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CROP DIVERSIFICATION AND ITS RELEVANCE IN RISK MANAGEMENT IN THIRUVARUR DISTRICT OF TAMILNADU, INDIA

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ABSTRACT

Crop diversification at farm level is accepted to be an effective tool in risk mitigation in agriculture. But this concept of crop diversification is not been adopted much by farmers of Thiruvarur for reason unknown. Hence a study was undertaken to analyse the factors influencing the farmers awareness on the relevance of crop diversification in risk management and to rank the reason for non – adoption of crop diversification in Thiruvarur district of Tamilnadu. With regard to selection of study area, Thiruvarur district was considered as the universe of the study. The Mannargudi block of this district was purposively selected since it possesses cultivation area falling under both upstream irrigation as well as tail end irrigation. The Logit analysis revealed that the awareness on crop diversification had been positively and significantly influenced by education level of farmers, size of farm, no of agri – related meetings attended by respondents and labour scarcity. Further, Garrett ranking analysis revealed that the farmer's attitude of "more reliance on traditional methodologies" was the prime reason for non - adoption of crop diversification in Thiruvarur district. Efforts may be enhanced by the institutional authorities to popularise the concept of crop diversification and its relevance in risk mitigation in agriculture. Village specific crop diversification models have to be identified considering the local features and advocated.

***Keywords*:** crop diversification, risk management.

Introduction

Thiruvarur district falls under the agro climatic zone of Cauvery delta region. This district is essentially a deltaic terrain and the elevation is between 15 and 35 metres. It is slopping towards the East with a total geographical area of 2097.09 sq.km.Net cultivated area stands at 154378 Ha. The district is fed by Cauvery, Vennar, and Grand Anaicut canal. In Thiruvarur district Paddy is the principal crop. The district has both single cropped and double cropped rice based cropping system. Paddy is followed by pulse crops. Black gram and Green gram are the important pulse crops. Pulses are grown either under irrigated or rice fallow conditions. Groundnut follows paddy in new delta area under assured irrigated conditions. Gingelly is also sown during February under rainfed and irrigated conditions. Vegetables like Brinjal, Chillies, and Gourds are grown in well drained lands under assured irrigated conditions but in a limited area. Sugarcane is cultivated as cash crop followed by ratoon. Coconut gardens, Bamboo are scattered in the district. Mango, Jack, Citrus, Guava are found in specific pockets.

In an overall perspective, the other side of farming scenario in Thiruvarur district presently is that farming is not considered as a remunerative and convenient profession as in earlier days. The farmers of the delta region previously used to take up paddy cultivation in two subsequent seasons without much hard ships. But presently they are struggling hard to harvest a single 'kuruvai' crop due to less water availability in Cauvery river. The wide spread pattern of mono cropping system in the district is also perceived to add fuel to the fire.

Also, it's a known fact that, 'crop diversification' an effective alternative tool to manage such situation is a forgotten concept in delta region. Farmers are more used to the mono cropping systems alone, with a few number of crops which are conventionally familiar to them. The awareness on the relevance of crop diversification at farm level for risk management in agriculture is very much lagging among these farmers. Under this background the study was carried out with the following specific objectives

- To analyse factors influencing the farmers awareness on the relevance of crop diversification in risk management.
- To rank the reasons for non – adoption of crop diversification in Thiruvarur district of Tamilnadu.

Materials and Methods

Thiruvarur district was considered as the universe of the study. The Mannargudi block of this districts was purposively selected since it possesses cultivation areas falling under both upstream irrigation as well as tail end irrigation. In the block, 60 farmers were selected at random. The primary data collected from these farmer's respondents were utilized for further analyses in the study.

1. Logit Model

This study utilized the logistic regression model to empirically quantify the relative influence of various factors

responsible for farmers' awareness on the relevance of crop diversification in risk management.

The logit model in this study postulates that P_i, the probability of the i^{th} respondent's awareness is a function of an index variable Z_i, summarizing a set of the individual attributes. Hence, let us consider the following representation of respondent's awareness.

$$P_i = E(Y = 1/X_i) = \frac{1}{1+e^{-(\beta_1+\beta_2 X_i)}} \quad ...(1)$$

Where, e is the familiar base of the natural logarithm. Now, let equation (1) be rewritten as

$$P_i = \frac{1}{1+e^{-Z_i}} \quad ...(2)$$

Where $Zi = \beta_1+\beta_2 X_i$

Equation (2) represents the (cumulative) logistic distribution function (Gujarati, 1998)

It could be verified that as Z_i ranges from - ∞ to + ∞, P_i ranges between 0 and 1 and that P_i is nonlinearly related to Z_i(i.e., X_i). However, we would encounter an estimation problem, because P_i is not only nonlinear in X but in the β's as well, as can be seen clearly from (1). This means that the familiar OLS procedure could not be made to estimate the parameters. But this problem is more apparent than real because (1) is intrinsically linear, which can be shown as follows:

If P_i, the probability of the respondents' being awareness is as given by (2), then, $(1-P_i)$, the probability of not being aware is

$$1-P_i = \frac{1}{1+e^{Z_i}} \quad ...(3)$$

$$\frac{P_i}{1-P_i} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} = e^{Z_i} \quad ...(4)$$

Now, $\frac{P_i}{1-P_i}$ is simply the odds ratio in favour of the respondent being awareness,

Now, by taking the natural log of (4), we would obtain:

$$L_i = \text{In}\left(\frac{\hat{P}}{1-\hat{P}_i}\right) = Z_i = \beta_1+\beta_2 X_i \quad ...(5)$$

That is, L, the log of the odds ratio, is not linear in X, but (from the estimation view point) linear in the parameters. It might be noted that the linearity assumption of OLS does not require that the X variables be necessarily linear. So we can have X^2, X^3, etc., as regressors in the model. For our purpose, it is the linearity in the parameters that is crucial. L is called the logit, and hence the name logit model or (5).

Features of the Logit model

1. As P goes from 0 to 1 (i.e., as Z varies from - ∞ to + ∞), the logit L goes from- ∞ to + ∞. That is, although the probabilities (of necessity) lie between 0 and 1, the logits are not so bounded.
2. Although L is linear in X, the probabilities themselves are not.
3. The interpretation of the logit model is as follows: β_2, the slope, measures the change in L for a unit change in X.

Estimation of the Logit Model

For estimation purposes, equation (5) can be written as follows:

$$L_i = \ln\left[\frac{P_i}{1-P_i}\right] = \beta_1+\beta_2 X_i + u_i \quad ...(6)$$

To estimate the model, we need, apart from X_i, the values of the logit L_i, but now we run into some difficulties. If we have data on individual respondents, $P_i = 1$ for the respondent's being aware is $P_i = 0$, otherwise. But, if we put these values directly into the logit L_i, we obtain:

$L_i = \ln\left(\frac{1}{0}\right)$ for the respondent being aware

$L_i = \ln\left(\frac{0}{1}\right)$ if otherwise

Obviously, these expressions are meaningless. Therefore, if we have data at the micro or individual level, we cannot estimate (6) by the standard OLS routine. In this situation, one may have to resort to the maximum likelihood method to estimate the parameters.

2. Garrett Ranking Analysis

To study and rank the reasons for non-adoption of crop diversification, Garrett's ranking technique was employed (Garrett, 1969). The order of merit assigned by the respondents for the reasons were converted into ranks using the formula,

Percent Position= $\frac{100(R_{ij}-0.5)}{N_j}$

Where,

R_{ij}= Rank give for i^{th} factor by j^{th} individual

N_j=number of factors raked by j^{th} individual

By referring to Garrett's table, the percentage positions estimated were converted into scores and then for each factor the scores of various respondents were added and mean value was arrived at. These means were arranged in descending order. The reason having the highest mean value was considered as the most important and was given the highest rank and vice versa.

In the present study Garrett's ranking techniques was used to rank the reasons for non - adoption of crop diversification.

Results and Discussion

Factors Determining the Awareness on the Relevance of Crop Diversification in Risk Management

The logit model was employed to quantify the degree of influence of various factors involved in determining the awareness of farmers on the relevance of crop diversification in agricultural risk management.

The results in Table - 1 shows the results of the logistic regression analysis. A lower log likelihood value (35.178) indicated that the model had better fit with the data. The estimate of Negelkerke R^2 (0.734) indicated that 73 percent of variation in dependent variable might be accounted for by all included predictor variables.

The logistic regression results revealed that the awareness on crop diversification had been positively and significantly influenced by the factors education, size of farm, no of Agri-related meetings attended by the respondents and labour scarcity.

Out of the four factors, the values of which are statistically significant, the factor "No of agri–related meetings attended" by the respondent seems to influence more on the degree of awareness on the relevance of crop diversification in agricultural risk management.The results reveal that the odds of being aware of crop diversification increases by 5.6 times with every unit increase in the factor "No of agri – related meeting attended". The next important factor is understood to be the labour scarcity. The odds of being aware of crop diversification increases by 3.5 times if the respondent had experienced labour scarcity. With regard to "Education" the odds favouring the awareness on the relevance of crop diversification in risk management increases by 2.7 times with one unit increase in the factor.The factor "Size of farm" also influences positively on awareness and the odds of being aware of crop diversification increases by 2 times with one unit increases of the size of farm.

Practically, the logit model results reveal that.

- When a farmer frequently attends agri related meetings the chances of being aware of the crop diversification concept increases.
- The constraints like labour scarcity also drives the farmer to seek for alternatives and it makes the farmers to be aware of the concepts like crop diversification.
- Naturally education of the farmer also acts as an influencing factor. The education would provide a wide exposure in general and also would make him to realise the importance of the available agricultural techniques.
- The size of farm plays a positive role in making the farmer aware of the crop diversification concept. Large farmers in general are affordable to take up the risk involved in adopting new alternatives.

Reasons for Non – Adoption of Crop Diversification

Garrett Ranking Analysis

Identifying the major reasons for a problem and ranking them in respondent's perception is one of the most practical and reliable approaches followed in social sciences researches which helps the researcher to find tangible solutions for many complex issues.

Garrett ranking technique was used in this study to rank the reason for non - adoption of crop diversification in Thiruvarur district.It is certain that at least a reasonable proportion of farmers in Thiruvarur district would be aware of the relevance of crop diversification concept in risk mitigation. It is also certain that even the farmers who are aware of the merit of crop diversification have not adopted it due to some reasons. Hence the study attempted to identify the reasons and rank them for a better understanding using Garrett ranking techniques. The results are presented in Table 2.

The reasons "More reliance on traditional methodologies" ranked first for the non - adoption of crop diversification. They strongly believe that the prevailing cropping pattern and crop selection is the best suitable option considering the available local features. The second reason is "Lack of availability of skilled labour for non – conventional crops". This reason seems to be more valid technically, but needs to beverified at micro level and the problem has to be addressed by the relevant authorities. The third reason is "Contented sense of living". This sort of reasons may not be encouraged and accepted. Such conceptions may even be out of a discouraged and frustrated mind-set of farmers. They need to be motivated and pulled into the main stream of the economy.

Policy Suggestion

- Efforts may be enhanced by the institutional authorities to popularise the concept of crop diversification and its relevance in risk mitigation in agriculture.
- Village specific crop diversification models have to be identified considering the local features and advocated.

Table 1 : Logistic Regression Estimates on the Factors Influencing Crop Diversification

Sl. No	Variables	MLE Co-efficient	Odds Ratio	P Values
1	Age	0.002	1.002	0.954
2	Education	0.978***	2.658	0.003
3	Size of Farm	0.713**	2.040	0.042
4	No of Adult Involved in Farming	-0.480	0.619	0.522
5	No of Agri Related Meetings Attended	1.719**	5.580	0.026
6	Labour Scarcity	1.241*	3.459	0.104
7	Water Scarcity	-0.324	0.723	0.714
8	Ratio of Other to Farm Income	-0.264	0.768	0.861
	Constant/Intercept	-11.258	0.000	0.022
Nagelkerke R^2 : 0.734				
-2 Log likelihood : 35.178				

*** Significant at 1 % level of Probability
** Significant at 5 % level of Probability
* Significant at 10 % level of Probability

Table 2 : Constraints Encountered by Farmers of Thiruvarur District

Sl. No	Statements	Garrett Mean Score	Rank
1	More reliance on traditional methodologies	71.8	I
2	Lack of availability of skilled labour for Non – conventional crops	67.2	II
3	Contented sense of living	63.1	III
4	Lack of consistency in Metturwater availability	58.4	IV
5	Lack of technical know – how	51.2	V
6	Lack of financial back-up	45.2	VI

References

Chandrakanth Reddy, I.; Prabakar, C.; Devi, K.S.; Ponnarasi, T. and Peter, Y.S. (2019).“An Economic Analysis on Jackfruit Production and Marketing in Cuddalore District of Tamilnadu, India, Plant Archives, 19(2): 2801-2809.

Nisha Devi, R.S. Prasher (2018). Agricultural diversification in Himachal Pradesh: An economic analysis Indian Journal of Economics and Development, 6(12): 2320-9828.

Pandey. A.P. (2016). Socio Economic Factors of Contract Farming: A Logistic Analysis. IRA-International Journal of Management & Social Sciences; 03(03).

Prabakar, C. (2015) Scope for Tuna Fisheries in Indian Marketing System, International Journal of Current Research in Life Sciences, 04(01): 264-270.

Prabakar, C. (2015) Impact of Motorization on Standard of Living of Fisher folk in Tamil Nadu, Agriculture Update, 3(3&4): 260-265.

Sita Devi, K. (2005). Impact of Micro Finance in Pushing Back Rural Poverty in Cuddalore District, Unpublished Ph.D. Thesis Submitted to Department Agricultural Economics, Annamalai University, Annamalainagar., p.81.

E - Sources

http://research-advances.org/index.php/RAJMSS.

https://timesofindia.indiatimes.com/city/madurai/Farmers-change-crop-pattern-due-to-lack-of-water-in-Tiruvarur/articleshow/21078089.cms

https://www.researchgate.net/publication/338782869_An_Analysis_of_Cropping_Pattern_and_Crop_Combination_Regions_of_Thiruvarur_District_2011-2016_Tamilnadu_India

https://www.cambridge.org/core/journals/journal-of-agricultural-and-applied-economics/article/logit-model-of-farmers-decisions-about-credit/AE10956C41D4F534A6234D0FB2509368

https://www.researchgate.net/publication/274394043_An_Application_on_Multinomial_Logistic_Regression_Model