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## Effects of factors influencing extension contacts on agricultural productivity

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### Abstract

The agricultural extension service plays an important role not only in recommending on the appropriate use of inputs but also for maximizing the output at minimum cost. But despite the bare necessity of extension service in rural area for optimizing the farm productivity, most of the farms (irrespective of size groups) are deprived of getting the effective extension service. Thus, an attempt has been made in this paper to analyse the perception of the farmers on the significant importance of various factors influencing extension contacts and their impact on productivity. The Primary data collected from 474 sample farms (during the year 2014-15) of three different agro-climatic zones such as irrigated, semi-irrigated and non-irrigated areas located in three different blocks of Bargarh district of Odisha under Hirakud Command Area have been analyzed by factor analysis and the resultant factors were regressed with Rice productivity to observe their impact on productivity. The factors (clubbed into certain broad factors in each categories of extension parameters) such as Efficiency of Government Staff for Extension support Services, Farmers' Awareness by Institutions on farming technology and Government policies, Formal and informal sources of delivering extension services and Effective Promotional Support Service for Extension are found having positive and significant effects on the agricultural productivity in the area under study.

**Keywords:** factors influencing, agricultural productivity

### 1. Introduction

A general consensus exist that extension services, if properly designed and implemented, agricultural productivity can be improved (Romani Mattia 2003, Evenson and Mwabu 1998; Bindlish and Evenson 1993; Birkhaeuser *et al.* 1991) <sup>[21, 5, 6]</sup>. The term extension has been defined by various scholars (Bembridge, 1990, Röling, 1988, Swanson & Claar, 1984, Oakley & Garforth, 1985, Rivera, 1989) <sup>[4, 24, 17, 19]</sup>, in different ways such as extension for productivity improvement, community development and spread of non-formal agriculture related education which will ultimately be attributed towards the development of agriculture and living standard of the rural community at large. Agricultural Education has a positive effect on the Agricultural Productivity. Education and training can change the attitude of a farmer. The farmers who are trained and exposed to outside can be a role model for other farmers and educating them through non-formal education so that they also can adopt the new technologies for increasing the productivity. The dissemination of new information and demonstration of new skills for the benefit of the community-at-large is the function of agricultural extension activities (C. Padhy and B.K. Jena, 2015) <sup>[18]</sup>. Agricultural Extension and Farmer Education plays important role for improving their knowledge of new techniques and technologies, in addition to providing them with any physical resources necessary for implementation, can dramatically increase the farmers' level of productivity (Rosegrant & Cline, 2003) <sup>[22]</sup>. The relationship between Farmers' education and farm efficiency can be well-defined through worker effect, allocative effect, and choice of production technique (Schultz, 1975. Feder, Lau, and Slade (1987) <sup>[23, 14]</sup> showed that the Training & Visit system of agricultural extension implemented in India resulted in "a high probability of at least an acceptable rate of return to intensified extension". The term extension can also be defined as the conscious use of communication and information to help people form sound opinions and make good decisions (Van den Ban and Hawkins, 1996) <sup>[25]</sup> by developing their technical, organizational and managerial skills and practices (Birmer *et al.*, 2006, Christoplos, 2010) <sup>[8]</sup>.

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<sup>10]</sup>. The agricultural extension intends not only to increase productivity and income (Anderson and Feder, 2007; Waddington *et al.*, 2010) <sup>[1]</sup>, but also to improve multifaceted aspects of rural life. A lot of review across the world on extension services shows that the impact of extension services on rural livelihoods is mixed: very high rates of return in some cases and negligible achievements in other cases (Rivera, Qamar and Crowder, 2001; Anderson and Feder, 2007) <sup>[1, 20]</sup>. However, it is also acknowledged by many experts that estimating the impact of extension on rural livelihoods quantitatively is a challenging task (Anderson and Feder, 2007) <sup>[1]</sup>. The purpose of extension is to disseminate advice to farmers. Knowledge gaps contribute to yield gaps. Extension may be looked into in relation to both primary production and market links, and the contributions of all providers of extension such as public and private. The two major interrelated issues like coverage of small farmers, and the public sector's role and effectiveness are yet to be resolved. (Marco Ferroni and Yuan Zhou, 2012). Delivering extension services properly often becomes difficult as widely dispersed farmers can be hard to reach, and their information varies considerably. Larger farmers are benefited disproportionately. Budgets of extension agencies may be inadequate. There is often too few agents face the problems like motivation, competence, performance, and accountability (Anderson, 2007) <sup>[1]</sup>. Further, many of the literature recognize the role of extension in promoting productivity, sustainable resource use, and agricultural development (Singh, 1999) <sup>[29]</sup>. But public provision has overall fallen short of expectations. Links between research, extension, and farmers are seen to be inadequate, and uncoordinated efforts abound (Planning Commission, 2008) <sup>[27]</sup>. Keeping the discussion made above in view, an attempt has been made in the study to identify the factors affecting extension contacts and their impact on agricultural productivity.

## 1.2 Objectives

The objectives of the present study are to

1. Find out the significant factors affecting various aspects of agricultural extension services in the area under study.
2. To assess the impact of factors significant to extension service on agricultural productivity.

## 1.3 Data Base and Methodology

The primary data collected from the different farm sizes (viz. Small, Medium and Big Farms) of different agro-climatic zones (by canal irrigation status under Hirakud command area such as irrigated, semi-irrigated and non-irrigated areas) located in three different blocks of Bargarh district of Odisha during the year 2014-15 are considered for the study. Altogether 474 farms considered for the study. In this study the whole samples (pooled data) were considered instead of the farm size wise and area wise analysis as because the extension services provided in the areas of the study located in the same district (irrespective of irrigation status of the villages under study) are of homogeneous type. The perceptions of the farmers based on 5 likert scale such as 1 for strongly agreed, 2 for agreed, 3 for disagree, 4 for strongly disagree and 5 for neutral on various aspects and factors of agricultural extension service rendered in the area under study. The factors influencing the agricultural extension service in the area under study have been

categorized into five broad categories such as factors influencing (1) Quality Government Support Services (2) Institutions and policy Support Services, (3) Farmer Orientation Services, (4) Disseminating Information on Farming Incentives and (5) Publicity and Promotion Services.

The Factor Analysis as an analytical tool has been used to reduce the factors to manageable levels without loss of information and for combining into one factor, the variables that are highly correlated with one another.

Further, the Multiple Linear Regression Analysis (OLS) has been undertaken to assess the impact of significant factors drawn from each of the categories relating to extension services on the Agricultural Productivity (i.e. Rice Productivity in this study).

## 1.4 Factor analysis

Factor analysis is an interdependence technique, i.e., it determines the relationship between variables without dividing the data matrix into 'dependent' and 'independent' variables. It, therefore, does not attempt identification of causal relationships. In this research, it is used mainly for two purposes as reduction of data to manageable levels without loss of information and for combining into one factor the variables that are highly correlated with one another. The final data set then gets reduced to factors, smaller in number than the original variables, that are totally or largely uncorrelated with each other. Determination of the dimensions surrounding the variables that constitutes a factor.

A factor is, thus, a linear combination of the variables that are correlated with one another, with  $a_{ij}$  as the weights or factor score coefficients.

$$F_1 = a_{i1}X_1 + a_{i2}X_2 + a_{i3}X_3 + \dots + a_{in}X_n$$

Every variable  $X_i$  that is correlated with other variables to form factor  $F_1$  shares some of the variance with other variables, called communality. *Communality* is, thus, the percentage of variable  $X_i$ 's variance that is common to other variables it is correlated with each other. In addition, it has a small unique element not shared with the others.

Again, the variable  $X_i$  may also be correlated with another group of variables, which are not very significantly correlated with the first group of variables, to form another factor  $F_2$ . Variable  $X_i$  can, therefore, be expressed as:

$$X_i = A_{i1}F_1 + A_{i2}F_2 + A_{i3}F_3 + \dots + A_{im}F_m + V_i U_i,$$

Where  $X_i$  is the  $i^{\text{th}}$  standardized variable,  $F_1, F_2, F_3, \dots, F_m$  are the factors that  $X_i$  forms part of,  $A_{ij}$  is the standardized multiple regression coefficient of variable  $X_i$  on factor  $j$ ,  $U_i$  is the unique element in  $X_i$ , and  $V_i$  is the regression coefficient of  $X_i$  on  $U_i$ . So, it is the percentage of variance explained by all the factors extracted, i.e. the percentage of variance of a variable that is shared with all other variables. So, to measure this, the significant relation with the variables, different numbers of major components were used as input variable for these above discussed analysis. The Correlation matrix is the output of the variables to show the correlation of each variable with each other variable. Factor group of variables form a highly inter correlated set, expressing a common dimension.

The correlation of a variable with a factor is called “factor loading” These loadings are used to interpret factors. In the unrotated form, a variable usually loads more than one factor and here, loading has been mentioned in the total variance table of the factor analysis.

Further, the matrix that exhibits the factor loadings of all the standardized variables on all the factors is extracted.

Principal component method has been applied in this research by arranging the factors in order of decreasing variance. The first factor accounts for the maximum amount of explained variance, the next factor explains the maximum amount of variance left unexplained after the first factor has been extracted, and so on. It operates with standardized variables, with zero mean and unit variance.

The Eigen value is the total variance explained by a factor output, which is also highlighted on total variance table. . Since it deals with standardized variables with unit variance, this is the least amount of variance value which can provide useful information through factorization. Using the Eigen value criterion, it is possible to extract factors up to the point where the Eigen value of a factor becomes one. Factors with Eigen value below one are not retained.

#### 1.4.1 Quality of Government Support Service

The perceptions of the farmers on quality of support service provided by the government based on the four variables considered under this category have been analyzed to obtain significant factors as follows.

It is observed from Table-1 (showing Communalities) that all the four factors considered for analyzing the quality of support service provided by the government to the farmers as perceived by the farmer respondent are found best fit to the factor solution as the initial value is set at 1 and the corresponding value of factor extraction are found more than 0.5. Further, Table-2 represents the ‘total variance’ based on Eigen value to determine how many factors to extract with a rule-of-thumb that the higher the Eigen value of a factor, the higher is the amount of variance explained by the factor. Accordingly, looking at the

Cumulative% column as shown in Table-2, it is found that the ‘two factors’ extracted together account for 58.7% of the total variance (information contained in the original 4 variables). Hence the number of variables has been reduced from 4 to 2 underlying factors. Finally, Table-3, representing Rotated Component Matrix reveals the grouping of the variables according to the factor loading. Accordingly, it is found from this table that the variables such as Priority on farming care (24 X 7) and Quality of service of the supporting staff of government have loadings of 0.458, and 0.827 as shown in Column-1 of the table and hence these two factors may be clubbed into one factor such as ‘Factor-1’. Thus, the Factor-1 which is a combination of the aforesaid two variables can be renamed or interpreted as ‘Efficiency and Effectiveness of Government Staff for providing Extension support Services to Farmers’. Similarly, the higher factor loadings found in Column-2 of Table-3, for the variables such as Added Services are available and wide and easy availability of Paddy/pulses/oil seeds are 0.766, and 0.741 respectively and hence these two variable may be clubbed into one factor such as ‘Factor-2’. Thus, the Factor-2 which is a combination of these two variables can be renamed or interpreted as “Effective Support Service by Government Machineries to ensure easy availability and accessibility of resources”.

It can thus be inferred from the above analysis that the four numbers of factors clubbed together result in two significant factors such as ‘Efficiency and Effectiveness of Government Staff for providing Extension support Services to Farmers’(Factor-1) and “Effective Support Service by Government Machineries to ensure easy availability and accessibility of resources” (Factor-2) affecting the support services rendered by the government to the farmers as a matter of extension contacts to be availed by the farmers for improving the agricultural production and productivity. Thus these factors are to be taken into consideration for rendering proper extension services to have positive effect on agricultural productivity.

**Table 1:** Communalities

Factors	Initial	Extraction
Quality of service provided by the supporting staff of government	1.000	.685
Support Service by Government Machineries for Value Addition to agricultural produces	1.000	.739
Support Service by Government for wide and easy availability of Paddy/pulses/oil seeds	1.000	.716
Support Service by Government on Priority for farming care (24 X 7)	1.000	.657

N.B: Extraction Method: Principal Component Analysis.

**Source:** own compilation from collected data

**Table 2:** Total Variance on service quality of the government

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%
Quality of service provided by the supporting staff of government	1.218	30.454	30.454	1.218	30.454	30.454
Support Service by Government Machineries for Value Addition to agricultural produces	1.132	28.289	58.743	1.132	28.289	58.743
Support Service by Government for wide and easy availability of Paddy/pulses/oil seeds	.964	24.110	82.852			
Support Service by Government on Priority for farming care (24 X 7)	.686	17.148	100.000			

N.B: Extraction Method: Principal Component Analysis.

**Source:** own compilation from collected data

**Table 3:** Rotated Component Matrix

	Component	
	1	2
Quality of service provided by the supporting staff of government	.827	.
Support Service by Government Machineries for Value Addition to agricultural produces		.766
Support Service by Government for wide and easy availability of Paddy/pulses/oil seeds		.741
Support Service by Government) on Priority for farming care (24 X 7)	.458	

N.B. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization  
**Source:** own compilation from collected data

**1.4.2 Institutional and Policy Support Services**

The perceptions of the farmers on the support services provided by means of government policy and initiatives of different important institutions for the spread of effective extension services which may ultimately affect the agricultural productivity can be analyzed by considering the 5 numbers of variables in this study as depicted in the following tables so as to draw the significant factors which may be useful for rendering proper extension services for improving productivity in agriculture.

The first step in interpreting the output is to look at the factors extracted, their Eigen values and the cumulative percentage of variance. It is observed from the cumulative% column of Table-4 that the two factors extracted together account for 55.86% of the total variance (information contained in the five original variables). This is pretty good bargain, because we are able to economize on the number of variables (from 5 it has reduced to 2 underlying factors), while only 44.14% of the information content has been lost (i.e.55.86% is retained by the 2 factors extracted out of the 5 original variables).

Now, the next task is to interpret about these two extracted

factors as represented in Table-5. It is observed from Table-5, the rotated factor matrix, that in the first column there are two significant factors found influencing the institutional support services i.e. Farmers’ Club and Market Committee for MSP (Minimum Support Price) having loadings of 0.904, and 0.909 respectively. Hence, these two variables can be clubbed into one factor i.e. Factor-1 and named as ‘Institutional support service for Farmers’ Awareness on basics of farm produces and their Market’. Similarly, it is found from Table-5 that the variables Cooperative society, Government and Extension Agencies have higher loadings of 0.641, 0.479 and 0.706 respectively. Hence, these three variables are combined together to form one factor i.e. Factor 2 and can be named as ‘Institutional support service for Farmers’ Awareness on Govt. policies, schemes, incentives and technology of farming’. It can thus be inferred from the above analysis that the institutional support by different types of institutions for extension services to make the farmers informed and assist about their produces, agricultural policies/schemes, market and technology etc. which will ultimately be attributed to improvement in agricultural productivity.

**Table 4:** Communalities

	Initial	Extraction
State/central govt. policy	1.000	.230
Farmers club	1.000	.827
Cooperative society	1.000	.411
Extension Department	1.000	.500
Market Committee for MSP (minimum support price)	1.000	.825

Extraction Method: Principal Component Analysis.  
**Source:** own compilation from collected data

**Table 5:** Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%
State/central govt. policy	1.661	33.214	33.214	1.661	33.214	33.214
Farmers club	1.132	22.649	55.863	1.132	22.649	55.863
Cooperative society	.971	19.424	75.287			
Extension Department	.888	17.750	93.037			
Market Committee for MSP (minimum support price)	.348	6.963	100.000			

Extraction Method: Principal Component Analysis  
**Source:** own compilation from collected data

**Table 6:** Component Matrix

	Component	
	1	2
State/central govt. policy		.479
Farmers club	.909	.
Cooperative society		.641
Extension Department		-.706
Market Committee for MSP (minimum support price)	.904	

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization  
**Source:** own compilation from collected data

**1.4.3 Farmer orientation**

The perceptions of the farmers on various factors influencing their orientation on different issues of farm practices and management being supported by various means as mentioned in the following tables (nine variables considered under this category) have been analyzed to obtain significant factors as follows.

Table-6, labeled Total Variance Explained lists the Eigen values associated with each factor before extraction, after extraction and after rotation. Before extraction, it has identified 9 linear components within the data set. The eigen

values associated with each factor represent the variance explained by that particular linear component and the table also shows the eigen value in terms of the percentage of variance explained where the first factor explains about 16.95% of total variance followed by 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> factors found explaining relatively large amounts of variance, whereas subsequent factors explain only small amount of variance. The table extracts all factors with Eigen values greater than 1 and hence four factors are found significant revealing 57.72% of cumulative variance is as shown in table-6, The Table-7, labeled Rotated Component Matrix contains the same information as the component matrix is calculated after rotation. Factors with loadings less than 0.4 have not been considered here as per the theoretical propositions of this analysis. Based on this the significant factors have been identified from each of the four columns of table-7 and clubbed into one factor for each column element. Thus altogether the numbers of significant factors combined together result in four Factors affecting farmer orientation and accordingly renamed as follows

**Factor 1:** It is found from the first column of table-7 with explained variance of 16.96% based on respondents' perception) that 2 out of 9 variables are significant. Hence, these two significant variables such as Staffs are well trained in provisioning and maintaining quality of services and Provisioning of single window system are clubbed together into one and named as "Professionalization of staffs in delivering extension service"

**Factor 2:** The second column of table-7 (with explained variance of 14.49% based on respondents' perception) reveals that 3 out of 9 variables are found significant. These three factors such as Govt. provides information time to time for new products, Simple procedure for new farming & documentation and Product process are market oriented combined together result in one factor which can be named "Effective dissemination of information on various farm practices"

**Factor 3:** The third column of table-7 (with explained variance of 13.47% based on respondents' perception) shows that 2 out of 9 variables are found significant. Hence

these two variables viz. Govt. arrange workshops/seminars for orientation and Employee's politeness, friendliness towards Farmers can be clubbed together and named as "Formal and informal sources of delivering extension services"

**Factor 4:** The fourth column of table-7 (with explained variance of 12.80%. based on respondents' perception) depicts that 2 out of 9 variables are found significant. These two variables such as Quick complaint redressal and Easy accessibility with the higher authorities (on grievances and its redressal) can be combined into one and named as "Awareness on easy and quick redressal mechanism to farmers' grievances"

It can be inferred from the above analysis that the professionalization of staff, effectiveness of information dissemination, sources of delivering extension services and proper grievance redressal mechanism are the significant factors towards farmers' orientation for availing best of the extension services and information assistance on issues of farm practices which may be utilized to optimize and improving their agricultural productivity.

**Table 7: Communalities**

	Initial	Extraction
Govt. provides information time to time for new products	1.000	.323
Staffs are well trained in provisioning and maintaining quality of services	1.000	.501
Govt. arrange workshops/seminars for orientation	1.000	.587
Provisioning of single window system	1.000	.627
Employee's politeness, friendliness towards Farmers	1.000	.686
Quick complaint redressal	1.000	.592
Simple procedure for new farming & documentation	1.000	.640
Easy accessibility with the higher authorities (on grievances and its redressal)	1.000	.630
Product process are market oriented	1.000	.609

Extraction Method: Principal Component Analysis.

Source: own compilation from collected data

**Table 8: Total Variance Explained**

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%
Govt. provides information time to time for new products	1.526	16.956	16.956	1.526	16.956	16.956
Staffs are well trained in provisioning and maintaining quality of services	1.304	14.489	31.445	1.304	14.489	31.445
Govt. arrange workshops/seminars for orientation	1.212	13.469	44.914	1.212	13.469	44.914
Provisioning of single window system	1.153	12.806	57.720	1.153	12.806	57.720
Employee's politeness, friendliness towards Farmers	.939	10.438	68.158			
Quick complaint redressal	.856	9.507	77.665			
Simple procedure for new farming & documentation	.793	8.807	86.472			
Easy accessibility with the higher authorities (on grievances and its redressal)	.651	7.231	93.702			
Product process are market oriented	.567	6.298	100.000			

Extraction Method: Principal Component Analysis

Source: own compilation from collected data

**Table 9: Rotated Component Matrix**

	Component			
	1	2	3	4
Govt. provides information time to time for new products		-.493		
Staffs are well trained in provisioning and maintaining quality of services	.681			
Govt. arrange workshops/seminars for orientation			.733	
Provisioning of single window system	.767			

Employee’s politeness, friendliness towards Farmers			.792	
Quick complaint redressal				.721
Simple procedure for new farming & documentation		.767		
Easy accessibility with the higher authorities (on grievances and its redressal)				.686
Product process are market oriented		.596		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization  
 Source: own compilation from collected data

**1.4.4 Information on Farming Incentives**

The perceptions of the farmers on the information obtained on certain aspects of formal credit and Government assistance/schemes etc. (nine variables considered under this category) for farming related issues have been analyzed obtain significant factors as follows.

It is observed from the analysis of table-8 that there are 2 factors which are extracted accounting for a total of 55.41 per cent of variations on 4 variables where each of these 2 factors contributes to 29.48 per cent, and 25.93 per cent of variance respectively. Based on the factor loading it is found from column-1 of table-9 that two factors such as preliminary charges (0.789), and special assistance schemes /offers (0.695) are found significant and hence they can be clubbed and named as “Government Policy/ Schemes/incentives on Agri. financing” (Factor-1). Similarly, from column-2 of table-9 the two significant factors found are charges and seed charges with factor loading 0.731 and 0.713 respectively and hence they can be

grouped into one and named as “Information of cost of capital and seeds” (Factor-2).

It can thus be inferred from the above analysis that information on various policy/schemes/incentives of the government for the farmers as well; as the information on the cost of capital and seeds which are two critical inputs to farming practice may have substantial effect on the agricultural productivity of the farmers provided their extension contacts in this regard is effective.

**Table 10: Communalities**

	Initial	Extraction
Scale of Agri. Finance	1.000	.642
Interest charges	1.000	.534
seed charges	1.000	.515
Special assistance schemes /offers	1.000	.526

Extraction Method: Principal Component Analysis.

Source: own compilation from collected data

**Table 11: Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%
Scale of Agri. Finance	1.179	29.485	29.485	1.179	29.485	29.485
Interest charges	1.037	25.933	55.418	1.037	25.933	55.418
seed charges	.910	22.743	78.162			
Special assistance schemes /offers	.874	21.838	100.000			

Extraction Method: Principal Component Analysis.

Source: own compilation from collected data

**Table 12: Rotated Component Matrix**

	Component	
	1	2
Scale of Agri. Finance	.789	
Interest charges		.731
seed charges		.713
Special assistance schemes /offers	.695	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

Source: own compilation from collected data

**1.4.5 Publicity and promotion**

The perceptions of the farmers on the various sources of spreading awareness and information on the usefulness of extension services for the farmers to augment the agricultural productivity have been analyzed to obtain significant factors affecting the publicity and promotion aspects of extension services as follows.

It is observed from Table-10 there are two factors found significant explaining 51.8% of cumulative variance (The table extracts all factors with Eigen values greater than 1). Accordingly, column-1 of table-11, shows out of 5 there are 3 factors (with explained variance of 29.1% based on respondents’ perception) such as Effectiveness of mass media, Publicity campaign at local level and Promotional calls having higher factor loadings (Factor loadings less than 0.4 have not been considered) can be grouped into one

factor (i.e. Factor-1) and named as “Effective Medium of Communication for Extension”. Similarly, column-2 of table-12 reveals that out of 5 there are 2 factors (with explained variance of 22.74%. based on respondents’ perception) such as Promotional messages / information and Effectiveness of govt. supporting staff having higher factor loadings (Factor loadings less than 0.4 have not been considered) can be grouped into one factor (i.e. Factor-2) and named as “Effective Promotional Support Service for Extension”.

It can thus be inferred from the above analysis that promotion and publicity are the important aspects for making the required extension service to the farmers for improvement in agricultural productivity. Thus the factors like effective medium of communication and promotional support services for the cause promoting extension services to reach to the farmers easily are to be considered while designing promotional strategies for spreading the usefulness of extension services for the farmers.

**Table 13: Communalities**

	Initial	Extraction
Effectiveness of mass media	1.000	.279
Publicity campaign at local level	1.000	.573
Promotional messages / information	1.000	.753
Promotional calls	1.000	.414
Effectiveness of govt. supporting staff	1.000	.573

Extraction Method: Principal Component Analysis.

Source: own compilation from collected data

**Table 14:** Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%
Effectiveness of mass media	1.455	29.106	29.106	1.455	29.106	29.106
Publicity campaign at local level	1.137	22.746	51.852	1.137	22.746	51.852
Promotional messages / information	.989	19.790	71.641			
Promotional calls	.727	14.546	86.187			
Effectiveness of govt. supporting staff	.691	13.813	100.000			

Extraction Method: Principal Component Analysis.

Source: own compilation from collected data

**Table 15:** Rotated Component Matrix

	Component	
	1	2
Effectiveness of mass media	.478	
Publicity campaign at local level	.756	
Promotional messages / information		.837
Promotional calls	.634	
Effectiveness of govt. supporting staff		.622

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

Source: own compilation from collected data

**1.5 Effect of Factors of extension contacts on Agricultural Productivity**

In order to examine the influence of factors affecting extension contacts on agricultural productivity, the multiple linear regressions (OLS method) has been applied and the results are presented in Table-13. The factors affecting extension contacts are considered as independent variables and the agricultural (Paddy) productivity is considered as dependent variable. The results show that the coefficient of multiple determinations (R<sup>2</sup>) is 0.753 and adjusted R<sup>2</sup> is 0.742 indicating the regression model is good fit (Table-14). It is inferred that about 75.30 per cent of the variation in dependent variable (productivity) is explained by the independent variables (Factors Affecting Extension Contacts extracted from Factor analysis). The F-value of 2.176 is statistically significant at five per cent level indicating that the model is significant (Table-15). Hence, the null hypothesis i.e. there is no significant influence of extension factors affecting productivity is rejected.

The regression model with Y= Agricultural (Rice) Productivity and

$$X_i = X_1 \dots X_{12}$$

(i.e. the factors extracted from factor analysis) can be represented as follows: (X<sub>i</sub>) in the model as:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + b_{12}X_{12}$$

It is observed from table-16 that t-test for the significance of independent variables indicates that at 5% level of significance X<sub>1</sub>, X<sub>4</sub>, X<sub>7</sub>, X<sub>9</sub>, X<sub>10</sub> and X<sub>12</sub> are statistically significant and also found positive as represented by the respective regression coefficients in the model. It means for every increase in the initiative to improve the effectiveness of the factors of extension contacts such as X<sub>1</sub> = Efficiency of Government Staff for Extension support Services, X<sub>4</sub> = Farmers' Awareness by Institutions on farming technology and Government policies, X<sub>7</sub> = Formal and informal sources of delivering extension services, X<sub>9</sub> = Government Policy/ Schemes/incentives on Agri. Financing, X<sub>10</sub> = Information of cost of capital and seeds and X<sub>12</sub> = Effective Promotional Support Service have positive and significant impact on the agricultural productivity of the farmers in the area under study. Therefore these factors such as X<sub>1</sub>, X<sub>4</sub>, X<sub>7</sub>, X<sub>9</sub>, X<sub>10</sub> and X<sub>12</sub> should be given proper weightage for policy perspective.

**Dependent Variable:** productivity (i.e. Production of paddy per acre in rupees)

**Table 16:** Effect of Factors of extension contacts on Agricultural Productivity

Independent variables	Unstandardized Coefficients	Standardized Coefficients	t
(Constant)	1.37		54.800
X <sub>1</sub> = Efficiency of Government Staff for Extension support Services,	0.144	0.074*	5.538
X <sub>2</sub> = Effectiveness of Government support service for easy availability and accessibility of resources	-0.006	-0.009	-0.231
X <sub>3</sub> = Farmers' Awareness by Institutions on production and Marketing,	0.012	0.02	0.462
X <sub>4</sub> = Farmers' Awareness by Institutions on farming technology and Government policies	0.171	0.12*	6.840
X <sub>5</sub> = Professionalization of staffs in delivering extension service	0.008	0.014	0.308
X <sub>6</sub> = Effective dissemination of information on various farm practices	-0.026	-0.044	-1.000
X <sub>7</sub> = Formal and informal sources of delivering extension services,	0.171	0.119*	6.577
X <sub>8</sub> = Awareness on easy and quick redressal mechanism to farmers' grievances	0.003	0.005	0.115
X <sub>9</sub> = Government Policy/ Schemes/incentives on Agri. Financing	0.102	0.034*	3.778
X <sub>10</sub> = Information of cost of capital and seeds	0.104	0.006*	4.160
X <sub>11</sub> = Effective Medium of Communication for Extension	0.01	-0.001	0.385
X <sub>12</sub> = Effective Promotional Support Service for Extension	0.183	0.139*	7.320
R Square	0.753		

F	2.176 *
Number of Observations, Number of Variables	474, 13

**Note:** 1) \*Indicates significant at 5% level of significance (as 5% level is considered as the standard)

2) Standardized regression coefficient has been considered for analysis

### Conclusion

The perceptions of farmers on the factors affecting their extension contacts have been analyzed by factor analysis and the factors (obtained from grouping of significant factors) under different heads of analysis found are as follows:

**Quality of Government Support Service:**  $X_1$  = Efficiency of Government Staff for Extension support Services and  $X_2$  = Effectiveness of Government support service for easy availability and accessibility of resources.

**Institutional and Policy Support Services:**  $X_3$  = Farmers' Awareness by Institutions on production and Marketing and  $X_4$  = Farmers' Awareness by Institutions on farming technology and Government policies.

**Farmer Orientation:**  $X_5$  = Professionalization of staffs in delivering extension service,  $X_6$  = Effective dissemination of information on various farm practices,  $X_7$  = Formal and informal sources of delivering extension services and  $X_8$  = Awareness on easy and quick redressal mechanism to farmers' grievances.

**Information on Farming Incentives:**  $X_9$  = Government Policy/ Schemes/incentives on Agri. Financing and  $X_{10}$  = Information of cost of capital and seeds

**Publicity and Promotion:**  $X_{11}$  = Effective Medium of Communication for Extension and  $X_{12}$  = Effective Promotional Support Service for Extension.

Further, it is found from the regression analysis that out of the various factors affecting extension contacts of farmers, the factors found positive and significantly affecting the agricultural productivity are:  $X_1$  = Efficiency of Government Staff for Extension support Services,  $X_4$  = Farmers' Awareness by Institutions on farming technology and Government policies,  $X_7$  = Formal and informal sources of delivering extension services  $X_9$  = Government Policy/ Schemes/incentives on Agri. Financing,  $X_{10}$  = Information on cost of capital and seeds and  $X_{12}$  = Effective Promotional Support Service for Extension.

It can thus be concluded that extension contacts of farmers is one of the effective tools for knowledge management which will ultimately be helpful for improvement in agricultural productivity. Hence it is suggested to emphasize the factors of extension contacts found positive and significantly affecting the agricultural productivity, while designing the suitable and farmers' friendly extension contacts policy for overall development of agricultural sector in the area under study in particular and national perspective in general.

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