Determinants of Adoption of Improved Varieties of Mungbean : A Farm Study in Rajasthan

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ABSTRACT

In this paper an examination of determinants of adoption of new mungbean varieties was performed with help of data collected from 100 randomly selected farmers of Jhunjhunu district of Rajasthan. It was found that the greatest impact on adoption behaviour was that of source of information about new varieties. If a farmers came to know about a new variety either through television or through research institutions, they believed it to be credible information and acted on it. Further, adopters were found to be younger in age, more educated, with larger operational holdings, having higher yield, more price conscious and had access to credit and extension services. Moreover, if the purpose was home consumption, it was most likely that the farmer would grow local variety whereas if getting more fodder was the purpose, the farmer would grow improved mungbean varieties. Therefore, any varietal development programme must take into consideration the taste and fodder aspects of mungbean cultivation. To conclude, adoption decision was found to be a combination of economic and attitudinal variables of the farmers.

Key words : *Adoption; Mungbean; Logit model*

*M*ungbean is an important pulse crop of India. It supplies a substantial quantity of easily digestible protein to the cereal-based diet of rural households. Mungbean's low requirement of inputs and its ability to restore soil fertility through symbiotic nitrogen fixation make it particularly important to resource poor farmers (Ali *et al.*, 1997). In India it is predominantly grown in the states of Maharashtra, Andhra Pradesh, Orissa, Rajasthan, Tamil Nadu and Bihar. However, mungbean area and production are almost stagnant (Singh and Asthana, 1998). Efforts to augment its production would require two-pronged approach -first, development of high yielding varieties and second, to spearhead a large -scale adoption of existing improved varieties of mungbean. The present paper is focussed on the second alternative.

Mungbean is grown generally in *kharif* (July to September) in the state of Rajasthan for agricultural activities of the state are very much dependent on monsoon. The district of Jhunjhunu was selected for the study as it falls under the "Arid Western Plane Agro-Eco Region" of the state and acts as a representative district of such environment. Only 22.5 percent of total cropped area of the district is irrigated and almost 99 per cent irrigation is provided by wells. Mungbean is a major pulse crop of the district and it has been reported that more than 60 per cent of pulses requirement for consumption at households is met by mungbean. It is grown in *kharif* season and is characterized by low yield. Major varieties

being grown, apart from local varieties, are RMG-62, K-851 and ML-5. The mungbean production environment in the district is presented in Table 1.

Table 1. Mungbean Production Environment in Jhunjhunu District

Percent of farmers growing new mungbean cultivars (%)	75.00
Average yield of local varieties (q/ha)	5.01
Average yield of improved mungbean varieties at farmers'field (q/ha)	6.44
Average mungbean yield at farmers' fieilds (q/ha)	5.43
Demonstration yield (q/ha)	7.12
Yield gap II (%)	30.00
Average annual rainfall in the district (mm)	450
Area irrigated as per cent of gross cropped area (%)	22.5

A survey was conducted during 2003-04 using a structured questionnaire and completed by face-to-face interviews. The survey questionnaire covers : (i) the physical characteristics of the farm, (ii) the characteristics of the farmer (e.g. age, gender, experience, education), (iii) cropping pattern, (iv) input use, (v) sources of information and contact with others, and (vi) attitude of the farmer towards selected variety of mungbean and its sustainability implications. A total of 100 farmers spread across 4 villages of the district were interviewed.

METHODOLOGY

The Farmers are classified into two groups - adopters and non-adopters, based on their adoption behavior of

the new varieties. A farmer is influenced by a set of variables, which are usually not observable. Therefore, a latent variable, y^*, an unobservable index of the willingness of each producer to grow new varieties of mungbean, that can be related to a set of explanatory variables X as follows :

$$y^*_i = \textbf{\textit{b}}'X_i + u_i \qquad i = 1,......N$$

The observed pattern of adoption can then be described by a dummy variable y such that $y_i = 1$ if firm i has adopted; $y^* = 0$ if it has not adopted. These observed values of y are related to y^* as follows:

$$y_i = 1 \text{ if } y^*_i > 0$$
$$y_i = 0 \text{ otherwise}$$

and
$$Pr(y_i = 1 = Pr(y^*_i > 0)$$
$$= Pr (u_i > - \textbf{\textit{b}}'X_i) = 1 - F (- \textbf{\textit{b}}'X_i)$$

Where, F is the cumulative distribution function for u. Here we focus on the logit model, which is based on the logistic distribution.

$$P_i = Pr (y_i = 1) = \frac{e^{bX}}{(1 + e^{bX})}$$
$$= \Lambda(\beta'X)$$

Where L denotes the logistic cumulative distribution function. The odds ratio, which defines probability of adoption relative to non-adoption, is given as:

$$\frac{P_i}{(1 - P_i)} = e^{\beta}$$

The results of the analysis using logit model are presented in the next section. Variables used and their explanation is presented in Table 2.

Table 2. Descriptive Statistics of the Sample Households

Variable	Description and Values	Mean	Standard Error
Age	Age of the farmer at the date of survey (years)	44.43	1.2749
Hhsize	Size of the farm household (No.)	7.77	0.5875
Hyield	Perception of the farmer about higher yield of mungbean (if yes =1; 0 otherwise)	0.53	0.0510
Ophol	Operational holding of the farmer (ha)	4.05	1.5076
Owncons	If farmer grows mungbean for home consumption = 1; 0 otherwise	0.79	0.0409
Resinst	If source of information about new varieties is a research institution = 1; 0 otherwise	0.27	0.0446
Tv	If source of variety information is TV = 1; 0 otherwise	0.04	0.0197
Yschool	Years of schooling of the farmer (years)	9.50	0.4432
Extcont	If extension services are available to the farmer =1; 0 otherwise	0.50	0.5025
Resfodd	If farmer grows mungbean for fodder purpose also = 1; 0 otherwise	0.33	0.0473
Crediacc	If farmer has accessibility to credit facilities = 1; 0 otherwise	0.54	0.0501
Accproma	If farmer has access to product market to sell his produce = 1; 0 otherwise	0.73	0.0509
Goodprice	If farmer grows mungbean to fetch a price better that its substitutes = 1; 0 otherwise	0.57	0.0493
Radio	If source of variety information is radio 1; 0 otherwise	0.26	0.0441
Soilhealth	If farmer believes mungbean improves soil health = 1; 0 otherwise	0.35	0.0479

RESULTS AND DISCUSSION

The results of the logit analysis are summarised in Table 3. Here we present the "odds ratios" (or eb) rather than the b coefficients themselves. The interpretation is that as the explanatory variables change, the probability of adoption changes by that factor, i.e. variables with an odds ratio of greater than unity would increase the probability of adoption, while those with a value of less than unity would have a negative impact on adoption.

The probability of adoption is seen to increase if a farmer has the perception that new varieties yield more, the farmer gets information about such varieties either on television or from local research institution (e.g. Krishi Vigyan Kendra or agricultural university) and obtaining fodder for livestock is one of the objectives of growing mungbean. For example, if the sources of information about new varieties were television and research institution,

the probabilities of adoption of new mungbean varieties increased by 7.7 and 5.7 times, respectively. Similarly, better price of mungbean in comparison of its substitute crops, e.g. bajra, urdbean and maize; farmer's household size; size of operational holding; access to credit, output market and extension facilities were found to be influencing adoption decision positively.

Alternatively, the probability of adoption decreased if the age of the farmer was more and his purpose of mungbean cultivation was its home consumption. It should be noted that the farmers preferred the taste of local varieties of mungbean as compared to improved varieties. This might have discouraged them from adopting improved varieties if the purpose was home consumption. Variables "Radio" and "Soilheal" were not found to be significant and hence not selected in the final equation fitted.

Table 3. Binomial Logit Results for Adoption of Improved Mungbean Varieties

Variable Name	Odds Ratio (e^{β})	Standard Error of β Coefficients	Level of Significance
Age	0.85	0.0427	**
Hhsize	1.25	0.0131	**
Hyield	4.31	1.0162	*
Ophol	1.08	0.0327	*
Owncons	0.45	0.0984	*
Resinst	5.70	0.8890	*
TV	7.72	2.8876	**
Yschool	1.23	0.1016	*
Extcont	1.44	0.0093	**
Resfodd	5.60	0.0959	**
Crediacc	1.58	0.0091	**
Accproma	1.19	0.0086	*
Goodprice	4.59	0.4282	*
Overall correct prediction	88%		
Log likelihood	-21.094		
Chi-square (13)	91.291**		
Goodness of fit	77.944		
R^2	0.80		

**and* show significance at 1 and 5 per cent probability levels, respectively.

CONCLUSION

Adoption of new mungbean varieties at a larger scale is an important step towards increasing pulses production in the country. Hence understanding of the factors that lead farmers to adopt is key component of policy design. In this paper an examination of determinants of adoption of new mungbean varieties was performed and results presented. It was found that the greatest impact on adoption behaviour was that of source of information about new varieties. If a farmer came to know about a new variety either through television or through research institutions, they believed it to be credible information and acted on it. This finding was consistent with the view that information is one of the crucial "software" aspects of innovation (Rogers, 1983). Further, adopters were found to be younger in age, more educated, with larger operational holdings, yield and price conscious and had access to credit and extension services. Moreover, if the purpose was home consumption, it was most likely that the farmer would grow local variety whereas if getting more fodder was the purpose, the farmer would grow improved mungbean varieties. Therefore, any varietal development programme must take into consideration the taste and fodder aspects of mungbean cultivation. To conclude, adoption decision was found to be a combination of economic and attitudinal variables of the farmers.

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