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Determinants of adoption of Godavari (BDN 2013-41) pigeon pea variety in Parbhani district of Maharashtra

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Abstract

This paper focused on the determinants of the adoption of Godavari (BDN 2013- 41) Pigeon pea variety and its impact on production structure of Pigeon pea in Parbhani district of Maharashtra. In first stage, by using multi-stage sampling design 60 adopter and 60 non-adopter with total sample sized 120, had been selected from two tehsils of Parbhani district. Logit or Logistic regression model was used to analyzed the significant level of different socio-economic and recommended determinants were used in adoption of Godavari (BDN 2013-41) Pigeon pea variety. The result showed that both socio-economic factors (Age, Education and Farm size) and recommended factors (Seed, Chemical fertilizers) showed significant impact on adoption of Godavari (BDN 2013-41) Pigeon pea variety. Thus, socio- economic factor i.e. Age and Education were significant at level 5, Farm size significant at level 10. Similarly, recommended factor i.e. Seed significant at level 10 and Chemical fertilizer significant at level 5 respectively.

Keywords: Determinants, Godavari (BDN 2013-41), significant, logit or logistic regression

Introduction

Pigeon pea is the world's fifth and India's second important pulse crop. Pigeon pea is a significant pulse crop for food and feed, including large amounts of carbohydrates, protein, essential amino acid, fiber, vitamins, and minerals. Pigeon pea is beneficial as food and animal feed in a variety of ways. Dal, mature and immature seeds, diet nutrition in humans. The developed seeds of pigeon pea and its by-products are vital for animal feed.

Pigeon pea is the second leguminous crop highly grow in Marathwada region of Maharashtra after Soybean. Godavari (BDN 2013-41) is one of the variety of Pigeon pea grown in Marathwada region of Maharashtra, developed by Agricultural Research Station (ARS), Badnapur in the year 2018. The variety recommended for irrigated land and heavy soil in drought area. Minimum one irrigation required for higher production. The yield ranges between 19.5-24.5 qntl./ha. The identified character of Godavari (BDN 2013-41) is yellow colour of flower and colour of mature seeds is white. The variety taken maturity within 160-165 days. As per the recommendation seed rate for Godavari (BDN 2013-41) is 10-12 kg./ha which helps to maintain the plant population in field and increases the production of farmer. The pigeon pea variety Godavari (BDN 2013-41) is resistant to wilt, sterility mosaic disease (SMD) and white seeded.

Methodology Logit or Logistic model

The determinants of adoption were achieved by application of logistic regression is a statistical technique that can be used to analyse the relationship between a single dependent variable and several independent variables. The multiple regression equation explained above takes the following form.

$$\text{Logit} = \text{Li} = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \dots + \beta_{11}X_{11} + \mu$$

Where,

Y = Dependent variable B0 = Intercept

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B1, B2, B3..... B11 = Regression coefficients. With respect to..... X1, X2, X3.....X11 = Explanatory variables.

Sr. No.	Dependent Variable (Y)	Particular	Independent Variable (X)	Particular
1	Adopter	1	Age	X1
2	Non-Adopter	0	Education	X2
3			Farm Size	X3
4			Yield	X4
5			Income	X5
6			Seed	X6
7			Sowing Time	X7
8			Spacing	X8
9			Manure	X9
10			Chemical Fertilizer	X10
11			Intercultural Operation	X11

The basic model of Logit estimation (Gujrati, 2004).

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

For ease of exposition, we right (1) as

$$P_i = 1 / (1 + e^{-Z_i}) = e^{Z_i} / (1 + e^{Z_i}) \tag{2}$$

Where, $Z_i = \beta_1 + \beta_2 X_i$

Where P_i is the probability that farmers are Godavari Pigeon pea variety adopter then $(1 - P_i)$ is the probability that farmers are non-adopter and 'e' is the exponential constant.

Equation (2) represents a cumulative logistic distribution function. Which it is easy to verify that Z_i ranges from $-\infty$ to $+\infty$, p_i ranges between 0 to 1 and the logit goes from $-\infty$ to $+\infty$.

Dependent variable: (Y)

Adopter: adopter of Godavari (BDN 2013-41) Pigeon pea variety taken '1' as a particular.

Non-adopter: Non-adopter of Godavari (BDN 2013-41) Pigeon pea variety taken '2' as a particular.

Independent Variable: (X)

Socio-economic determinants

Age: As per the study age of adopter of Godavari (BDN 2013-41) more than non-adopter. It means adopter having more farming experienced than non-adopter.

Education: Rate of illiteracy more in non-adopter than adopter, similarly highest number of adopter had been completed their higher education than non-adopter.

Farm size: The adopter and non-adopter of Godavari (BDN 2013-41) categorized according to land holding i.e. marginal, small, semi-medium, medium land and large land holder.

Yield: The yield of Pigeon pea categorized into two types i.e. main produce and by- produce. As per the study adopter of Godavari (BDN 2013-41) Pigeon pea had highest yield than non-adopter.

Income: Annual income of adopter of Godavari (BDN 2013-41) more as compared to non-adopter.

Recommended Determinants

Seed: As per the recommendation the seed rate of Godavari (BDN 2013-41) pigeon pea variety per hectare 10-12 kg/ha. it helps to maintain adequate plant population in pigeon pea farm.

Sowing time: As per the recommendation sowing time was between 15 June to 15 July.

Spacing: 90x30 cm. and 90x20 cm. recommended spacing for Godavari (BDN 2013-41) Pigeon pea variety.

Manure: 15 tone/ha farm yard manure (FYM) recommended for increase production of pigeon pea.

Chemical fertilizer: The chemical fertilizer like Nitrogen (N), Phosphrous (P), Potash (K) and Sulphur (S) recommended at rate 25:50:30:20 kg/ha/NPKS.

Intercultural operation: Intercultural operation like two weeding, two hoeing and two harrowing recommended for increase higher production. Particular consider insist of weeding, hoeing and harrowing i.e. 1,2,3.

Results and Discussion

The results of the Logit or logistic model's analysis of the variables influencing farmer's adoption of the Godavari (BDN 2013-41) variety. A variety of socio-demographic and economic characteristics were included in the explanatory variable, such as yield, Age, education, farm size, income, yield and some recommended practices like seed, sowing time, spacing, manure, chemical fertilizer and intercultural operation etc.

Table 1: Determinants for Adoption of Godavari (BDN 2013-41) Pigeon pea Variety

Sr. No.	Variable	Estimate Coefficient	Standard error
1	Intercept	-6.74	5.21
2	Age X1	0.16*	0.07
3	Education X2	0.48*	0.2
4	Farm size X3	174.6**	57.28
5	Income X4	0.0001	0.0002
6	Yield X5	2.26	2.19
7	Seed X6	-16.18**	5.01
8	Sowing time X7	-1.19	0.85
9	Spacing X8	-0.7	0.78
10	Manure X9	-0.029	0.2
11	Chemical fertilizer X10	-0.023*	0.09
12	Intercultural operation X11	-0.46	1.31

(Dependent variable: Adoption of Godavari (BDN 2013-41) variety (Yes=1; No=0)

Note: '**' and '*' represent significance at '5' percent and '10' percent levels, respectively.

It was possible to draw the conclusion that from various social factors the Age and Education at 10 percent level of significance, was noteworthy and had the intended positive

connotation. The social factor like Age and Education inbuilt the experience and decision- making process between individual which helps to enhance the farm production by selection of high yielding varieties, inputs like fertilizers and plant protection chemicals and conducting various farm operations at right time and right place. Farm size in pigeon pea farming was positively significant i.e. (5 percent level of significant), the large size of farm helps to getting more yield from crops.

Recommended agronomical variables like seed, sowing time, spacing, manure, chemical fertilizer and intercultural operations are taken to evaluate their impact on production of pigeon pea. Seed (seed rate) has significant at five percent

with negative sign. The Godavari (BDN 2013-41) seed material resistant to sterility mosaic virus (SMV) and having high yield potential which helps to minimize the cost of plant protection chemicals and getting high yield to farmers. Chemical fertilizer like Nitrogen, Phosphorous, Potash, Sulphur and Micronutrients are significant at five percent (5 Percent level of significant) with negative sign, according to data application of chemical in adequate amount at right time and right place helps to enhance the production of farmers. According to recommendation adequate amount of fertilizer like Nitrogen (25 Kg/ha), Phosphorous (50 Kg/ha), Potash (30 Kg/ha) and Sulphur (25 kg/ha) enhance the production of Godavari (BDN 2013-41) adopter farmers.

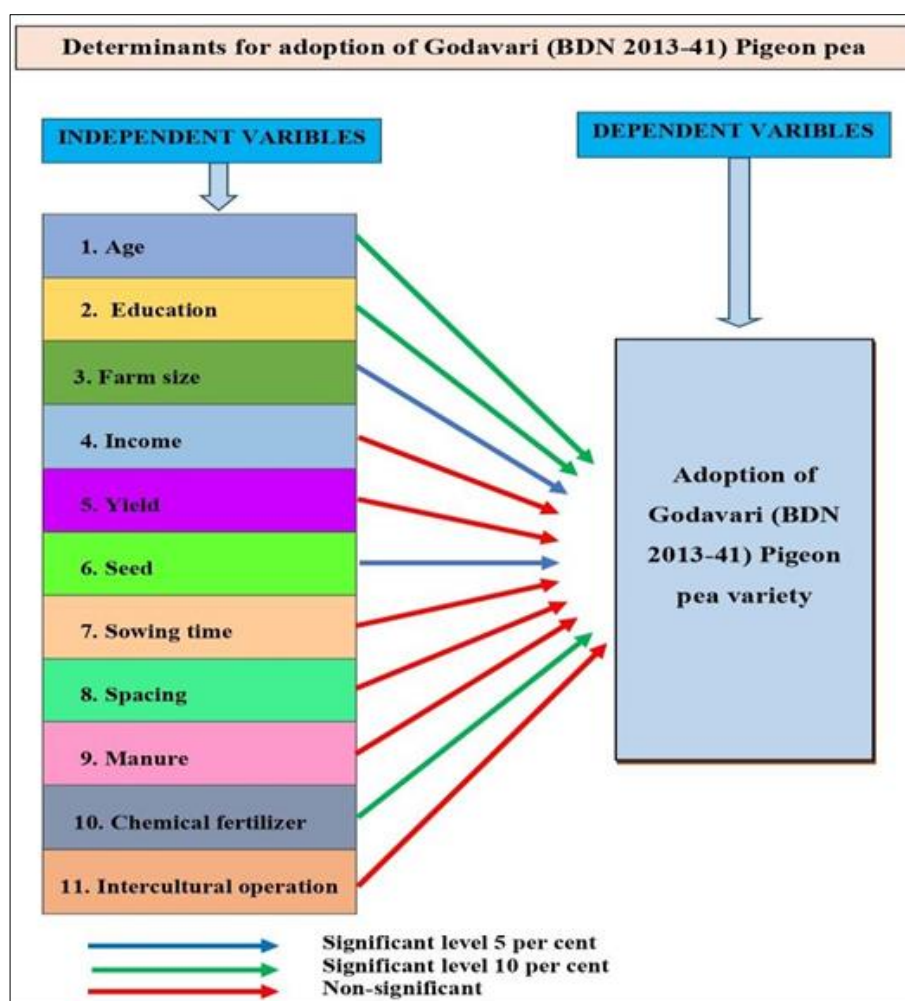


Fig 1: Graphical representaton of determinants for adoption of Godavari (BDN 2013-41) pigeon pea variety

Conclusion

1. Logit or logistic model was utilized to evaluate the determinants of adoption of Godavari (BDN 2013-41) Pigeon pea variety.
2. The result of logit model was analyzed that determinants like age and education were positively significant at 10 percent level and farm size was positively significant at 5 percent level.
3. The determinants like seed and chemical fertilizer were negatively significant at level 5 percent.

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