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Factors influencing the extent of adoption of blackgram variety LBG – 752 in Krishna district of Andhra Pradesh

Sandra Prasanthi

Assistant Professor, Department of Agricultural Economics, College of Agriculture, Annamacharya University, Rajampet, Andhra Pradesh, India

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Corresponding Author: Sandra Prasanthi

Abstract

The study was carried out to understand the extent of adoption of blackgram LBG – 752 variety in Krishna district of Andhra Pradesh. A multi stage sampling technique was employed for the study. A total sample of 60 farmers were selected in Krishna district. Primary data were collected from the sampled farmers by using a well – structured questionnaire. Data were analysed by using tobit regression model. The tobit regression results indicated that age of the farmer and average annual farm income of farmer has positive and significant influence on the extent of adoption of LBG – 752 variety. On the contrary, experience in farming and access to membership has significant and negative impact on extent of adoption of LBG – 752 variety. This study also examines the constraints faced by non – adopter farmers for the adoption of LBG – 752 variety. For constraints, garret ranking was employed and the results revealed that lack of availability of seed, pest management, lack of awareness to identify blackgram varieties, low market etc., were the major constraints for the non – adopted farmers in the study area.

Keywords: Extent of adoption, LBG-752, Tobit, Garret and Krishna

1. Introduction

Pulses are an important component of the Indian diet since they are a major source of protein. Pulses are known as "poor man's meat" since dairy and animal products are seldom consumed by India's poorest people, both in rural and urban areas. India accounts for about 25 per cent of global pulse production and it is also the largest consumer (27%) and importer (14%) of the pulses. Total Pulses production in the country was about 23.02 million tonnes. Area under pulses in India is 28.3 m ha and the average productivity is 776 kg ha⁻¹(2020-2021). Blackgram, greengram, chickpea, pigeon pea, lentil, and field pea are the most common pulse crops grown in India. Blackgram is scientifically known as *Phasiolus mungo* and commonly called as Urad in India.

India is now the world's leading producer and consumer of blackgram, accounting for more than 70 per cent of worldwide output. Myanmar and Pakistan come in second and third, respectively. It produces about 24.5 lakh tonnes of Urad annually from about 4.6 million hectares of area, with an average productivity of 533 Kg per hectare in 2020-21. Blackgram area accounts for about 19 per cent of India's total pulse acreage which contributes 23 per cent of total pulse production. About 95 per cent of urdbean (blackgram) production comes from 10 states of Madhya Pradesh, Rajasthan, Andhra Pradesh, Uttar Pradesh, Tamil Nadu, Maharashtra, Jharkhand, Gujarat, Karnataka and West Bengal.

In Andhra Pradesh it is mostly grown as rabi crop under rice fallows. Andhra Pradesh has 3.82 lakh ha of area under

blackgram with a production of 3.43 lakh tones and with a productivity of 842kg ha⁻¹. In Andhra Pradesh, Krishna district is the major blackgram growing district. In Krishna district, blackgram is growing in 1.23 lakh ha with a production of 1.65 lakh tonnes and with a productivity of 1337 kgs ha⁻¹(DES AP 2020-21). LBG-752 is the dominant blackgram variety cultivate in Krishna district.

The study was conducted with the following objectives;

- To analyse the extent of adoption of Blackgram LBG – 752 variety in Krishna district of Andhra Pradesh and
- To identify the constraints faced by non – adopter farmers in adoption of LBG – 752 variety in Krishna district of Andhra Pradesh

2. Methodology

A Multi – stage sampling procedure was adopted for the study. In Andhra Pradesh, Krishna district was purposively selected, because it is having 1.23 lakh ha with a production of 1.65 lakh tonnes and with a productivity of 1337 kgs ha⁻¹(DES AP 2020-21) under blackgram cultivation. In Krishna district, Movva mandal was selected purposively, it has 11221.1 ha of area under Blackgram cultivation. In Movva mandal, 3 villages were selected with highest area under Blackgram LBG – 752 variety. Those were, Kaza (1825.2 ha), Nidumollu (1473.2 ha) and Movva (1157.2 ha). From each village, 20 samples were collected; 10 adopters and 10 non – adopters were selected randomly, thus making a total sample of 30 adopters and 30 non – adopters. Primary data as well as secondary data were collected to study the

objectives. The data pertains to the year 2021-2022. The selected respondents were interviewed personally with the well structured schedule. The information collected was analysed by using Tobit regression and Garret ranking technique.

2.1 Tobit Regression Model

Tobin (1958) developed a framework for estimating models of censored dependent variables. The tobit regression model developed by Tobin (1958) will be carried out to analyse the extent of adoption of Blackgram LBG – 752 variety by the farmers. The extent of adoption of Blackgram LBG – 752 variety is defined as the proportion of area under Blackgram LBG – 752 variety to the total Blackgram land area. The empirical tobit model was specified as follows;

$$Y^* = \beta_0 + \beta_i X_i + \mu_i$$

$$Y = Y^* \text{ if } \beta_0 + \beta_i X_i + \mu_i > 0 \dots\dots\dots 1$$

$$Y_i = 0 \text{ if } \beta_0 + \beta_i X_i + \mu_i < 0$$

where,

Y_i = the extent of adoption of Swarna variety

Y^* = latent variable (which is not observable)

X_i = vector of explanatory variable

B_i = vector of parameters to be estimated and

μ_i = an independent normally distributed error term with zero mean and constant variance

The model parameters were estimated by maximizing the Tobit likelihood function of the following form

$$L = \prod_{Y^* > 0} \frac{1}{\sigma} f\left(\frac{Y_i - X_i}{\sigma}\right) \prod_{Y^* \leq 0} F\left(-\frac{\beta_i x}{\sigma}\right) \dots\dots\dots 2$$

Where f and F were the density function and the cumulative function of Y^* , respectively. $\prod_{Y^* \leq 0}$ means the product over those of i for which $Y^* \leq 0$ and $\prod_{Y^* > 0}$ means the product over those of i for which $Y^* > 0$.

The marginal effect of explanatory variables was estimated as follows.

The change in the intensity of adoption with respect to a change in an explanatory variable among adopters was:

$$(\partial E(y_i/y_i^* > 0)/\partial x_i) = B_i \left[1 - \frac{zf(z)}{F(z)} - \left[\frac{f(z)}{F(z)} \right]^2 \right]$$

where,

$F(z)$ = the cumulative normal distribution of Z ,

$f(z)$ = the value of the derivative of the normal curve at a given point (i.e., unit normal density),

Z = the z-score for the area under normal curve and

β = vector of Tobit maximum likelihood estimates and σ is the standard error of the error term

The empirical model of the effects of a set of explanatory variables on the extent of adoption of Blackgram LBG – 752 variety applying the maximum likelihood estimation technique was specified using the following linear relationship:

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

y_i = Proportion of area allocated to the Blackgram LBG –

752 variety

X_1 = Age (in years)

X_2 = Education (0=Illiterate, 1-Primary, 2-Secondary, 3-Intermediate, 4-Graduate Degree and 5-Post Graduate)

X_3 = Size of the family (in number)

X_4 = Experience in farming (in years)

X_5 = Access to membership in farmers' organisation (1=yes, 0=otherwise)

X_6 = Access to financial services (1=yes, 0=no)

X_7 = Average annual farm income of farmer (in rupees)

X_8 = Non-farm income of the farmer (1=yes, 0=otherwise)

X_9 = Extension contact (1-Occasionally, 2-Rarely and 0-No)

$b_1, b_2, \dots, b_9$ are parameters corresponding to estimated variables' coefficients.

μ_i is the error term and consists of unobservable random variables

2.2 Garret Ranking Technique

Garret ranking test is used to identify and prioritize the constraints in adoption of LBG-752 blackgram variety for the non – adopter farmers in the study area.

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

where,

R_{ij} = Rank given for the i^{th} item by the j^{th} individual

N_j = Number of items ranked by the j^{th} individual

The per cent position of each rank is converted to scores by referring to tables given by Garret and Woodworth (1969). By referring to Garrett's table, the per cent positions estimated were converted into score. Thus, for each problem, the mean score was estimated. The problem with the highest mean value was considered as the most important one and the others followed in that order. The constraints were analysed for LBG-752 blackgram variety for the non-adopted farmers.

3. Results and Discussion

3.1 Extent of Adoption of Blackgram Variety LBG – 752

The tobit regression model was employed to analyse the extent of adoption of Blackgram LBG – 752 variety and the results were presented in Table 1. The results indicated that the chi – square (0.05) was significant suggesting that the model has a strong explanatory power. The pseudo R^2 value showed that 60.3 per cent variation in the dependent variable was explained by the independent variables. This indicated that the model showed a good fit to the data. The age of the farmer and average annual farm income of farmer has positive and significant influence on proportion of land allocated under Blackgram LBG – 752 variety. On contrary, experience in farming, access to membership and access to financial services have negative and significant impact on the extent of adoption of Blackgram LBG – 752 variety.

Age of the Farmer

It showed positive and significant influence on the extent of adoption of Blackgram LBG – 752 variety. It was statistically significant at 5% level of significance. The marginal value 0.01 indicated that extent of adoption

increased by 1 percent with one year increase in the farmers' age. Age of the farmer influence farmers to increase the proportion of area under blackgram LBG – 752 variety. The results were similar with Tiamiyu *et al.* (2009) [12].

Average Annual Farm Income of the Farmer

Average annual farm income of the farmer showed positive and significant influence on the proportion of land allotted

to blackgram LBG-752 variety and it was found significant at 5% level of significance. The coefficient of the marginal effect of the variable was 0.04 implied that the intensity of adoption of Blackgram LBG – 752 variety increased by 4 percent. The farmers were more interested to allocate their farm land to LBG – 752 variety due to higher average annual farm income. The results were in consistent with Atinafu *et al.* (2022) [13].

Table 1: Tobit results of the extent of adoption of LBG-752 blackgram variety

Variables	Coefficient	Standard Error	P-value	dy/dx
Age of the farmer (X ₁)	0.01	0.00	0.05	0.01**
Education status of the farmer (X ₂)	-0.03	0.01	0.14	-0.03
Size of the family (X ₃)	-0.02	0.03	0.35	-0.02
Experience in farming (X ₄)	-0.02	0.00	0.01	-0.02***
Access to membership (X ₅)	-1.83	0.68	0.03	-0.18***
Access to financial services (X ₆)	-0.05	0.07	0.44	-0.05
Average annual farm income of farmer (X ₇)	0.04	0.02	0.09	0.04**
Non-farm income (X ₈)	-0.09	0.08	0.26	-0.09
Extension contact (X ₉)	-0.09	0.06	0.19	-0.09
Constant	0.25	0.44	0.56	
LR chi2	16.70			
Prob>chi2	0.05			
Pseudo-R2	0.63			
Sample Size	30			

***Significant at 1% and **Significant at 5% level of significance

Experience in Farming

The experience of the farmer found negative and significant relationship with the level of adoption of LBG – 752 variety and statistically significant at 1% level of significance. A marginal value of -0.02 indicated that 2 per cent decrease in the level of adoption with one year increase in the farming experience of the farmer. It implies that farmers were not willing to increase the proportion of land under LBG – 752 variety, if there was increase in the experience in farming.

Access to Membership in Farmers' Organisation

Farmers' membership found negative and significant relationship with the intensity of adoption at 5% level of significance. It indicated that negative association between the membership and intensity of adoption of LBG – 752 variety. A marginal value of -0.18 represented that the intensity of adoption decreased by 18 percent with the increase in membership of farmers in organisation. Farmers participation in social organisation increases the social networks and share of information on different varieties which leads to decrease in the extent of adoption of LBG – 752 variety.

3.2 Constraints Faced by Non – Adopter Farmers in the Adoption of Blackgram LBG – 752 Variety

Garret ranking technique was employed to study and prioritize the constraints faced by the non – adopter farmers in the adoption of Blackgram LBG – 752 variety. The results were presented in Table 2. Lack of availability of seed with a mean score of 67.77 was identified as the major constraint in the adoption of Blackgram variety LBG-752. It was followed by pest management (61.90), lack of awareness to identify different varieties (52.20), low market price (47.23), lack of market accessibility (42.33), high cost of plant protection chemicals (36.13) and lack of financial

services (35.43). Shashikant *et al.* [8] reported that the pest and disease incidence, lack of extension service accessibility and non-availability of required varieties were the constraints in the production and marketing of Redgram.

Table 2: Constraints faced by non – adopter farmers

Constraints	Mean Score	Rank
Lack of availability of seed	67.77	I
Pest management	61.90	II
Lack of awareness to identify different varieties	52.20	III
Low market price	47.23	IV
Lack of financial services	42.33	V
High cost of plant protection chemicals	36.13	VI
Lack of financial services	35.43	VII

4. Conclusion

The study concluded that, the extent of adoption of Blackgram LBG – 752 variety was positively and significantly associated with the age of the farmer and average annual income of the farmer. These two variables indicated that there is increase in the proportion of land under Blackgram LBG – 752 variety. On the contrary, experience in farming and access to membership showed negative and significant impact on the proportion of area under LBG – 752 variety. It indicates that, these variables, decreases the level of adoption of Blackgram LBG – 752 variety. And it also studied about constraints faced by the non – adopter farmers in the study area. The major constraints were, lack of availability of seed at right time, followed by pest management and lack of awareness to identify different varieties.

For the increase in the intensity of adoption the extension departments must demonstrate the low cost of production methods. The extension networks should penetrate much deeper into the farming societies and increase the awareness

on adoption of LBG – 752 variety through promotional activities. Programmes should be conducted to encourage progressive and young farmers to increase the level of adoption of LBG – 752 variety. Considering high demand for the seed during season, sufficient quantity should be made available at the seed outlets. Farmers should be updated with the prices so that they can know in which period the price will be high so they can make sale arrangements. Promoting different organisations which can make future trading and also information regarding FPO in the study area.

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