



CHALLENGES IN THE ADOPTION OF MECHANISATION AMONG PADDY FARMERS IN ERODE DISTRICT : AN EMPIRICAL ANALYSIS

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ABSTRACT :

Farm mechanization plays an important role in improving the efficiency, productivity, and sustainability of paddy cultivation. The study examines the major problems faced by paddy farmers in adopting farm mechanization. Garrett's Ranking Technique was used to identify and prioritize the constraints based on farmers' perceptions. High initial investment cost emerged as the most serious constraint, followed by financial barriers and limited availability of mechanized equipment. Kendall's Coefficient of Concordance was employed to assess the degree of agreement among farmers regarding the identified problems. The findings highlight the need for financial support, improved machinery accessibility, farmer training, and technical assistance to promote mechanization in paddy cultivation.

Keywords: Farm Mechanisation, Paddy Cultivation Technique and Technical Knowledge

INTRODUCTION

Farm mechanization has emerged as a key strategy for enhancing the efficiency, profitability, and sustainability of paddy cultivation. The adoption of agricultural machinery enables farmers to perform various farm operations in a timely manner, reduces dependence on manual labour, minimizes production costs, and improves the overall productivity of paddy farming. Identifying the problems faced by farmers in adopting mechanization is essential for understanding the barriers that hinder technological advancement in paddy cultivation. A systematic assessment of these constraints helps prioritize the most critical issues affecting mechanization and provides valuable insights for policymakers, agricultural extension agencies, financial institutions, and machinery manufacturers. Addressing these challenges through appropriate policy measures, financial assistance, capacity-building programmes, and improved access to mechanization services can accelerate the adoption of modern agricultural technologies.

Against this background, the present chapter examines the major problems encountered by paddy farmers in the adoption of farm mechanization using Garrett's Ranking Technique. The analysis identifies the relative importance of each problem based on farmers' perceptions and highlights the most critical constraints that require immediate attention for promoting sustainable and efficient mechanization in paddy cultivation.

PROBLEMS FACED BY THE FARMERS IN ADOPTION OF MECHANIZATION IN PADDY CULTIVATION: GARRETT'S RANKING ANALYSIS

The Garrett's Ranking Technique was employed to identify and prioritize the problems faced by farmers in the adoption of farm mechanization in paddy cultivation. Under this technique, the ranks assigned by the farmers to each problem were first converted into percent positions using the formula:

$$\text{Percent Position} = 100(R_{ij} - 0.5) / N_j,$$

Where:

- R_{ij} = Rank given for the i th factor by the j th respondent
- N_j = Total number of factors ranked by the j th respondent

Based on the computed percent positions, Garrett values were obtained from the standard Garrett Conversion Table. Since the study comprised ten problems, the Garrett scores corresponding to the ten ranks were 75, 67, 60, 53, 50, 47, 40, 33, 26, and 18, respectively. The scores assigned by all the farmers for each problem were aggregated to obtain the total Garrett score. Subsequently, the total score for each problem was

divided by the total number of farmers to derive the mean Garrett score. Finally, the problems were ranked in descending order of their mean Garrett scores, with the highest mean score indicating the most severe problem encountered by the farmers in the adoption of farm mechanization.

Table 1
Problems faced by the farmers in adoption of mechanization in paddy cultivation: Garrett's Ranking Analysis

S.No	Problems	SCALE AND SCORE VALUES OF RANKS											Total score	Mean score	Rank
		Ranks	I	II	III	IV	V	VI	VII	VIII	IX	X			
		Scale													
		value(x)	82	70	63	57	52	47	42	36	29	18			
1	High initial investment cost	F	103	98	84	72	52	48	43	36	29	18	583	58.197	I
		Fx	8446	6860	5292	4104	2704	2256	1806	1296	841	324	33929		
2	High depreciation and maintenance of equipment	F	92	86	78	71	66	57	49	39	28	17	583	52.633	V
		Fx	7544	6020	4914	4047	3432	2679	2058	1404	812	306	30685		
3	Financial Barriers	F	81	76	71	68	61	58	51	43	39	35	583	54.305	II
		Fx	6642	5320	4473	3876	3172	2726	2142	1548	1131	630	31660		
4	Limited availability of mechanized equipment	F	70	66	73	71	69	65	61	57	36	15	583	54.163	III
		Fx	5740	4620	4599	4047	3588	3055	2562	2052	1044	270	31577		
5	Inadequate technical knowledge and skills	F	58	61	67	74	80	82	68	49	32	12	583	53.590	IV
		Fx	4756	4270	4221	4218	4160	3854	2856	1764	928	216	31243		
6	Less investing capacity of farmers	F	49	57	74	79	85	59	69	54	36	21	583	52.539	VI
		Fx	4018	3990	4662	4503	4420	2773	2898	1944	1044	378	30630		
7	Environmental pollution	F	35	28	27	33	30	20	23	36	161	190	583	36.472	X
		Fx	2870	1960	1701	1881	1560	940	966	1296	4669	3420	21263		
8	Destruction of soil structure	F	38	42	51	17	50	73	97	92	55	68	583	45.410	VIII
		Fx	3116	2940	3213	969	2600	3431	4074	3312	1595	1224	26474		
9	Resistance to Change	F	34	21	20	35	29	45	50	97	119	133	583	38.719	IX
		Fx	2788	1470	1260	1995	1508	2115	2100	3492	3451	2394	22573		
10	Fragmented Land Holdings	F	23	48	38	63	61	76	72	80	48	74	583	45.631	VII
		Fx	1886	3360	2394	3591	3172	3572	3024	2880	1392	1332	26603		
	TOTAL	N	583	583	583	583	583	583	583	583	583	583			

Source: Computed value

The above table 1 shows that high initial investment cost is the most serious problem faced by the farmers in adopting mechanization in paddy cultivation, securing the first rank with the highest mean Garrett score of 58.197. The result indicates that the substantial capital required for purchasing

agricultural machinery acts as the foremost barrier to mechanization. Small and marginal farmers, in particular, may find it difficult to invest in costly machinery due to limited financial resources and inadequate access to institutional credit.

The problem of financial barriers occupies the second position with a mean Garrett score of 54.305. This finding suggests that farmers face considerable difficulty in mobilizing adequate funds for mechanization, and that inadequate access to timely and affordable institutional finance compounds the burden created by high investment requirements.

Limited availability of mechanized equipment ranks third with a mean Garrett score of 54.163. This indicates that farmers often face challenges in obtaining suitable agricultural machinery during peak cultivation periods. Limited access to custom hiring centres, machinery rental services, and equipment dealers affects the timely execution of farm operations and discourages mechanization.

The fourth-ranked problem is inadequate technical knowledge and skills, with a mean Garrett score of 53.590. This finding suggests that many farmers experience difficulties in operating, maintaining, and effectively utilizing modern agricultural machinery because of insufficient technical expertise and inadequate training. The absence of regular extension services and practical demonstrations further limits the effective adoption of mechanized technologies.

High depreciation and maintenance of equipment is ranked fifth with a mean Garrett score of 52.633. Farmers perceive that the recurring expenses associated with machinery maintenance, repairs, replacement of spare parts, and depreciation significantly increase the cost of mechanized farming, thereby reducing its economic viability.

The sixth position is occupied by less investing capacity of farmers, which records a mean Garrett score of 52.539. The result indicates that many farmers possess limited financial capacity to purchase or upgrade agricultural machinery. Inadequate savings, restricted access to affordable finance, and uncertainty regarding returns from mechanization contribute to this problem.

Among the lower-ranked problems, fragmented land holdings receive the seventh rank with a mean Garrett score of 45.631. The findings indicate that fragmented and small landholdings reduce the operational efficiency of agricultural machinery and limit the economic feasibility of adopting mechanization. However, compared with other constraints, this issue is perceived as relatively less severe.

Destruction of soil structure secures the eighth rank with a mean Garrett score of 45.410. This finding reflects the concern among farmers that the repeated use of heavy agricultural machinery may lead to soil compaction, deterioration of soil structure, and reduced soil fertility, which may adversely affect long-term agricultural productivity. Nevertheless, farmers appear to regard this as a comparatively minor concern relative to financial and technical constraints.

Resistance to change is assigned the ninth rank with a mean Garrett score of 38.719. This suggests that although some farmers continue to prefer traditional farming methods and hesitate to adopt modern technologies, behavioural resistance is not considered a major impediment when compared with financial and technical constraints.

Finally, environmental pollution receives the tenth rank with the lowest mean Garrett score of 36.472, indicating that it is perceived as the least significant problem influencing the adoption of mechanization. Farmers generally prioritize immediate economic and operational challenges over environmental concerns while making decisions regarding mechanization.

PROBLEMS FACED BY THE FARMERS IN ADOPTION OF MECHANIZATION IN PADDY CULTIVATION: KENDALL'S CO-EFFICIENT OF CONCORDANCE ('W')

The Kendall's Coefficient of Concordance ('W') was used to examine the degree of agreement among the farmers regarding the problems faced in the adoption of mechanization in paddy cultivation. The analysis identifies the relative importance of various constraints based on the rank scores given by the farmers.

Table 2

Problems Faced by the Farmers in Adoption of Mechanization in Paddy Cultivation: Kendall's Co-Efficient of Concordance ('W')

S.No.	Problems	Rank Sum	Mean Score	Rank
1	High initial investment cost	3304	5.667	I
2	High depreciation and maintenance of equipment	3229	5.539	V
3	Financial Barriers	3299	5.659	II
4	Limited availability of mechanized equipment	3247	5.569	III
5	Inadequate technical knowledge and skills	3239	5.556	IV
6	Less investing capacity of farmers	3172	5.441	VI
7	Resistance to Change	3103	5.322	IX
8	Destruction of soil structure	3169	5.436	VIII
9	Environmental pollution	3132	5.372	X
10	Fragmented Land Holdings	3171	5.439	VII

The above Table-2 presents the problems faced by the farmers in adopting mechanization in paddy cultivation based on Kendall's ranking technique. The results reveal that *high initial investment cost* was ranked as the most important problem with the highest rank sum of 3304 and a mean score of

5.667, indicating that the expensive nature of mechanized equipment is the major barrier for farmers, particularly small and marginal farmers with limited financial resources. The problem of financial barriers secured the second rank with a rank sum of 3299 and mean score of 5.659. This finding suggests that farmers face considerable difficulty in mobilizing adequate funds for mechanization, and that inadequate access to timely and affordable institutional finance compounds the burden created by high investment requirements.

The constraint limited availability of mechanized equipment was ranked third with a rank sum of 3247 and a mean score of 5.569, indicating difficulties in accessing suitable machinery. Inadequate technical knowledge and skills obtained the fourth rank with a rank sum of 3239 and a mean score of 5.556, highlighting that lack of awareness and technical expertise limits the effective operation of machinery.

High depreciation and maintenance cost of equipment was ranked fifth with a rank sum of 3229 and a mean score of 5.539, suggesting that farmers are concerned about the recurring financial burden associated with maintaining machines. Less investing capacity of farmers secured the sixth rank with a rank sum of 3172 and a mean score of 5.441, indicating that limited financial strength affects machinery adoption.

The problems such as fragmented land holdings and destruction of soil structure were ranked seventh and eighth with mean scores of 5.439 and 5.436, respectively. This shows that small-sized, scattered landholdings and concerns over soil quality create additional difficulties in adopting mechanization.

Resistance to change was ranked ninth with a mean score of 5.322, while environmental pollution was ranked tenth with the lowest mean score of 5.372, indicating that these factors were considered comparatively less severe by the farmers.

Table 3
Kendall's Coefficient of Concordance ('W') Test

Test	Value
Kendall's Coefficient of Concordance (W)	0.015
Calculated Chi-square (χ^2)	78.705
Degree of Freedom	9
Table Value (5%)	16.919
Result	Significant

The Kendall's Coefficient of Concordance test shows a W value of 0.015, indicating a low degree of agreement among the farmers in ranking the identified problems. The calculated chi-square value (78.705) is higher than the table value (16.919) at 5 percent level of significance with 9 degrees of freedom. Hence, the ranking opinions of farmers are statistically significant. This indicates that although the level of agreement is low, there exists a significant consensus among farmers regarding the major constraints affecting the adoption of mechanization in paddy cultivation.

CONCLUSION

The present chapter examined the problems faced by farmers in the adoption of mechanization in paddy cultivation. Farm mechanization plays an important role in improving agricultural efficiency, reducing labour dependency, lowering production costs, and enhancing productivity. However, the adoption of mechanized technologies among farmers is influenced by several economic, technical, operational, and institutional constraints.

The Garrett's Ranking Analysis was employed to identify and prioritize the major problems encountered by farmers. The findings revealed that high initial investment cost was the most severe problem, securing the first rank with the highest mean Garrett score of 58.197. This indicates that the high cost of purchasing machinery is the major obstacle limiting mechanization adoption, particularly among small and marginal farmers. Financial barriers ranked second with a mean score of 54.305, reflecting the difficulty farmers face in mobilizing adequate funds and accessing affordable institutional credit. Limited availability of mechanized equipment (54.163) and inadequate technical knowledge and skills (53.590) were ranked third and fourth respectively, indicating that accessibility to suitable machinery and the lack of technical expertise significantly influence farmers' decisions regarding mechanization.

High depreciation and maintenance costs (52.633) and less investing capacity of farmers (52.539) were ranked fifth and sixth, showing farmers' concerns about the recurring financial burden and their limited capacity to invest in machinery. The lower-ranked constraints included fragmented land holdings (45.631), destruction of soil structure (45.410), resistance to change (38.719), and environmental pollution (36.472). Although these issues affect mechanization adoption, farmers perceived financial and technical constraints as more critical compared to socio-behavioural and environmental problems.

Further, Kendall's Coefficient of Concordance was used to examine the level of agreement among farmers regarding the ranking of mechanization problems. The value of Kendall's W was found to be 0.015, indicating a low degree of agreement among farmers. The calculated chi-square value of 78.705 was higher than the table value of 16.919 at 5 percent level of significance with 9 degrees of freedom, confirming that the ranking opinions of farmers were statistically significant.

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