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A study on adoption of farm machineries in Sali paddy cultivation in Assam

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Abstract

Farm mechanization implies the use of various power sources, improved farm tools and equipment's, with a view to reduce the drudgery of the human beings and draught animals, which increase the crop production and productivity. About 65.00 per cent of the Indian population depends on agriculture for their livelihood. In the recent years, non availability of farm labourers and fragmentation of land holdings forced many farmers to mechanize their farms and over the last few years as there has been considerable progress in agricultural mechanization. Mechanization in agriculture is predominantly taking place mainly for operations where traditional practices have failed to achieve the precision in operations. Keeping this in view a study was conducted to know the adoption of farm mechanization on paddy grower in Assam. A survey was conducted by interview method from the Sali paddy growers to elicit information regarding adoption level of farm mechanization in sali paddy. It was revealed that majority of the respondents 56.25% had medium level of adoption and 15.63% had high level of adoption of farm machineries.

Keywords: Adoption, Sali paddy, farm machineries, Assam

Introduction

Rice is a staple food for more than half of the global population, is an essential cereal grain globally. It is indispensable in ensuring food security, nutritional security, employment creation, and livelihood sustenance, especially in Asia, where the majority of global rice production and consumption occurs (FAO, 2023) [3]. Rice is an important crop in India and it plays a huge role in India's agricultural economy. People in India grow rice in different environmental conditions. These include areas with irrigation areas that rely on rain and even areas that are prone to flooding. In the North-Eastern part of India in Assam rice is the main food that people eat. People in Assam grow rice during three seasons. These seasons are called *ahu*, *sali* and *boro* rice. Out of these three types of rice *sali* paddy is the common. It takes up the land and produces the most rice so it is very important to the economy of the state. Rice is a part of the food economy in Assam and it helps people have enough food to eat. Rice production is essential, for the people of Assam. (Directorate of Economics & Statistics, Assam, 2023) [2]. The paddy crop of *sali* variety is usually transplanted in monsoon season while harvesting takes place in winter. Traditionally, the crop of *sali* paddy was grown in puddled lowlands using extensive manual labour in nursery preparation, transplanting, weeding, harvesting, threshing and post-harvest activities. But, the rice cultivation has now been increasingly forced owing to shortage of labour, higher cost of wages, delays in farm operations and increasing cost of cultivation. found that traditional rice cultivation involved about 850–900 hours of manual labour per hectare. (Mehta *et al.* 2024) [7].

Adoption of farm mechanization became one of the most important requirements of modern farming system since it saves human labour and time, improves accuracy in farm operation, intensifies cultivation and reduces cost of production per unit of output. Farm mechanization has made an effective contribution towards increasing farm productivity and developing agriculture in India. (Tiwari *et al.* 2019) [11]. Likewise, farm mechanization goes hand in hand with the

problems of labour shortage, increasing cost of rural wages and changes in agriculture. (Pingali 2007) ^[8].

For rice production, mechanization involves the use of tractors, power tiller, rotavator, puddler, drum seeder, seed drill, mechanical transplanter, cono weeder, power weeder, sprayer, reaper, thresher, and combine harvester. The timely completion of field operations plays a significant role in rice cultivation because the delay in transplanting and harvesting may have direct effects on yield and quality of the grain. reported that mechanical transplanting of rice ensures timely transplanting, uniform spacing, lesser labor demand, and effective plant stand. Similarly, the mechanical harvesting with the help of reapers and combine harvesters also ensures minimal harvest losses and faster post-harvest processing. (Guru *et al.* 2018) ^[4].

While India has seen substantial improvement in the adoption of machinery, there are considerable differences among various states, farm sizes, and types of farming systems. The ownership and utilization of agricultural machinery depended upon farm sizes, access to irrigation, and the agro-ecological characteristics of regions. In general, large farms tend to use agricultural machinery much faster than smaller farms because it is economically viable for them. (Sarkar, 2020) ^[9].

The mechanization process for eastern and north-eastern regions of India, particularly Assam, has been slow on account of fragmented holdings, non-uniform field geometry, frequent rains, soft soil, and poor infrastructures in rural areas. In such environments, smaller equipment like power tiller and mini tiller becomes more appropriate than large tractors. observed that appropriate size and scale-appropriate mechanization using two-wheel tractor technology have played an important role in bringing about changes in agriculture and rural development in many parts of Asia. (Justice *et al.* 2020) ^[5]. The inclusion of machinery into farming practices is growing extensively, driven by its ability to generate cost savings and increase the net profit. (Chaudhari *et al.* 2023) ^[11].

The other constraint related to adoption of farm machinery relates to high costs involved in the acquisition of tractors, transplanters, threshers, and combine harvester. Most often, small and marginal farmers do not have enough financial resources to own these expensive farm machineries. Sharing of

farm machinery could be beneficial for increasing mechanization levels among smallholders in developing countries. (Singh, 2013) ^[10]. Climate change scenario has made the need for mechanization more relevant than before. Unseasonal delayed arrival of monsoons, unpredictable rainfall patterns, and shorter time window periods for farming operations make it necessary to finish farming operations on time.

For this reason, a study into the adoption of farm equipments by farmers growing sali paddy would be quite pertinent in terms of determining current levels of adoption, recognizing important determinants, assessing constraints, and developing measures to promote mechanization.

Methodology

The present study was conducted in 4 agro climatic zones of Assam where paddy cultivation is being done extensively. From each zone one district of Assam namely *i.e* Jorhat from UBZ, Sonitpur from NBPZ, Morigaon from CBVZ and Bongaigaon from LBVZ were selected for the study as in these areas rice cultivation is found to be dominant. From each district 40 respondents were selected which comprised a total of 160 respondents as the final sample. The areas were selected purposively for the study. A multistage random sampling design was followed for the selection of respondents in the present study.

The adoption level of farm machineries used in sali paddy cultivation was measured under 3 categories namely fully adopted, partially adopted and not adopted at all. Here, fully adopted referred to those respondents who used the farm machineries completely for cultivation purpose whereas partially adopted referred to those respondents who used the farm machineries to some extent or occasionally, but not fully adopted. Not adopted at all refers to those respondents who did not the particular farm machinery at all.

Results and Discussion

Table 1 reveals the adoption pattern of different farm equipment's among the respondents.

Table 1: Adoption of farm machineries for cultivation of Sali paddy

Statements	Fully Adopted	Partially adopted	Not adopted
	Frequency (%)	Frequency (%)	Frequency (%)
Have you adopted the M.B plough for land preparation in your field?	136 (85.00)	24 (15.00)	0 (0.00)
Have you adopted disc plough for tillage operations in crop cultivation?	127 (92.50)	21 (13.12)	12 (7.50)
Do you use disc harrow for secondary tillage practices?	0 (0.00)	0 (0.00)	160 (0.00)
Do you utilize power tiller for performing different agricultural operations?	160 (100.00)	0 (0.00)	0 (0.00)
Have you adopted the tractor for cultivation and field management activities?	160b (100.00)	0 (0.00)	0 (0.00)
Are you aware of the paddy transplanter for transplanting paddy seedlings?	57 (35.62)	13 (8.12)	90 (56.25)
Do you use the power weeder for weed control in crop fields?	0 (0.00)	0 (0.00)	160 (100.00)
Have you adopted the cono weeder for intercultural operations in paddy cultivation?	0 (0.00)	160 (100.00)	0 (0.00)
Have you adopted the power pump for irrigation purposes on your farm?	60 (37.50)	100 (62.50)	0 (0.00)
Have you adopted the knapsack sprayer for application of pesticides and chemicals?	50 (31.25)	70 (43.75)	40 (25.00)
Have you adopted the power sprayer for plant protection activities in crops?	0 (0.00)	0 (0.00)	160 (100.00)
Do you use the sickle for harvesting the crops?	160 (100.00)	0 (0.00)	0 (0.00)
Are you aware about the combined harvester for harvesting and threshing operations?	28 (17.50)	30 (18.75)	102 (63.75)
Have you adopted the axial flow thresher for threshing of the harvested crops?	98 (61.25)	9 (5.62)	53 (33.12)
Have you adopted the paddle thresher for separating grains from harvested plants?	0 (0.00)	0 (0.00)	160 (100.00)
Have you adopted the winnower for cleaning and separating grains after threshing?	0 (0.00)	0 (0.00)	160 (0.00)
Have you adopted the tractor and trolley for transportation of farm inputs and produce?	160 (100.00)	0 (0.00)	0 (0.00)
Do you utilize the solar dryer for drying of the harvested agricultural produce?	0 (0.00)	0 (0.00)	160 (100.00)
Have you adopted the portable rice mill for rice processing activities?	57 (35.62)	0 (0.00)	103 (64.37)
Have you adopted the rice pulverizer for pulverizing and processing rice products?	32 (20.00)	0 (0.00)	128 (80.00)

Table 1 reveals that during the land preparation stage, (85.00%) of the respondents had fully adopted the M.B plough, followed by 15.00% who had partially adopted the M.B plough. 92.50% had fully adopted the disc plough followed by 13.12% of the respondents who had partially adopted only 7.50% of the respondents did not adopt the disc plough. None of the respondents adopted the disc harrow all total 160 respondents did not adopt the disc harrow. All the respondents (100.00%) adopted the power tiller as well as tractor. 35.62% of the respondents had fully adopted the paddy transplanter while 8.12 had partially adopted and 56.25% of the respondents did not adopt it at all. 100.00% of the respondents did not adopt the power weeder at all. All 100.00% of the respondents partially adopted the cono weeder for interculture operations followed by 37.50% of the respondents who had fully adopted the power pump while 62.50 had partially adopted it. During the plant protection stage, 31.25% of the respondents had fully adopted the knapsack sprayer followed by 62.50% of the respondents who had partially adopted the knapsack sprayer. None of the respondents had adopted the power sprayer. Almost all the respondents (100.00%) fully adopted the sickle during the harvesting stage followed by 17.50% of the respondents who had fully adopted the combined harvester while 18.75% of the respondents partially adopted it while 63.75% did not adopt it at all. During the threshing stage 61.25% of the respondents fully adopted the axial thresher, 5.62% had partially adopted it while 33.12% of the respondents did not adopt it at all. 100.00% of the respondents did not adopt the paddle thresher at all followed by 100.00% of the respondents who did not adopt the winnower at all. 100.00% of the respondents had fully adopted the trolley for transportation purpose followed by 100.00% of the respondents who did not adopt the dryer for drying purpose. 64.37% of the respondents did not adopt the portable rice mill while only 35.62% of the respondents had fully adopted it. 20.00% of the respondents fully adopted the rice pulverizer for rice powder preparation while 80.00% of the respondents did not adopt it at all.

Table 2: Distribution of respondents according to adoption of farm machineries

Category	Range	f (%)	Mean	S.D
Low	Less than 20.42	45 (28.12)	22.13	1.71
Medium	20.42-23.84	90 (56.25)		
High	More than 23.84	25 (15.63)		

Table 2 reveals that majority (56.25%) of the respondents had medium level of adoption which resembles with the study conducted by Kakki *et al.* (2022) ^[6] followed by 28.12% of the respondents who had low adoption level and 15.63% of the respondents had high adoption level. The mean was found to be 22.13 with S.D of 1.71.

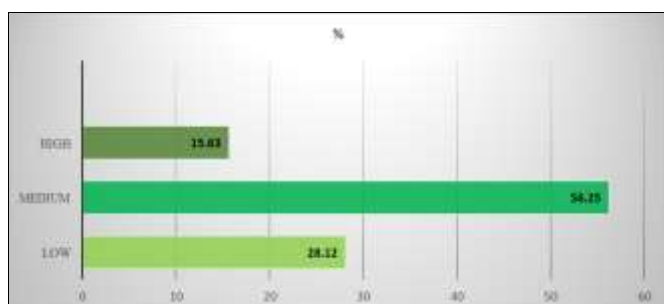


Fig: Graph showing distribution of respondents according to adoption of farm machineries

Conclusion

The current study shows that farmers in Assam are using farm machines for growing paddy at a level. This means they are moving from farming to using machines. Using machines has benefits like reducing the hard work that farmers have to do making sure that everything is done on time and increasing the amount of food that is produced. Even though using machines is helpful not many farmers are using them because of some problems. The government has started some programs like giving subsidies and setting up Custom Hiring Centres to help farmers use machines which need to be improved so that all farmers can use them. If farmers know more about the benefits of using machines and if they can get the help they will be more likely to use the machineries. The study says that using machines can really help farmers in Assam but we need to make sure that all farmers can avail them at a subsidised rates. The government should help farmers by making it easier for them to buy machines by teaching them how to use machines and by making sure that they have the support they need. This will help farmers produce food earn more money and make sure that farming in the area is strong for a long time. Farm machines can really help farmers, in Assam and farm machines will make a difference in the way that paddy is grown in Assam.

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