RESEARCH ARTICLE

RELATIONSHIP BETWEEN INDEPENDENT AND DEPENDENT VARIABLES OF RECOMMENDED MAIZE PRODUCTION TECHNOLOGY

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Abstracts: This investigation was carried out in three district of Bastar plateau of Chhattisgarh State to assess the relationship between independent and dependent variables of recommended maize production technology. 270 farmers were considering as respondents for this study. Respondents were interviewed through personal interview. Collected data were analyzed with the help of suitable statistical methods. The analysis of the results showed that relationship between independent and dependent variables of recommended maize production technology, Farming experience, family size, land size, occupation, annual income, irrigation facility, source of information, contact with extension personnel, participation in extension activities, overall marketing, opinion about maize production, risk orientation, scientific orientation and knowledge had significant correlation with adoption of maize, whereas, farming experience, family size, occupation, annual income, irrigation facility, overall marketing, opinion about maize production, risk orientation, scientific orientation, knowledge and land size had significant correlation with productivity of maize.

Keywords: Association, Adoption, Productivity, *Zea mays*

INTRODUCTION

Maize (*Zea mays* L.) is one of the most important cereal crops in the world and has the highest production among all the cereals. It is a miracle crop, it has very high yield potential, there is no cereal on the earth which has so immense potentiality and that is why it is called 'queen of cereal'. Besides, maize has many types like normal yellow, white grain, sweet corn, baby corn, pop corn, waxy corn, high amylase corn, high oil corn, quality protein maize, etc. Maize is the most important crop in the world after wheat and rice (Verheys,Undated). It is an important staple food in many countries and is also used as animal feed and many industrial applications. Maize is 3rd major crop in India after rice and wheat (Cox, R., 1956 & Reddy *et. al.* 2013). Maize is important cereal crop which provides food, feed, fodder and serves as a source of basic raw material for a number of industrial products viz, starch, protein, oil, food sweeteners, alcoholic beverages, cosmetics, bio-fuel etc, it is cultivated over 8.12 million hectare area with an annual production of 19.77 million tones and an average productivity of 2,435 kg ha-1 (Langade *et. al*. 2013). Maize is the third most important food grain in India after wheat and rice. In India, about 28% of maize produced is used for food purpose, 11% as livestock feed, 48% as poultry feed, 12% in wet milling industry (for example starch and oil production) and 1% as seed (AICRP on Maize, 2007). Maize crop in the state has an area of 123430 ha with the production 254134 MT (C.G. Agriculture Statistic Report 2014).The area and production of Maize crop in Kanker district was 11511 ha and 25705 MT respectively, area of maize crop in Kondagaon district is 13586 ha with production of 31831 MT while the coverage of maize in Bastar district is 9560 ha with the production of 22398 (C.G. Ag. statistic Report 2014). The dependent and independent variables has been studied with standard parameter and their relationship with each other has been investigation and presented. The present study was undertaken with specific objectives to ascertain the relationship between independent and dependent variables about recommended maize production technology among the respondents of Bastar plateau of Chhattisgarh.

MATERIALS AND METHODS

The present study was carried out in Bastar plateau of Chhattisgarh State. Three districts in the zone *i.e.* Kanker, Kondagaon and Bastar were undertaken for the study. Two blocks from each of the selected district Block Antagarh and Koylibeda in Kanker District, Keshkal and Baderajpur in Kondagaon, Bastar and Bakawand in Bastar District. Each selected block 3 villages *viz.* Irrabodi, Amagaon, Godri, in Antagarh Block, Chotekapsi, Kodosalhebhat, Manegaon, in Koylibeda Block, Cherbeda, Toraibeda, Amoda in Keshkal Block, Baderajpur, Toraipara, Khargaon(Manduki) in Baderajpur Block, Ikchapur, Bagmohlai, Dubeumargaon in Bastar Block, Belputi, Khotlapal and Mangnar in Bakawand Block were selected and from each selected village, 15 farmers were selected randomly. In this way total two hundred seventy respondents were selected to response as per the interview schedule designed for the study. Collected

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data were analyzed by the help of various statistical tools *i.e.* frequency, percentage, mean, standard deviation, correlation and regression, *etc.*

The dependent and independent variables has been studied with standard parameter and their relationship with each other has been investigation and presented.

(i) Mean

Mean of sample was calculated by using the following formula:

$$X = \frac{\sum x}{N}$$

Where,

X = Mean of the variables

$\sum x$ = Sum of scores (observation) of variables

N= Total number of respondents

(ii) Standard deviation

Standard deviation was calculated by using following formula:

$$SD = \sqrt{\frac{\sum x^2}{n} \left[\frac{(\sum x)^2}{n} \right]}$$

Where,

S.D. = Standard deviation

x = Deviation obtained from mean

n= Number of observations

Pearson's coefficient of correlation

This technique was used to find out the relationship between independent and dependent variables with the help of SPSS technique through coefficient of correlation which is follows:

$$r = \frac{N \sum xy - \sum x \sum y}{\sqrt{N \sum x^2 - (\sum x)^2 \, . \, N \sum y^2 - (\sum y)^2}}$$

Where,

r = Correlation coefficient

x = Score of independent variable

y = Score of dependent variable

N = Number of observation

Multiple regressions

For the present study SPSS technique was used to know the partial and complete influence of independent variables through linear model of regression equation which is as follows:

$$Y^1 = a + b^1x^1 + b^2x^2 + \ldots\ldots\ldots + bnxn$$

Where,

Y^1 = Dependent variable

$x^1 \ldots xn$ = Independent variables

a = Constant value

$b^1 \ldots bn$ = The regression

RESULTS AND DISCUSSION

The result and discussion of the present study have been summarized under the following heads:

Correlation analysis of independent variable with the adoption and productivity of maize

Table 1. Correlation analysis of independent variable with the adoption and productivity of maize

S. No.	Independent variables	Coefficient of Correlation "r" Values	
		Adoption	Productivity
X_1	Education	0.078	0.058
X_2	Family size	0.277**	0.157**
X_3	Farming experience	0.181**	0.202**
X_4	Social participation	0.055	0.035
X_5	Land size	0.191**	0.153*
X_6	Occupation	0.414**	0.211**
X_7	Annual income	0.369**	0.304**
X_8	Irrigation facility	0.543**	0.618**
X_9	Source of information	0.244**	0.115
X_{10}	Contact with extension personnel	0.446**	0.105
X_{11}	Participation in extension activities	0.251**	-0.011
X_{12}	Overall marketing	0.371**	0.200**
X_{13}	Opinion about maize production	0.455**	0.404**
X_{14}	Risk orientation	0.379**	0.291**
X_{15}	Scientific orientation	0.600**	0.427**
X_{16}	Knowledge	0.621**	0.556**

** Significant at 0.01 level of probability, * Significant at 0.05 level of probability

Correlation coefficient between the selected characteristics of the respondents with adoption and productivity of maize was worked out and the values of correlation coefficient are presented in Table No. 1. It is cleared from the data that out of all selected 16 characteristics, the fourteen variables *viz* family size, farming experience, land size, occupation, annual income, irrigation facility, source of information, contact with extension personnel, participation in extension activities, overall marketing, opinion about maize production, risk orientation, scientific orientation and knowledge had found to be positive and highly significant correlation was found with adoption of maize at 0.01 level of probability. Whereas, two variable, *viz.* education and social participation had no statistically significant correlation with adoption of maize production technique. Correlation coefficient between the selected characteristics of the respondents with productivity of maize, eleventh variable *viz.* family size, farming experience, occupation, annual income, irrigation facility, overall marketing, opinion about maize production, risk orientation, scientific orientation and knowledge had found to be positive and highly significant correlation was found with productivity of maize at 0.01 level of probability and one variable viz. land size was found to be positively and significantly correlated with the productivity of maize at 0.05 level of probability. Whereas, five variable *viz.* education, social participation, source of information, contact with extension personnel and participation in extension activities had no significant correlation with productivity of maize.

Multiple regression analysis of independent variables with adoption and productivity of maize production technique

The results of multiple regression analysis of selected characteristics with adoption and productivity of maize are presented in Table No. 2 Out of 16 independent variables, three variable *viz.* irrigation facility, scientific orientation and knowledge contributed positively and significantly related towards adoption of maize production technique at 0.01 level of probability, whereas, two variables *viz.* contact with extension personnel and opinion about maize production contributed significantly related towards adoption of maize production technique at 0.05 level of probability. Variable i.e. education, family size, farming experience, social participation, land size, occupation, annual income, source of information, participation in extension activities, overall marketing and risk orientation had no significant related in adoption of maize production technique.

The results of multiple regression analysis of selected characteristics with productivity of maize, out of 16 independents variables, four variable *viz.* irrigation facilities, overall marketing, opinion about maize production and knowledge contributed positively and significantly towards productivity of maize at 0.01 level of probability. Variable scientific orientation contributed significantly towards productivity of maize at 0.05 level of probability. Whereas, eleventh variables *viz.* education, family size, farming experience, social participation, land size, occupation, annual income, source of information, contact with extension personnel, participation in extension activities and risk orientation had no significant contribution in productivity of maize.

Table 2. Multiple regression analysis of independent variables with adoption and productivity of maize

S. No.	Independent variable	Regression analysis			
		Adoption		Productivity	
		"t" value	"b" value	"t" value	"b" value
X_1	Education	-2.002	-0.221	-0.746	-0.348
X_2	Family size	1.126	0.363	-1.702	-2.314
X_3	Farming experience	-1.109	-0.274	0.551	0.574
X_4	Social participation	-1.290	-0.233	-1.645	-1.252
X_5	Land size	0.151	0.045	1.931	2.439
X_6	Occupation	1.203	0.142	-2.313	-1.152
X_7	Annual income	-0.741	-0.268	0.785	1.200
X_8	Irrigation facility	5.984**	0.856	8.984**	5.414
X_9	Source of information	-2.054	-0.156	-1.419	-0.456
X_{10}	Contact with extension personnel	2.047*	0.234	-3.221	-1.556
X_{11}	Participation in extension activities	-0.746	-0.098	-4.620	-2.580
X_{12}	Overall marketing	1.557	0.064	2.694**	0.470
X_{13}	Opinion about maize production	2.045*	0.098	3.258**	0.658
X_{14}	Risk orientation	0.609	0.048	-0.718	-0.238
X_{15}	Scientific orientation	2.756**	0.229	2.241*	0.784
X_{16}	Knowledge	2.892**	0.148	4.948**	1.071

** Significant at 0.01 level of probability (2.594) $R^2 = 0.559$ $R^2 = 0.590$

* Significant at 0.05 level of probability (1.969)

Model wise multiple regression analysis of independents variables with adoption of maize production technique.

Different models were tested for findings their predicting ability and determine the best predictors for adoption of maize production technique of respondents (Table 3). Every time one or more variables were dropped to find out the best model with

Table 3. Model wise multiple regression analysis of selected independent variables with adoption of maize production technique

Model No.	Variables included in the models	R^2	'F' value
M^1	X_{16}	0.386	171.682** at 1,273 df
M^2	X_{16},X_{15}	0.451	111.600** at 1,272 df
M^3	X_{16},X_{15},X_8	0.517	96.641** at 1,271df
M^4	$X_{16},X_{15}, X_8, X_{10}$	0.526	74.897** at 1,270 df
M^5	$X_{16},X_{15},X_8,X_{10},X_1$	0.534	61.616** at 1,269 df

** Significant at 0.01 per cent level of probability

Note: X_1- Education, X_8- Irrigation facility, X_{10}- Contact with extension personnel, X_{15}- Scientific orientation, X_{16}- Knowledge.

lowest number of variables explaining highest adoption. Model – I revealed that 38 percent adoption can be explained by considered 16 independent variables and one depend variable (adoption) which have significant 'F' value at 1 percent level. Model II, III, IV and V explained about contribution of adoption as 45, 51, 52 and 53 percent, respectively.

Model wise multiple regression analysis of independents variables with productivity of maize

Different models were tested for findings their predicting ability and to determine the best predictors for productivity of maize of respondents (Table 4). Every time one or more variables were dropped to find out the best model with lowest number of variables explaining highest productivity. Model–I revealed that 38 percent productivity of maize can be explained by considering 16 independent variable and one dependent variable (productivity of maize) which have significant 'F' value at 1 percent level. Model II, III, IV, V and VI explained about contribution of productivity of maize as 45, 48, 52, 53 and 55 percent respectively.

Table 4. Model wise multiple regression analysis of selected independent variables with productivity of maize

Model No.	Variables included in the models	R^2	'F' value
M^1	X_8	0.382	168.700** at 1,273 df
M^2	X_8,X_{16}	0.455	113.366** at 1,272 df
M^3	X_8,X_{16},X_{11}	0.489	86.415** at 1,271df
M^4	$X_8,X_{16}, X_{11}, X_{13}$	0.523	73.901** at 1,270 df
M^5	$X_8,X_{16},X_{11},X_{13},X_{10}$	0.539	62.909** at 1,269 df
M^6	$X_8,X_{16},X_{11},X_{13},X_{10}X_{12}$	0.553	55.242** at 1,268 df

** Significant at 0.01 per cent level of probability

Note: X_8- Irrigation facility, X_{10}- Contact with extension personnel, X_{11}- Participation in extension activities, X_{12} - Overall marketing, X_{13}- Opinion about maize production, X_{16}- Knowledge.

CONCLUSION

From the above research findings it can be concluded that farming experience, family size, land size, occupation, annual income, irrigation facility, source of information, contact with extension personnel, participation in extension activities, overall marketing, opinion about maize production, risk orientation, scientific orientation and knowledge had significant correlation with adoption of maize, whereas, farming experience, family size, occupation, annual income, irrigation facility, overall marketing, opinion about maize production, risk orientation, scientific orientation ,knowledge and land size had significant correlation with productivity of maize.

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