversification had the potential to provide a net profit of Rs.200,000 per ha. This study establishes the scope for enhancing coconut value chain productivity through adoption of improved production technologies, better coordination in procurement, and community level processing and thus, will be a benchmark for extension strategies having a value chain perspective.

Keywords: Coconut, marketing, NAIP, production constraints, value addition, value chain

INTRODUCTION

Coconut is cultivated in geographically contiguous extents in India either as a homestead crop or as plantations that makes it a prime sector of economic activities in those regions. The country has at least five well established processing lines in the coconut sector besides its use as raw nuts for domestic and religious purposes. They are copra and coconut oil; desiccated coconut; tender coconut; coconut fibre; and products from shell. Till the late 1980s, the price of coconut was stable with intra year range of monthly price below Rs. 300 per 1000 nuts. But in 1981, it increased to Rs. 668 and later went well above Rs. 1000 in many years. Owing to price fluctuations and increase in cost of production, quite often, farmers were compelled to sell their produce at a loss. This situation also has a toll on crop husbandry and adoption of technologies for coconut farming. On the other hand in an open economy, agriculture sector has to be extremely competitive so as to meet consumer demands for products of international quality standards. With a focus on this issue, in several reports it is suggested that enterprise diversification and community level value addition are the key activities to make coconut farming competitive (Sairam, *et. al.*, 2004; Anithakumari *et. al.*, 2011; Krishnakumar *et. al.*, 2013). An issue stems out immediately is the volatile nature of prices of value added products as even a marginal increase in the market arrival of such products may results in drastic reduction in price (Birthal *et. al.*, 2007). Moreover, marketable surplus of individual farmers would be too small to be traded remuneratively in distant markets due to lack of access to market information, transport network and other logistics (Reddy, 2013). Kalavathi and Anithakumari (2011) reported

that the coconut producers' groups in Kerala have limitations like unorganized markets, inadequate government support and lack of permanent establishment and infrastructural facilities for storage and processing. Further, the structural constraints of the sector in terms of fragmented holdings, non-uniform levels of knowledge, skill and resources, and prevalence of non-transparent and multi-node marketing channels are also to be overcome by an individual coconut farmer to achieve market competitiveness. Some of these issues studied earlier that include clustering of coconut farmers in the root(wilt) disease affected area (Anithakumari, 2008); potential of farm level value addition (Anithakumari *et. al.*, 2011); and coconut based farming systems as adopted by farmers (Thamban *et. al.*, 2006). However, comprehensive studies on issues related to production, post-harvest handling, processing and marketing with an objective to achieve competence have so far not been reported. Such an analysis could be best performed under the frame work of value chain. Value chain analysis would help to develop competitive strategies, understand the source(s) of competitive advantage, and identify and/or develop the linkages and interrelationships between activities that create value (Porter, 1985). Furthermore, smallholders' participation in the global value chain is expected to enhance productivity and competitiveness (World Bank, 2008). With this focal theme, the Indian Council of Agricultural Research initiated research on 'Production to Consumption System' under the World Bank assited National Agricultural Innovation Project (NAIP). As part of this project, research on coconut value chain was attempted at ICAR-Central Plantation Crops Research Institute, Kasaragod: The salient findings of the project are the major motivation of the present research paper.

MATERIALS AND METHODS

The project on 'Value Chain in Coconut' was implemented in Kasaragod district of Kerala state during the period 2008 to 2012. Geographically it is situated between 12°02' 30" to 12°46' 50" north latitudes and 74°52 '30" to 75°25 '31" east longitudes. The district receives more than 3000 mm rainfall a year of which 88% is only during June to August leading to long dry spells during the subsequent months. Majority of the cultivated area in the district has gravelly laterite soil (62%), the other soil types being sandy (6%); loamy (12%); sandy/laterite loam (5%); and forest soil (15%).

Coconut is the principal crop in the district covering an area of over 63000 ha and is cultivated in all the 38 panchayats. Its cultivation started several centuries ago and thus evolved a trade of its own, but not described in terms of well-defined nodes of its value chain. Therefore, to understand the existing value chain, a survey was conducted during August-September 2008 to collect base line data which was used for describing the coconut value chain and identifying constraints for better value realization. Cluster sampling method was followed for collecting data at holding level: Farmers belonging to 25 ha of contiguous coconut holdings constituted a cluster; one cluster was formed in each of the eight randomly selected panchayats. A structured and pre-tested interview schedule was employed for data collection from a total of 408 farmers. Data on industrial units adopting coconut processing and community level initiatives for coconut value added products were collected from secondary sources.

The constraints in value realization were prioritized through a participatory approach for which a series of meetings involving various stakeholders (researchers, farmers, extension officials of agriculture and allied departments, credit agencies, local self governments) were held. Technology interventions identified to strengthen the coconut value chain in the district were carried out during the period 2008 and 2012. Activities related to enhancing production was implemented in 250 ha area belonging 534 farmers grouped into 10 clusters representing diverse agro-climatic conditions of the district. The scope of product diversification in coconut was achieved by developing 14 processing protocols, four types of machinery and one pilot plant. To ensure continuous supply of value added products for marketing studies, four Women Self Help Groups (SHG's) were formed. Consumer preference studies, consumer awareness programmes, and comparison of alternative channels of marketing were carried out for coconut chips and Virgin Coconut Oil (VCO). A schematic presentation of the value chain that was in operation and activities initiated/augmented as part of its upgrading under NAIP is shown in Fig. 1.

As value chain is dynamic (Kaplinsky and Morris, 2001), approach on its analysis was evolved during the implementation phase of interventions and later refined following the guidelines as in UNIDO (2009) and Webber and Labaste (2010). For a specific research inquiry, research questions were framed for the chosen point of entry to the value chain. Upgrading of value chain was attempted by acquisition of technological capabilities and market linkages to improve competitiveness and move into higher-value activities as suggested by Kaplinksy and Morris (2001). Economic analysis was carried out as per the framework proposed by Das (1982) for small-holder plantation crops.

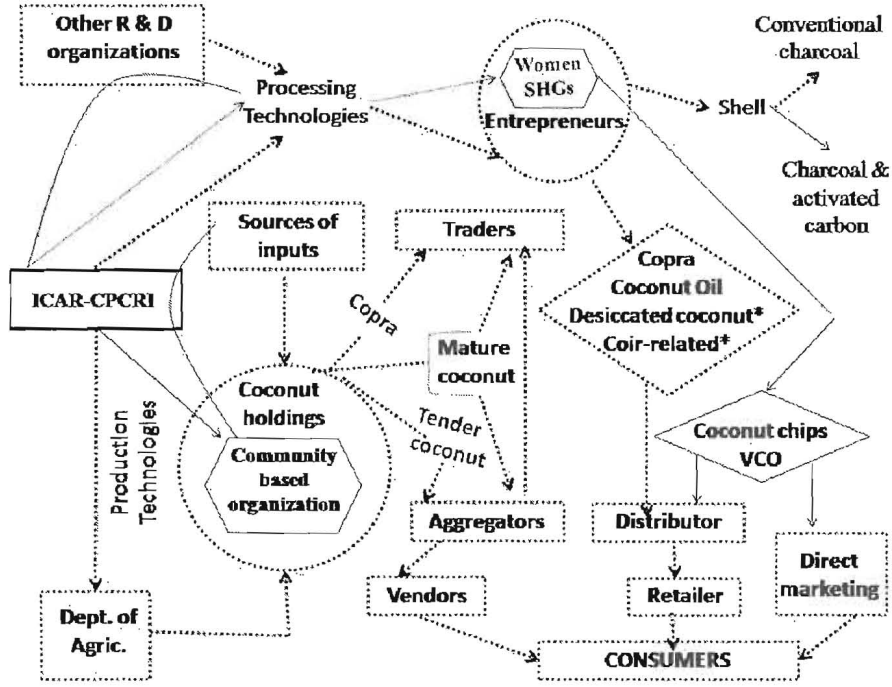

Fig. 1: Flow diagram of the upgraded coconut value chain. The dotted arrows indicate the activities that were in practice. Line arrows indicate activities related to interventions carried out as part of National Agricultural Innovation Project

RESULTS AND DISCUSSION

A commodity value chain will have the agricultural production as its primary activity (Bockel and Tallec, 2005) and many 'sub-chains' will be in operation related to the upstream (seed, inputs, machinery etc.) and downstream (aggregation, commodity-marketing, processing, and consumer-marketing) flow of activities. Analysis of a value chain thus starts with demarcation of its boundaries followed by identification of activities, agents responsible and functions. Broadly the coconut value chain may be segmented into four parts viz., production, post-harvest handling, processing, and marketing. Major activities in these segments and shortcomings observed are described below along with benchmarking as per the base line survey.

The production segment

Coconut holdings in Kasaragod district are mostly homesteads having area less than 0.5 ha (45%): Holding having area > 2 ha is only 6.5%. As tiny-holdings are not contributing much to the commercial operations, in the study, holdings of size < 0.2 ha were excluded. Accordingly in the sample, 28% holdings were in the category of 0.2 to 0.5 ha and 57% holdings in the category of 0.5 to 2.0 ha. Predominance of small and marginal holdings indicates the relevance and importance of adopting group approaches in farming for effective use of improved agricultural practices.

The local Tall type, West Coast Tall, alone was observed to be cultivated in the selected holdings: Number of Dwarf type of palms was only 153. As harvesting tender coconut from tall palms is laborious, coconut farmers in the district are constrained to realize the price advantage for tender coconut. This is also reflected in a study conducted by Jayasekhar *et. al.* (2014) where it was reported that more than 70% of tender coconut requirement in Kasaragod district is met from Tumkur district of Karnataka.

The age-wise distribution of coconut palms indicates that only 2% palms belong to the juvenile group (less than 5 years of age). This implies that in the recent years farmers are not undertaking any new planting of coconut. The situation needs further attention that even after loss of many palms due to bud rot disease in many parts of Kasaragod district (Rohini Iyer and Reshmi, 2005), replanting with new coconut seedlings was not carried out by the farmers.

Though many crops were found to be grown in the coconut gardens, only one or two crops were cultivated in 54% of the holdings as intercrops. Most commonly cultivated intercrops in coconut holdings are black pepper and banana. Plant density for intercrops in majority of the holdings was much below the optimum (Table 1). For instance, against the average number of 104 coconut palms per holding, only 38.8 black pepper vines and 36.9 banana plants were grown. Underutilization of interspaces was also reported

in other coconut growing tracts in the country (Sud *et. al.*, 2004, Thamban *et. al.*, 2006; Krishnakumar *et. al.*, 2013). Importance of crop diversification and intensification in providing stable income to the farmers is highlighted in many studies and reports. Nevertheless, coconut farmers are not fully utilizing intercropping opportunities. Non-availability of quality planting material, constraint in producing marketable quantity of produce, labour availability and water scarcity are the major limiting factors for adoption of intercropping as opined by farmers during the survey.

Table 1: Inter/mixed cropping in coconut garden

Intercrops	Holdings having intercrops cultivated		Average number of intercrops per holding	
	Number	Percentage	Holdings with intercrops	Overall
Pepper	217	53.19	72.8	38.8
Tree spices	18	4.41	9.9	0.4
Banana	196	48.04	76.8	36.9
Pineapple	65	15.93	332.5	53.0
Ginger	23	5.64	9.3	0.5
Turmeric	28	6.86	6.1	0.4
Tapioca	53	12.99	78.7	10.2
Yams	85	20.83	31.7	6.6
Colocasia	76	18.63	12.3	2.3

It has been observed that mixed farming is practiced in 35% of the holdings. However, only a few farmers (2%) were adopting cultivation of fodder grass despite the fact that shade tolerant varieties are available for cultivation in the interspaces of coconut.

Basin opening and application of organic manures were the most commonly practiced operations in the coconut holdings (97.3% and 88.4%, respectively). It was observed that farmers are not applying organic manures in adequate quantity (Table 2). Thus there is scope for organic recycling through vermicomposting and cultivation of green manure crops in coconut garden. This becomes all the more important in the context of growing awareness among coconut farmers about the concept of organic farming. Application of chemical fertilizers in the recommended doses, at appropriate time, and through suitable method is an important component of integrated nutrient management practice for sustainable coconut production. Chemical fertilizer is applied in 50% holdings. Lack of knowledge about the correct dose and frequency of application of fertilizers limits the adoption of balanced nutrition of crops cultivated.

Table 2: Type and quantity of organic manures applied in coconut holdings

Type of organic manure	No. of holdings	Percentage to the total adopted holdings	Average quantity applied (kg/palm/ year)
FYM/cow dung	145	64.5	20.8
Green leaves	327	80.2	18.4
Compost	11	2.7	17.0
Vermicompost	5	1.2	14.0
Branded organics	42	10.3	6.1
Neem cake	105	25.7	2.6

Adoption of plant protection technologies was observed to be very low (3.4%). Incidence of bud rot disease was observed in 84.1% holdings surveyed with one or two affected palms. However, in 25% of the holdings, the incidence was severe with a crop loss of 16 palms per hectare. Removal of affected palms is an important component of IDM for bud rot disease, but farmers were not adopting any action for want of compensation from the Government. Farmers were also not taking any prophylactic measures to prevent the spread of the disease. The stem bleeding disease of coconut, which will result in gradual reduction of yield, is another major disease in the area. Though the control of the disease is relatively easy either with fungicides or with biocontrol agents, farmers were not aware of these technologies. Rhinoceros beetle is the major pest of coconut in the region, but the extent of adoption of recommended practices for its management was very low (4%).

Three-fourth of the coconut holdings of the study area are having undulating topography with gentle (29%), moderate (22%) and steep (24%) slopes. Only limited soil conservation methods were adopted in such gardens, indicating the scope for adopting further conservation measures. The importance of adopting soil and water conservation in coconut garden assumes significance as 50% coconut holdings in the district are not irrigated during summer months.

Irregular planting and cultivation of intercrops in coconut gardens limit the scope of using tractor/tiller for farm operations. Use of other farm machineries in coconut gardens was also very low. Despite non-availability of skilled palm-climber for harvesting and plant protection operations, only in five holdings mechanical climbing devices were found to be used. Another labour intensive operation is weed control in the garden, but motorized weed cutter was in use only in 2.4% holdings.

Post-harvest handling, processing, and marketing segments

On farm value addition in coconut is limited to making of copra (21.1%) which is sold to the oil mills or to the traders. Nearly half the matured nuts harvested are sold to the agents of small scale copra producing units or to the Aggregators. Only a meagre share of the production is used as tender coconut (0.3%); trader/agent having contract with the farmer would arrange the harvesting.

There are only a few enterprises on coconut processing in Kasaragod district; their operations restricted with traditional products like copra and coconut oil. There are five copra-making units, 49 small scale coconut oil mills and three coconut fibre units registered as small scale industrial units in the district. Though large number of women SHGs are functioning in the district which manages agri-related enterprises, only a very few are having micro enterprises on coconut (copra and coconut oil). Hence, there exists a wide gap between the potential and actual utilisation of opportunities for the production and marketing of coconut value added products.

Upgrading of value chain

Improvements in the upstream segment of coconut value chain was achieved through adoption of production technologies, timely procurement of farm inputs at a competitive rate and in adequate quantity, and skill development of farmers and labourers. Technology Interventions to overcome the constraints identified in production segment of value chain and the outcomes achieved are shown in Table 3. Enhancing coconut productivity and farm income as a whole is critical for improving coconut value chain: a weak production system will be catastrophic for the processing sector.

Based on reports on effectiveness of group approach for enhancing technology adoption in coconut homesteads (Anithakumari, 2008; Kalavathi and Anithakumari, 2011; Anithakumari *et. al.*, 2012; Kalavathi *et. al.*, 2012; Krishnakumar *et. al.*, 2013), it was decided to form Community Based Organizations (CBOs) in the selected 'clusters'. Office bearers of the CBOs were selected in a democratic manner and empowered with management skills. This approach was observed to be effective in collective procurement of inputs, scheduling agricultural operations and preparation of developmental schemes to be implemented through different agencies: a detailed account on this can be seen in Thamban *et. al.* (2016).

Proper adoption of farming technologies depends on level of knowledge and skill of both farmers and farm labourers. Benefits from upgrading of value chain in this dimension

Table 3: Technology interventions made in production segment of the value chain and outputs

Constraints addressed	Interventions implemented	Output
Issues on scale of operation in homesteads of small holding-size	Formation of Community Based Organizations (CBO) of farmers	10 CBOs formed
Low/non-uniform knowledge and technology adoption	Training programmes Technology demonstrationAdvisory field visits	39 training programmes/seminars Demonstrations in 534 holdings
Under utilization of interspaces; lesser crop diversity as intercrop	Training, Institute visit	Newly released varieties of six crops introduced
Non availability of quality planting material	Supply of planting material of appropriate varieties of suitable intercrops	Made available 50,000 planting materials of different crops
Inadequate manuring	Soil–test based fertilizer application Organic recycling through vermicomposting Growing of leguminous crops in coconut basin	Pre- & post soil fertility data in 315 holdings 60 vermicomposting units built Incorporated biomass equivalent to 25% of N requirement
Crop/yield loss due to bud rot/stem bleeding diseases	Participatory implementation of IDM	16 demonstrations; 469 affected palms removed
Inadequate supply of critical inputs	Bulk procurement of plant protection chemicals	Fungicide against bud rot (100 kg); and stem bleeding disease (80 l)
Shortage of skilled palm climber for PP operations	Training programmes for palm-climbers	10 training programmes
Soil erosion/ Moisture stress management	Training programmes Demonstration of soil and water conservation techniques; mulching	4 training programmes 10,000 Half-moon buds reinforced with pineapple; 8000 catch pits; mulching in 400 holdings
Non-availability of palm-climbers and labourers for farm operations	Popularization of mechanical climbing device	8 training programmes on use of mechanical climbing device;30 devices provided to CBOs
	Popularizing labour saving gadgets for farm operations	Demonstration of weed cutter in 4 clusters
Harvesting of mature nuts (> 99% as mature nuts)	Dwarf coconut varieties suitable for tender purpose not popular	Establishment of compact block of Chowghat Orange Dwarf (130 palms)

are long lasting besides further dissemination beyond targeted beneficiaries. Training programmes/seminars in different areas of production and processing were organized under the project. To popularise the use of climbing devices and thereby increasing the skilled man power for harvesting and plant protection activities, 30 climbing devices were provided to the CBOs.

Collective procurement made for farm inputs were: (i) planting material for intercropping; (ii) seeds of cover crops for growing in the coconut basins; (iii) plant protection chemicals; and (iv) chemical fertilizers. Non-availability of elite planting material was a major concern of farmers in the region for adoption of intercropping. Different agencies are to be contacted for different crops which only accentuated the perplexity of farmers. In view of this issue, the research team established linkages with various institutions and ensured the availability of planting material well in advance. Plant protection (PP) chemicals, the key factor for adoption of IDM/IPM practices, were not available with local stockists. Hence, CBOs were assisted to procure required quantity of PP chemicals directly from regional-stockists.

Interventions made in the processing and marketing segments of the value chain are shown in Table 4. Some of these activities were towards developing new products and markets that are expected to improve strategic productivity. Two candidature products identified in this regard were Virgin Coconut Oil (VCO) and sweet coconut chips. Critical intervention with regard to VCO was technology development while for coconut chips it was marketing strategies.

At the time of project initiation, entrepreneurs were depending on different agencies including overseas for getting information on VCO processing. The technology know-how and consultancy fees charged by these agencies were very high which acted as an entry barrier for small and medium entrepreneurs. Besides, scale of operation (more than 10000 nuts a day) of such units also demands large investments (both fixed- and working-capital). Standardization of VCO processing protocols (hot- and fermentation-processing) together with indigenously designed and developed machinery (testa remover, milk extractor, VCO cooker, and fermentation tank) helped to reduce the investment requirement nearly to one-fifth: In terms of charges levied for technology know-how, reduction was between 60 to 95%. It also provided flexibility in input capacity (500 nuts a day onwards) synchronising with scale of investment. Demonstration units of VCO processing that are operated by women SHGs confronted with issues related to retail packaging, byproduct utilization, marketing, competitive pricing, complying regulations etc. These issues were not resolved satisfactorily during the tenure of the project but addressed subsequently. This affordable technology was well received by entrepreneurs as is evident from over 31 Agreements signed for transfer of its know-how (Muralidharan *et al.*, 2017).

Processing protocol for sweet coconut chips was developed and commercialized by CPCRI in the year 2002. Though the product has consumer acceptance as indicated from studies conducted in different parts of the country, its marketing was far below the expectations. Its sale was chiefly confined to exhibitions. To understand problems associated with marketing, samples obtained from different producers were analysed and also conducted focus group discussions. The limiting factors indicated are: (i) use of improper raw material (i.e., over matured nuts – more than 10 months old); (ii) chips of non-uniform sizes; (iii)improper drying – temperature should not exceed 60 to 70 °C; (iv) non-uniform shelf life owing to inadequate packaging – the product is hygroscopic in nature; and (v) lack of consumer awareness. Accordingly activities were planned to overcome these limitations. For ensuring continuous supply of coconut chips for marketing studies, comprehensive training programmes covering various steps involved in preparation of coconut chips, were conducted for the members of four women SHGs formed under the project. To enhance the shelf life, a three-layer packaging consisting

Table 4: Interventions made in value addition and marketing

Constraints addressed	Interventions implemented	Output
Knowledge and machinery not available for product diversification	Design and development of machinery for coconut processing	Testa-remover; Coconut milk extractor; VCO Cooker; Fermentation tank
	Standardization of protocols for coconut value added products	Protocols for 14 value added products standardized
	Establishment of processing units/pilot plants	4 SHGs for coconut value addition; One pilot plant for activated shell charcoal
Coconut products, other than conventional, not available in the market	Market promotion of value added products	60 exhibitions; 16 training programmes
	Informative-packaging	Arrived quality standards (4) and packaging (3) of coconut products
	Consumer preference studies	Coconut chips-7 States VCO-one State

of Aluminium foil, PP, and HDPE complying with the recommendation of Indian Institute of Packaging, Mumbai was used. Use of coconut chips as a healthy direct snack as well as tastemaker for various recipes was prominently inscribed. The nutritional facts of coconut chips (as per the test-report from DFRL, Mysore) as well as its use as healthy snack and tastemaker of various cuisines) were mentioned in the packet. Towards consumer awareness, the product was displayed in exhibitions where free samples were distributed along with literature; display-racks/boards placed in large retails in selected cities, and conducted many seminars in different parts of the country. To ensure availability of chips in distant places, a distributor was introduced in the supply chain. These activities eventually established an operational supply chain for the product.

It can be seen that the present study employed three out of seven strategies proposed by Mitchell *et al.,* 2009, while discussing upgrading of value chain to engage successfully the rural poor. The adopted strategies are (i) horizontal coordination to achieve economies of scale in supplies and to reduce transactions cost (related to activities of CBO); (ii) process upgrading by increasing output with reduced cost (related to agronomic practices); and (iii) product upgrading including quality (protocols for novel coconut products). These strategies are also matching with methods for improving value chain productivity as suggested by Webber and Labaste (2010) *viz.*, (i) human capital management (related to training and skill upgradation); (ii) application of improved technology, manufacturing, and service processes within specific segments to increase operational productivity (increase in yield from the cropping system); and (iii) choosing appropriate markets and products and by adding new product features and service components (termed as strategic productivity).

Economic returns realized on upgrading the value chain

Returns from coconut based cropping system are obtained throughout the year. For some of the interventions, the economic yield was realised within a year (e.g., intercropping of annual crops). Perennial crops planted in the interspaces (e.g., black pepper, nutmeg) were in the juvenile phase at the time of conclusion of the project and thus not included while calculating economic returns. Coconut yield in the fourth year from the introduction of improved agronomic practices was considered keeping in view of the lagged response for yield in the crop. Value added in the production segment of the value chain is summarized in Table 5. It may be seen that average net return at holding level is more than Rs.100,000 an increase of over 100% from the baseline values (Rs. 44,981).

Among the four women SHGs formed for production of coconut value added products, two were fully functional during the project period and data recorded from these units were used for analysis. A unit processing 120 nuts per day for coconut chips can earn an annual income of Rs. 2,250,000; net profit for the unit would be Rs. 900,000. For operation of such a unit, produce from an area of 4 ha would be sufficient. Value realization per unit area of cultivation is thus obtained is Rs. 225,000. Value addition from the production of VCO is also on similar type. From a small-scale unit of VCO having an input capacity of 500 nuts a day, annual income is worked out to be Rs. 5,437,500 with net return of Rs. 3,562,500. Such a unit requires coconut production from 16 ha and thus unit area value realization is worked out to be Rs. 222,650. It may be worked out from Table 5 that value realized (average) from enhancing operational productivity of the value chain is Rs. 200,201 which is only slightly less than what realized from interventions on enhancing strategic productivity. It may be noted here that in certain cases, the unit value addition from improved agronomic practices was more than Rs. 500,000 as in the case of intercropping of banana var. Chengalikodan (Thamban *et. al.,* 2016).

Distribution of value share in the downstream activities of the chain with primary producers is a matter of concern but it is beyond the scope of the present study, as farmers' organizations are not having enough resources and leadership to attempt the value addition and distribution. Moreover, the present day consumer-marketing scenario is not offering premium price for coconut products and hence value addition in the processing segment of the value chain may not have any leveraging effect as seen from this study. Similar observations are made by Gilbert (2007) while

Table 5: Economic returns due to interventions in the production segment of coconut value chain

Item	Sample size	Economic returns (Rs)		Total for the project area (Rs.)
		Mean	SD	
Cultivation of annuals as intercrops in coconut holdings	462 holdings	67640.00	47029.00	31,250,000
Savings from N fertilizer on growing of leguminous crops in the coconut basins	37695 basins	2.85	0.74	107,000
Vermicomposting (per cycle) of coconut leaves in specially made tanks	60 tanks	1440.00	414.61	259,200
Additional income per holding from increase in nut yield (during 4th year)	534 holdings	35206.71	12300.07	18,800,381

analysing the global value chains of cocoa and coffee. Large share of the consumer price of these commodities are distributed among agents involved in marketing rather than the primary producer or processor. Despite this fact, competitive and remunerative production system will remain as the core of Indian coconut industry as it is only the driving force of growth in the processing sector facing stiff competition from other coconut producing countries.

One of the most rewarding activities in the project was the regular field visits of project team and interaction with farmers. It not only created confidence among the farmers to adopt new technologies but also helped to carry out necessary midcourse corrections. The prevailing extension system in the state seems to be inadequate to meet this requirement. It was observed that besides training, farmers and farm labourers are to be appraised of the critical steps of technologies while implementing the same in the field.

CONCLUSION

Description and documentation of agents and flow of activities of coconut value chain that prevail in a traditional coconut tracts in India indicated scope for enhancing productivity through improved technologies, better coordination in procurement and use of inputs, and community level processing. Organizing farmers and empowering them to take appropriate decisions on adoption of technologies and collective procurement of farm-inputs with a price advantage had made the participating farmers to realize over 100% increase in net returns. Involvement of farmers beyond production, i.e., in the downstream flow of activities of the value chain, is however not adequate for any profit sharing. Farmers' organizations thus needed further hand holding to move up in the value chain. The conventional extension system is not fully equipped to meet this requirement. The present study would be a benchmark while formulating extension strategies with value chain perspectives.

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