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Effectiveness of Backward and Forward Linkages in Fruit Cultivation: A study of NERAMAC (North Eastern Regional Agricultural Marketing Corporation Limited)

Litan Das¹, M. S. Nain², Rashmi Singh³, R. Roy Burman⁴ and Anil Kumar⁵

ABSTRACT

NERAMAC, a public sector organisation was set up to support fruit producers of north eastern India in fruit cultivation, marketing, processing and employment generation. It thereby bridges the gap between the farmers and the market to enhance the agricultural procurement, processing, and marketing infrastructure. The effectiveness of NERAMAC in technology advisory service, input delivery services and marketing services in Dhubri and Karimganj district of Assam were studied. An *ex-post facto* research design was used for the study and the data were collected from 120 respondents comprising of 80 beneficiary farmers and 40 non-beneficiary farmers of NERAMAC. The effectiveness was measured through effectiveness index developed for this purpose. The extension services in respect of backward and forward linkages rendered by NERAMAC were found to be medium in effectiveness by majority of the farmers in the region.

Keywords: NERAMAC, backward and forward linkages, effectiveness index.

INTRODUCTION

The Indian farmers are facing severe challenges of geographical isolation, low productivity, climate change, pest and diseases, quality and quantity of irrigation water, credit, lack of market support including large number of middleman in marketing of agricultural produce, improper farm advisory services, inadequate farm machinery services, lack of entrepreneurial opportunities and insufficient infrastructural support for small and marginal farmers. Small farmers also face new challenges on integration of value chains, liberalization and globalization effects, market volatility and other risks and vulnerability, adaptation of climate change *etc.* (Thapa and Gaiha, 2011). Over the years, the total cultivable land is shrinking steadily, the grain area per person in India has shrunk steadily for several decades. In 1950 it was 0.22 hectares and is now below 0.10 hectares. It is projected that by 2050 the figure will be as less as 0.06 hectares per person (Larsen, 2003). In this context, food security becomes a prime concern for all of us. Fruits can play a vital role in attaining food and nutritional security of India, especially in the backward regions like Assam state of North eastern India which occupies an important position in terms of fruit production among the states of north eastern India. Among the fruits, oranges, pineapple, cashew nut, mango, banana, acid lime, are major fruits grown in this region (CMI SRC, 2005).

The major problem in the backward regions are lack of an

efficient marketing system (Planning Commission, 2007). The middlemen intervention being a serious concern for farmers in general and specific in backward regions like north east as the real profit goes to them who buy up the farm products at farm gate at nominal price and sell at outrageous prices to the consumers. This behaviour of middle men have discouraged genuine stakeholders getting into agriculture because of the marginal profit associated with it as the middle men cart away the bulk of the profits, posing serious threat to food security (Oguoma, 2010).

In many countries, government extension services are criticized for being inefficient and out of touch with the needs of their clients and the wider society (Carney, 1998). There is a large gap between the farmers and the government agencies regarding proper information about what to grow, how to grow and when to grow. North Eastern Regional Agricultural Marketing Corporation Limited (NERAMAC), a central public sector undertaking promoted by North Eastern Council, is an institutional innovation in the form of procurement of the marketable surplus of fruits and vegetables, its processing and marketing along with input support to producers. NERAMAC is active in the region since 1982-83. In addition to undertaking processing and marketing activity, it also takes up activities to enhance entrepreneurial skills of the fruit crop growers. However, regular training of staffs in organizational coordination and management has been stressed for enhanced

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effectiveness (Das *et al*, 2014). As such the effectiveness of different extension agencies working at ground level needs to be viewed from the eyes of stakeholders. Keeping this in view, the study was conducted to assess the effectiveness of NERAMAC in providing backward and forward linkage services which is a public extension system operational in North eastern part of India.

METHODOLOGY

The study was conducted in two districts namely Dhubri and Karimganj of Assam state of India. Two blocks from each district namely Mankachar and South Salmara from Dhubri district and Badarpur and South Karimganj from Karimganj were selected purposively having highest activities of NERAMAC. Two villages from each selected block were selected randomly, making a total of 8 villages accordingly. Ten farmers from each selected village made the sample of beneficiary farmers and five from each village were selected as non-beneficiary respondents. An *ex-post facto* research design was used for the study. Farmers' perception about different forward and backward linkage services provided by the NERAMAC were focused for the study. For the purpose of measuring effectiveness, an index was adopted after necessary modification from Mukherjee (2012). The effectiveness of agricultural extension system was operationalized as comprising the - components - viz. forward and backward linkage services, extent of adoption, increase in yield, increase in profit/income and farmers satisfaction. The data collection was performed by personal interview method.

Forward and backward linkage services: Availability of services, accessibility, appropriateness, timeliness and quality were studied on three point continuum scale. The highest was scored 3 and lowest as one whereas timeliness of service was scaled on two point continuum *i.e.* Yes (2) and No (1).

Extent of adoption of technology: The extent of adoption was measured for the recommended cultivation and post harvest practices for fruits. The extent of adoption was measured as per cent of adoption of recommended practices as given below:

$$\text{Extent of adoption} = (\text{Actual practice} / \text{Recommended practices}) \times 100$$

Increased yield of farmers: It was calculated by subtracting the earlier yield per acre of the crop before intervention of NERAMAC from present yield after intervention of NERAMAC. Following formula was used:

$$\% \text{ increase in yield} = (\text{Increase in yield per acre} / \text{Earlier yield per acre per year}) \times 100$$

Increased income of farmers: Increased income was calculated by subtracting the earlier income per hectare of the crop before intervention of NERAMAC from present profit after intervention of NERAMAC. The following formula was used:

$$\% \text{ income increase} = (\text{Increased in income per hectare} / \text{Earlier income per hectare}) \times 100$$

Satisfaction index: To measure farmer's satisfaction of extension service, the index prepared by Kumar, (2005) was used after necessary modification. There were seven statements scored on five point continuum *viz.* strongly agree (5), agree (4), undecided (3), disagree (2) and strongly disagree (1). The highest score one can obtain was 35 and lowest 7. The responses were added to get satisfaction score. The satisfaction index was calculated as:

$$\text{Farmers' satisfaction index} = (\text{Individual score obtained} / \text{Maximum score}) \times 100$$

The respondents were classified into five categories from very low to very high level by dividing the score into five classes of equal interval.

Effectiveness index: The effectiveness index was prepared based on all the above mentioned parameters and was calculated by the following equation:

$$EI = (FBS * W1 + EA * W2 + IY * W3 + II * W4 + FS * W5) / (W1 + W2 + W3 + W4 + W5 + W6)$$

Where,

EI: Effectiveness index

FBS: Mean score of forward and backward linkage services

EA: Score of Extent of Adoption

IY: Per cent increase in yield

II: Per cent increase in Income

FS: Farmer's satisfaction score

Wi are respective weight as per mean of experts rating to the above components

RESULTS AND DISCUSSION

The results and appropriate discussion has been presented in five sub heads *viz.* perceptions regarding forward and backward linkage services, timeliness of the services, extent of adoption, increase in production and income of the farmers and perceived satisfaction with

NERAMAC services.

Forward and backward linkage services: The forward and backward linkage services were categorized in sub heads like; availability of services, accessibility of inputs, quality, timeliness of services supply, and appropriateness of services. The responses of 80 NERAMAC beneficiary farmers described in table 1 shows that forward and backward linkage services of NERAMAC was found to be medium in availability by 62.5 per cent of farmers, high by 23.7 per cent and very high by 10 per cent. The services were found to be high in accessibility by 73.7 per cent of farmers, whereas, 16.2 per cent farmers found the services medium in accessibility. The services was found to be high in appropriate by 76.25 per cent farmers whereas, 17.5 per cent farmers found it medium. As per farmers' response about timeliness, the service was found to be medium in timeliness by 67.5 per cent farmers whereas, 7.5 per cent farmers found it high in timeliness and very high to 10 per cent of farmers. In case of quality of services it was found to be medium by 46.2 per cent and high by 23.7 per cent of farmers.

Table 2 shows appropriateness of the technologies provided by NERAMAC. It was operationally defined as suitability of the technology provided by the NERAMAC based on farming conditions and climate of the farmers in particular region. The perception of the farmers was obtained on degree of appropriateness of various services. About 66 per cent farmers perceived that the latest package of practice in the form of 'Raw material services with market updates' provided by NERAMAC was appropriate to their field situation and 30 per cent farmers perceived it highly appropriate for their location. Sixty per cent farmers perceived that the service provided by NERAMAC was appropriate to their field situation and 27.5 per cent farmers perceived it highly appropriate for their location in 'up to date support in allied sectors of agriculture'. About 'capacity building' services, 51.2 per cent farmers believed that it was appropriate in their situation while 35.0 per cent farmers believed that it was highly appropriate in their condition. It illustrated that 53.75 per cent farmers perceived appropriate 'market support' by the NERAMAC while 22.5 per cent farmers perceived it as moderately appropriate to their field situation. 63.75 per cent farmers experienced that the services for the 'post-harvest technology' were appropriate in their situation while 21.2 per cent farmers experienced it as somewhat appropriate in their condition. It also shows that 71.25 per cent farmers perceived that the 'processing services' provided by NERAMAC was appropriate to their field situation and 27.5 per cent farmers perceived it highly appropriate for their location.

Timeliness of the services: It referred to the availability of the technology and the services provided by the

NERAMAC at the appropriate time to the farmers in terms of seasonality of the crops grown in particular area. The perceptions of the farmers were sought on the relativity of newness of technology. Table 3 represented the frequency and percentage of response of the farmers to the timeliness of the services of the NERAMAC. It showed that 68.75 per cent farmers perceived that information regarding the raw material services was provided in advance of the season while 6.25 per cent farmers perceived that it was provided far in advance of the cropping season. Seventy per cent farmers assumed that information regarding the practices of allied sectors was provided in advance while 13.75 per cent farmers felt that it was provided far in advance. In case of market support, 57.5 per cent farmers felt that it was provided far in advance. For the post-harvest technology, 30 per cent farmers perceived that the services were provided in advance and 50 per cent farmers responded that it was provided at the time of technology to be used.

Extent of adoption: The NERAMAC is promoting different fruit crops in this region. There were several recommendations in fruit cultivation and post harvest handling with proper market support prescribed by NERAMAC. Farmer's perception regarding the adoption of practices was sought and the results are presented in table 4. Majority of farmers (40 per cent) have highly adopted the recommended practices and 25 per cent of farmers adopted the recommended practices in medium. About 24 per cent had adopted the recommended practices very highly. The findings are similar with the findings of Kumar A. (2005) and Mukherjee (2011).

Increase in production and income of beneficiaries after NERAMAC intervention: The increase in production and income after intervention of NERAMAC were divided in five equal categories. Table 5 reveals that most of the farmers (30 %) had very high (80 % and above) had increase in their production after the intervention of NERAMAC. There was high (61-80 %) increase in the production of 23.8 per cent of the farmers whereas medium (41-60%) increase in production of 20 per cent of the farmers. Only 15 per cent farmers had low (21-40 %) increase in their production and very low (0-20 %) increase in the production of 11.2 per cent farmers NERAMAC in their locality. Overall increase in production was 66.29 per cent. The findings are similar with the findings of Kumar A. and Vijayaragavan (2007). Table 5 further shows that there was very high (80 % and above) change in income for the 75 farmers, 12.5 per cent farmers have medium (40-60%) increase in income. Only 10 per cent farmers had high (60-80%) increase in income. The overall average change in income of the

farmers was 130.4 per cent after the intervention of NERAMAC.

Farmers' perceived satisfaction level from the services of NERAMAC: The farmer's satisfaction was operationally defined as the perceived need contentment by the utilization of services provided by NERAMAC. Table 6 depicted that 70 per cent of the total farmers had medium level of satisfaction with the services provided by the NERAMAC and 10 per cent farmers had high level of satisfaction. Five per cent farmers had very high satisfaction with the NERAMAC.

The findings are similar with the findings of Kumar (2005). The obtained score was divided into five equal groups ranging from low to high effectiveness of the NERAMAC services. Table 7 revealed that 62.5 per cent of the total farmers perceived that the NERAMAC effectiveness was medium.

Out of the total farmers, 16.2 per cent farmers perceived it very high effective in obtaining the services regarding their farming. There were 21.2 per cent farmers believed that it was highly effective to meet their needs. The findings are similar with the study of Chandrasekhar (2013) and Mukherjee (2011).

Table 1: Farmers' responses regarding forward and backward linkage of NERAMAC (n=80)

Category	Availability	Accessibility	Appropriateness	Timeliness	Quality
Very low (0-20)					
Low (21-40)	5(6.2%)	3 (3.75%)	1 (1.25%)	12(15%)	15(18.7)
Medium (41-60)	50 (62.5%)	13(16.2%)	14 (17.5%)	54(67.5%)	37(46.2)
High (61-80)	19 (23.7%)	59(73.7%)	61(76.25%)	6(7.5%)	19(23.7)
Very high (81-100)	8(10%)	5(6.2%)	4(5%)	8(10%)	9(11.2%)
Mean	64.55	67.34	65.56	68.43	73)12
S.D	6.18	5.56	5.87	4.36	7.78

Table 2: Distribution of farmers as per perceived appropriateness of the services provided by NERAMAC (n=80)

Services	HA		AP		MA		SA		NA	
	f	%	f	%	f	%	f	%	f	%
Raw material services with market updates	24	30.00	53	66.25	1	1.2	2	2.50	0	0.00
Up to date support in allied sectors of agriculture	22	27.5	48	60.0	10	12.5	0	0.00	0	0.00
Market support	17	21.25	43	53.75	18	22.50	2	2.50	0	0.00
Entrepreneurial services	11	12.5	16	21.2	3	4.5	52	62.5	0	0.00
Procurement services	10	12.5	17	21.2	3	4.5	27	34.5	0	0.00
Processing services	22	27.5	57	71.25	1	1.2	0	0.00	0	0.00
Advisory services	0	0.00	11	13.75	52	62.5	17	21.2	1	1.2
Capacity building	28	35.0	41	51.2	11	13.8	0	0.00	0	0.00
Input services with protection technologies	23	28.8	10	12.5	20	25.0	52	62.5	0	0.00
Post-Harvest Technologies	2	2.50	51	63.75	8	10	17	21.2	2	2.50

HA=highly appropriate, AP=Appropriate, MA=moderately appropriate, SA=somewhat appropriate, NA=Not at all appropriate

Table 3: Distribution of farmers as per perceived timeliness of the services by NERAMAC (n=80)

Services	FA		IA		UT		TL		TO	
	f	%	f	%	f	%	f	%	f	%
Raw material services with market updates	5	6.25	55	68.75	15	18.8	5	6.25	0	0.00
Up to date support in allied sectors of agriculture	11	13.75	56	70	9	12	0	0.00	0	0.00
Advisory service	3	3.75	26	37.8	51	63.75	0	0.00	0	0.00
Market support	7	8.75	46	57.5	10	12.5	17	21.25	0	0.00
Entrepreneurial services	5	6.2	45	56.5	50	62.5	4	5.0	0	0.00
Procurement services	25	31.25	40	50	15	18.8	29	36.2	0	0.00
Processing services	3	3.75	23	28.75	19	23.75	11	13.75	0	0.00
Capacity building	3	3.8	42	52.5	15	18.8	0	0.00	0	0.00
Input services with protection technologies	2	2.5	43	51.2	32	40	3	3.8	0	0.00
Post-harvest technologies	6	7.50	24	30	40	50	0	0.00	0	0.00

FA=Far in advance, IA=In advance, UT=at the time of usage of technology, TL= When technology loses its objective newness, TO=When technology becomes obsolete

Table 4: Extent of overall adoption of recommended practices (n=80)

Category	Frequency (percentage)
Very low (0-20)	1 (1.25%)
Low (21-40)	8 (10%)
Medium (41-60)	20 (25%)
High (61-80)	32 (40%)
Very high (81-100)	19 (23.75%)
Mean	65.00
S.D	4.4

Table 5: Distribution of farmers based on increase in production and income from fruit crop after NERAMAC services (n=80)

Category	Class Score (%)	Production		Income	
		Frequency(Percentage)	Frequency(Percentage)	Frequency(Percentage)	Frequency(Percentage)
Very Low	0-20	6 (7.5)	1 (1.25)		
Low	20-40	9 (11.25)	10 (12.50)		
Medium	40-60	32 (40.0)	36 (45.0)		
High	60-80	20 (25.0)	20 (25.0)		
Very High	80-Above	13 (16.25)	13(16.25)		
Mean		61.69	85.50		
Standard Deviation		5.45	7.69		

Table 6: Satisfaction level of farmers based from NERAMAC services (n=80)

Category of Satisfaction	Class Score	Frequency	Percentage
Very low	0-20	01	1.20
Low	20-40	9	11.2
Medium	40-60	56	70.0
High	60-80	10	10
Very high	80-100	4	5.0
Mean		24.17	
Standard Deviation		5.46	

Table 7: Distribution of farmers based on effectiveness index scores
n=80

Category of Effectiveness	Class Score	Frequency	Percentage
Very Low	0-20	0	0.00
Low	20-40	0	0.00
Medium	40-60	50	62.5
High	60-80	17	21.2
Very High	80-100	13	16.2
Mean		71.45	
Standard Deviation		5.34	

CONCLUSION

The study on effectiveness found that most of the farmers were moderately satisfied with the services from NERAMAC. Though, the adoption of recommended practices was still high, increase in production was medium resulting medium to high increase in income level of farmers. The services were found good in accessibility and appropriateness though the services were found medium in availability, timeliness, and quality. It can be concluded that proper technical backstopping by research institutes, forward and backward linkages for financial needs and learning-by-doing supported by inter-firm network collaboration may enhance the competitive potential of the fruit growers. There should be better coordination and convergence among different institutions like ATMAS, SAUs, and KVKs by forming linkage with this organizations and other governmental or non-governmental organizations for better grass-root level coordination. The input services with protection technologies, entrepreneurial services and procurement services were rated towards lower side as such services need to be more focused and the intensity need to be increased for wider coverage in number and subject matter areas. The market support and procurement services need to be more tailored to the need of the stakeholders.

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