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*Research Note*

## **Factors Affecting Adoption of Monocropping of Rice in Manipur: A Logistic Approach<sup>§</sup>**

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### **Abstract**

The study conducted in the state of Manipur, has identified the factors affecting monocropping of rice as the cropping intensity of the state is only 107 per cent. Multistage random sampling has been followed to select the districts, blocks, villages and finally the farmers and logit model has been used for the analysis. The study has observed that availing of institutional credit and educational level are among the important factors which decrease monocropping. The study has highlighted the need for focus on crop diversification and increasing cropping intensity. Strengthening of co-operative societies, increasing availability and accessibility to credit facilities, increasing awareness about new technologies, etc. will help in increasing the cropping intensity, thereby using the available rich resources to the optimum level in the state.

**Key words:** Monocropping, Rice, Manipur, Institutional Credit

**JEL Classification:** Q16, Q13

### **Introduction**

Agriculture occupies a dominant place in the economy of the Manipur state and it is fully concentrated in rice cultivation. The rice cultivation is predominantly done in the valley constituting only a small part (8 %) of the total state area. The agro-climatic condition is also most suitable for the cultivation of rice by traditional method of farming. Prior to 1980, there was self-sufficiency in rice production, except under abnormal monsoon conditions. But, rice production and productivity seem to have become stagnant over the past couple of years in the state even though the productivity is higher in the state than the all-India

average. Rice being the staple food of the state, food shortage is becoming a major problem with increasing population. There was a shortage of about 88,000 tonnes of rice in 1989-90.

Monocropping of rice is a common phenomenon in most of the districts of the state despite being endowed with fertile soil and rich natural resources. The cropping intensity of the state was found to be quite low (> 107%) as compared to the national average (136%). Cropping pattern has not only remained foodgrain-centric but tended to be further concentrated rather than diversified. The state, therefore, has scope of increasing the intensification of crop production. This study was taken up with the major objective of identifying the factors responsible for monocropping of rice in the study area. Logistic regression models were evaluated from a set of nine variables.

### **Methodology**

Multistage random sampling technique was followed to select the districts, blocks, villages and finally

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the farmers. The state has four plain districts, of which two districts selected randomly for the study were: Bishnupur and Imphal East. All the five blocks of these two districts were considered for the present study, two from Bishnupur district and three from Imphal East district. A total of nine villages were selected from these two districts by proportionate random sampling. A list of all the households of the selected villages was made based on their operational landholding. The farmers were divided into four distinct groups based on their operational landholding, viz. marginal (<1 ha), small (1.01-2 ha), medium (2.01-5 ha) and large (> 5 ha). Proportionate random sampling was followed and five per cent of the households were selected from each stratum. Accordingly, a sample of 139, 101, 92 and 37 farmers from marginal, small, medium and large farms, respectively, were selected for the study. Thus, a total of 369 farm households formed the sample for the study. The data pertaining to the year 2007-08 were collected through comprehensive pre-tested schedules and personal interviews by recall memory method.

### The Model

The logit regression model was specified as follows:

$$L_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + u_i$$

where,

- $X_1$  = Availing institutional credit; 1 if yes; 0, otherwise,
- $X_2$  = Availing non-institutional credit; 1 if yes; 0, otherwise,
- $X_3$  = Availability of inputs; 1 if yes; 0, otherwise,
- $X_4$  = Age of a farmer in years,
- $X_5$  = Experience of a farmer in years,
- $X_6$  = Education of a farmer; 1 if literate; 0, otherwise,
- $X_7$  = Nutrition; 1 if cultivates rice only for household consumption; 0, otherwise,
- $X_8$  = Comparative advantage of rice over other crops; 1 if cultivates rice because of comparative advantage over other crops; 0, otherwise.
- $X_9$  = Non-awareness of technology; 1 if the farmer cultivates rice because of non-awareness of technology of other crops; 0, otherwise.

$\beta_0$  = Intercept;  $\beta_1, \dots, \beta_9$  are the coefficients associated with each explanatory variable  $X_1, \dots, X_9$ , respectively, and

$u_i$  = Error-term

SYSTAT software package was used to run the analysis for identifying the factors affecting adoption of monocropping in rice in Manipur.

### Results and Discussion

The  $\chi^2$  values of each model for all the farm-size groups were found statistically significant, implying that the selected models (containing the constant and the explanatory variables) fitted the data well. The estimated coefficients for the logistic regressions and their significance levels have been presented in Table 1. The estimated coefficients ( $\hat{\alpha}$ s) reflect the effect of corresponding explanatory variables on the odds of occurrence of monocropping. A negative coefficient indicates a positive (decreased) effect on monocropping (i.e. an increase in the level of that variable will reduce monocropping, *ceteris paribus*), and conversely, a positive coefficient suggests that an increase in the corresponding variable will increase monocropping *ceteris paribus*.

The odds in adoption of monocropping of rice are listed in Table 2. The availing of institutional credit has been found negatively significant in marginal and medium farms. The odds in following monocropping decreased with increased availability of institutional credit in the marginal, small and medium farm-size groups. The results implied that chances for farmers availing institutional credit not going for monocropping of rice were 6.89-times in the marginal and 26.32-times in the medium farms-size groups. Availing of institutional credit increased the capital availability, enabling the farmers to opt for cropping intensification. The adequacy of individual farmer's financial resources is to be augmented from outside (Kumar, 1976).

From the development perspective, the agricultural credit is important in sustained absorption of technological innovations. It is seen that the technology adopters tended to borrow far more than the non-adopters do. However, in the large farm-size group, the odds ratio of following monocropping was positive but not significant. Thus, we may conclude that institutional credit is a crucial factor in increasing cropping intensity. Dreze and Sen (2002) have also

**Table 1. Coefficients of fitted logistic-regression models for different farm-size groups in Manipur state**

Variable	Marginal farms	Small farms	Medium farms	Large farms
Availing institutional credit	-1.931** (0.623)	-0.705 (0.575)	-3.277*** (0.877)	1.105 (1.316)
Availing non-institutional credit	-1.154* (0.528)	-0.698** (0.251)	- 1.467* (0.852)	0.276 (1.322)
Availability of input	0.064 (0.717)	-0.419 (0.614)	-0.544 (0.767)	-1.471 (1.396)
Age	0.024 (0.082)	0.064 (0.062)	0.052 (0.102)	0.637 (0.411)
Education	-1.394* (0.586)	-0.329 (0.643)	-0.594** (0.163)	-2.438* (0.807)
Experience	0.005 (0.078)	-0.087 (0.055)	0.004 (0.100)	-0.373 (0.249)
Nutrition	1.768** (0.534)	0.641*** (0.152)	0.971* (0.374)	1.057* (0.387)
Comparative advantage	1.665* (0.782)	2.128** (0.810)	0.004 (0.719)	-2.818 (1.937)
Non-awareness of technology	0.430 (0.511)	1.359 (0.657)	0.734* (0.338)	1.977* (0.616)
Constant	2.310* (0.765)	2.644 (1.441)	4.532** (1.369)	-3.935 (2.682)
Model $\chi^2$	41.508***	29.588**	31.376***	20.051*
No. of observations	139	101	92	37

Notes: Figures within the parentheses indicate standard errors.

\*, \*\* and \*\*\* denote significance at 10 per cent, 5 per cent, and 1 per cent levels, respectively.

**Table 2. Factors with significant positive (odds ratio > 1.0) and negative (odds ratio < 1.0) effects on monocropping of rice in Manipur state**

Variable	Marginal farms	Small farms	Medium farms	Large farms
Availing institutional credit	0.145**	0.494	0.038***	3.019
Availing non-institutional credit	0.315*	0.498**	0.231*	1.318
Availability of input	1.066	0.658	0.580	0.229
Age	1.024	1.066	1.053	1.898
Education	0.248*	0.719	0.552**	0.087*
Experience	1.005	0.917	1.004	0.689
Nutrition	5.859**	1.898***	2.640*	2.878*
Comparative advantage	5.286*	8.398**	1.004	0.059
Non-awareness of technology	1.537	3.892	2.083*	7.221*

Note: \*, \*\* and \*\*\* denote significance at 10 per cent, 5 per cent, and 1 per cent levels, respectively.

reported similar findings in Himachal Pradesh. However, in the present survey, fewer farmers were found availing institutional credit. Though a cooperative bank which is a significant lending institution in the rural areas, has been in existence for a long time, it is almost defunct in the study area. Lack of people's participation

in decision-making may be one of the reasons for its failure. The factors like absence of proper management, lack of peoples' participation, excessive politicization, weak infrastructural facilities and lack of computerization processes hamper the growth of cooperative banking (Bishnu, 2008).

Availing non-institutional credit was found to have lesser odds in monocropping under three farm-sizes, viz. marginal, small and medium farms. Farmers availing non-institutional credit had 3.17-, 2.01- and 4.33-times chances of not following monocropping of rice in the marginal, small and medium farm-sizes, respectively. Non-institutional credit is easy to procure and does not take a long time in processing, and therefore most of the farmers prefer it. However, for large farm-size availing of non-institutional credit did not have a significant effect on monocropping. Large farmers have a strong economic base and therefore do not require additional financial support and this may be the main reason for a positive coefficient in institutional as well as non-institutional credit.

The availability of inputs was expected to have lower odds in monocropping. But, the analysis has revealed that availability of inputs did not have any effect on a farmer's following monocropping or not on any of the farm-size groups. The analysis has concluded that the availability of inputs was not an important determining factor for monocropping of rice in any of the farm-size groups. Age also had no effect on any of the farm-size groups.

A higher level of education had lower odds in monocropping under three farm-size groups, viz. marginal, medium and large farm-sizes and it respectively had 4.03-times, 1.81-times and 11.49-times chances of growing other crops than rice in corresponding farm-sizes. It implies that with increase in educational level, the chances of monocropping decrease. As education level increases, people adopt improved technologies which lead to a decrease in monocropping and increase in cropping intensity. Education not only helps in taking better crop management decisions, but also facilitates receiving of needed information through media and other extension services. Further, the analysis has revealed that experience had no effect on monocropping of rice.

Growing rice for nutritional purpose leads to higher odds in the occurrence of monocropping in all the farm-size groups. It is well - known that almost 100 per cent of the population in this state depends on rice as its principal diet. Therefore, almost all the farmers basically grow rice for nutritional requirement of the household and then opt for marketing of the surplus produce.

In the marginal and small farm-size groups, the comparative advantage of rice over other crops had a significant effect on monocropping, leading to higher odds in occurrence of monocropping. Rice being the staple food, its market must be sound and inputs and technology should also be readily available. Therefore, it must be advantageous than other crops. The comparative advantage of rice was not found to affect monocropping of rice in medium and large farm-size groups.

Non-awareness about technology of other crops leads to higher odds of occurrence of monocropping in the medium and large farm-size groups, implying that with non-awareness about technology of other crops, there were 2.08-times and 7.22- times more chances of going for monocropping of rice in the medium and large farm-size groups, respectively. It indicates that non-awareness about technology for other crops was one of the main reasons for going for monocropping. The medium and large farms being economically sound, possess land and capital but the lack of technological knowledge about other crops must be the main reason for following monocropping. For the marginal and small farm-size groups, it was not significant. Even though non-awareness about technology for other crops did persist, there might be other factors like lack of capital which might be the reasons why it was not significant in the marginal and small farms.

## Summary and Conclusions

Among the factors affecting monocropping of rice in Manipur, availing of institutional credit has been found to be negatively significant in the marginal and the medium farms, while availing of non-institutional credit is negatively significant in the marginal, small and medium farms. Education has been found negatively significant across three farm-sizes, viz. marginal, medium and large farms. Nutrition has affected all the farms positively and significantly. Comparative advantage and non-awareness about technology have also affected all the farms positively, though comparative advantage has been found significant only in marginal and small farms, while non-awareness about technology has been observed significant only in medium and large farms.

There is a need for greater focus on crop diversification for which systematic research on farming system is called for. It will help in achieving higher

income, more employment, judicious use of land and water, sustainable development and environmental improvement. Research may be initiated for alternative crops suitable during the *rabi* season.

Increasing availability and accessibility to credit facilities will enhance crop diversification as the farmers availing credit facilities have been observed to follow cropping intensification. Community-based credit organizations need to be strengthened by encouraging the participation of the people in decision-making and other activities of the credit institution and revival of the existing co-operative banks. Illiteracy, ignorance and conservativeness of the society have been found some of the important reasons for the failure of a co-operative society. Therefore, education and generation of awareness about the objective of the co-operative society will help in arousing peoples' interest.

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