Current Journal of Applied Science and Technology

39(16): 76-82, 2020; Article no.CJAST.58703
ISSN: 2457-1024
(Past name: British Journal of Applied Science & Technology, Past ISSN: 2231-0843, NLM ID: 101664541)

Constraints in Coconut Value Chain – A Framework for Analysis Using Response Priority Index

K. Kalidas[1*], K. Mahendran[1] and K. Akila[2]

[1]Department of Agricultural and Rural Management, Tamil Nadu Agricultural University, Coimbatore-641003, Tamil Nadu, India.
[2]Department of Agricultural Economics, Vanavarayar Institute of Agriculture, Pollachi – 642013, Tamil Nadu, India.

Authors' contributions

This work was carried out in collaboration among all authors. Author KK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author KM managed the analyses of the study. Author KA managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2020/v39i1630738
Editor(s):
(1) Dr. Tushar Ranjan, Bihar Agricultural University, India.
(2) Dr. Orlando Manuel da Costa Gomes, Lisbon Accounting and Business School (ISCAL), Lisbon Polytechnic Institute, Portugal.
Reviewers:
(1) Kassa Tarekegn Erekalo, Arba Minch Research Center, Southern Agricultural Research institute, Ethiopia.
(2) Arjun Prasad Khanal, Agriculture and Forestry University, Nepal.
Complete Peer review History: http://www.sdiarticle4.com/review-history/58703

Original Research Article

Received 18 April 2020
Accepted 24 June 2020
Published 25 June 2020

ABSTRACT

Coconut, a versatile crop with multifaceted uses of its products, hence it is eulogized as "*Kalpavriksha*" (Tree of Heaven). Coconut is one of the most important commercial crops in many tropical countries and contributes significantly to its economy. India, with the rich biodiversity of coconut, is the largest producer with 33.02 percent share or 22167 million nuts of the world's production. Even though it leads in area, production and productivity, farmers were facing many problems in production and marketing of coconut. Hence a clear understanding on problems from production to marketing with the involvement of various stakeholders (farmers, harvest contractors, commission agents, exporters, processors, wholesalers, retailers) in coconut value chain to help the policy makers for better decision making. Constraints faced by the various stakeholders in coconut production and marketing were elicited and analyzed to find out the significance and priority of the constraints using responses priority index. It was evident that in coconut production, yield decrease

**Corresponding author: E-mail: kalidas.via@gmail.com;*

due to pest and disease occurrence ranked first with a response priority index value of 2.69. Interventions are required from the state department of agriculture and agricultural university on the management of pests and diseases. In marketing, high fluctuation in coconut prices ranked first with RPI score of 2.39. Daily price fluctuation resulted from an unstable market was the major problem regarding coconut marketing. It is the need of hour to set up an institutional body which would foresee the price movements and availability of coconut and bridges the gap between demand and supply and develop innovative models for upgrading the technology and market information. So, the above suggestions can be generalized to other parts of the country to reap maximum production and systematic marketing of coconut which will surely benefit to coconut growers and also to India's economy.

Keywords: Marketing; production; productivity; stakeholders.

1. INTRODUCTION

Agriculture has been the strength of the Indian economy since centuries old. The primary source of livelihood for 58.00 percent of India's population depends on agriculture [1]. India ranks second among worldwide in agriculture production with 2.40 percent of the global area, which supports 16.00 percent of the world's human population and 17.00 percent of the domestic animal population. India's agriculture sector, including horticulture, accounted for 42.00 percent of the total employment with a total production of 291.10 million tons in 2019-20 [1]. Plantation crops production had shown impressive growth in area and production. Among plantation crops, Coconut with the production of 41765 lakh nuts, Areca nut with 8.33 lakh tons, and Cashew nut with 8.17 lakh tons was produced in India in the year 2018-19 [2]. Over the decades, the area under cultivation of coconut was higher when compared to other plantation crops, but in production, tea stands first followed by coffee. The total area of cultivation, production of major plantation crops (Tea, Coffee, Arecanut, Cashew nut, Coconut, and Rubber) is given in Table 1.

1.1 Coconut – Tree of Heaven

As a versatile nature of the crop and the multifaceted uses of its products, coconut is eulogized as "*Kalpavriksha*" (Tree of Heaven). Coconut is grown in more than 25 countries throughout the tropics and subtropics, with an annual production of around 67 billion nuts from an area of 11.906 million ha, and the average productivity of the crop is 5638 nuts per ha [3]. With an annual production of around 21,384 million nuts, coconut contribution to the nation's GDP is about 34,100 crores rupees. The area had increased from 18.24 lakh ha in 2000-01 to 21.74 lakh ha in 2018-19, production has increased from 12678.4 million nuts (2000-01) to 21384.33 million nuts (2018-19) and productivity has also increased from 6951 nuts per hectare (2000-01) to 11350 nuts per hectare in 2017-18, and it gets declined in 2018-19 to 9815 nuts per hectare. In India, Kerala ranks first with the production of 7.63 billion nuts (35.69 percent) from an area of 7.56 lakh ha (34.74 percent). Karnataka stands second in the area with 6.15 lakh hectares and third in production, with 23.96 percent (5.123 billion nuts). Tamil Nadu stands second in production with 24.84 percent (5.31 billion nuts) and third in the area, of about 4.37 lakh hectares. In terms of productivity, Andhra Pradesh stands first (172 percent of average productivity) with 13563 nuts per ha, followed by West Bengal with 12464 nuts and Tamil Nadu with 12144 nuts per ha (i.e., 154 percent of average productivity), Coconut Development Board, 2019 [3].

1.2 Problem Focus

Information provided from the earlier sections and during the field visits and discussion with the farmers indicated that there is a massive potential for the coconut industry and the extent of which it affects the rural population through employment. Even though India ranks first in the production and productivity of coconut, coconut farmers in India were facing many problems in the production of coconuts [4], which leads to a decline in the production of quality nuts reflecting the competitive nature in the industry globally.

Study by Anandu [5] indicated that occurrence of pest and diseases, high input cost, lack of irrigation facilities, shortage of trained tree climbers and lack of scientific knowledge in coconut production, price fluctuations, lack of market information and inadequate storage facilities were the problems faced by the coconut farmers.

Table 1. Area and production of plantation crops in India

Crop	2000-01		2010-11		2018-19	
	Area	Prod.	Area	Prod.	Area	Prod.
Tea	0.5	848.4	0.58	966.7	0.57	1233.14
Coffee	0.31	301.2	0.41	302	0.45	316
Arecanut	0.29	0.33	0.4	0.48	0.518	0.9
Coconut	1.84	125.9	1.9	157.5	2.18	213.84
Cashew	0.72	0.45	0.95	0.67	1.062	0.817
Rubber	0.4	0.63	0.48	0.86	0.64	0.75

Source: DES, MoA, GOI and APEDA 2019

Various studies show that coconut marketing starts from the farmers' field after harvesting the nut. The marketing of coconut differs from that of other fresh fruits and vegetables because of its natural durability of coconuts. Harvesting of coconut is done by laborers hired by the farmers or the harvesting contractor. Labor for harvesting is another challenge, since the availability of technical labor is sparse, that effects the quality of harvesting nuts [6].

Farmers were facing many problems in the cultivation of coconut since coconut is a perennial crop and the economic yield started from 7th year onwards; these problems were significant for coconut farmers. Many factors have been cited as reasons but the primary reason includes the presence of a large number of intermediaries, lack of technical know-how in coconut production, poorly organized small scale producers, and lack of market information among the market actors. Hence, the main objective of the study is to analyze the constraints faced by the various stakeholders (farmers, harvest contractors, commission agents, exporters, wholesalers, retailers, processors) of the coconut value chain in the study area were identified, ranked using response priority index and the results are presented in this section.

2. METHODOLOGY

A Multi-stage random sampling technique was employed to select the respondents based on the time and resource constraints. In the first stage, among various districts in Tamil Nadu, Coimbatore, Tirupur, Erode and Namakkal were selected based on the area and production of coconut. These districts contributed to 39.26 percent of the area under coconut cultivation in the state (CDB, 2019) [3]. In the second stage, based on the area under coconut cultivation, three taluks in each district viz., Pollachi, Anaimalai and Kinathukadavu in Coimbatore district, Udumalpet, Dharapuram and Palladam in Tirupur district, Mohanur, Paramathi Velur, Kabilarmalai in Namakkal district and five taluks viz., Perundurai, Gobichettipalayam, Sathyamangalam, Modakurichi and Kodumudi in Erode district were selected.

In the third stage, two blocks were selected from each taluk based on the area under coconut cultivation and farmers were randomly selected from the villages of selected blocks. In Namakkal, due to lesser area under cultivation, only one block was purposively selected. Twenty-five farmers from nine taluks in Coimbatore (3 Taluks), Tirupur (3 Taluks) and Namakkal (3 Taluks) and fifteen farmers from five taluks of Erode district were selected with the total of 300 coconut farmers were selected randomly. The farmers were contacted individually for collection of details regarding constraints in production and marketing of coconut with the help of a well-structured and pre-tested interview schedule. Besides the sample farmers, commission agents, harvest contractors, exporters, processors, wholesalers and retailers were selected randomly to analyse the problems in coconut marketing. The details of the sample respondents were given in Table 2. Primary data was collected from the respondents during the months of April – September 2019 and the secondary data collected were related to the agricultural year 2018-19.

To identify the constraints expressed by the farmers and intermediaries in production and marketing of coconuts and whether the emphasis should be given for the number of responses to a particular priority or the highest number of responses to a constraint in the priority. Responses-priority index (RPI) was constructed as a product of the proportion of responses (PR) and priority estimate (PE) where PR for the i^{th} constraint is the ratio of number of responses for a particular constraint to the total responses as per equation

$$(RPI)_I = \sum_{j=1}^{k} f_{ij} X_{[(k+1)-j]} / \sum_{i=1}^{1} \sum_{j=1}^{k} f_{ij}$$

Where,

RPIi = Response priority index for i^{th} constraint,
f_{ij} = Number of responses for the j^{th} priority of the i^{th} constraint (i= 1, 2……, I; j= 1,2,3…..k),
$\sum_{j=1}^{k} f_{ij}$ = Total number of responses for the i^{th} constraint
K = Number of priorities (1- Strongly agree, 2-Agree, 3-Moderate, 4- Disagree, 5- Strongly disagree),
$X_{[(k+1)-j]}$ = Scores for the j_{th} priority,
$\sum_{i=1}^{1} \sum_{j=1}^{k} f_{ij}$ = Total number of responses to all constraints

Table 2. Sample intermediaries, processors and consumers in the value chain selected for the study

District / Intermediaries	Coimbatore	Tirupur	Erode	Namakkal	Total
Farmers	75	75	75	75	300
Commission agents	10	10	10	10	40
Harvest Contractors	10	10	10	10	40
Exporters	10	10	0	0	20
Farmer Producer Company	1	1	1	1	4
Processors	5	5	5	5	20
Wholesalers	10	10	10	10	40
Retailer	10	10	10	10	40
Total	71	71	71	71	504

Larger the RPI higher was the importance for that constraint. Navaneetham [7] studied the constraints faced by farmer producer company using responses priority index and concluded that problem in obtaining bank loan, no waiving off of license fee, cumbersome process of registration of FPCs, not able to raise funds from farmers and capturing market for selling the produce which were the major causes for failure of some FPCs in the state.

3. CONSTRAINTS FACED BY THE COCONUT STAKEHOLDERS IN WESTERN REGION OF TAMIL NADU

3.1 Constraints Faced by the Farmers in the Production of Coconuts

Farmers were facing many problems in the cultivation of coconut, since coconut is a perennial crop and the economic yield started from 7^{th} year onwards; these problems were significant for coconut farmers. Constraints faced by the sample farmers in coconut production were elicited and analyzed to find out the significance and priority of the constraints. The results of the analysis are furnished in the below section.

With respect to the production constraints (Table 3), yield decrease due to pest and disease occurrence ranked first with response priority index value of 2.69. Interventions are required from the state department of agriculture and agricultural university on the management of pests and diseases. Trainings and timely availability of effective pesticides will help to reduce the loss of yield due to pests and disease incidence. The loss of yield due to nutrient deficiency ranked second with an index value of 2.46. Estimation of nutrition deficiency that can be made available and easily accessible to the farmers would reduce the yield loss due to this factor. Since most of the coconut crop is above productive age, they are old, senile and unproductive palms ranked third among the factors with an index value of 2.37. Presently, the Coconut Development Board has announced the rejuvenation and replanting of coconut palms, hence the popularization of this scheme among the farmers would help to reduce the impact of this problem. High labor cost, lack of institutional support ranked next among the list of constraints. Non-adoption of scientific practices by the farmers ranked last with an index value of 1.92, indicates the necessity of scientific practices in coconut production. the positive impact on the adoption of scientific practices.

Table 3. Production constraints faced by the coconut farmers

Particulars	No. in respective priorities			Total responses	RPI	Rank
	LI	I	MI			
Pest and Disease incidence	2	89	209	300	2.69	I
Nutrient deficiency	35	93	172	300	2.46	II
Old, senile and unproductive palms	54	81	165	300	2.37	III
High labor cost	65	76	159	300	2.31	IV
Lack of institutional support	68	81	151	300	2.28	V
Lack of proper irrigation facilities	60	101	139	300	2.26	VI
Lack of availability of good seedlings	88	100	112	300	2.08	VII
High cost of inputs	95	102	103	300	2.03	VIII
Non adoption of scientific cultivation practices	113	97	90	300	1.92	IX

LI – Least Important, I – Important, MI – Most Important

Table 4. Constraints faced by the farmers in marketing of coconut

Particulars	No. in respective priorities			Total responses	RPI	Rank
	LI	I	MI			
High coconut price fluctuation	64	56	180	300	2.39	I
Price fixation between intermediaries and farmers	83	89	128	300	2.15	II
Irregular and late payment by the intermediaries	68	134	98	300	2.10	III
Limited market information on price	93	98	109	300	2.05	IV
High commission and brokerage	95	102	103	300	2.03	V
Inefficient functioning of regulated market	102	95	103	300	2.00	VI
High transportation cost	112	98	90	300	1.93	VII
Inadequate storage facilities	114	98	88	300	1.91	VIII

LI – Least Important, I – Important, MI – Most Important

Table 5. Constraints faced by the market intermediaries

Particulars	No. in respective priorities			Total responses	RPI	Rank
	LI	I	MI			
Improper market information	6	45	109	160	2.64	I
Lack of required quantity	15	56	89	160	2.46	II
High marketing cost (Harvesting, Transportation)	24	55	81	160	2.36	III
Lack of institutional support with respect to credit	21	66	73	160	2.33	IV
Lack of quality nuts	54	50	56	160	2.01	V

LI – Least Important, I – Important, MI – Most Important

Table 6. Constraints faced by the processors

Particulars	No. in respective priorities			Total responses	RPI	Rank
	LI	I	MI			
Lower capacity utilization	2	3	15	20	2.65	I
High price fluctuation	2	6	12	20	2.50	II
Inconsistent supply of raw materials	3	6	11	20	2.40	III
Lack of technical man power for processing	3	8	9	20	2.30	IV
Poor consumer awareness and consumption habits	4	8	8	20	2.20	V
Lack of institutional support with respect to promotion	7	5	8	20	2.05	VI
Lack of institutional support with respect to credit	8	7	5	20	1.85	VII

LI – Least Important, I – Important, MI – Most Important

3.2 Constraints Faced by the Farmers in the Marketing of Coconuts

Constraints faced by the farmers in the marketing of coconut were analyzed and presented in the Table 4.

High fluctuation in coconut prices ranked first with RPI score of 2.39. Daily price fluctuation resulted from an unstable market was the major problem regarding coconut marketing. Hence, there is a need for government intervention to fix the price on weekly/fortnightly basis. Minimum Support Price for copra has been fixed by the Government of India; hence there is an urge to fix minimum support price for coconut also which protects the farmer from price fluctuation. Price fixation and bargaining between the intermediaries and farmers become the second important constraint (2.15) faced by the farmers. This was due to the daily fluctuating market price of the coconuts. There was a need for the authorized and official sources of information on the price to the farmers, which would help to avoid the conflict between the farmer and intermediaries. Irregular and late payments by the intermediaries were the next constraint with RPI value of 2.10, followed by limited market information on price, high commission or brokerage, inefficient regulated market, high transport cost, and storage facilities. Based on the priority ranking, we could found that major constraints faced by the farmer in coconut marketing were due to the lack of a regulatory body for fixing the price and controlling the market. The Government should intervene and establish an institutional setup to regulate the price and disseminate market information.

3.3 Constraints Faced by the Market Intermediaries

Response priority index was calculated for the constraints faced by the intermediaries of the coconut value chain and presented in Table 5.

The major constraint faced by the market intermediaries is due to improper market information (2.64) on price ranked first. Lack of required quantity was ranked second constraint (2.46), which was due to seasonal variability in coconut production. High marketing cost ranked third major priority (2.36), followed by a lack of institutional support and a lack of quality nuts. The distance market and fluctuating fuel price are the reason for high marketing costs. Systematic and scientific production helps to improve the production of coconut; farmers are advised to take such steps to improve the production and productivity of coconut. The use of alternate modes of transportation and marketing would help to reduce the increasing marketing cost.

3.4 Constraints Faced by the Coconut Processors

Processors prioritized the constraints faced by them in coconut were analyzed and the results are presented in Table 6.

Lower capacity utilization (2.65) ranked first among the constraints faced by the processors, which was due to a lack of market promotion and availability of coconut. Most of the processing units were underutilized, which increased the cost of production indirectly. High price fluctuation was the second major constraint followed by an inconsistent supply of raw materials, which was due to seasonality in nuts productivity. Another most significant challenge faced by the processor was lack of institutional setup in terms of technology, credit facility and marketing information.

4. CONCLUSION AND RECOMMENDATIONS

Overall analysis of the constraints using response priority index, concluded that farmers faced yield decrease due to pest and disease occurrence is the biggest problem for them. Most of the stakeholders in the coconut value chain faced daily fluctuation in price, the gap between production and requirement of nuts and lack of market information are the major problem faced by them.

Based on the findings from the study, measures taken by the policy makers includes,

1. Development of new variety with better productivity, pests and disease resistance and drought tolerance can be taken up to improve the production of coconut.
2. Set up an institutional body which would foresee the price movements and availability of coconut the bridges the gap between demand and supply and develop innovative models for upgrading the technology and market information.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ACKNOWLEDGEMENT

The author gratefully acknowledges the Coconut Development Board, Cochin for enriching the study with the secondary data on the area, production and productivity of coconut in India, Tamil Nadu and Western Tamil Nadu and Department of Horticulture and Plantation Crops for providing data on area and production of plantation crops. The author also feels dutiful to thank Dr. K. Mahendran, Professor, Department of Tamil Nadu Agricultural University for his sole mentorship and contribution to the successful completion of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. IBEF. Indian Agriculture and Allied Industries Industry Report In April 2020: Indian Brand Equity Foundation; 2020. Available:https://www.ibef.org/industry/agriculture-india.aspx
2. Department of Horticulture and Plantation Crops (DHPC). Plantation Crops in India. Government of Tamil Nadu; 2019.
3. CDB. State / District / Block wise Area,Production & Productivity of coconut. Kochi: Coconut Development Board; 2020. Available:https://www.coconutboard.gov.in/Statistics.aspx
4. Vanamadevi. A study on cultivation and marketing problems of coconut growers in thali panchayat, Udumalpet. International Conference on "Research avenues in Social Science", Coimbatore; 2017.
5. Anandu Bhovi. Production and marketing of coconut in Karnataka state an econometric analysis. EPRA International Journal of Economic and Business Review. 2016;4(10):12-15.
6. Banu RH, Barin. Problems of marketing practices of coconut products in Thanjavur District, Tamilnadu. Asia Pacific Journal of Research. 2017;1(4):250-256.
7. Navaneetham B, Mahendran K, Sivakumar SD. Analysis of constraints for performance improvement of FPCs in Tamil Nadu. International Journal of Farm Sciences. 2019;9(2):12-18.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/58703