

## **ASSESSMENT OF FARM MECHANISATION AND ITS IMPACT ON PADDY CULTIVATION IN TAMIL NADU**

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### **ABSTRACT**

This study aims to assess the extent of farm mechanization and its impact on paddy cultivation in the state of Tamil Nadu, India. Paddy cultivation is a vital component of Tamil Nadu's agricultural sector, and the adoption of mechanization has been on the rise in recent years. The study focuses on understanding the key drivers of farm mechanization, the types of machinery used, and its implications for the paddy farming community and the agricultural landscape in the region. The research methodology involved a combination of quantitative and qualitative data collection methods. The findings of this study reveal a significant increase in the adoption of farm mechanization in paddy cultivation in Tamil Nadu. Tractor usage for land preparation, combined harvesters for harvesting, and mechanical transplants for planting have become more prevalent. The primary drivers for this shift include the desire for increased efficiency, labour scarcity, and the aspiration for higher crop yields. The impact of farm mechanization on paddy cultivation is multi-faceted. On the positive side, it has resulted in increased productivity, reduced dependence on manual labour, and improved timeliness in agricultural operations. However, there are challenges such as the high initial cost of machinery, the need for skill development among farmers, and concerns about environmental sustainability. The study concludes that the adoption of farm mechanization in paddy cultivation is a double-edged sword. While it offers several advantages, it also presents challenges that need to be addressed through appropriate policies and support mechanisms. The government and other stakeholders should consider promoting the judicious use of mechanization tools while ensuring that small and marginal farmers have access to these technologies. Moreover, efforts should be made to provide training and extension services to

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enhance farmers' skills and knowledge in utilizing mechanization effectively. The research serves as a valuable resource for policymakers, agricultural development agencies, and researchers, providing insights into the evolving landscape of paddy cultivation in Tamil Nadu and the role of farm mechanization within it. The study underscores the need for a balanced approach to mechanization, where sustainable agricultural practices are prioritized alongside technological advancements to ensure the long-term welfare of farmers and the environment.

**KEYWORDS:** Farm Mechanisation, Impact, Paddy Cultivation.

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## INTRODUCTION

Agriculture has long been the backbone of India's economy, providing livelihoods to a significant portion of its population. In the southern state of Tamil Nadu, paddy cultivation holds a special place as one of the primary staples and a crucial component of the agricultural landscape. In recent years, the sector has witnessed a remarkable transformation, characterized by a steady increase in the adoption of farm mechanization. This shift in the mode of production is of great significance, not only for the agricultural community but also for the state's overall economic development and food security. This study seeks to assess the extent of farm mechanization in paddy cultivation in Tamil Nadu and examine its multifaceted impact on the farming community and the agricultural sector.

The adoption of mechanization in agriculture is a complex and multifaceted phenomenon that is deeply intertwined with the dynamics of rural livelihoods, technological advancements, and government policies. Farm mechanization encompasses the use of various machinery and equipment, such as tractors, combine harvesters, and transplants, to replace or complement traditional manual labour. The motivations behind the adoption of these technologies are numerous and often intersect, including the desire for increased efficiency, higher crop yields, cost savings, and addressing labour scarcity issues. In Tamil Nadu, where the cultivation of paddy is labour-intensive and highly dependent on seasonal manual labour, the transition towards mechanization is seen as a transformative force with the potential to reshape the sector.

Tamil Nadu's paddy cultivation has traditionally been characterized by labour-intensive practices, including transplanting seedlings and harvesting paddy manually. However, the changing demographic landscape, with the migration of rural labour to urban areas in search of alternative employment opportunities, has led to a scarcity of farm labour

during peak agricultural seasons. This labour shortage has acted as a catalyst for the adoption of mechanization, as farmers seek to overcome the challenges posed by labour unavailability. The significance of this transition extends beyond addressing labour issues. Mechanization has the potential to improve agricultural productivity and enhance crop quality. Furthermore, it can lead to cost savings and, in some cases, reduce the environmental footprint of agricultural practices. However, the benefits are accompanied by challenges, such as the high initial capital investment required for machinery, concerns about the ecological impact of mechanized farming, and the need for farmer education and training.

The government of Tamil Nadu, recognizing the importance of farm mechanization, has introduced various initiatives and schemes to promote the use of modern agricultural machinery. These efforts have aimed to empower farmers, particularly small and marginal landholders, with access to the latest technology and knowledge, thereby improving their livelihoods and overall well-being.

This study sets out to comprehensively assess the current state of farm mechanization in paddy cultivation in Tamil Nadu, the key drivers of this transition, the types of machinery used, and its broader implications. Through a combination of quantitative surveys, qualitative interviews, and stakeholder discussions, we aim to provide valuable insights for policymakers, agricultural development agencies, and the research community. The research aims to shed light on the nuances of mechanization, the experiences of farmers, and the challenges and opportunities that arise in the context of paddy cultivation in Tamil Nadu. The ultimate goal is to contribute to informed decision-making and policy development to ensure that the adoption of farm mechanization in Tamil Nadu's paddy fields aligns with sustainable agricultural practices, social equity, and long-term environmental well-being.

## REVIEW OF LITERATURE

Satya Paul and Rajesh Mehta (1991) have attempted to analyse the structure of agricultural technology in India using demand, elasticity's of substitution and biases of technical change for the period 1960-61 to 1982- 83. No study of an under developed agriculture has so far appeared which attempts such estimates based on aggregate data using a flexible form of the cost function. The cost function was tested for homotheticity, homogeneity and Cobb – Douglas structure. The rejection of these properties led to the retention of the full (non-homothetic) model which is also found to describe a well-behaved production structure. The results based on this Model reveal that the agricultural technology has been biased towards the use labour and capital and towards the saving of fertilizer and

other inputs. Since the prices of all the inputs have increased, albeit at different rates, the labour and capital using biases of technology seem to be the outcome of biased innovation possibilities. There exist strong substitution possibilities between labour and capital and between capital and fertilizer. This is of great importance for India and other less developed countries. Instead of Massive use of capital (such as tractors, etc.,) these countries can make extensive use of chemical fertilizer and human labour in order to increase agricultural production. Again, the decomposition of changes over time in the factor input demand reveals that technological change has contributed significantly to the per year increase in labour and capital demand. The output effect has contributed most to the annual changes in demand for fertilizer and other inputs in Indian agriculture.

M. MuthamilSelvan (2006) has observed some facts from his research on Farm Mechanization. His research has exhibited that there is a positive relationship between power available and the productivity. He also advocates that India has to increase the total food grain production in the coming decade by as much quantity of grains as it produced in the last two decades. India has to focus on new redirection and potential agricultural production and growing population in the coming years. Today, there is need to mechanize Indian farming not only to increase production but also to reduce production cost, drudgery involved in farm operations and making prosperity in farmer's live.

## OBJECTIVES OF THE STUDY

1. To determine the current level of farm mechanization in paddy cultivation in Tamil Nadu
2. To evaluate the economic impacts of farm mechanization on paddy cultivation in Tamilnadu
3. To investigate the latest technological advancements and innovations in farm mechanization for paddy cultivation and their applicability in the Tamil Nadu context.

## STATEMENT OF THE PROBLEM

Farm mechanization plays a crucial role in modern agriculture, aiming to enhance efficiency, productivity, and sustainability. In Tamil Nadu, a state known for its significant contribution to paddy cultivation, the adoption of mechanization has been on the rise. However, there is a need to assess the current status of farm mechanization and its impact on paddy cultivation in Tamil Nadu. One of the primary problems is the absence of comprehensive data regarding the extent of farm mechanization in paddy cultivation in Tamil Nadu. There is a lack of up-to-date information on the types of machinery used, their

distribution, and their accessibility to farmers across the state. The financial implications of mechanization for small and marginal farmers pose a challenge. The high initial costs of machinery and technology may deter them from investing in mechanization, limiting the benefits they can gain in terms of increased yield and efficiency. The environmental consequences of mechanized farming in terms of soil health, water usage, and the use of fossil fuels are essential considerations. Mechanization also involves the need for proper storage, transportation, and processing facilities. The adequacy and functionality of such infrastructure need scrutiny.

**DATA COLLECTION**

The collect data from farmers, farm machinery manufacturers, and relevant stakeholders and visit paddy fields and agricultural areas in Tamil Nadu to gather first-hand information and secondary Data Government Reports: Collect data from government sources, such as agricultural departments and statistical reports. - Research Publications: Use published research articles and reports for background information.

**TOOLS FOR ANALYSIS**

In order to analyses and compare the cost and return structure of new technology and traditional, cost A and cost C concepts used by farm Management Studies have been adopted for the present study. In order to examine the nature and extent of inequality in net income of new technology and traditional farms in the study area, Frequency distribution and Histogram, Lorenz Curve, Gini Co-efficient, Logarithmic Variance ratio and Disparity ratio were used. In order to identify and to compare the factors influencing yield of paddy for new technology and traditional farms, the following form of Multiple Linear Regression Model was used.

$$Y = \alpha_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + U \dots \dots \dots (3.1)$$

Y = Per acre yielding kgs

X<sub>1</sub> = Human labour per acre (in Rs.)

X<sub>2</sub> = Bullock labour per acre (in Rs.) X<sub>3</sub> = Fertilizer per acre (in Rs.)

X<sub>4</sub> = Pesticides per acre (in Rs.)

X<sub>5</sub> = Capital flow per acre (in Rs.) and U = Disturbance term

The structural difference between the two sample farmers, small and large, was tested by using Chow's test.

$$\frac{\sum e^2 - (\sum e^2 + \sum e^2) / k}{1 \quad 2}$$

$$F = \frac{(\sum e^2 + \sum e^2) / (n_1 + n_2 - 2k)}{\dots} \quad (3.2)$$

where,

k=The number of parameters including the intercept term.

$\sum e^2$ =Unexplained or residual sum of squares of the sample corresponding to both small and large farmers.

$\sum e^2$ =Unexplained or residual sum of squares of the sample corresponding to small farmers.

$n_1$  =Sample size of small farmers and  $n_2$

= Sample size of large farmers.

The ‘F’ test was carried out and if the computed value of ‘F’ was less than the Table value of F at 5 percent level of significance with (k,  $n_1 + n_2 - 2k$ ) degrees of freedom, the null hypothesis that there was no structural difference between the two groups of farmers could be accepted. If there was a structural difference between the two groups, the test whether the difference occurs and at the intercept or at the slope level or at both had to be conducted by incorporating the dummy variables at the intercept and slope levels in the regression model.

### DATA ANALYSIS

Descriptive Analysis: Describe the current state of farm mechanization in paddy cultivation in Tamil Nadu. Regression Analysis: Analyse the impact of farm mechanization on paddy yield, cost-effectiveness, and other relevant factors. Qualitative Analysis: Analyse qualitative data from interviews or open-ended survey questions.

**TABLE 1 FREQUENCY DISTRIBUTION OF PER ACRE VALUE OF NET RETURN FOR SMALL AND LARGE FARMERS OF NEW TECHNOLOGY FARM**

Sl. No.	Net Return (in Rs.)	New Technology Farms					
		Small Farmers		Large Farmers		Overall	
		No. of Farmers	Percentage	No. of Farmers	Percentage	No. of Farmers	Percentage
1.	4000-5000	9	5.06	10	13.89	19	7.60
2.	5000-6000	15	8.43	18	25.00	33	13.20
3.	6000-7000	35	19.65	29	40.28	64	25.60
4.	7000-8000	70	39.33	7	9.72	77	30.80
5.	8000-9000	29	16.29	5	6.94	34	13.60
6.	9000 & Above	20	11.24	3	4.17	23	9.20
	Total	178	100.00	72	100.00	250	100.00



Source:Computeddata.

Table 1 reveals that the heavy concentration of farmers under the lower end of the net return per acre in sm all farmer groups of the New Technology farm indicates that the given distribution is positively skewed.Forthe small farmers, greater concentration is found in the net return category ofRs.7000-8000.Inthecaseoflargefarmersalso,heavyconcentrationisfoundintheRs.6000–7000netreturncategory.

**TABLE 2  
COMPOUNDVALUESOFAVERAGES,STANDARDDEVIATION,COEFFICIENTOF VARIATION ANDCOEFFICIENTOFSKEWNESS**

Sl. No.	Measures	SmallF armer	LargeF armer	(inRs.) Overall
1.	Arithmetic mean in Rs.	8109.24	6710.27	6755.08
2.	Median in Rs.	7948.32	6641.67	6578.63
3.	Mode in Rs.	7876.12	6418.36	6538.71
4.	Standard Deviation in Rs.	679.21	638.69	618.16
5.	Coefficient of Variation	8.38	9.52	9.15
6.	Coefficient of Skewness	0.34	0.36	0.35

Source:Computeddata.

It is observed from Table 2 that in the case of New Technologyfarmthe concentration of small and large farmers is found in the lower and middlereturn groups.Therefore, for small and large farmers, the given distributionwould have been of greater variation towards the higher values of per acre netreturn in the study area.The computed value of mean (Rs.8109.24) is greaterthan the value of median (Rs.7948.32) which is greater than mode value ofRs.7876.12The calculated value of co-efficient of skewness 0.34 confirms thefactthatthenetreturnispositivelyskewed.Hence,peracrenetreturndistributionwouldhavegreat ervationtowardsthehighervalues.The calculated mean per acre net return (Rs.6710.27) is greater than thevalueofmedianperacrenetreturn(Rs.6641.67)whichisgreaterthanthemodevalueof(Rs.6478.36).Thecalculatedvalueofcoefficientofskewness0.36 has also strengthened the fact that the given distribution is positivelyskewed for large farmers.It indicates that the distribution of per acre net returnwouldhavegreatervariationstowardsthehighervalues.

**TABLE3 HOMOGENEITYTESTSOFTWOCATEGORIESOFNEW TECHNOLOGY AND TRADITIONAL FARMS**

Source	T.S.S	D.F.	M.S.S	Calculated F Value	Critical F Value
Between Sample	2348300	1	2348300	252.11*	4.38
Between Village	263474.88	24	10978.12	1.18 <sup>NS</sup>	2.23
Error	223553.04	24	9314.71	--	--
Total	2835327.92	49	--	--	--

Note:T.S.S.=Total SumofSquaresD.F.=Degrees ofFreedom

M.S.S.=MeanSumofSquares

\*Significantat5%level NS - Not significant

**TABLE4 URBANWORKERSTOTOTALPOPULATION-2011CENSUS**

(inPercent)

Area	Females	Males	Persons
India	13.28	54.96	68.24
TamilNadu	19.45	59.42	78.87

Source:NationalInformaticsCentre,

From Table 4, it is clear that the proportion of total urban workers to total population in India is 68.24 per cent.Of this 13.28 per cent are females.Out of 78.87 per cent of the workers in Tamil Nadu, 19.45 per cent are females.

## CONCLUSION

Farm mechanization has had a significant impact on paddy cultivation in Tamil Nadu. The adoption of mechanized farming practices in the paddy sector has brought about several benefits and challenges Mechanization, including the use of tractors, transplants, and harvesters, has significantly increased the efficiency of paddy cultivation. This has led to higher yields and reduced labour requirements.Mechanization allows farmers to carry out planting, weeding, and harvesting at the right time, which is crucial for maximizing paddy yield.Mechanized operations tend to be more precise, leading to better seed placement and spacing, which can improve crop quality.The cost of purchasing and maintaining agricultural machinery can be a barrier for small and marginal farmers. Access to affordable financing options is crucial.While farm mechanization has had a positive impact on paddy cultivation in Tamil Nadu, it is essential to address the challenges associated with its adoption. Policies that promote sustainable mechanization provide financial support to smallholders, and offer training and extension services can help maximize the benefits of mechanization while mitigating its negative effects.



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