FACTORS INFLUENCING THE IMPACT OF MECHANIZATION IN RICE CULTIVATION AMONG FARMERS OF NORTH COASTAL ZONE OF ANDHRA PRADESH, INDIA

Abstract

The purpose of this study was to assess factors affecting the impact of mechanization in rice cultivation among rice farmers. The simple random sampling technique was used to select 120 rice farmers of Srikakulam and Vizianagaram districts of North Coastal Zone of Andhra Pradesh. Data was gathered by using a well structured interview schedule. The findings of the study showed that education, farm size, mass media exposure, extension contact, social participation, economic orientation and deferred gratification had a positive and significant relation with the impact of mechanization in rice cultivation at 1 per cent level of significance. Age and annual income had non-significant relation with the impact of mechanization in rice cultivation. The 'R^{2}' value was 0.728 which portrayed that all the selected nine independent variables put together explained 72.80 per cent variation in the impact of mechanization in rice cultivation.

Keywords: Impact, Rice Farmers, Farm Mechanization, rice cultivation

Introduction

Agriculture is the 'art and science of growing plants and the raising of animals for food, other human need, or economic gain'. Indian economy is basically agrarian in nature. Agriculture has retained its pride place of being the backbone of the Indian economy. Mahatma Gandhi said, "India lives in villages and agriculture is the soul of Indian economy". Nearly two-thirds of its population depends directly on agriculture for its livelihood and sustenance. Rice is the major food grain crop in India. It is in fact the dominant crop of the country. India is one of the leading producers of rice crop accounting for 20 per cent of all world rice production. Rice is the staple food of the people of the eastern and southern parts of the country. The production of rice was the highest with over 135.54 million tons in fiscal year 2023 across India among the other food grains. It is the most important grain with regard to human nutrition and calorific intake, providing more than one fifth of the calories consumed by worldwide by the human species. Andhra Pradesh ranking 3rd position in production and produces 128.95 lakh tons of rice in India. It is a leading rice producer with a production of 12% of total rice produced in the country. Rice is the Principal food crop cultivated throughout the state providing food for its growing population, fodder to the cattle and employment to the rural masses [7,10]. In Andhra Pradesh rice is the major crop cultivated in more than 22 lakh hectares during Kharif and Rabi seasons. The study area, Srikakulam and Vizianagaram districts are famous for its paddy fields and are the highest area under rice cultivation in North Coastal Zone.

Agricultural mechanization which entails the use of machines to perform several activities on the farm in order to save time, money spent on hiring of labour and most importantly increases the level of production which will automatically lead to a simultaneous increase in the farmer's income. The agricultural mechanization is an important support of modernity and development [5,6]. The choice of machinery and equipment to be used depends

on several factors including the size of the farm, the relationship of complementarity or substitutability of the labour force and its price, the expected increase in production and the availability in markets of machinery and equipment for rental [8,9]. The purpose of this study is to identify the impact of mechanization in rice cultivation and assess factors affecting it.

Material and Methods

The study was conducted in Srikakulam and Vizianagaram districts of Andhra Pradesh during the year 2022. *Ex post facto* research design was followed for the study. Three mandals from each of the selected districts and two villages from each mandal viz., Jalumuru and Lingalavalsa from Jalumuru mandal, Nandigam and Temburu from Nandigam mandal, Narsapuram and Palatalagam from Santhabommali mandal, Pakki and Piridi from Bobbili mandal, Pentasriramapuram and Vasantha from Gantyada mandal, Mandavakuriti and Siripuram from Santhakaviti mandal were selected by using simple random method from which 120 rice farmers were selected as sample. In order to study the nature of relationship between the factors influencing the impact of mechanization in rice cultivation, correlation co-efficient (r) were computed and the values were presented in table 1. To determine the combined effect of all the carefully chosen independent variables in explanation of variation in the impact of mechanization in rice cultivation, Multiple Linear Regression analysis was carried out. The computed co-efficient of determination (R^2) value and partial regression co-efficient (b) values with their corresponding 't' values were presented in table 2. The R^2 and 'b' values were tested statistically for their significance.

Results and Discussion

In order to study the nature of relationship between the profile of the rice farmers with the impact of farm mechanization in rice cultivation, correlation co-efficient (r) were computed and the values were presented in the table 1.
The relationship between the profile and the impact of farm mechanization in rice cultivation were tested by null hypothesis and empirical hypothesis.

Null Hypothesis (H0)

There will be no significant relationship between profile characteristics *viz*., age, education, farm size, annual income, mass media exposure, extension contact, social participation, economic orientation and deferred gratification with the impact of mechanization in rice cultivation.

Empirical Hypothesis (H1)

There will be significant relationship between profile characteristics *viz*., age, education, farm size, annual income, mass media exposure, extension contact, social participation, economic orientation and deferred gratification with the impact of mechanization in rice cultivation.

Age Vs Impact of farm mechanization

It is clear from the table 1 that co-efficient of correlation ($r = -0.101^{NS}$) between age and impact of farm mechanization in rice was less than the table value of 'r' at 0.05 level of significance. So, the null hypothesis was accepted and empirical hypothesis was rejected.

Accordingly, it could be assumed that there was a negative and non-significant relationship between age and impact of mechanization in rice cultivation.

Above trend implies that the impact of mechanization in rice cultivation was not affected in any way by variations in their age. The probable reason might be that irrespective of age, the farmer with need, interest, sufficient knowledge and favourable attitude towards farm technologies, will naturally experience high impact of mechanization in rice.

Education Vs Impact of farm mechanization

It is evident from the table 1 that co-efficient of correlation (r = 0.698**) between education and impact of farm mechanization was greater than the table value of 'r' at 0.01 level of significance. So, the null hypothesis was rejected and empirical hypothesis was accepted. Accordingly, it could be assumed that there was a positive and significant relationship between education and impact of mechanization in rice cultivation.

Since educated farmers had high level of knowledge on the farm technologies in rice cultivation and they were exposed to different mass media, and had high capability to show its impact in rice cultivation. This contributed to the above positive and significant relationship.

Farm Size Vs Impact of farm mechanization

It is apparent from the table 1 that co-efficient of correlation (r = 0.302**) between farm size and impact of farm mechanization was greater than the table value of 'r' at 0.01 level of significance. So, the null hypothesis was rejected and empirical hypothesis was accepted. Accordingly, it could be assumed that there was a positive and significant relationship between farm size and impact of mechanization in rice cultivation.

The possible reason might be that farm size is a criterion related to adoption of improved practices. Farm size enhances the extension of adoption of rice technologies by the farmers which led them to experience higher impact. Further, higher the farm size, more efforts are needed in crop management. It is well known fact that farmers with larger farm size grow more crops and more interested in innovations and technologies. As a result, it is quite possible that farmers with larger farm size evinced keen interest to know about new farm technologies and had thorough understanding of the usefulness of various farm implements. Hence, farm size showed positive impact on mechanization in rice cultivation.

Annual income Vs Impact of farm mechanization

It is evident from table 1 that co-efficient of correlation ($r = 0.055^{NS}$) between annual income and impact of mechanization was less than the table value of 'r' at 0.05 level of significance. Hence, the null hypothesis was accepted and empirical hypothesis was rejected. Accordingly, there existed a positive and non-significant relationship between annual income and impact of mechanization in rice cultivation.

The possible reason might be that majority of the respondents had medium annual income and it is fairly normal when the farmers were small and marginal. Farmers can only earn a medium family income as majority of the farmers rely on agriculture, which is highly prone to natural disasters, causing them to earn a medium family income. The low annual income of the rice farmers led them to adopt less farm technologies,t which showed less impact of mechanization in rice cultivation. Hence, annual income was showing a positive and non significant relationship with impact of mechanization in rice cultivation.

Mass media exposure Vs Impact of farm mechanization

It is vivid from the table 1 that computed co-efficient of correlation (r=0.681**) between mass media exposure and impact of mechanization was greater than the table value of 'r' at 0.01 level of significance. Therefore, the null hypothesis was rejected and empirical hypothesis was accepted. Consequently, it might be concluded that there was a positive and significant relationship between mass media exposure and impact of mechanization in rice cultivation.

It is quite natural that improved mass media exposure widens the understanding and responsiveness on the acceptance of recommended practices. Thus, when the farmers' exposure to mass media increases, the level of impact of mechanization in rice cultivation increases. The farmers who were in regular contact with information resources through mass media access could able to widely adopt the various farm machinery and implements, Which showed its impact in rice cultivation. Hence, mass media exposure was showing a positive and significant relationship with impact of mechanization in rice cultivation.

Extension contact Vs Impact of farm mechanization

A perusal of table 1 revealed that co-efficient of correlation (r = 0.679**) between extension contact and impact of mechanization was greater than the table value of 'r' at 0.01 level of significance. Hence, the null hypothesis was rejected and empirical hypothesis was accepted. Accordingly, there existed a positive and significant relationship between extension contact and impact of mechanization in rice cultivation.

The probable reason might be that the extension contacts of the rice farmers with extension officials, scientists, ADA's, AEO's and other progressive farmers helped in gaining required knowledge on various farm implements used in rice cultivation. The other reason might be that rice farmers actively participated in various extension activities which led them to adopt various farm implements thus shown its positive impact in rice cultivation.

Social participation Vs Impact of farm mechanization

It is apparent from the table 1 that computed co- efficient of correlation (r=0.660**) between social participation and impact of mechanization was greater than the table value of 'r' at 0.01 level of significance. Henceforth, the null hypothesis was rejected and empirical hypothesis was accepted. Consequently, it might be deduced that there was a positive and significant relationship between social participation and impact of mechanization in rice cultivation.

The above result specifies that level of social participation play a vital role in motivating the farmers in showing positive behavior towards farm mechanization. Because of such active participation in various village level institutions, Rythu mitra groups and Self help groups, the rice farmers might have spent much of their time in the conversation on productive and economic agricultural related aspects with other members of society including the benefits of farm mechanization. Hence, there was a positive and significant relationship between social participation and impact of mechanization in rice cultivation.

Economic orientation Vs Impact of farm mechanization

It could be elucidated from the table 1 that computed co-efficient of correlation (r = 0.595**) between economic orientation and impact of mechanization was greater than the table value of 'r' at 0.01 level of significance. Accordingly, the null hypothesis was rejected and empirical hypothesis was accepted. Hence, it might be concluded that there was a positive and

significant relationship between economic orientation and impact of mechanization in rice cultivation.

The above outcome established that impact of mechanization in rice cultivation increases, when the farmers have higher economic orientation. Farmers with higher economic orientation tends to adopt improved technologies in order to fetch higher income which requires the farmers to be well aware of the technologies they adopt. Medium to high economic orientation of the respondent farmers helped in increasing their standard of living. Thus, there was a positive and significant relationship between impact of mechanization and economic orientation.

Deferred gratification Vs Impact of farm mechanization

It is vivid from the table 1 that computed co-efficient of correlation (r=0.419**) between deferred gratification and impact of mechanization was greater than the table value of 'r' at 0.01 level of significance. Therefore, the null hypothesis was rejected and empirical hypothesis was accepted. Consequently, it might be concluded that there was a positive and significant relationship between deferred gratification and impact of mechanization in rice cultivation.

Deferred gratification in general is the optimism of the farmers to wait for the anticipated produce or profits. Greater the deferred gratification greater would be the satisfaction. The farmers with more deferred gratification got more profits and had better knowledge on various farm implements lead to the adoption of various farm implements in rice cultivation. Adoption of farm implements showed a positive impact in rice cultivation. Thus, there was a positive and significant relationship between impact of mechanization and deferred gratification.

Table 1: Correlation coefficients between the profile of rice farmers with the impact of mechanization in rice cultivation

S. No.	Independent variable	Correlation coefficient (r)values
X_1	Age	-0.101^{NS}
X_2	Education	0.698**
X_3	Farm size	0.302 **
X_4	Annual income	0.055 ^{NS}
X_5	Mass media exposure	0.681**
X_6	Extension contact	0.679**
X_7	Social participation	0.660**
X_8	Economic orientation	0.595**
X_9	Deferred gratification	0.419**

* : Significant at 0.05 level of probability
** : Significant at 0.01 level of probability
NS : Non-significant

The result from the table 1 indicated that education, farm size, mass media exposure, extension contact, social participation, economic orientation and deferred gratification had a positive and significant relation with the impact of mechanization in rice cultivation at 1 per cent level of significance. Age and annual income had non-significant relation with the impact of mechanization in rice cultivation.

Combined effect of all independent variables on impact of mechanization in rice Cultivation

To determine the combined effect of all the carefully chosen independent variables in explanation of variation in the dependent variable *i.e.,* impact of mechanization in rice cultivation, Multiple Linear Regression analysis was carried out. The computed co-efficient of determination (R^2) value and partial regression co-efficient (b) values with their corresponding 't' values were presented in table 2. The R^2 and 'b' values were tested statistically for their significance.

The 'R^2' value was 0.728 which portrayed that all the selected nine independent variables put together explained 72.80 per cent variation in the impact of mechanization in rice cultivation.

The partial regression coefficients presented in the table 2 further unfolded that the independent variables *viz*., farm size, mass media exposure and extension contact were constituted with positive significance as apparent from their significant 't' values. Farm size enhances the extension of adoption of innovative technologies specifically related to mechanization aspects which resulted in higher impact. Higher the farm size, more efforts are needed in crop management. It is well known fact that the big farmers usually go for growing of diversified crops in larger areas, hence, were more interested in adoption of new technologies particularly in the mechanization aspects to save time and money. As a result, it is quite possible that the farmers with larger farm size evinced keen interest to know about new farm technologies and understand the usefulness of various farm implements. Further, it is quite natural that improved mass media exposure widens the understanding and responsiveness on the acceptance of recommended practices. Thus, when the farmers' exposure to mass media increases, the level of impact of mechanization in rice cultivation also increases. Framers with good extension contact with extension officials, scientists, ADA's, AEO's and other progressive farmers helped to gain sufficient knowledge on various farm implements used in rice cultivation. The other reason might be that the active participation of rice farmers in various extension activities led them to adopt various farm implements thus showed its positive impact in rice cultivation. This implied that the above mentioned independent variables had contributed to a maximum variation in the impact of mechanization in rice cultivation.

Table 2: Multiple Linear Regression analysis of the selected independent variables with impact of mechanization in rice cultivation

S.	Variables	'b' value	Standard error	't' value

No.				
X_1	Age	-0.066	0.044	-1.489 NS
X_2	Education	-0.011	0.058	-0.198 NS
X_3	Farm size	0.361	0.201	1.837**
X_4	Annual income	-0.041	0.029	-1.425 NS
X_5	Mass media exposure	0.293	0.139	2.112*
X_6	Extension contact	0.841	0.036	2.443*
X_7	Social participation	-0.062	0.304	-0.205 NS
X_8	Economic orientation	-0.002	0.081	-0.025 NS
X_9	Deferred gratification	0.150	0.089	1.679 NS

$R^2 = 0.728$

* : Significant at 0.05 level of probability

** : Significant at 0.01 level of probability

NS : Non-significant

Conclusion

This research has been conducted to assess the impact of mechanization in rice cultivation in the Srikakulam and Vizianagaram districts of North Coastal Zone of Andhra Pradesh. According to the results, education, farm size, mass media exposure, extension contact, social participation, economic orientation and deferred gratification had a positive and significant relation with the impact of mechanization in rice cultivation at 1 per cent level of significance. Age and annual income had non-significant relation with the impact of mechanization in rice cultivation. The 'R^2' value was 0.728 which portrayed that all the selected nine independent variables put together explained 72.80 per cent variation in the impact of mechanization in rice cultivation.

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