Original Research Article

Adoption of Farm mechanization in rice cultivation in Villupuram district

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ABSTRACT

Rice is a predominant food crop that was extensively cultivated and consumed in India. Recently, small and fragmented land holdings and labour scarcity during the peak season are driving farmers toward farm mechanization. Villupuram is one of the prominent districts with the maximum area under rice cultivation. The study was conducted to examine the adoption level of various recommended implements and machinery by rice farmers in the Villupuram district. Of the 13 blocks of Villupuram district three blocks were selected for this study. A total of 120 farmers were selected for the study using a proportionate random sampling method. Ex-post facto research design was used for the study. Data were collected using a well-structured and pre-tested interview schedule. The findings of the study revealed that most respondents had a medium level of adoption of farm implements and machinery in rice cultivation. Most respondents adopted a combined harvester, tractor, power tiller, rotavator and power sprayer. None of the respondents adopted bund maker, seed cum fertilizer drill, rice cum Daincha seeder, rotary weeder, power weeder, drone operated sprayer, reaper and thresher in last year's rice cultivation.

Keywords: Farm mechanization, rice cultivation and adoption.

1. INTRODUCTION

Rice is a primary food crop for more than half of the world's population. In the world scenario, rice is the third leading crop that is widely cultivated preceded by wheat and maize. Rice is widely consumed in many regions of the world, including Southern and Eastern Asia. In India, the rice cultivated area during 2020-21 is 45.1 million hectares and total rice production is 112.4 million tonnes. Rice is the predominant crop in Tamil Nadu, which is widely grown in all the districts with an area of 18.50 lakhs ha as well as an average production of 70.72 lakh MT per year. In Tamil Nadu, the Villupuram district is ranked as one the most important rice cultivating districts preceded by the Cauveri delta and Thamirabarani command area, because of the Thenpennai river in its vicinity. Nevertheless, the cost of cultivation is significantly rising as a result of rising labour costs and higher hiring charges. At the same time, non-availability of water, climate change and low prices for the produce affect rice cultivation, forced to migration of farmers and agricultural labours to their nearby cities for employment opportunities. Besides, the landless labourers and marginal farmers switch over to Rural Employment Guarantee Scheme considering the daily wage to be a better source of income. This situation leads to a labour shortage and high cost of labour during peak season. Farm mechanization is the ideal alternative to this nuisance. The key operations in which farm mechanization is involved are land preparation, planting, plant protection, and harvesting. Using farm implements and mechanization can ensure farm operation in time, reduce wastage and deal with the labour shortage. Hence, this study attempts to analyse the adoption of farm mechanization by rice growers. Rajkhowa et al., (2020) (1) revealed that 67.50 per cent of the farmers had a medium level of adoption, 22.5 per cent of the farmer had a low level of adoption and the remaining 10 per cent of the

farmers belong to high level of adoption. Likewise, Teja et al., (2022) (2) concluded that 44 farmers (36.67 %) had a medium level of adoption, 40 farmers (33.34 %) fell under the low adoption group and 36 farmers (30 %) belongs to the high adoption category. According to Shoba et al., (2018) (3) nearly half of the respondents (45.33 %) had a medium level of adoption followed by a low level of adoption (38.00 %) and the remaining had high adoption (28.00 %) of tractor drawn implements.

2. METHODOLOGY

Villupuram district chosen for this study since it is one of the districts with the large proportion of rice area under cultivation. Three blocks namely Koliyanur, Kanai and Tiruvennainallur, were sorted out from a total of 13 blocks based on the largest area of rice cultivation. In each block, two revenue villages with the most rice area were selected. A total of 120 farmers was chosen for the study by using the propionate random sampling method. Ex-post facto research design was used for the study. A well-structured and pre-tested interview schedule was employed to collect the primary data. Mean, Percentage analysis and standard deviation were used to analyse the data.

3. RESULTS AND DISCUSSION

Adoption level of recommended farm machinery in rice cultivation, both overall adoption and machinery-specific adoption are explored.

3.1 Overall adoption of rice machinery

Table 1 disclosed that more than half of the respondents (54.17 %) had a medium level of overall adoption followed by a low (24.17 %) and high (21.66 %) level of overall adoption of farm implements and machinery in rice cultivation. The cause might be the high cost of machinery, high fuel cost, lack of availability of custom hiring centres and lack of awareness and knowledge about the machinery (Shoba et al, 2018) (3), Personal reasons could be the majority of the respondents were middle aged (54.17 %) and had medium level of education (63.33 %). Most of the respondents had fragmented marginal and small land holding (84.90 %). The findings had a similarity to the findings of Raina, A. (2020) (4). More than fifty per cent of the respondents had low level of social participation (69.17 %), high information seeking behaviour (53.33 %), less risk orientation (54.17 %) and less economic motivation (67.50 %). Farmers had a neutral attitude (51.60 %) towards farm mechanization. Results conformed with the findings of Hasan et al., (2021) (5). The other reason could be most of the respondents had moderate possession (64.17 %) of farm machinery and implements. This result had a similarity to the findings of Reddy R.S.C et al., (2018) (6). It could be concluded that the majority of the respondents had a medium level of adoption of farm implements and machinery in rice cultivation. The results are similar to that of Teja et al., (2021) (2).

Table 1. Distribution of respondents based on overall adoption of rice farm machinery and implements

(n=120)

S. No.	Category	Number	Per cent
1.	Low	29	24.17
2.	Medium	65	54.17
3.	High	26	21.66

Total	120

3.2. Machinery wise adoption level of farm mechanization in rice cultivation

To conduct a thorough investigation and produce insightful results, the adoption level of each recommended machinery and implement were also investigated**.** The recommended farm implements and machinery in rice cultivation were explored under six dimensions viz., field preparation, sowing and transplanting, weeding, plant protection, harvesting and post-harvest.

3.2.1. Adoption level farm mechanization in field preparation

It was concluded from Table 2 that more than 60 per cent of the respondents fully adopted a power tiller (68.33 %), tractor (67 %) and tractor operated rotavator (67.50 %) followed by a tractor drawn leveller (55.83 %). Tractor drawn cage wheel and bullock drawn leveller were fully adopted by 46.67 per cent and 41.67 per cent respectively. Only 8.33 per cent and 5.83 per cent of the respondents fully adopted mould board plough and disc plough respectively. Bund maker was not adopted by any of the respondents. The findings were comparable with that of Shoba et al., (2018) (3).

Table 2 Distribution of respondents based on Adoption of farm machineries in Field Preparation

(n=120)

S. No.	Item	Fully Adopted		Partially adopted		Not adopted	
		Number	Per cent	Number	Per cent	Number	Per cent
1.	Tractor	81	67.50	24	20.00	15	12.33
2.	Power tiller	82	68.33	22	18.33	16	13.33
3.	Mould board plough	10	8.33	14	11.67	96	80.00
4.	Tractor drawn Disc plough	7	5.83	18	15.00	95	79.17
5.	Tractor drawn Cage wheel	56	46.67	5	4.17	59	49.17
6.	Tractor operated Rotavator	81	67.50	24	20.00	15	12.33
7.	Bullock drawn leveller	50	41.67	4	3.33	66	55.00
8.	Tractor drawn leveller	67	55.83	1	0.83	52	43.33
9.	Bund maker	00	00	00	00	120	100.00

3.2.2. Adoption of farm mechanization in sowing and transplanting

Table 3 showed that one-fourth of the respondents (25.00 %) fully adopted rice drum seeder followed by rice transplanter (23.33 %). None of the respondents adopted seed cum fertilizer drill and rice cum Daincha seeder. The reason might be the hiring charges for drum seeder is very low compared to other transplanting equipment. Most of the cultivators are poor, unable to afford expensive machinery (**Madhukar et al, 2021) (7).**

Table 3: Distribution of respondents based on Adoption of implements and machinery in sowing and transplanting

(n=120)

S. No.	Item	Fully Adopted		Partially adopted		Not adopted	
		Number	Per cent	Number	Per cent	Number	Per cent
1.	drum seeder	30	25.00	00	00	90	75.00
2.	Rice transplanter	28	23.33	00	00	92	76.67
3.	Seed cum fertilizer drill for paddy	00	00	00	00	120	100.00
4.	Rice cum Daincha seeder	00	00	00	00	120	100.00

3.2.3 Adoption of weeding implements

Only 7.50 per cent of the respondents adopted Conoweeder. Cent per cent of the respondents adopted neither rotary weeder nor power weeder. Possible causes include lack of awareness, and rapid effects of herbicide application.

Table 4: Distribution of respondents based on Adoption of Weeding implements

S. No.	Item	Fully Adopted		Partially adopted		Not adopted	
		Number	Per cent	Number	Per cent	Number	Per cent
1.	Conoweeder	9	7.50	00	00	111	92.50
2.	Rotary weeder	00	00	00	00	120	100.00
3.	Power weeder	00	00	00	00	120	100.00

3.2.4 Adoption of plant protection equipment

Table 5 reported that 62.50 per cent of the respondents fully adopted power sprayers followed by battery sprayers (24.17 %). Only 8.33 per cent of the respondents fully adopted a knapsack sprayer. None of the respondents adopted drone operated sprayer. The reason might be that availability of power sprayers in the farming community is high at the same time it had high pressure, low drudgery and more area coverage than other sprayers. Low capacity and high cost do not encourage farmers' adoption behaviour towards battery sprayers.

Table 5: Distribution of respondents based on Adoption of plant protection equipment

(n=120)

S. No	Item	Fully Adopted		Partially adopted		Not adopted	
		Number	Per cent	Number	Per cent	Number	Per cent
1.	Knapsack sprayer	10	8.33	3	2.50	107	89.17
2.	Battery operated sprayer	29	24.17	54	45.00	37	30.83
3.	Power sprayer	75	62.50	31	25.83	14	11.67
4.	Drone operated sprayer	00	00	00	00	120	100.00

3.2.5. Adoption of harvesting equipment

It could be identified that a cent per cent of respondents adopted a combined harvester. On the other hand, none of the respondents adopted paddy reaper and paddy thresher. The reason might be that combined harvester minimizes harvesting cost and time. It requires only one labour to operate and it can be used directly at the field level.

Table 6: Distribution of respondents based on Adoption of harvesting equipment

(n=120)

S. No	Item	Fully Adopted		Partially adopted		Not adopted	
		Number	Per cent	Number	Per cent	Number	Per cent
1.	Combined harvester	120	100.00	00	00	00	00
2.	Paddy reaper	00	00	00	00	120	100.00
3.	Paddy thresher	00	00	00	00	120	100.00

3.2.6. Adoption of straw handling equipment

It was found in Table 7 that 48.30 per cent of the respondents adopted baler. Reasons were Small and marginal farmers don't want to store the paddy straw for an extended period. When long-term storage and long-distance transportation are required, farmers adopt balers.

Table 7: Distribution of respondents based on Adoption of straw handling equipment

S. No.	Item	Fully Adopted		Partially adopted		Not adopted	
		Number	Per cent	Number	Per cent	Number	Per cent
1.	Baler	58	48.33	14	11.67	48	40.00

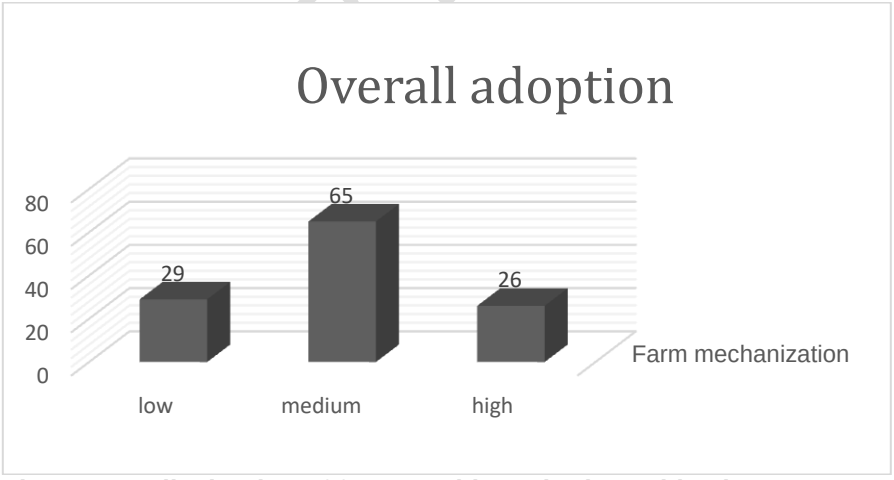

Fig. 1. Overall adoption of farm machinery in rice cultivation

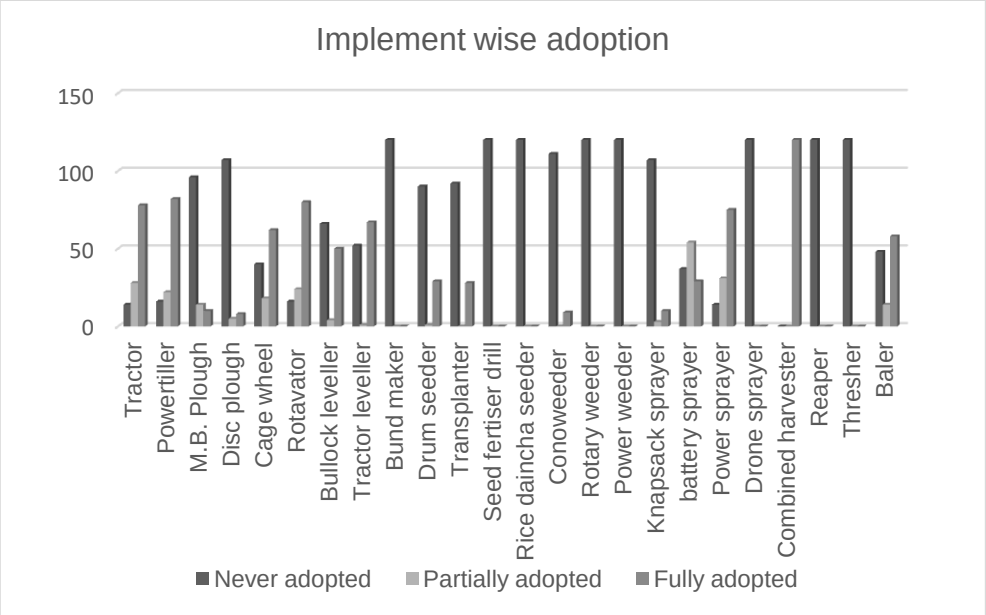

Fig. 2. Implement wise adoption of farm machinery in rice cultivation

4. CONCLUSION

Study indicates, that there was a considerable disparity in the level of adoption of farm mechanization in the sampled area. The Majority of the respondents (54.17 %) had a medium level of overall adoption of farm mechanization in rice cultivation. All the respondents adopted a combined harvester. More than 50 per cent of the respondents fully adopted power tiller (68.33 %), tractor (67.67 %), rotavator (67.67 %), power sprayer (62.50 %) and tractor-drawn leveller (55.83 %). Nearly half of the respondents (48.33 %) fully adopted baler. 20 to 25 per cent of the respondents fully adopted mould board plough (23.33 %), drum seeder (24.2 %), transplanter (23.33 %) and battery-operated sprayer (24.17 %). Less than 10 per cent of the respondents fully adopted disc plough (5.83 %), Conoweeder (7.50 %) and knapsack sprayer (8.33 %). None of the respondents adopted bund maker, seed cum fertilizer drill, rice cum Daincha seeder, rotary weeder, power weeder, drone operated sprayer, reaper and thresher. The findings of the study suggested that responsible institutions and government agencies should work more to hasten farmers' adoption of farm mechanization for sustainable rice production. Custom hiring facilities are required to rent the equipment on a payment basis. **(Tiwari et al., 2019) (8)**. Most farmers are longing to know about improved machinery and adoption but they need assistance. The findings of the study will assist the policy maker in determining the best course of action for the adoption of mechanization among the farmers of the Villupuram district, which will strengthen the rice production in Villupuram district as a whole.

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