



Research Article

Impact assessment of rice production technology recommended by Assam Agricultural University in terms of structural changes and cropping intensity in Assam

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SUMMARY : A study was conducted in the districts of Karimganj, Lakhimpur and Jorhat of Assam to assess the impact of AAU recommended rice production technology in terms of structural changes occurring in farmer fields in Assam. A purposive sampling technique was followed and statistical methods such as percentage, frequency, mean and ranking was used for analysing the data. Data were collected through personal interview method during the period from late 2009 to early 2010. A total of 360 respondents were interviewed with the help of the structured schedule. About 12.50 per cent sample farmers had Kutcha irrigation channels throughout the three years covered under the study. In terms of farm machinery, 67.50 per cent respondents had sprayers and 48.61 per cent had weeders. Also, 36.67 per cent respondents had tube wells while 19.72 per cent and 3.33 per cent respondents had pump sets and dusters, respectively. About 1.39 per cent respondents also had threshers. Among the sampled respondents 4.17 per cent had power tillers and 0.28 per cent had tractors. Moreover, 93.61 per cent respondents possessed improved mud boundaries. It was seen that the total average cropping intensity in relation to rice in the study area was 108.90 per cent. Among the three districts covered under the study Lakhimpur had the highest average cropping intensity in relation to rice (120.82%) followed by Karimganj (106.58%) and Jorhat (99.30%).

KEY WORDS :Impact assessment,
Structural changes,
Cropping intensity

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BACKGROUND AND OBJECTIVES

Rice is the most widely consumed staple food for a large part of the world's human population, especially in Asia. Rice occupies about two-third of the total cropped area in the state of Assam. Assam, situated in the eastern part of the country, is the gateway of the North Eastern India. Assam occupies a strategically important position. Its economy is termed as corridor economy, as the state is connected to the rest of the country by a small strip of land in its western border (Bardoloi and Neog, 1986). The economy of the state is

primarily a rural-based where more than 87 per cent of the population dependent on agriculture. Nearly 80 per cent of total cropped area was rainfed signifying that dependency of agriculture on vagaries of nature and vulnerability to risk (Goswami, 1989). The state is endowed with abundant water resource, which is also to be developed properly (Baishya *et al.*, 1997). Being the single major source of agricultural GDP, rice plays a significant role in the economy of Assam. Further, its importance in the consumption basket (the average monthly consumption per capita is about 13 kg) also speaks volumes on the rice

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orientation of the state (Barah *et al.*, 2001). Another noteworthy fact is that, rice is traditionally-grown throughout the year *viz.*, winter, autumn and summer seasons, with winter (*Kharif*) rice as the main crop. The adoption of modern rice cultivars has increased a lot in the past three decades. Modern cultivars continue to replace thousands of traditional cultivars (Chang, 1987).

The average productivity of rice in Assam is much lower than the national level (Barah *et al.*, 2001). A mere increase of 50 kg rice/ha in Assam can lead to a total estimated income of more than Rs.125 crores to the state from around 25 lakh ha of rice. This is possible when technology is most appropriate to the farmers' situation and needs and technology dissemination processes are quicker and more efficient. It is very essential to assess the impact of rice production technology recommended by Assam Agricultural University in terms of structural changes in farmers' fields.

Impact of any developmental activity can be of various forms such as economic, material achievement, socio-economic, organizational, behavioural etc. Each of these forms again consists of variety of elements. So, researchers usually address certain selected element of specific forms in a study. The crucial question in an impact assessment study is what to assess? Different behavioural scientists are answering this question with similar views, but in different words: "Impact study could try to assess the welfare of technological change" (Hertford and Schmitz, 1977).

According to Norton and Davis (1981) "Impact assessment is an evaluation focused on the outcomes or impact of a programme, policy, organization or technology". According to Jahnke *et al.* (1985) "Impact assessment should try to present a precise view of knowledge produced". The author also added that negative results are worth knowing as they guide future research intension and explain on short term research project.

Neog (1994) studied the impact and quality of technology transfer in selected growth centres of AAU. He measured the impact in terms of mean cropping intensity, knowledge on technology modules and extent of adoption of technology modules by comparing beneficiary and non-beneficiary respondents. In this study, impact has been assessed by considering several dimensions which in turn helped us to find out how much impact AAU recommended rice production technologies had in the study area.

RESOURCES AND METHODS

The study was carried out in the districts of Karimganj, Lakhimpur and Jorhat. These districts were purposively selected as Jorhat and Karimganj basically have rice research stations. Lakhimpur was also selected along with the other two districts as it conducts research on deep water rice. The

number of farmers interviewed in each of the districts was 120, taking the total sample size to 360 farmers. The data in the present study were collected directly from the farmers with the help of the structured schedule, through personal interview method. The statistical technique used are frequency, percentage, mean and rank.

OBSERVATIONS AND ANALYSIS

The different structural changes occurring in farmers' fields during the years covered under the investigation and the cropping intensity with relation to rice was also studied to help assess the impact of AAU recommended rice production technology. The various structural changes considered were the presence or absence of irrigation channels, different types of farm machinery, improved cowsheds, improved storage structures, rice mills etc.

Structural changes in farmers' fields :

It is evident from Table 1 that 12.50 per cent sample farmers had Kutcha irrigation channels throughout the three years covered under the study. None of the sampled respondents had pucca irrigation channels. In terms of farm machinery, 67.50 per cent respondents had sprayers and 48.61 per cent had weeders. Also, 36.67 per cent respondents had tube wells while 19.72 per cent and 3.33 per cent respondents had pump sets and dusters, respectively. About 1.39 per cent respondents also had threshers. Among the sampled respondents 4.17 per cent had power tillers and 0.28 per cent had tractors. Moreover, 93.61 per cent respondents possessed improved mud boundaries.

About 65.56 per cent respondents had traditional storage structures and 76.94 per cent respondents had traditional cow sheds. A noteworthy thing about the cowsheds was that among the 33.33 per cent permanent cow sheds in the district every single one was completely concrete. Most of the permanent cow sheds were found in Karimganj district as stealing of cows is common in some areas of the district. The permanent cowsheds of the other two districts weren't covered from all sides and mostly had half walls. About 29.17 per cent respondents had deepened *khals* that were dug for irrigation and 3.61 per cent respondents had permanent drainage facilities. Also, 1.94 per cent respondents had rice mills in the study area. Apart from the addition of one power tiller in 2008-09 there was no change in the number of machinery or other structures throughout the three years covered under the study. But the presence of machinery including tractors, power tillers and certain other facilities suggest good impact of AAU recommended rice production technology.

Since only three years were covered under the study it was difficult to find drastic structural changes. Also, a few

farmers claimed that some of the machineries like pump set and sprayers were purchased by them for the purpose of vegetable cultivation and cannot be attributed to impact of rice. But, several farmers claimed that the facilities seen in the

first year (2006-07) covered under the study was a direct result of adoption of AAU recommended technology. Hence, it can be concluded that AAU recommended rice production technology had a positive impact on the study area.

Table 1 : Structural changes in farmers' field in the study area

(n=360)

	2006-07		2007-08		2008-09	
	F	%	F	%	F	%
Irrigation channels (<i>Kutcha</i>)	45	12.50	45	12.50	45	12.50
Irrigation channel (<i>Pucca</i>)	0	0.00	0	0.00	0	0.00
Tractor	1	0.28	1	0.28	1	0.28
Power tiller	14	3.89	14	3.89	15	4.17
Pump set	71	19.72	71	19.72	71	19.72
Tube well	132	36.67	132	36.67	132	36.67
Sprayer	243	67.50	243	67.50	243	67.50
Weeder	175	48.61	175	48.61	175	48.61
Thresher	5	1.39	5	1.39	5	1.39
Duster	12	3.33	12	3.33	12	3.33
Permanent drainage	13	3.61	13	3.61	13	3.61
Improved mud boundary	337	93.61	337	93.61	337	93.61
Khals (deepened dug for irrigation)	105	29.17	105	29.17	105	29.17
Cowshed permanent structure	83	23.06	83	23.06	83	23.06
Cowshed temporary structure/ bamboo structure	277	76.94	277	76.94	277	76.94
Storage, improved/ permanent	124	34.44	124	34.44	124	34.44
Storage, traditional	236	65.56	236	65.56	236	65.56
Rice mill	7	1.94	7	1.94	7	1.94

F = Frequency

% = Percentage

Table 2 : Structural changes in farmers' field in Karimganj district

(n=120)

	2006-07		2007-08		2008-09	
	F	%	F	%	F	%
Irrigation channels (<i>Kutcha</i>)	9	7.5	9	7.5	9	7.5
Irrigation channel (<i>Pucca</i>)	0	0.00	0	0.00	0	0.00
Tractor	1	0.83	1	0.83	1	0.83
Power tiller	6	5.00	6	5.00	6	5.00
Pump set	25	20.83	25	20.83	25	20.83
Tube well	20	16.67	20	16.67	20	16.67
Sprayer	72	60.00	72	60.00	72	60.00
Weeder	48	40.00	48	40.00	48	40.00
Thresher	5	4.17	5	4.17	5	4.17
Duster	9	7.50	9	7.50	9	7.50
Permanent drainage	0	0.00	0	0.00	0	0.00
Improved mud boundary	120	100	120	100	120	100
Khals (deepened dug for irrigation)	35	29.17	35	29.17	35	29.17
Cowshed permanent structure	40	33.33	40	33.33	40	33.33
Cowshed temporary structure/ bamboo structure	80	66.67	80	66.67	80	66.67
Storage, improved/ permanent	12	10.00	12	10.00	12	10.00
Storage, traditional	108	90.00	108	90.00	108	90.00
Rice mill	4	3.33	4	3.33	4	3.33
Any other	0	0.00	0	0.00	0	0.00

F = Frequency

% = Percentage

Structural changes in farmers' fields in Karimganj district:

Table 2 shows that 7.5 per cent sample farmers had *Kutcha* irrigation channels throughout the three years covered under the study. None of the sampled respondents had *pucca* irrigation channels. In terms of farm machinery, 60 per cent respondents had sprayers and 40 per cent had weeders. Also, 20.83 per cent respondents had pump sets while 16.67 per cent and 7.5 per cent respondents had tube wells and dusters, respectively. About 4.17 per cent respondents also had threshers. Among the sampled respondents 5.00 per cent had power tillers and 0.83 per cent had tractors. All the respondents possessed improved mud boundaries.

About 90 per cent respondents had traditional storage structures and 66.67 per cent respondents had traditional cow sheds. A noteworthy thing about the cowsheds was that among the 33.33 per cent permanent cow sheds in the district every single one was completely concrete. They looked like godowns rather than cow sheds. Some of the respondents resided in mixed houses (mud and concrete) themselves but kept their cows in completely concrete sheds. These villages were very near the Bangladeshi border. Since cows fetch very handsome prices in Bangladesh, cow stealing was very common in these areas.

Due to this reason the farmers made sure the cows were completely secure in concrete sheds. Also, 3.33 per cent respondents had rice mills in this district. There was absolutely

no change in the number of machinery or other structures throughout the three years covered under the study. But the presence of machinery including power tillers and certain other facilities suggest good impact of AAU recommended rice production technology. Also, several farmers claimed that the facilities seen in the first year covered under study was a direct result of adoption of AAU recommended technology. Since these villages had been cultivating recommended HYV for a really long time, they have accrued a lot of benefit over that period of time.

Structural changes in farmers' fields in Lakhimpur district:

It is clear from Table 3 that 15.83 per cent sample farmers had *Kutcha* irrigation channels throughout the three years covered under the study. None of the sampled respondents had *pucca* irrigation channels. In terms of farm machinery, 80.83 per cent respondents had sprayers and 66.67 per cent had weeders. Also, 76.67 per cent respondents had tube wells while 35.83 per cent and 2.50 per cent respondents had pump sets and dusters, respectively. None of the sampled respondents had threshers throughout the period covered under the study. Among the sampled respondents 2.50 per cent had power tillers in 2006 and 2007 while this figure increased to 3.33 per cent in 2008. None of the sampled respondents possessed tractors while all of them had improved mud boundaries.

Table 3 : Structural changes in farmers' fields in Lakhimpur district**(n=120)**

	2006-07		2007-08		2008-09	
	F	%	F	%	F	%
Irrigation channels (<i>Kutcha</i>)	19	15.83	19	15.83	19	15.83
Irrigation channel (<i>Pucca</i>)	0	0.00	0	0.00	0	0.00
Tractor	0	0.00	0	0.00	0	0.00
Power tiller	3	2.50	3	2.50	4	3.33
Pump set	43	35.83	43	35.83	43	35.83
Tube well	92	76.67	92	76.67	92	76.67
Sprayer	97	80.83	97	80.83	97	80.83
Weeder	80	66.67	80	66.67	80	66.67
Thresher	0	0.00	0	0.00	0	0.00
Duster	3	2.50	3	2.50	3	2.50
Permanent drainage	6	5.00	6	5.00	6	5.00
Improved mud boundary	97	80.83	97	80.83	97	80.83
Khals (deepened dug for irrigation)	40	33.33	40	33.33	40	33.33
Cowshed permanent structure	10	8.33	10	8.33	10	8.33
Cowshed temporary structure/ bamboo structure	110	91.67	110	91.67	110	91.67
Storage, improved/ permanent	79	65.83	79	65.83	79	65.83
Storage, traditional	41	34.17	41	34.17	41	34.17
Rice mill	1	0.83	1	0.83	1	0.83
Any other	0	0.00	0	0.00	0	0.00

F = Frequency

% = Percentage

About 65.83 per cent respondents had permanent storage structures and the rest had traditional storage structures while 91.67 per cent respondents had traditional cow sheds and the rest had permanent cow sheds.

The reason behind such a healthy percentage of respondents having permanent storage structures was probably the fact that most of the respondents stored only the grain of the paddy crop in this district. This enabled them to store their harvest in sacks in their own residence and they did not need a separate structure for it. This practice is more prevalent among the Moslem farmers and since a vast majority of the sampled respondents of this district were Moslems, we found this trend. Only 0.83 per cent respondents had rice mills in this district. There was only one change in the number of machinery or other structures throughout the three years covered under the study. The number of power tillers increased by one in 2008-09. This farmer was from 2 no. Urang Basti and most of the respondents of this village had large land holdings. Moreover, one of the farmers of this district sold his power tiller in 2005 after only two years of purchasing it. Although there weren't many structural changes in this district during the study period, presence of machinery including power tillers and certain other facilities suggest good impact of AAU recommended rice production technology. But, unlike Karimganj several farmers claimed that some of the machineries like pump set and sprayers were purchased by them for the

purpose of vegetable cultivation.

Structural changes in farmers' fields in Jorhat district :

It is clear from Table 4 that 14.17 per cent sample farmers had *Kutch*a irrigation channels throughout the three years covered under the study. None of the sampled respondents had *pucca* irrigation channels. In terms of farm machinery, 61.67 per cent respondents had sprayers and 41.67 per cent had weeders. Also, 16.67 per cent respondents had tube wells while 2.50 per cent had pump sets.

None of the sampled respondents had threshers or dusters throughout the period covered under the study. Among the sampled respondents 4.17 per cent had power tillers. None of the sampled respondents possessed tractors. All of them had improved mud boundaries while 5.83 per cent respondents had permanent drainage.

About 27.50 per cent respondents had permanent storage structures and the rest had traditional storage structures while 72.50 per cent respondents had traditional cow sheds and the rest had permanent cow sheds. As most of the respondents did not store only the grain of the paddy crop in this district the number of permanent storage structures is far less compared to Lakhimpur. Only 1.67 per cent respondents had rice mills in this district.

There was absolutely no change in the number of machinery or other structures throughout the three years

Table 4 : Structural changes in farmers' fields in Jorhat district

(n= 120)

	2006-07		2007-08		2008-09	
	F	%	F	%	F	%
Irrigation channels (<i>Kutch</i> a)	17	14.17	17	14.17	17	14.17
Irrigation channel (<i>Pucca</i>)	0	0.00	0	0.00	0	0.00
Tractor	0	0.00	0	0.00	0	0.00
Power tiller	5	4.17	5	4.17	5	4.17
Pump set	3	2.50	3	2.50	3	2.50
Tube well	20	16.67	20	16.67	20	16.67
Sprayer	74	61.67	74	61.67	74	61.67
Weeder	47	41.67	47	41.67	47	41.67
Thresher	0	0.00	0	0.00	0	0.00
Duster	0	0.00	0	0.00	0	0.00
Permanent drainage	7	5.83	7	5.83	7	5.83
Improved mud boundary	120	100.00	120	100.00	120	100.00
Khals (deepened dug for irrigation)	30	25.00	30	25.00	30	25.00
Cowshed permanent structure	23	19.17	23	19.17	23	19.17
Cowshed temporary structure/ bamboo structure	87	72.50	87	72.50	87	72.50
Storage, improved/ permanent	33	27.50	33	27.50	33	27.50
Storage, traditional	87	72.50	87	72.50	87	72.50
Rice mill	2	1.67	2	1.67	2	1.67
Any other	0	0.00	0	0.00	0	0.00

F = Frequency

% = Percentage

covered under the study in this district also. But the presence of machinery including power tillers and certain other facilities suggest good impact of AAU recommended rice production technology. Also, several farmers claimed that the facilities seen in the first year covered under study was a direct result of adoption of AAU recommended technology and varieties. Since these villages had been cultivating recommended HYV for a really long time, they have accrued a lot of benefit over that period of time.

Cropping intensity in relation to rice in the study area :

It is evident from Table 5 that total average cropping intensity in the study area was 108.90 per cent. Among the three districts covered under the study, Lakhimpur had the highest average cropping intensity in relation to rice (120.82%) followed by Karimganj (106.58%) and Jorhat (99.30%). Table 5 also shows that Jorhat district did not show any change in cropping intensity in relation to rice during the years covered under the study. Also, Jorhat was the only district that did not have a single farmer who practiced double cropping. When asked about the reason for this, they said that earlier most of the respondents cultivated *Ahu* rice along with *Sali*, but in recent years *Ahu* cultivation had been discontinued due to

various reasons like stray cattle problem, weeds and lack of water. *Boro* varieties were also not cultivated in Jorhat district due to the lack of irrigation facilities. Moreover, the number of small streams was very less in Jorhat district and this prevented the farmers from diverting water from such streams to their fields for *Boro* cultivation. Cropping intensity in Karimganj showed a slight increasing trend though it was minuscule. Whereas, Lakhimpur showed a highest cropping intensity in 2006-07(122.36%) and the lowest in 2007-08 (119.84%). Although, Karimganj and Lakhimpur cultivated *Ahu* varieties, the coverage of these varieties was very poor. The reason behind this may be the ever present cattle problem and the problem of assured irrigation. Weeds are also one of the problems in *Ahu* cultivation. Overall, the area under *Ahu* varieties is decreasing day by day even in Karimganj and Lakhimpur. The biggest problem faced by the farmers is due to stray cattle which are let loose by villagers that do not cultivate this type of rice. So, most of the respondents (especially in Karimganj district) said that they cultivated *Ahu* varieties on plots adjacent to their homestead garden for better monitoring. Naturally these plots were small and this helped them to manage the stray cattle. Moreover, some of the respondents claimed that they could go for *Ahu* cultivation

Table 5 : Cropping intensity in relation to rice in the selected districts of the study area

(n=360)

District	Village	2006-07	2007-08	2008-09	Average
Karimganj (n=120)	Hassanpore	103.11	103.11	101.81	102.67
	Kujab	112.30	112.30	112.30	112.30
	Darakuna	115.30	116.62	120.35	117.42
	Pacharghat	98.81	98.81	98.81	98.81
	Khagragura	102.10	104.50	104.50	103.70
	Borbadri	104.57	104.57	104.57	104.57
	District average	106.03	106.65	107.06	106.58
Lakhimpur (n=120)	1 no. Rampur	100.00	100.00	100.00	100.00
	2 no. Urang Basti	131.67	129.91	127.70	129.76
	Bowalguri	139.47	139.47	139.47	139.47
	Sherabbhati	135.58	133.33	137.11	135.34
	1 no Dejoo Pathar	100.00	96.63	100.00	98.88
	Jooritooop	127.43	119.71	117.24	121.46
	District average	122.36	119.84	120.25	120.82
Jorhat (n=120)	Hilikha sanatan gaon	100.00	100.00	100.00	100.00
	Karalibari	100.00	100.00	100.00	100.00
	Bogar Gaon	98.31	98.31	98.31	98.31
	Rangajan Maran Gaon	97.50	97.50	97.50	97.50
	Thengal Gaon	100.00	100.00	100.00	100.00
	Purani Mati Phota gaon	100.00	100.00	100.00	100.00
	District average	99.30	99.30	99.30	99.30
Total average					108.90

by erecting bamboo fences, but ever since they started cultivating AAU recommended HYV's they did not feel the need to go for *Ahu* cultivation as their needs were fulfilled by the *Sali* crop. Also, erecting bamboo fences would increase their cost of cultivation and they did not want to do it for the *Ahu* crop which is not the primary rice crop of the state. Moreover, several farmers who were cultivating *Boro* varieties in Sherabbhati village of Lakhimpur district as a group were considering quitting, as the problem of stray cattle had gone out of hand. So, it can be said that the number of farmers practicing double cropping was coming down. Although, research projects promoting double cropping are going on in Assam Agricultural University, still a negative trend was seen in this regard. So, Assam Agricultural University should look into the matter before farmers from districts which cultivate *Ahu* and *Boro* varieties stop going for commercial cultivation altogether.

Conclusion :

The study showed that in terms of structural changes apart from the addition of one power tiller in 2008-09 there was no change in the number of machinery or other structures throughout the three years covered under the study. But the presence of machinery including tractors, power tillers and certain other facilities suggest good impact of AAU recommended rice production technology. Since only three years were covered under the study it was difficult to find drastic structural changes. Also, a few farmers claimed that some of the machineries like pump set and sprayers were purchased by them for the purpose of vegetable cultivation and cannot be attributed to impact of rice. But, several farmers claimed that the facilities seen in the first year covered under the study was a direct result of adoption of AAU recommended technology. Hence, it can be concluded that AAU recommended rice production technology has had a positive impact on the study area. In terms of cropping intensity in relation to rice, it was seen that both Karimganj and Lakhimpur had cropping intensities above 100 per cent. But, the trend seen in the study area was not promising as most of the respondents were discontinuing the cultivation of *Ahu*

varieties and *Boro* varieties due to stray cattle problem, weeds and lack of irrigation.

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