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SOCIOECONOMIC FACTORS AFFECTING ADOPTION OF RECOMMENDED DOSE OF FERTILIZER (RDF) IN KARNATAKA STATE

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Abstract

The study investigated the adoption of Recommended Dose of Fertilizer (RDF) in selected districts of Karnataka state. Hundred farmers were randomly selected from each area. The main tool for data collection was the questionnaire method. Data collected were analyzed using binary logit regression analysis. The findings revealed that socioeconomic characteristics of farmers significantly affected the adoption of RDF. The main determinants of farmers to adopt the RDF were age, educational level, gender, household size and farm size. All these factors were positively correlated to RDF and significant in the regression analysis conducted in the study. Farmer's age and distance from shop to field were negatively correlated to adoption of RDF.

***Key words*:** RDF, Karnataka, Major Crops and Regression analysis.

Introduction

The secret of rapid agricultural progress in the under developed countries is to be found much more in agricultural extension, fertilizers, new seeds, pesticides and water supplies than in altering the size of the farm, introducing machinery, or in getting rid of middle men in the marketing process. Adoption of agricultural technologies is influenced by a number of interrelated components within the decision environment in which farmers operate. For instance, Feder *et al.* (1985) identified lack of credit, limited access to information, aversion to risk, inadequate farm size, insufficient human capital, tenure arrangements, absence of adequate farm equipment, chaotic supply of complementary inputs and inappropriate transportation infrastructure as key constraints to rapid adoption of innovations in less developed countries. However, not all factors are equally important in different areas and for farmers with different socio-economic situations.

Socio-economic conditions of farmers are the most cited factors influencing technology adoption. The variables most commonly included in this category were age, education, household size, landholding size, livestock ownership and other factors that indicate the wealth status of farmers. Farmers with bigger land holding size are assumed to have the ability to purchase improved technologies and the capacity to bear risk if the technology fails. This was confirmed in the case of use of fertilizer by Nkonya *et al.* (1997) in Tanzania.

The use of fertilizers is affected by a number of factors like irrigation, high yielding variety seeds, size of the farm credit etc. In the production process in agriculture cultivators demand for fertilizers generally depends on three factors, *viz.*, (a) Decision on fertilizer application, (b) Choice of crop (*i.e.*, for which crop fertilizer should be applied); and (c) Rate of application (per unit of cropped area). The first factor is basically a state of awareness and knowledge of the farmer regarding fertilizer use on crops he commonly grows. The other two issues are generally governed by profitability of fertilizer use at farm level. The level of fertilizer use increases with increased response to the use of fertilizers. The level of fertilizer use is influenced by the price of fertilizer relative to the price of the product (Mala 2013).

Methodology

Binary Logit Regression Analysis

The logit model was used in capturing the qualitative

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responses of the dependent variable. In the present study it was employed to capture the probability of a particular household will a adopting the recommended dose of fertilizer or not. When the dependent variable is dichotomous in nature, application of linear regression model leads to erroneous results. Under such circumstances binary choice models are used and they assumed that individuals are faced with a choice between two alternatives and that the choice made depends on characteristics of the individuals. The purpose of the model is to determine the probability that an individual with a given set of attribute will adopting the recommended dose of fertilizer for particular crop or not. The simplest form of the model involves the dependent variable assuming a binary response, which takes the value 1 or 0. The commonly used qualitative response model are the linear probability model (LPM), the logit model, the probit model, and tobit model.

The logit mode based on the logistic probability is specified as,

$$P_i = F(Z_i) = F(A + \sum_{i=1}^{n} B_i X_i) = \frac{1}{1 + e^{-zi}}$$

Where

$$Z_i = A + \sum_{i=1}^{n} B_i X_i$$

After simplication, the logit model can be written as:

$$Z_i = In \frac{P_i}{(1 - P_i)} = A + \sum_{i=1}^{n} B_i X_i$$

Where,

L_i= Logit as it follows logitc regression

P_i= Probability that a randomly chosen farmer applying RDF

$1-P_i$= Probability that the farmer will not applying the RDF

A= Constant

B_is= Logit coefficients

X_is= Independent variable

U_i= Error term

$P_i/1- P_i$ = Odds ratio in favor of the farmers applying the RDF (*i.e.* the ratio of the probability that a farmers applying the RDF to the probability that it will not apply).

The independent variables considered in the logit model were

X_1= Age

X_2= Education level

X_3= Experience

X_4= Family size

X_5= Type of family

X_6= Size of land holding

X_7= Type of land ownership

X_8= Type of soil

X_9= Type of irrigation

X_{10}= Farming expenditure

X_{11}= Distance from house to field

X_{12}= Distance from shop to field s

X_{13}= Number of shops in the locality

X_{14}= Annual income

Results and discussion

In this study, an attempt was made to identify the socio-economic factors responsible for adoption of RDF of major crops growing in the two districts. The Binary Logistic Regression Model was used to identify the most appropriate factor constraining the adoption. Further the extent to which each factor contributing to the level of adoption was determined.

The factors influencing the adoption of RDF on major crops grown by the farmers of Dharwad district was presented in the table 1. The result of the study revealed that none of the variables are found to be significant impact on adoption of RDF in case of maize crop. The R^2 was 33.8 per cent. The experience of the farmer was found to be positively and significantly contributing the adoption of RDF in case of Bt cotton. The total variation explained by the independent variable was 32.7 per cent. Whereas in case of soybean, annual income of the farmer was found to be positively and significantly influencing the adoption of RDF. Remaining variables were found to be non- significant. On an overall number of shops was found to be positively and significantly influencing the adoption of RDF in case of Dharwad district. Total variation in the independent variables was found to be 16.3 per cent.

The table 2 explains the factors influencing the adoption of RDF on major crops grown by the farmers of Davangere district. In case of maize and paddy none of the variables found to be significantly influencing the application of RDF. The variables such as age, distance from house to field and distance from shops to field were found to be negatively influencing the application of RDF in both the crops. Whereas remaining variables found to be positively influencing the application of RDF. The total

variation explained by the independent variables in maize and paddy were 23 and 40.8 per cent respectively. In case of sorghum age is negatively and significantly influencing the application of RDF with the coefficient was -68.3 per cent. The experience of the farmer was found to be positively and significantly influencing the application of RDF with the coefficient was 0.080. The R^2 value 33.6 percent. On an overall in Davangere district experience of the farmers found to be positively influencing the application of RDF to the crops and the coefficient was 0.105. The variation in the independent variables on the dependent variables was found to be 15.4 per cent.

From the table 1 it is concluded that annual income is positive and significantly contributing the application of RDF at 10 per cent level of significance in case of maize crop. This implies that per unit increasing in the annual income farmers are likely to adopt the application of RDF was by 16.9 per cent. Gbegeh and Akubuilo, 2013 also analysed socio economic factors for fertilizer use in crops. Further remaining variable were found to be non-significant. The R^2 value was 33.8 per cent.

From the Table 1 it is clear that in case of Bt cotton experience of the farmer found to be significant at 5 per cent level of significance and it has positive sign. It implies that per unit increase in the years of experience will increase use of RDF by the 19.4 per cent. This might be due to experienced farmers have better knowledge and information on agricultural practices (Feder *et al*., 1985). Remaining factors were found to be non-significant. The type of the land ownership found to be significant at 10 per cent level of significance. It means that if the farmer owned the land there will be increase in adoption of RDF by 65.4 per cent. Age of the farmers, distance from house to field and distance from shop to field were found to negative and non-significant impact on adoption of RDF of BT cotton in Dharwad district similar results were obtained by Obisesan *et al.*, 2013. The R^2 was found that 32.7 per cent.

Determinants of RDF use in case of soybean was computed and it was presented in the Table 1. From the Table 1 it is revealed that annual income was positive and significantly contributing the application of RDF in case of soybean crop with the coefficient 3.568. This indicates that per unit increase in the annual income there will be increase in the adoption of RDF was 35.68 per cent. These results were on par with the results of Pashupati *et al*. 2005. The size of land holding was positively and significantly contributing the application of RDF at 10 per cent level of significance. It implies that per unit increase in the area will increase the application of RDF will be 56.8 per cent. This might be due to Owners and operators of large-sized farms have the economic resources, and can afford to take the risk involved in trying out a new idea or practice. This agrees with the findings of Gbegeh and Akubuilo (2013) who stated that an positive relationship exist between size of land holding and the adoption of improved agricultural technology. Distance from shop to field was negative and significant at 10 per cent level of significance. This implies that the

Table 1: Determinants of Recommended Dose of Fertilizer (RDF) use on major crops by the farmers of Dharwad district.

Sl. No	Variables	Maize		Bt cotton		Soybean		Overall	
		Coefficient	P- value	Coefficient	P- value	Coefficient	P- value	Coefficient	P- value
1.	Age (X_1)	-0.121	0.722	-0.141	0.116	-0.140	0.431	-0.042	0.374
2.	Education level (X_2)	0.653	0.253	0.141	0.177	0.097	0.632	0.011	0.834
3.	Experience (X_3)	6.201	0.152	0.194**	0.029	0.054	0.739	0.033	0.461
4.	Family size (X_4)	3.182	0.177	0.109	0.751	0.356	0.471	0.032	0.627
5.	Type of family (X_5)	12.646	0.109	0.291	0.880	1.402	0.678	0.433	0.317
6.	Size of land holding (X_6)	1.193	0.135	0.022	0.932	0.568*	0.059	0.017	0.805
7.	Type of land ownership (X_7)	32.324	0.998	0.654*	0.093	22.364	0.999	19.386	0.999
8.	Type of soil (X_8)	2.893	0.333	0.727	0.502	0.858	0.185	0.022	0.876
9.	Type of irrigation (X_9)	14.105	0.215	37.019	1.000	30.616	0.998	0.015	0.976
10.	Farming expenditure (X_{10})	22.935	0.132	0.312	0.447	31.926	0.998	0.388	0.421
11.	Distance from house to field (X_{11})	-2.134	0.117	-0.290	0.234	-2.034	0.319	-0.095	0.524
12.	Distance from shop to field (X_{12})	-0.270	0.397	-38.296	1.000	-2.855*	0.071	-0.213	0.130
13.	No. of shops in the locality (X_{13})	4.614	0.235	0.249	0.553	1.558	0.676	0.064***	0.008
14.	Annual income (X_{14})	1.690*	0.066	0.031	0.945	3.568**	0.048	0.050	0.569
15.	Constant	-95.337	0.129	18.139	1.000	-94.672	0.998	0.339	0.849
16.	R^2	0.338		0.327		0.432		0.163	

***Significant at 1%, **Significant at 5%, *Significant at 10%

Table 2: Determinants of Recommended Dose of Fertilizer (RDF) use on major crops by the farmers of Davanagere distric

Sl. No	Variables	Maize		Paddy		Sorghum		Overall	
		Coefficient	P- value	Coefficient	P- value	Coefficient	P- value	Coefficient	P- value
1.	Age (X_1)	-0.093	0.362	-2.292*	0.083	-0.683**	0.047	-0.099*	0.081
2.	Education level (X_2)	0.201	0.269	2.638	0.150	0.145	0.510	0.089	0.186
3.	Experience (X_3)	0.099	0.388	2.128*	0.088	0.807**	0.031	0.105**	0.038
4.	Family size (X_4)	0.108	0.750	3.536	0.101	0.044	0.938	0.059	0.640
5.	Type of family (X_5)	1.455	0.412	52.909*	0.090	6.574	0.147	1.195	0.132
6.	Size of land holding (X_6)	0.377	0.309	2.106*	0.077	1.154	0.126	0.059	0.137
7.	Type of land ownership (X_7)	0.284	0.841	0.746	0.909	6.618*	0.075	0.129	0.869
8.	Type of soil (X_8)	1.080	0.104	-	-	3.422*	0.089	0.430	0.585
9.	Type of irrigation (X_9)	3.771	0.103	-	-	-	-	0.473	0.510
10.	Farming expenditure (X_{10})	5.866*	0.054	1.324	0.626	0.736	0.227	0.105	0.397
11.	Distance from house to field (X_{11})	-0.581	0.261	-0.546	0.629	-2.006	0.190	-0.119	0.271
12.	Distance from shop to field (X_{12})	-3.440*	0.066	-18.070	0.998	-2.475	0.319	-0.045	0.882
13.	No. of shops in the locality (X_{13})	0.378	0.368	4.733*	0.067	0.183*	0.070	0.003	0.984
14.	Annual income (X_{14})	0.192	0.788	19.257	0.998	0.124	0.787	0.157	0.249
15.	Constant	16.717	0.099	-79.062	0.134	6.655	0.411	0.049	0.985
16.	R^2	0.230		0.408		0.336		0.154	

***Significant at 1%, **Significant at 5%, *Significant at 10%

longer the distance, the less the probability of fertilizer use. The result shows that one kilo meter increase in the distance to the nearest fertilizer shop reduces fertilizer use by 2.855 per cent similar results were obtained by Waithaka *et al*. (2007). The other factors were found to be non-significant regarding the application of RDF. The R^2 value was 43.2 per cent. It implies that total variation in independent was explained by 43.2 per cent.

It is also observed that from the Table 1 factors affecting the RDF use in different crops grown in the Dharwad district. Number of shops in the locality was found to be positively and significantly influencing the adoption of RDF in case of all the three crops. This indicates that increase in the number of shops there will be increase in the adoption of RDF by 6.42 per cent. The remaining variables were found to be non-significant. The R^2 value explains the total variation in the independent variables and it was 16.3per cent.

The factors influencing adoption of RDF on major crops by the farmers Davangere district was shown in table 2. It indicates that farming expenditure was positively and significantly influencing the adoption of RDF at 10 per cent level of significance in case of maize crop. It indicates that per unit increase in the farming expenditure there will be increase in adoption of RDF by 58.66 per cent. The distance from shop to field was negatively and significantly influencing the adoption of RDF at 10 per cent level of significance. It means that per unit increase in the distance from shop to field there will be decrease in adoption of RDF by 34.4 per cent. The R^2 was value was 23 per cent.

In case of paddy crop it is observed that experience, type of the family, size of land holding and number of shops in the locality are the significant in the use of RDF. This means that per unit increase in these variables there will be increase in the adoption RDF by 2.128, 52.909, 2.106 and 4.733 per cent respectively (Obisesan, 2013 and Knepper, 2002). Age of the farmers was negatively and significantly influencing the adoption of RDF at 10 per cent level of significance. This means that age of the farmers had negative effect on the likelihood of using RDF. This agrees with the findings of Gbegeh and Akubuilo (2013) who stated that a negative relationship exists between age and adoption of improved agricultural practices, and that age decreases the probability of adoption agricultural innovations. It may be that older farmers are more risk-averse and less likely to be flexible than younger farmers and thus have a lesser likelihood of adopting new technologies. The R^2 was value was 40.8 per cent.

Whereas in case of sorghum growing farmers, age of the farmers was negative and significantly contributing the application of RDF in sorghum growing farmers at 5% level of significance with coefficient was -0.683. Experience of the farmer was positive and significant at 5%. The coefficient was 0.807 which means that per unit increase in the year will increasing the RDF by 0.807%. Type of ownership, type of soil and number of shops in the locality were found to be positive and

significantly contributing the application of RDF with coefficients of 66.18, 34.22 and 1.83 respectively similar results were obtained by Waithaka *et al*. (2007). The R^2 was 0.336 which means that 33 percent of the variation due to the independent variables.

On an overall age of the farmer was found to be negative and significantly contributing the application of RDF at 10 per cent level of significance. This might be due to younger farmers are more likely to adopt the agricultural innovation compared to the older aged farmers with the coefficient of -0.099 (Pashupati *et al*. 2005). Experience of the farmers was found to be significant at 5 per cent level of significance. The experience of the farmer is significant at 5 per cent and has a positive sign. This implies that farmers with higher level of experience use RDF than those with lower level of experience. The coefficient is 0.105 which means that a unit increase in years of experience will increase fertilizer use by the 10.5 per cent. This may be due to the fact that more experienced farmers are enlightened on the benefits of using improved farm inputs such as fertilizer on crop production (Anangwe, 2010) Remaining factors were found to be non-significant. The total variation in the independent variables was found to be 15.4 per cent. The farmer and type of land ownership are significantly influencing the application of RDF in case of BT cotton crop. Size of land holding, distance from shop to field and annual income were found to be significant factors on adoption of RDF in case of soybean crop.

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