Factors Affecting the Adoption of Blackgram(LBG-752) X-Variety in Krishna District of Andhra Pradesh, India

ABSTRACT

The study was carried out to analyse the factors affecting the adoption of Blackgram variety LBG-752 in Krishna district of Andhra Pradesh. It specifically describes the determinants and the constraints by the farmers for adoption of Blackgram variety LBG-752. A multi-stage sampling procedure was used to select 60 farmers for the study in Krishna district. Primary data were collected from the sampled farmers by using a well-structured questionnaire. Data were analysed by employing logistic regression and garret ranking technique. The logistic regression results showed that the farm size, size of the family, experience of the farmer and average annual farm income of the farmer were positively and significantly influenced the adoption of Blackgram variety LBG-752. On the other hand, age of the farmer was shown significant and negative influence on the adoption of Blackgram variety LBG-752. The garret ranking results revealed that the lack of knowledge to identify Blackgram varieties, lack of extension service and non- availability of required varieties during sowing period *etc.*, were the major constraints faced by the farmers in the adoption of Blackgram variety LBG-752 in the study area.

Key words: Determinants, LBG-752, Adoption, Logit, Garret and Krishna

INTRODUCTION

India is now the world's leading producer and consumer of Blackgram, accounting for more than 70 per cent of worldwide output. It produces about 24.5 lakh tonnes of Blackgram 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 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 tonnes and with a productivity of 842 kg ha^{-1} (TE 2019-20). In Andhra Pradesh, Krishna 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}. LBG-752 is the dominant Blackgram variety cultivates in krishna district.

As area, production and productivity of Blackgram is highest in krishna district, the present study factors affecting the adoption of Blackgram production in krishna district of Andhra Pradesh will enable us to find the factors for this high rate of adoption which eventually lead to the high area, production and productivity in Krishna district.

The study "Factors Affecting the adoption of Blackgram variety LBG-752 in Krishna district of Andhra Pradesh" with the following objectives:

1. To analyse the determinants of adoption of Blackgram variety LBG-752 in Krishna district of Andhra Pradesh and
2. To identify and prioritize the constraints in adoption of Blackgram variety LBG-752 in Krishna district of Andhra Pradesh.

MATERIALS AND METHODS

Multi-stage sampling technique was employed for the study. In Andhra Pradesh, Krishna district was purposively selected for the study, because it is the first district in the state with Blackgram cultivation area of 1.23 lakh ha with a production of 1.65 lakh tonnes. In Krishna district, Movva mandal is selected purposively because it has 11221.1 ha of area under Backgram cultivation. In Movva mandal, 3 villages with highest area under Blackgram variety LBG-752 was selected. Those are 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 farmers were selected, thus making a total sample of 30 adopters and 30 non-adopters. Primary as well as secondary data were collected to fulfil the designed objectives. The data pertains to the year 2021-2022. The selected respondents were interviewed personally with the help of a well-structured interview schedule. The information collected was analysed by using logistic regression model and garret ranking technique.

Logistic Regression Model

The logistic regression was developed and popularized primarily by Berkson (1944). In the present study the logistic regression model developed by Berkson (1944) was used to analyse the determinants of adoption of Blackgram variety LBG-752. The logit model assumes that the random variable Z_i predicts the probability of adoption of Blackgram variety LBG-752. The basic model of the logit estimation (Gujarati, 2004) is as follows:

$$p_i = F(Z_i) = F(\alpha + \beta X_i) = \frac{1}{(1+\exp Z_i)} \quad \ldots..(1)$$

where,

$F(Z_i)$ the standard normal density function for the possible values of the index Z_i

p_i = the probability of adoption of Blackgram variety LBG-752

X_i = set of explanatory variables

α = regression intercept, and

β= a vector of coefficient. Where, i = 1, 2, 3, ..., n

Where p_i is the probability of adoption of Blackgram variety LBG-752, given X_i (the explanatory variables) and are parameters to be estimated. The log odds of the probability that an individual is willing to adopt is given by

$$Z_i = \log\left(\frac{Pi}{1-Pi}\right) = \alpha + \beta_i X_i + \ldots \beta_n X_n + E \ldots.. (2)$$

where:

i = 1, 2 …. N are observations

Z_i = the natural logarithm of choice for the i^{th} observation

X_n = the nth explanatory observation

E = the error or disturbance term.

For this study, the above equation is expressed implicitly as

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + u_i$$

Y = Adoption of Blackgram variety LBG-752 (1- adopter, 0 - non-adopter)

X_1 = Farm size (in hectares)

X_2 = Age of the farmer (in years)

X_3 = Education status of the farmer (0-Illiterae, 1-Primary, 2-Secondary, 3-Intermediate, 4-Graduation and 5-Post graduation)

X_4 = Size of the family (in number)

X_5 = Experience in farming (in years)

X_6 = Access to membership (1-yes, 0-otherwise)

X_7= Access to financial services (1-yes, 0-otherwise)

X_8= Average annual farm income of farmer (in rupees)

b_1, b_2 . . . b_7 are parameters corresponding to estimated variables' coefficients.
u_i is the error term and consists of unobservable random variables.

Marginal effect of a continuous independent variable on the probability. The marginal effect is

$$\frac{dp}{db} = f(bX)b$$

p = the probability of adoption of Blackgram variety LBG-752

b = slope coefficients

The choice on the above factors is based on the assumption towards the influential capability of these factors in acting as determinants of LBG-752 blackgram variety adoption decision by the farmer. Most of the factors used for analysis base their possibility in such a way that the more favourable or intensive the factor might be the more it is likely to contribute towards adopting the LBG-752 variety. The above logit model and marginal effect of selected variables on the probability of adoption of Blackgram variety LBG-752 have been analysed using statistical software STATA 13.0.

Garret Ranking Technique

Garret ranking test is used to identify and prioritize the constraints in adoption of Blackgram variety LBG-752 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 Blackgram variety LBG-752 adopter farmers.

Results and Discussion

Determinants of adoption of Blackgram variety LBG-752

The logistic regression model was used to analyse the determinants of adoption of Blackgram variety LBG-752 and the results were presented in Table 1. The Cox & Snell R^2 was 0.54 and Nagelkerke R^2 was 0.62 showed that the model's predictive capability explained 59 per cent and 79 per cent, respectively, of the farmer's decision to adopt Swarna (MTU-7029) rice variety. Hosmer and Lemeshow Chi-square stood at 0.70 which indicated that the efficiency of the data set on the final results. The variables such as age, education, farm size and average annual farm income of the respondents were positively and significantly influenced the adoption of Blackgram variety LBG-752. On the contrary, experience of the respondents was significantly and negatively influenced the adoption of Blackgram variety LBG-752.

Farm Size: Farm size of the respondents showed positive relationship with farmers adoption of Blackgram variety LBG-752 and found statistically significant at 1 per cent level. This indicated that positive relationship between the farm size and the adoption decision of farmer. The marginal value of 0.39 for this variable indicated that the probability of adoption increased by 39 per cent with one per cent increase in the farmers' area. The farmers' with large farm size had higher capacity to adopt Blackgram variety LBG-752. The results were in consistent with Devi and Ponnarasi (2009).

Age of the farmer: Age of the farmer showed positive relationship with farmers' adoption of Blackgram variety LBG-752 and was found statistically significant. It was negatively significant at 10 per cent level of significance. The negative coefficient suggested a negative influence of the variable on the farmers' adoption decision. A marginal effect value of -0.061 for this variable indicated that, the probability of adoption decreases by 6.1 per cent when increased in the one year of age of the farmer. Age of the farmer influence farmers to not adopt Blackgram variety LBG-752. The results were similar with Abubakar *et al.* (2019) and Digal *et al.* (2020).

Table 1. Determinants of adoption of Blackgram variety LBG-752

Variables	Coefficient	Standard Error	P-value	dy/dx
Farm size (X_1)	1.739	0.513	0.000	0.396***
Age of the farmer (X_2)	-0.269	0.149	0.063	-0.061*
Education status of the farmer (X_3)	0.401	0.298	0.174	0.091
Size of the family (X_4)	1.037	0.440	0.013	0.236**
Experience in farming (X_5)	0.337	0.154	0.022	0.077**
Access to membership (X_6)	1.120	0.806	0.159	0.258
Access to financial services (X_7)	-0.255	0.903	0.774	-0.057
Average annual farm income of farmer (X_8)	0.004	0.001	0.053	0.001*
Constant	-3.820	5.281	0.469	-4.50e-07
Cox and Snell R^2	0.54			
Nagelkerke R^2	0.62			
Hosmer and Lemeshow Test	0.70			
No. of Observations	60			

Note: *** significant at 1 per cent level of significance, ** significant at 5 per cent level of significance and * significant at 10 percent level of significance.

Size of the family: Size of the family showed positive relationship with the adoption of Blackgram variety LBG-752 and found statistically significant at 5 per cent level of significance. This implied positive relationship between the size of the family and adoption of Blackgram variety LBG-752. A marginal effect value of 0.236 for this variable indicated that, the probability of adoption increased by 23.6 per cent when the farmers have larger family size. The results were in line with Chete (2021).

Farming experience of the farmer: Experience in farming of the respondents showed positive relationship with farmers adoption of Blackgram variety LBG-752 and found statistically significant. It was positively significant at 5 percent level of significance. This indicated positive relationship between the farming experience of the farmer and farmers' decision to adopt LBG-752 variety. A marginal effect value of 0.077 for this variable

indicated that, the probability of adoption increased by 7.7 percent when increase in the one year of farming experience of farmer. It could therefore imply that farmers were willing to adopt Blackgram variety LBG-752, if there was increase in the experience in farming. This is consistent with Kadafur *et* al. (2020) and Feleke and Zegeye (2006).

Average annual farm income of the farmer: Average annual farm income of the farmer of the respondents showed positive relationship with farmers adoption of Blackgram variety LBG-752 and found statistically significant. It was positively significant at 10 percent level of significance. This indicated positive relationship between the average annual farm income and adoption of Blackgram variety LBG-752. A marginal effect value of 0.001 for this variable indicated that, the probability of adoption increased by 0.1 per cent when increase in per cent average annual farm income of the farmer. It could therefore imply that farmers would be more willing to adopt Blackgram variety LBG-752, if there was increase in the average annual farm income of the farmer. The results were similar with Devi and Ponnarasi (2009).

Constraints in the adoption of Blackgram variety LBG-752

Garret Ranking technique was used to analyse the constraints faced by the adopter farmers in the adoption of LBG-752 variety. The results were presented in Table 2. Lack of knowledge to identify Blackgram varieties with a mean score of 67.43 was identified as the major constraint in the adoption of Blackgram variety LBG-752. It was followed by lack of extension service accessibility (63.35), non-availability of required varieties (55.27), low market price (52), high cost of plant protection chemicals (45.6) low market demand (42.08), poor seed quality issue (39.51) and pest and disease incidence (34.67). Shashikant *et al.* (2011) reported that the lack of knowledge to identify Blackgram varieties, 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 the adopter farmers in the adoption of Blackgram variety LBG-752

S. No	Constraints	Total Mean	Rank
1	Lack of knowledge to identify blackgram varieties	67.43	I
2	Lack of extension service accessibility	63.35	II
3	Non-availability of required varieties during sowing period	55.27	III
4	Low market price	52	IV
5	High cost of plant protection chemicals	45.6	V
6	Low market demand	42.08	VI
7	Poor seed quality issues	39.51	VII
8	Pest/Disease problems	34.67	VIII

CONCLUSIONS

From the study, it is concluded that the farm size, size of the family, experience of the farmer and average annual farm income of the respondents were positively and significantly influenced the respondents adoption decision of Blackgram variety LBG-752. On the contrary, age of the respondents was negatively and significantly influenced the farmers adoption decision of Blackgram variety LBG-752. The major constraints faced by the respondents in the adoption of Blackgram variety LBG-752 were lack of knowledge to identify Blackgram varieties, lack of extension service accessibility, non-availability of required varieties and low market price *etc*. As farmers were highly dependent on the traditional varieties, importance of resistance variety in getting the high yield along with the reduced cost of production have to be demonstrate by extension department. As demand will be high during the sowing period, timely availability of required seed should be made during the sowing period. Farmers should be updated with the forecasted prices so that they can come to know in which period the price will be high so that they can make their arrangements. Promoting institutions which make future trading should be encouraged.

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