

TECHNOLOGY TRANSFER THROUGH INSTITUTIONAL INTERVENTIONS AT GROWERS LEVEL: THE CASE OF RUBBER SMALLHOLDER SECTOR IN TRIPURA

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ABSTRACT

The Green Revolution has enhanced the food grain production to many folds but it has failed to bring corresponding changes in the socio-economic status of a majority of the farm households. Although a number of crop and region-specific factors have been highlighted for the observed asymmetries a major factor has been the deficiencies in the primary marketing leading to lower farm gate price realization. The results of the present study highlighted the relevance of comprehensive policy approaches in addressing the issues of unorganized rubber growers in Tripura through growers' consortiums organized under the Block planting Units (BPU) - Rubber Producers Societies (RPS) network. The institutional innovations led by Rubber Board and State Government agencies has been successful in the expansion of area under NR cultivation and improved the livelihood pattern of the Economically and Socially Marginalized Groups (ESMGs). The interventions implemented through BPS-RPS network have been found to be effective in transferring new technologies and ensuring remunerative farm gate prices. The better marketing efficiency of growers organized under the BPU-RPS network over the unorganized growers has been reflected in terms of lower price-spread, higher efficiency index and increased producers' share. The results of the study suggest the need for drawing guidelines for evolving appropriate models of interventions for individual crops to reap full benefits of enhanced productivity.

Keywords: natural rubber, institutional intervention, technology transfer, block planting units, rubber producers societies, marketing efficiency

INTRODUCTION

The Green Revolution has led to notable increases in India's food grain production and improvements in the household incomes of the stakeholders. However, the varied impacts of the green revolution across crops, regions and dependent households had been primarily influenced by the institutional and policy environments. At a sectoral level, the wave of green revolution was focused on the annual crops sector and it has by passed the perennial crops sector in the country due to a host of factors. Hence, technological innovations and institutional interventions in the perennial crops sector have been left to the respective commodity boards and other governmental agencies. Among the perennial crops in the country, the comprehensive policy packages ranging from production to marketing in the case of natural rubber (NR) have been unique for the progressive contents and the outcomes (George et al., 1988; George, 1999; Rai et al., 2016). The validity of this proposition is underlined by achievements experienced by the economically and socially marginalized groups even in a non-traditional region like Tripura (Joseph et al., 2010). The experience of

Tripura rubber project highlights the need for comprehensive policy packages and the limitations of unilateral approaches to productivity improvements for reaping the benefits of technological innovations. More precisely, technological innovations and transfer of technology have to be supplemented by a compatible marketing system to ensure a higher share in the value chain for distributive justice. In this background, the present study is conducted in Tripura with following specific objectives:

NATURAL RUBBER AND TRIPURA

Tripura occupies a pivotal position in India's rubber map in terms of relative shares in area under cultivation, production as well as potential area identified for NR cultivation. Tripura is also credited with higher utilization of potential area identified for rubber cultivation among the nontraditional rubber growing regions in the country. It is the second largest rubber cultivating and producing state in India.

The Rubber Board in collaboration with the state government agencies has been making concerted attempts

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to promote rubber cultivation in Tripura during the past four decades. The achievements in rubber cultivation and production are widely acknowledged and the dedicated efforts have transformed the agricultural sector in the targeted regions from traditional shifting cultivation (Jhum) to settled mode of income intensive rubber cultivation. The initial phase of NR cultivation in Tripura had been dominated by the public sector agencies. Simultaneously, attempts were also made to ensure active involvement of the local peasantry with region-specific institutional interventions and support programmes (Joseph *et al.*, 2009; 2012 and Sharma *et al.*, 2011). Among the various promotional schemes targeted for the promotion of NR across the targeted groups, Block Planting Scheme (BPS) and Rubber Producer's Societies (RPS) are unique. The BPS/RPS schemes have motivated the local peasantry to involve in all spheres of operation right from tapping, processing to marketing. The BPS is a collaborative project of the Rubber Board and Government of Tripura introduced in 1992 exclusively for the rehabilitation of Scheduled Tribes and Scheduled Castes. It is a comprehensive scheme with the characteristic features of group/community approach in all the spheres of operations up to primary processing & marketing and family labour participation as wage labour during the immature phase of the plantations spanning six years. Finally, the regular monitoring and supervision by the agencies concerned and active involvement of the beneficiaries have lent credibility and popularity to the scheme across regions and among the targeted communities within the state during the past two decades. At present there are 49 mature and nine immature block planting units (BPU) with 3423 beneficiary families. The involvement of RPS in primary processing and marketing of NR operating in a compact area of 2 to 3 km radius with membership ranging from 50 to 200 have provided adequate strength to group approach. At present, there are 59 RPS with group processing facilities. The institutions also provide a platform for effective implementation of extension programmes, technology transfer and help in linking the local peasantry to main stream development process. At present, natural rubber is an important component in the commercial agriculture in the state and it has a profound influence on the socio-economic life of the people.

OBJECTIVES

- (a) To assess the role of the rubber producers societies/ block plantation units in providing services for input delivery, processing and marketing of natural rubber in tripura
- (b) To study the impact of natural rubber on livelihood trends of growers
- (c) To examine the differences in the marketing costs, marketing margins, price spread and marketing efficiency

between the growers under institutionalized set up vis-à-vis growers not covered by BPU-RPS network

METHODOLOGY

The study was both exploratory and analytical, involving entirely different set of objectives. In order to achieve second objective of accessing impact of Natural Rubber plantation on livelihood trends, database was gathered from the NR cultivators irrespective of their association with BPU or RPS. The survey was conducted in the West Tripura, Sepaijala, Gomati and South Tripura districts as more than half of area under NR in the state is concentrated in these districts. Altogether, 544 small rubber growers were covered for accessing the conservational impact of natural rubber in Tripura. The survey was conducted during the period 2012 – 2015.

For attaining third objective of the study, a case study on marketing was conducted to access the marketing pattern of NR in Tripura. The database of the study consisted of information gathered from two categories of growers, viz., growers organized under BPU-RPS network (189 beneficiaries) and 116 individual growers covered neither by RPS nor by BPU. The survey was conducted in the West and South districts of Tripura as more than three fourth of area under NR in the state is concentrated in these two districts. Altogether, 305 small rubber growers were covered for accessing the marketing of natural rubber in Tripura. The survey also covered 39 intermediaries consisting of dealers, trading company and village traders/ sub agents of the dealers. The relevant primary data were collected by personal interview method during the year 2011-2012. The secondary data for marketing of natural rubber by RPS/BPU are collected for the period 2010-2011. The details on NR price pertain to the period 2010 – 2012. The following analytical concepts and tools were utilized for the analysis:

Farmers' Net Price

The net price received by the farmers was estimated as a difference between gross price received and sum of the transaction costs incurred. The farmers' net price was expressed in Equation (1):

$$NP_F = GP_F - C_F \dots(1)$$

where,

NP_F = The net price received by the farmers (₹/kg)

GP_F = The gross price received by farmers (₹/kg), and

C_F = The sum of transaction costs incurred by the farmers during marketing (₹/kg)

Marketing Margins

The margins of market intermediaries include profits and returns, which accrue to them for storage, the interest on capital and establishment. The general expression for estimating the margin of the intermediaries is given below:

Intermediaries margin = Gross price (sale price) – {Purchase price (cost price) + Cost of marketing}

Net marketing margin of dealer/ sub agent of dealer/ trading company is given mathematically by Equation (2):

$$MM_D = GP_D - \{GP_F + C_D\} \dots (2)$$

where,

MM_D = Net marketing margin of the dealer (Rs/kg)

GP_D = Gross Price (purchase price of consumer) (Rs/kg)

C_D = The marketing cost of the dealer /sub agent of dealer/ trading company (Rs/kg)

The definition of GP_F is same as given in Equation (1).

In the marketing chain, when more than one dealer is involved, i.e. if there are primary dealer/ sub agents, secondary dealers, etc., then the total marketing margin of the dealer's is the sum of the margins of all the dealers. Mathematically,

$$MM = MM_{D1} + \dots + MM_{Di} + \dots + MM_{Dn} \dots (3)$$

where,

MM: Total marketing margin

MM_{Di} is the marketing margin of the i^{th} dealer.

Similarly, total marketing cost (MC) incurred by the producer/seller and by various intermediaries was calculated as per Equation (4):

$$MC = C_F + C_D \dots (4)$$

Marketing Efficiency

Most commonly used measures are conventional output to input ratio, Shepherd's ratio of value (price) of goods marketed to the cost of marketing (Shepherd, 1965) and Acharya's modified marketing efficiency formula (Acharya

and Agarwal, 2004). Acharaya formula has been used to calculate the marketing efficiency of different channels of rubber. The higher ratio would indicate the higher marketing efficiency. The formula was expressed as Equation (5):

$$ME = \frac{NP_F}{MM + MC} \dots (5)$$

The definitions of NP_F , MM and MC were the same as in expressions (1), (3) and (4).

RESULTS AND DISCUSSION

Technology Transfer

The BPU- RPS is a platform in providing different services to the growers for scientific plantation followed by efficient processing and marketing. The Rubber Board supplies necessary inputs, equipment and services to growers via the institutionalized set up. These supports are crucial to sustain the income base of the targeted groups. Despite the differences in the extent of services rendered by different BPU- RPS they are complementary at a functional level. The BPU- RPS emphasize on the activities which improve the overall growth of rubber plantation. The training classes regarding rubber cultivation, estate management, efficient tapping and processing & marketing etc are regularly conducted for the members. For ensuring healthy plantation during immature phase spanning 7 years, periodic inspection is done. The Rubber Board provides planting subsidy during the immature phase so that the growers adopt good quality plantation material. The subsidized estate inputs include fertilizers, polythene sheets, and adhesive for rain guarding. The subsidies are channelised through the institutionalized set up with the objective to strengthening the community participation. The subsidies are also provided for constructing community smoke houses, chemical balance and electric oven for estimating dry rubber content.

The RPS also give a great impetus on activities which improve the processing and marketing facilities of small growers. The training classes are conducted in order to upgrade the processing skills of the growers. Facilities for processing good quality rubber are also provided on group basis. It helps in processing sheets of uniform grade with good quality parameters. The realization of higher prices for better grades has made the small growers grade-conscious, leading in improvement in quality of sheets, field coagulum, etc. During the initial phase, the RPS has to sell their produce to the local traders at throw away prices. To overcome the problems of primary marketing, the Rubber Board has promoted a trading company which is a collaborative venture

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of RPS and the Rubber Board.

Trends in livelihood earning pattern

(a) Current occupational pattern of Surveyed NR growers

The result of the study shows that the rural economy of Tripura is predominantly an agrarian society. The table 1 shows that 73.16 percent of the surveyed household lead their life as cultivators and agriculture was their primary source of livelihood. It provided employment to a majority of the working population of the region and gave them their

primary identity. Within the districts North/Dhalai half of the households were having agriculture as their primary occupation but the revealing fact is that around 17 percent of the households were found engaged as manual labour.

However, prior to inception of NR cultivation in the region, the livelihood of the rural population was mainly from manual labour. Although majority of the rural household were engaged in agriculture, but due to the low returns from agriculture the growers has to search for alternative sources of income. The more elaborated discussion was provided in next section.

Table 1 : Primary occupation of respondent household

n=544

Sr. No.	Primary Occupation	South	West	North/Dhalai	Total
1	Cultivator/ Farmer	139 (87.98)	196 (75.10)	63 (50.40)	398 (73.16)
2	Labourer	06 (3.80)	10 (3.83)	21 (16.80)	37 (6.80)
3	Shopkeeper/ Businessman	05 (3.16)	23 (8.81)	6 (4.80)	34 (6.25)
4	Job	07 (4.43)	31 (11.88)	35 (28.00)	73 (13.42)
5	No clear arrangement	01 (0.63)	01 (0.38)	-	02 (0.37)
Total		158 (100)	261 (100)	125 (100)	544 (100)

(b) Livelihood earning pattern prior to NR cultivation of surveyed NR growers

The results of the livelihood pattern prior to NR cultivation, presented in Table 2 reveals that major occupation of the surveyed household was manual labour (44.49 percent) and only sixteen per cent were found primary dependent on agriculture. The fourteen per cent of surveyed

household had no regular employment. It is evident from the table that prior to NR cultivation, the rural economy of the state was incapable of providing sustainable sources of livelihood for the rural poor. As the state was landlocked, the rural masses had only few options available for sustaining a good livelihood. Across different districts, it is revealed that majority of the households were dependent on manual labour as their primary source of livelihood.

Table 2 : Primary occupation of respondent household prior to nr plantation/ during immature period

n=544

Sr. No.	Primary occupation	South	West	North/Dhalai	Total
1	Cultivator/ Farmer	27 (17.09)	44 (16.86)	19 (15.20)	90 (16.54)
2	Labourer	88 (55.7)	116 (44.44)	38 (30.40)	242 (44.49)
3	Shopkeeper/ Businessman	11 (6.96)	49 (18.78)	6 (4.80)	66 (12.13)
4	Job	10 (6.33)	29 (11.11)	31 (24.80)	70 (12.87)
5	No clear arrangement	22 (13.92)	23 (8.81)	31 (24.80)	76 (13.97)
Total		158 (100)	261 (100)	125 (100)	544 (100)

Natural Rubber cultivation has brought a huge shift in the livelihood pattern of the rural population. The primary occupation of rural community has shifted from manual labour (44.49 percent) to cultivation of NR (73.16 percent). According to study conducted by Joby *et.al.*, 2010 in Tripura, NR cultivation has brought an overall increase of 112 per cent in income of the farmers in the region. Apparently NR has brought a considerable social upliftment in the area. While examining the pattern across districts/ regions, the more NR covered districts (West & South) shows high shift in pattern of income from manual labour (45 – 55 percent) to cultivator (75 – 88 percent). But the two districts (North/ Dhalai) where NR cultivation is in the initial stages, the shift of livelihood is in a transition stage. The North/ Dhalai region currently has 50 per cent households engaged in agriculture whereas prior to NR cultivation it was only 15 per cent.

The underline fact revealed by the two tables is that prior to NR cultivation the source of income in the rural economy of the state was uncertain. The subsistence agriculture followed in the area prior to introduction of NR failed to ensure sustainable livelihood to the rural community. With the introduction of NR in the state the rural mass got a new option for income. The institutional interventions of the Rubber Board and the State Govt. has provided good infrastructure and marketing network enabling the NR farmers to fetch good price for their produce (Sharma *et al.*, 2013).

According to FAO (2009, 2013) “Food Security exists when all people, at all times have physical, social and economic access to sufficient, safe and nutritional food which meets their dietary need and food preferences for an active and healthy life” In the light of FAO description, the NR cultivation in Tripura is instrumental in ensuring food security among the rural tribes which was lacking prior to the introduction of the crop. As to access the food available in the market one should have sufficient income. The low return trap in the state’s *Jhum* based agriculture could be revived only with the introduction of NR.-

Marketing Practices And Channels

The marketing of sheet rubber through four main supply chains under organized and unorganized sectors in the study region has been depicted in Figure 1. All the supply chains exhibited a four-tiered structure except the supply chain IV. The buyer at the end of the supply chain is primarily big dealers procuring NR on behalf of consuming industries located outside the state. A small portion is purchased by indigenous consuming industry. Around 83 per cent of sheet rubber in organized sector was marketed through supply chain I while 72 per cent of sheet rubber in the unorganized sector was marketed through supply chain III. It was observed that the growers in the organized sector (RPS/BPU) sold their produce as smoked sheet rubber whereas growers in the unorganized sector sold as unsmoked sheet rubber.

Organized	Supply Chain I	:	Grower ----- RPS/BPU ----- Trading Company ----- Buyer
	Supply Chain II	:	Grower ----- RPS/BPU ----- Dealer ----- Buyer
Unorganized	Supply Chain III	:	Grower ----- Agent of dealer ----- Dealer ----- Buyer
	Supply Chain IV	:	Grower ----- Dealer ----- Buyer

Fig.1. Supply chains of sheet rubber in Tripura

(a) Price Spread of Sheet Rubber

The price spread through four main supply chains of sheet rubber has been worked out in the study. The price spread in supply chain I (Grower – Rubber Producer’s Societies/Block Plantation Units – Trading Company - Buyer) is discussed in depicted in table 3. The growers supply latex at the collection center of the society (Group Processing Centre). These societies process the latex into smoked sheet rubber (commonly called ribbed smoked sheet) which is sold to the trading company. The supply chain shows an organized set up starting with individual growers backed by group

processing and marketing efforts of the societies. All the post-harvest expenses viz., processing, grading, packaging, transportation, loading/unloading and supervision, were collectively incurred by the member growers/society. A perusal of the Table 3 reveals that net price received by the grower was Rs 211.83 per kg which was 91.13 per cent of the buyer’s price. The expenses borne by the societies were Rs 5.22 per kg which was 2.25 per cent of the buyer’s price. The processing and development fee (supervision, construction & maintenance of the GPC etc.) were the major expenses

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Table 3 : Price Spread of sheet Rubber in Tripura

Supply Chain I: Grower-Society (RPS/BPU)-Trading Company- Buyer

Sr. No	Particulars	₹ / Kg	% share in buyer's price
1	Net Price received by Grower/ Society (RPS/ BPU's) purchase price	211.83	91.13
2	Expenses borne by RPS/BPU		
	i. Processing cost and development fee of Society	4.48	1.93
	ii. Transportation	0.66	0.28
	iii. Loading/Unloading	0.07	0.03
	iv. Others	0.01	0.00
	v. Sub total	5.22	2.25
3	RPS/ BPU's sale price / Trading Company's Purchase price	217.05	93.38
4	Margin of the Trading Company*	5.61	2.41
5	Trading Company's sale price / Buyer's purchase price	222.66	95.79
6	Expenses borne by the Buyer		
	i. Transport	5.18	2.23
	ii. Loading / Unloading	0.15	0.06
	iii. Tax @ 2%	4.45	1.92
	iv. Sub Total	9.78	4.21
7	Landing cost for Buyer	232.44	100.00

**For procurement and sale of sheet Rubber the trading company doesn't incur any transportation cost*

Table 4 : Price Spread of sheet Rubber in Tripura

Supply Chain II: Grower-Society(RPS/BPU)-Dealer-Buyer

Sr. No.	Particulars	₹ / Kg	% share in buyer's price
1	Net Price received by Grower/ Society (RPS/ BPU's) purchase price	203.73	89.19
2	Expenses borne by RPS/BPU		
	i. Processing cost and development fee of Society	5.52	2.42
	ii. Transportation	0.13	0.06
	iii. Loading/Unloading	-	
	iv. Others	0.10	0.04
	v. Sub total	5.75	2.52
3	RPS/BPU's sale price/ Dealer's purchase price	209.48	91.71
4	Expenses borne by Dealer		
	i. Transportation	0.19	0.08
	ii. Loading/unloading	0.06	0.03
	iii. Others	0.17	0.07
	iv. Sub total	0.42	0.18
5	Margin of the Dealer	2.56	1.12
6	Dealer's sale price/ Buyer's purchase price	212.46	93.02
7	Expenses borne by the Buyer		
	i. Transport	5.18	2.27
	ii. Loading / Unloading	0.15	0.07
	iii. Tax @ 5%	10.62	4.65
	iv. Sub Total	15.95	6.98
8	Landing cost for Buyer	228.41	100.00

Table 5 : Price Spread of sheet Rubber in Tripura**Supply Chain III: Grower-Village Trader-Dealer- Buyer**

Sr. No.	Particulars	₹ / Kg	% share in buyer's price
1	Net Price received by Grower/ Village Trader's purchase price*	184.74	83.38
2	Expenses borne by the Village Trader		
	i. Transportation	0.47	0.21
	ii. Loading/ Unloading	0.05	0.02
	iii. Others	-	
	iv. Sub Total	0.52	0.23
3	Margin of the Village Trader	7.39	3.34
4	Village Trader's sale price/ Dealer's purchase price	192.65	86.95
5	Expenses borne by the Dealer		
	i. Transportation	0.19	0.09
	ii. Loading/unloading	0.06	0.03
	iii. Others	0.17	0.08
	iv. Sub total	0.42	0.19
6	Margin of the Dealer	12.87	5.81
7	Dealer's sale price/ Buyer's purchase price	205.94	92.95
8	Expenses borne by the Buyer		
	i. Transport	5.18	2.34
	ii. Loading / Unloading	0.15	0.07
	iii. Tax @ 5%	10.30	4.65
	iv. Sub Total	15.63	7.05
9	Landing cost for Buyer	221.57	100.00
* Purchase at Farmgate			

Table 6 : Price Spread of sheet Rubber in Tripura**Supply Chain IV: Grower-Dealer- Buyer**

Sr. No.	Particulars	₹ per Kg	% share in buyer's price
1	Grower's sale price/ Dealer's purchase price	185.56	86.81
2	Expenses borne by the grower		
	i. Transportation	0.27	0.13
	ii. Loading/Unloading	-	-
	iii. Others	-	-
	iv. Sub total	0.27	0.13
3	Net Price received by Grower	185.29	86.68
4	Expenses borne by the Dealer		
	i. Transportation	0.19	0.09
	ii. Loading/unloading	0.06	0.03
	iii. Others	0.17	0.08
	iv. Sub total	0.42	0.20
	Margin of the Dealer	12.52	5.86
5	Dealer's sale price / Buyer's purchase price	198.50	92.86

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6	Expenses borne by the Buyer		
	i. Transport	5.17	2.42
	ii. Loading / Unloading	0.15	0.07
	iii. Tax @ 5%	9.93	4.64
	iv. Sub Total	15.25	7.14
8	Landing cost for Buyer	213.75	100.00

incurred by RPS/BPU. The margin of the Trading Company was 2.41 per cent. Although the trading company was found incurring various fixed expenses viz., establishment cost, store house expenses, staff salaries etc., for procurement and sale of sheet rubber the company does not incur any variable cost. The Manimilayar trading company is sponsored by The Rubber Board and Rubber Producers Societies. The expenses borne by the buyer was ₹ 9.78 per kg which was 4.21 per cent of buyer’s price (₹ 232.44 / kg).

The price spread of rubber in supply chain II (Growers- Block Plantation Units/ Rubber Producer’s Societies - Dealer -Buyer) is given in Table 4. Supply chain II reveals the organized set up under institutionalized support of RPS/BPU wherein the sheet rubber was sold to the NR dealers after group processing and marketing. The net price received by the growers was ₹ 203.73 per kg which was 89.19 per cent of the buyer’s price (₹ 228.41 per kg). The growers were not incurring the post-harvest expenses viz., processing, grading, packaging, marketing etc. All the post-harvest expenses were incurred by the society. The expenses borne by the society were ₹ 5.75 per kg. The expenses borne by the dealer was ₹ 0.42 per kg. The dealer margin was ₹ 2.56 per kg which was 1.12 per cent of the buyer’s purchase price. The expenses incurred by the buyer were high in supply chain II as compared to the supply chain I because the tax on the transaction through dealers was five per cent.

The price spread of sheet rubber in the unorganized sector (individual growers) is given in Tables 5 & 6. The supply chain III (Table 5) reveals that net price received by the growers as ₹ 184.74/kg which was 83.38 per cent of the buyer’s price (₹ 221.57/kg). The growers were found selling the produce as unsmoked rubber and agents/dealers were found smoking, grading and packaging the sheet rubber into different grades. The margin of the subagents and dealers was ₹ 7.39 and ₹ 12.87 per kg respectively, which were about three and six per cent of buyer’s price. The expenses incurred

by the buyer were almost equal to the buyer’s expenses in supply chain II but higher than in supply chain I.

The price spread of sheet rubber in supply chain IV (Grower-Dealer-Buyer) is given in Table 6. The grower’s sale price for sheet rubber was ₹ 185.56 per kg which is 86.81 per cent of the buyer’s purchase price. The growers were found selling unsmoked, ungraded sheets to the nearby dealers incurring only transportation expenses. The net price received by the growers was ₹ 185.29 per kg. The expenses borne by the dealer were about fifty paise per kg. The margin of the dealers was about six percent. The buyer was incurring an expense of Rs. 15.25 per kg.

Marketing efficiency of sheet rubber

Marketing efficiency shows the farmers share to that of expenses (cost and margins) incurred in moving the produce to the consumer (buyer in present study). The higher ratio would indicate the higher marketing efficiency (better performance of the market). The marketing efficiency of sheet rubber under different supply chains (Table 7) showed a higher marketing efficiency ratio in the organized sector mainly due to higher price realization by the farmers on account of group marketing and lower marketing margins. The operational efficiency, measured in terms of cost of performing marketing activities, was highest in supply chain I due to the benefits accruing from the economies of scale (the cost advantages that enterprises obtain due to size, output, or scale of operation), procurement of raw material and sale of processed NR. The supply chain II showed second highest marketing efficiency under the RPS-BPU organizational arrangements linked to private dealers. However, the unorganized growers dependent on private dealers represented in supply chain III and supply chain IV showed lower marketing efficiency. The lowest marketing efficiency in supply chain III was on account of more number of market intermediaries in the chain.

Table 7 : Market Efficiency of sheet rubber under different channels

Sr. No.	Particulars	Supply Chain I	Supply Chain II	Supply Chain III	Supply Chain IV
i	Buyer’s purchase price	232.44	228.41	221.57	213.75
ii	Price Spread	20.61	24.68	36.83	28.46
iii	Total marketing margin	5.61	2.56	20.26	12.52
iv	Total marketing cost	15.00	22.12	16.57	15.94
v	Net price received by growers	211.83	203.73	184.74	185.29
vi	Marketing efficiency	10.28	8.25	5.02	6.51

CONCLUSION

The study has focused on the potential benefits of comprehensive institutional interventions in rubber smallholder sector in Tripura. The institutionalized set up of BPU-RPS has been found effective in transferring new technologies generated by Rubber board. The institutionalized set up has been instrumental in providing good quality inputs at subsidized rate supplemented with periodic supervision. Linkages with rubber trading company ensure availability of good quality inputs at reasonable rates. In addition, the linkages are helpful to the smallholders in processing and marketing of rubber. The study revealed that the rural economy has transformed from a labour based subsistence livelihood pattern to a commercial plantation based economy.

The marketing efficiency of the four major supply chain dealing in sheet rubber in Tripura revealed that supply chain I opted by small rubber growers organized under RPS-BPU network is most efficient. The farmers share in buyer price was found highest in the supply chain I (91.13 %) and was the lowest in supply chain III (83.38 %). The higher operational efficiency as well as pricing efficiency has been reflected in lower price-spread, higher efficiency and growers' share. The study has demonstrated the benefits of community participation scheme with proper guidance and monitoring. This model of group processing and organized marketing system can be extended to growers not covered under the RPS-BPU network in the state.

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