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Farmers' perception of suitable upland 'Ahu' rice varieties in Assam

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ABSTRACT

Farmers' perception of suitability criteria for direct seeded upland 'Ahu' rice varieties with emphasis on the role played by ethno-cultural settings through application of various Participatory Rural Appraisal (PRA) tools and experimentation in the farmers' field was studied. It indicated that any upland 'Ahu' rice variety to be acceptable to the farmers of the study area should be high yielding, non-lodging, semi-tall (] 120 cm), early maturing (] 100 days) with quick early vigour, deep green leaves, well exerted long and heavy panicles, reasonable duration of seed dormancy, desired grain quality and resistance to rice gundhi bug, stem borers, blast and brown spot disease. The study indicated that the farmers' suitability perception of a variety even for similar growing environment might vary in different accounts due to ethno-cultural diversity suggesting the requirement of considering the ethno-cultural settings too along with the agro-ecological parameters of the target environments while deciding the breeding goals.

Key words: *Upland, 'Ahu' rice, ethno-cultural variation, farmers' perception, PRA tools*

Rice is the most important crop in Assam with coverage of 2.54 m ha of total 3.3 m ha cropped area. Among the three overlapping seasons in which rice is grown, 'Ahu' rice (March/April – June/July), grown in an area of 0.5 m ha, is predominantly direct seeded under rainfed upland ecosystem. With an average yield of less than 1000 kg ha^{-1}, the productivity of the rainfed direct seeded upland 'Ahu' rice is the lowest among all rice cultures of the state due to a number of serious problems. Consequently, only poor and disadvantaged farmers are growing upland 'Ahu' rice in Assam.

Several high yielding modern semi-dwarf rice varieties along with technological package of practices have been recommended for adoption in the direct seeded upland 'Ahu' rice ecosystems (Anon., 1997). But none of these varieties has got acceptance among the farmers despite intense efforts made by the concerned agencies for their dissemination. It has been observed that the farmers, particularly, those who are engaged in subsistence farming in the risk-prone marginal environments, shy away from those technologies, adoption of which requires them to make significant alteration in their existing farming systems, management practices and life style. Any variety or technology to be acceptable to the farmers must be suitable to the growing environment, compatible to the existing farming systems and must be in harmony with the socio-cultural settings of the farming community. Therefore, it may be assumed that the modern varieties recommended to the farmers of Assam for growing in upland 'Ahu' rice ecosystem have failed to meet the farmers' criteria of acceptance warranting a fresh look into the entire technology generation and recommendation process. Thus, the present study was undertaken to examine the role of ethno-cultural diversity for variation in farmers' choice perception of suitable varieties for direct seeded upland 'Ahu' rice.

MATERIALS AND METHODS

Two adjacent villages - Tayung gaon and Koilaghat located in the bank of the river Brahmaputra, about 45 km away from the Jorhat campus of Assam Agricultural University were selected to undertake the study. Of the two villages, Tayung gaon is inhabited by *Mising* community, an indigenous ethnic group of Assam known to have been growing direct seeded upland 'Ahu' rice crop from a very long past while Koilaghat is dominated by the *Bihari* community, migrants from Bihar settled in the locality sometime back. The two villages form a part of a very large upland 'Ahu' rice belt traversing

about 100 km along the southern part of the Brahmaputra. Hence, the information on the direct seeded upland 'Ahu' rice obtained from the farmers of the villages was expected to give good insight into the upland rice varieties and cultural practices prevalent among the farmers of a broad upland rice growing belt.

Two distinct approaches were employed in the study to extract information on farmers' perception of suitable upland 'Ahu' rice varieties. In the first approach, PRA tools such as focus group discussions and key informant interviews were employed in the two villages separately. In the second approach, altogether 20 rice varieties (*viz.*, Luit, Inglangkeri, TTB 196-4, Disang, Rongkhang, Lachit, ALR-41, TTB196-3, Dehangi, Kolong, Vandana, TTB 331-297-16-1, Chilarai, TTB 306-53-1, TTB 196-1, TTB 132-358-1, TTB 131-299-1, Dikhaw, TTB 306-64-1, Ikor guni) of different duration, plant architecture and grain quality attributes were grown in the farmers' field on April 8, 2005. Equal number of farmers (6 from each group on the first two dates of observations and 3 from each group on the last date of observation) randomly chosen from each of the two groups were asked to choose separately three best varieties from the 20 varieties grown in the field after 60, 90 and 110 days of sowing and allocate to the selected varieties 1st, 2nd, and 3rd position according to the preference. The three varieties, thus selected by using preference ranking, were assigned with the scores of 3, 2 and 1 for being adjudged as 1st, 2nd and 3rd, respectively. The total score for a selected variety was calculated as:

Total score = $A_1 \times 3 + A_2 \times 2 + A_3 \times 1$ Where, A_1, A_2 and A_3 were the number of farmers assigning 1st, 2nd and 3rd position, respectively to the variety.

It is noted that, while getting the varieties chosen, the farmers were deliberately not asked to assign position to all the 20 varieties as it was felt that farmers would have difficulty in visually ranking too many varieties using the scale from 1 to 20. Based on the experience of working with farmers in Uttar Pradesh, Paris *et al*. (2005) also suggested for application of simple rating system taking a scale of 1-3 or 1-5 only.

The farmers involved in scoring the varieties were also asked to give reasons for choosing particular varieties. The performance of the varieties in respect of the traits considered by the farmers for preferring one variety to the others was recorded using quantitative measurements or employing visual assessment on the dates of scoring the varieties. It is noteworthy that diverse varieties were used in the trial to help the farmers to visualize and correctly describe their choice perception in respect of different characteristics of a variety to ideally suit to their requirements rather than assessing their performance *per se*.

RESULTS AND DISCUSSION

The popularly grown traditional 'Ahu' rice varieties of the site of study are Ikorguni, Kolabor, Ikhajoi, Betguti and Bogilai. All these varieties are tall (120-130 cm at the time of harvest), lodging prone, mostly early maturing (90-110 days) sown broadcast during March 25- April 5 and harvested in June. Grains of the varieties vary in husk colour, kernel size and shape and pericarp pigmentation. Some more traditional varieties such as Kauri guni, Kapow guni, Dighali, Kutkong, Rongadoria, Amrow and Mesap (aromatic variety) *etc.* are also sparsely spread in the area. In both the villages, not a single modern variety was seen in the field or reported to be grown under the upland ecosystem. The farmers also reported that they did not have any knowledge if anybody in the entire upland rice belt was growing modern variety under this ecosystem. On the other hand, the participating farmers informed that they had been growing several improved rice varieties like Ranjit, Bahadur, Jaya etc. under transplanted rice production system indicating that the farmers are amenable to change provided suitable alternatives are made available to them. This clearly implies that the farmers rejected the modern varieties recommended for direct seeded upland 'Ahu' rice due to the failure of the varieties to meet the farmers' suitability criteria.

Weed, rice gundhi bug (*Leptocorisa oratoria usF*), stem borers, pre- and post-harvest sprouting, rodents, brown spot and blast are the major problems of upland 'Ahu' rice according to the farmers. Among all the problems, weed infestation was rated to be the most important. In fact, most of the cultural practices adopted by the farmers in upland rice culture centre around managing weeds. Unchecked weed competition was reported to reduce grain yield of upland 'Ahu' rice to the extent of more than 85 per cent (Sarmah, 1984; Sarmah, 1987; Bayan, 1990). The tall traditional

varieties with early vigour, and droopy leaves offer strong resistance to the weed growth and this is one of the important considerations for the farmers in choosing a variety for the upland rice ecosystem. Experiments have also confirmed the better weed suppressing ability of traditional varieties compared to modern semi-dwarf varieties (Anon., 1991). Weed suppressing ability of traditional variety Fapori in terms of reduction in weed dry matter was higher than that of Rasi and IR 50 by 62 and 36 per cent, respectively. Of course, the traditional varieties vary in their ability to suppress weeds (Anon., 1992). Among the insects, rice gundhi bug had been reported to be the most serious problem, particularly, when 'Ahu' rice was sown earlier or later than the normal sowing time.

Due to incessant rainfall during June, very often, it becomes difficult for the farmers to harvest 'Ahu' rice in time and to thresh their harvest immediately after harvesting. This results in the problem of pre- and post-harvest sprouting of the grains. The farmers identified this as one of the serious problems of 'Ahu' rice cultivation. The farmers from other places of Assam also laid emphasis on this problem in 'Boro' rice, which is also normally harvested in May-June (Pathak *et. al.*, 1999). During discussion, farmers did not talk about the problem of intermittent drought which is, normally, considered to be a serious constraint of upland 'Ahu' rice cultivation. The problem was clearly noticeable during experimentation in the site and the farmers talked about less rainfall received during the year and the problem of drought only at the time of discussion on the field experiment. Apparently, some degree of moisture stress during the upland 'Ahu' rice growing period is an acceptable fact as it is fairly a common feature and hence was not perceived by the farmers as a serious problem to mention.

Information obtained from group discussion and key informant interviews indicated that any variety to be ideally fitted to the direct seeded upland 'Ahu' rice culture should possesses the characteristics of high yield, better early vigour to compete with weeds, pre- and post-harvest sprouting resistance, semi-tall plant stature (≅120 cm), v) lodging resistance (*via* better culm strength than dwarf plant stature), resistance against rice gandhi bug and stem borers, white pericarp and little sticky, coarse grains with or without aroma for *Mising* farmers, and non-sticky, fine grain with or without aroma for *Bihari* farmers.

During group discussion, some farmers pointed out that more the plant height more was the possibility of lodging while some others indicated that more the plant height better was the panicle length and, consequently, better yield. In both the cases, the farmers reflected their keen observation on the crop, as both were technically correct considering the positive association of plant height with both lodging susceptibility and panicle length. However, the difference of emphasis reflected the variation among the farmers on their outlook. Such observations buttress the need of seeking active participation of the farmers in research programs.

The observations of the farmers are summarized in Table 1, 2, 3 and 4. On the first date of assessment, both the communities chose similar type of varieties or characteristics. Both the communities favoured the varieties that exhibited better plant stand, early vigour and greenness of the leaves. TTB 196-3,

Table 1. Farmers' choice of direct seeded upland 'Ahu' rice varieties 60 days after sowing

Variety	No. of farmers (N = 6)								Total Score
	Mising				Bihari				
	1st	2nd	3rd	Score	1st	2nd	3rd	Score	
Inglongkeri	0	1	2	4	0	1	1	3	7
Dehangi	0	1	2	4	0	0	1	1	5
Ikor guni	1	2	1	8	0	1	1	3	11
Tall sub-group	1	4	5	16	0	2	3	7	23
TTB196-3	5	0	1	16	4	2	0	16	32
Lachit	0	1	0	2	0	1	2	4	6
Luit	0	1	0	2	2	1	1	9	11
Dwarf sub-group	5	2	1	20	6	4	3	29	49

Table 2. Farmers' choice of direct seeded upland 'Ahu' rice varieties 90 days after sowing

Variety	No. of farmers (N = 6)								Total Score
	Mising				Bihari				
	1st	2nd	3rd	Score	1st	2nd	3rd	Score	
Inglongkeri	0	2	1	5	0	1	0	2	7
Dehangi	1	1	0	5	0	0	0	0	5
ALR- 41	2	1	0	8	2	0	1	7	15
Vandana	0	0	1	1	0	1	2	4	5
TTB 331-297-16-1	0	0	1	1	0	0	0	0	1
TTB 306-53-1	0	1	0	2	0	2	0	4	6
Tall sub-group	3	5	3	22	2	4	3	17	39
TTB196-3	0	1	1	3	1	0	2	5	8
Chilarai	0	0	1	1	0	0	0	0	1
Luit	2	0	1	7	3	2	1	14	21
TTB 131-299-1	1	0	0	3	0	0	0	0	3
Dwarf sub-group	3	1	3	14	4	2	3	19	33

Table 3. Farmers' choice of direct seeded upland 'Ahu' rice varieties 110 days after sowing

Variety	No. of farmers (N = 6)								Total Score
	Mising				Bihari				
	1st	2nd	3rd	Score	1st	2nd	3rd	Score	
ALR-41	1	1	0	5	1	1	0	5	10
Dehangi	I	2	0	7	0	0	1	1	8
TTB 331-297-16-1	0	0	1	1	0	0	0	0	1
Vandana	0	0	0	0	1	0	1	4	4
Inglongkeri	0	I	1	3	0	0	1	1	4
Ikor guni	I	0	I	4	0	0	1	1	5
Tall sub-group	3	4	3	20	2	1	4	12	32
Luit	I	0	1	4	1	2	0	7	11
TTB 131-299-1	0	0	0	0	1	1	0	5	5
Dwarf sub-group	1	0	1	4	2	3	0	12	16

an elite breeding line, had very good plant stand with early vigour and green leaves. First preference of the farmers from both the communities was for this variety indicating that both the communities were equally concerned with better plant stand and early vigour for direct seeded upland 'Ahu' rice. However, there was marked difference in choosing the 2nd and the 3rd varieties. The preference of the *Bihari* farmers for the improved varieties with semi-dwarf plant architecture (Table 1) became obvious while leniency of the *Mising* farmers towards the traditional varieties was seen. The traditional varieties attained height of about 100 cm at this stage of growth while the modern varieties attained about 70 cm. It was, however, very clear that the farmers from both the communities were equally concerned for the varieties and plant characteristics that could offer better competition against the weeds in the early stage of growth.

Vigour, tillering ability, greenness of leaves, plant height and duration were the main basis for choosing the varieties in the 2nd time of assessment. Notably, the semi-dwarf modern variety Luit was preferred by the farmers from both the communities mainly considering its tillering ability, desired plant population and early maturity, which was almost ready for harvest within 90 days of sowing. When all the varieties were considered together the preference of the '*Mising'* farmers for the varieties with tall plant

Table 4. Characteristic features of the selected upland 'Ahu' rice varieties and farmers' perceptions on those characters

Variety	Researchers' observations	Farmers' comments	
		Positive	Negative
ALR-41	Semi-tall plant stature, weak straw, fine grain with golden husk, susceptible to brown spot	Acceptable plant height, fine, aromatic grain with golden husk	Weak straw, light panicle, affected by leaf spots
Dehangi	Tall with strong culm, good early vigor, well exerted long panicles	Tall plant stature with strong culm, good early vigor	High spikelet sterility
TTB 331-297-16-1	Tall with medium culm strength, susceptible to leaf sport	Desired plant height, panicle length, grain type	Affected by leaf spots
Vandana	Tall with fairly strong straw	Desired plant height, well exerted long panicle	Weak straw
Inglongkeri	Tall, good tillering ability, broad droopy leaves	Desired plant height, good early vigor	High spikelet sterility
Ikor guni	Early maturing, tall with long droopy leaves and good early vigor	Desired plant height, good early vigor, short duration	Relatively low yield
Luit	Semi-dwarf, very early maturing, good crop stand and early vigor	Very short duration	Dwarf plant stature
TTB196-3	Modern plant type with semi-dwarf plan stature and erect leaves, very good plant stand and early vigor, long duration	Early vigor, plant stand	Long duration
Chilari	Modern plant type with semi-dwarf plan stature and erect leaves, long duration	Good early vigor and plant stand	Long duration
TTB 131-299-1	Semi-dwarf, poor early vigor	High number of panicles per unit area	Semi-dwarf plant stature
TTB 306-53-1	Tall stature, leaf spot susceptible	Tall stature with more panicles per unit area	Excessive leaf spot
Lachit	Modern plant type with semi-dwarf plan stature and erect leaves, long duration	Good plant stand and early vigor	Semi-dwarf, long duration

stature along with the other desired traits became evident while in case of '*Bihari'* farmers, the concern was more for various desired characteristics irrespective of the plant height. The farmers were for a height of about 110-120 cm, good vigor, lodging resistance, more tillers per unit area and ability to compete with weeds. Farmers of both the communities did not like to choose TTB 196-3 which was the most acceptable variety in the first assessment. The variety, being relatively late maturing did not show any sign of flowering at the time of 2nd assessment. It became very clear that the farmers would not compromise on their choice for early maturity The choice of the *Mising* farmers for varieties with relatively taller plant stature, longer panicle length along with early maturity became evident while the choice of *Bihari* farmers for varieties with higher panicle numbers and early maturity was clearly seen (Table 3 and 4).

On the whole, the *Mising* farmers exhibited bias towards the traditional type of varieties while those from the *Bihari* community did not show striking affinity towards the type of varieties currently in cultivation in the site even though their choice perceptions in respect of most of the important plant characteristics were similar to that of the former group of farmers. The observed difference between the two groups of farmers might have arisen due to the differences in the heritage of the two communities. A number of ethnic groups like *Mising, Karbi etc*. have been traditionally practicing direct seeding under upland 'Ahu' rice ecosystem for generations. Direct seeded 'Ahu' rice cultivation is an integral part of the culture and heritage

of these communities. Naturally, they have developed strong bias for the tall traditional type of varieties because of their association with these varieties for a very long time and also for the advantages of these varieties perceived on the basis of the experience over generations. On the other hand, the farmers from the *Bihari* community, though reportedly, grew upland rice crop before migrating to the village about three generations back had to adapt varieties and many cultural practices from the neighboring *Mising* community to suit their new agricultural situations. As upland rice cultivation is just one of the options for their livelihood than part of their cultural heritage they could adopt more unbiased view on new varieties and technologies.

From the study it became evident that any variety to be ideally suited to the upland 'Ahu' rice ecosystem of the study area should be high yielding, non-lodging, semi-tall (≅120 cm), early maturing (≅100 days) with quick early vigor to suppress weed growth, deep green leaves, well exerted long and heavy panicles, desired degree of seed dormancy to escape pre- and post-harvest sprouting, resistance against rice bug, stem borers, blast and brown spot, and grain quality traits suiting to the ethnic preferences. Even while there was considerable similarity of need perceptions, the two different ethnic groups differed in their emphasis on their requirement of various plant attributes. In Assam, there are more than 50 ethnic groups. Agro-ecological conditions of the upland rice-growing environment also, like any other rainfed crop ecology, vary widely in the state. This suggests that farmer's participatory study should be extended to encompass many more ethnic groups over wide geographical coverage across the state to objectively determine the breeding goals for development of direct seeded upland 'Ahu' rice varieties suiting to the diverse needs of the farmers.

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