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Extension services utilization pattern among KVK and ATMA beneficiary farmers in Chhattisgarh state of India

[1]AK Chaturvedani and [2]Mahesh Chander

[1]Assistant Professor, Department of Veterinary Extension, FVAS, RGSC-Banaras Hindu University, Mirzapur, Uttar Pradesh, India

[2]Principal Scientist, Division of Extension Education, ICAR- Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Corresponding Author: AK Chaturvedani

Abstract
Extension services are essential for improving agriculture and income in India, especially in states like Chhattisgarh. Institutions like KVKs and ATMA provide innovations and support to farmers. However, few farmers access these services, showing limited outreach. This study examined the extension services utilization pattern of farmers engaged with KVKs and ATMA in Chhattisgarh to inform more inclusive strategies. Research was carried out in three agro-climatic zones—Bastar Plateau, Northern Hills, and Chhattisgarh Plains—selecting one district per zone. A total of 240 beneficiary farmers were selected for the study, including 120 from KVK and 120 from ATMA, with 40 farmers chosen from each of the three districts in Chhattisgarh, using a multistage sampling technique. An ex-post facto design with a semi-structured interview schedule guided data collection, which was analyzed using descriptive and inferential statistics. Results show most respondents were young to middle-aged males, primarily Hindus from OBC communities. Education levels ranged from primary to high school, and farming was their main occupation, often supported by animal husbandry. Most lived in nuclear families with moderate education and income, residing in kuccha or mixed houses. The findings stress the importance of designing extension approaches that address this socio-demographic diversity to improve service reach and impact.

Keywords: ATMA, effectiveness, extension, service delivery, Chhattisgarh

Introduction
Extension services are crucial for improving agricultural productivity, profitability, and sustainability in India. Organizations like Krishi Vigyan Kendras (KVKs) and the Agricultural Technology Management Agency (ATMA) play a central role in spreading agricultural innovations and enhancing farmers' skills. KVKs serve as primary extension agents at the district level, whereas ATMA manages the execution of programs at the field level. Collectively, these institutions form the foundation of India's agricultural extension system (Gulati & Pravesh, 2018) [5].

Although extension services are crucial, their reach and effectiveness remain inconsistent. In agriculturally dependent states like Chhattisgarh, understanding the socio-demographic characteristics of farmers involved with KVKs and ATMA is important. Most farmers seek advisory support from friends, relatives, progressive farmers, input dealers, cooperatives, government extension officials, ATMA, KVKs, State Agricultural Universities, and various media sources such as television, radio, newspapers, mobile phones, and the internet (MANAGE, 2019) [12]. According to the NSSO Situation Assessment Survey (2014) [14], only 11% of farmers utilized government extension services, with the majority relying on informal channels like progressive farmers, media, or private agents—pointing to significant gaps in public extension coverage.

Furthermore, research by Sulaiman *et al.* (2014) [21] highlights the importance of enhancing the technical skills and innovation capabilities of extension workers to address the demands of modern agriculture. Farmers' access to and benefits from extension services are strongly affected by socio-demographic factors such as age, education, land ownership, and social status. However, there is a lack of detailed empirical data on these factors, particularly for KVK and ATMA beneficiaries in Chhattisgarh. This study aims to address this gap by examining the socio-demographic profiles of farmers engaged with KVK and ATMA in the region, with the goal of supporting the development of more inclusive and effective extension approaches.

Materials and Methods
The study was deliberately carried out in Chhattisgarh, which consists of three distinct agro-climatic zones: Bastar Plateau, Northern Hill Regions, and Chhattisgarh Plains. One district—Bastar, Surguja, and Durg—was randomly chosen from each zone to capture regional diversity. A total of 240 beneficiary farmers were selected, with 120 from KVK and 120 from ATMA. From each district, 40 farmers participating in KVK or ATMA programs were randomly

sampled, resulting in a total sample size of 120 farmers (3 districts × 40 farmers each) using a multistage sampling method.

An ex-post facto research design was used to assess the impact of extension services on farmers. Data were gathered through a pre-tested semi-structured interview schedule. The study focused on farmers involved with KVK and ATMA, employing multistage sampling: purposively selecting districts with active programs, then choosing blocks with intensive program activities, followed by random selection of beneficiary farmers within those blocks.

This approach ensured a representative and diverse sample for thorough quantitative and comparative analysis of socio-demographic, economic, and program-related factors among beneficiaries. Data were coded, organized, and analyzed using SPSS Version 20.0, applying statistical methods such as frequency, percentage, mean, standard deviation, Mann-Whitney U test and Chi-square test as appropriate for the research.

Results and Discussion
Socio-personal characteristics of farmers
In this study, variables studied under socio-personal characteristics were age, gender, religion and category of beneficiary farmers.

Age
A perusal of Table 1 shows that majority (39.17%) of the beneficiary farmers of KVK fell under middle age group (34-46) followed by young (38.33%) and old age (22.50%) categories. Age of respondents ranged between 20-59 years with mean age of 38.31±10.02 years. Majority (43.33%) of the ATMA beneficiary farmers fell under young age group (20-33) followed by middle (35.00%) and old age (21.67%) categories, with mean age of 36.99±10.18 years. A Z value of 1.010 suggests that the difference in average age between KVK and ATMA beneficiaries is not statistically significant at the 5% level. The data shows that only a small number of respondents were elderly compared to those in the young and middle-aged groups. These younger and middle-aged farmers typically take a keen interest in agriculture and are more willing to engage and share accurate information. Similar results have been observed in studies by Meena *et al.* (2010) [10], Otari *et al.* (2013) [15], Patel *et al.* (2013) [17], and Leena *et al.* (2014) [8].

Gender
Table 1 further indicates that majority (59.17%) of the KVK respondents were male and rest (40.83%) were female, whereas, majority (54.17%) ATMA beneficiary farmers were male and rest (45.83%) were female in pooled sample. The Chi-square value indicates no statistically significant difference in gender distribution between KVK and ATMA beneficiary farmers at the 5% significance level. The low number of female beneficiaries may be attributed to their limited exposure and greater involvement in household responsibilities. Similar findings were reported by Biradar (2009) [1] and Narayan (2010) [11], who noted that most beneficiary farmers were male.

Religion
Majority (79.17%) of the KVK respondents was Hindu

followed by Christian (16.67%) and Muslims (4.17%). Similar trend of religion was also observed in case of ATMA beneficiary farmers, *viz.* Hindu (82.50%), Christian (13.33%) and Muslims (4.17%). There was no significant difference in the distribution of respondents based on their religious faith among the beneficiary farmers in the study area. In Chhattisgarh, out of a total population of 2.56 crore, Hindus make up 93.25%, followed by Muslims at 2.02% and Christians at 1.92% (GOI, 2011). This population distribution explains why most respondents were Hindus. These results are consistent with the findings of Singh (2015) [19].

Category
Table 1 further shows the distribution of the sample population according to their cast/category. Thirty-nine percent of the respondents belonged to Other Backward Communities (OBCs) category followed by Scheduled Tribes (22.50%), General (21.67%) and Scheduled Caste (16.67%). Among ATMA beneficiary farmers, a similar pattern was observed, with the majority belonging to Other Backward Communities (31.67%), followed by Scheduled Tribes (27.50%), General category (25.00%), and Scheduled Castes (15.83%). This indicates that beneficiaries of both KVK and ATMA programs come from diverse social categories. NSSO data (2014) [14] also show that most agricultural households in India belong to the OBC group. Singh (2015) [19] reported comparable findings in Rewa district, Madhya Pradesh, where the majority of respondents were from Other Backward Communities.

Table 1: Distribution of the respondents on the basis of their socio-personal characteristics

Particulars	KVK (N=120)	ATMA (N=120)
Age (years)		
Young (20-33)	46 (38.33)	52(43.33)
Middle (34- 46)	47 (39.17)	42 (35.00)
Old (47- 59)	27 (22.50)	26 (21.67)
Mean ± SD	38.31± 10.02	36.99± 10.18
Z value	1.010	
Gender		
Male	71 (59.17)	65 (54.17)
Female	49 (40.83)	55 (45.83)
Chi-square value	0.611	
Religion		
Hindu	95 (79.17)	99 (82.50)
Muslim	5 (4.17)	5 (4.17)
Christian	20 (16.67)	16 (13.33)
Chi-square value	0.527	
Category		
General	26 (21.67)	30 (25.00)
OBC	47 (39.17)	38 (31.67)
SC	20 (16.67)	19 (15.83)
ST	27 (22.50)	33 (27.50)
Chi-square value	1.864	

Figure in parenthesis indicates percentage

Education level of respondents
Table 2 shows that 30.83 percent of the KVK beneficiary farmers had primary level education followed by high school (22.50%), middle school (15.00%), can read and write (14.17%), illiterate (9.17%) and graduate and above (8.33%). Among ATMA beneficiary farmers, 26.67 percent

had middle school level of education followed by high school (24.17%), primary school (21.67%), can read and write (14.17%), graduate and above (7.50%) and illiterate (5.83%). The Chi-square value for education levels between KVK and ATMA beneficiary farmers is not statistically significant at the 5% level. According to the Socio-Economic Caste Census (SECC) (2011) [20], 70.28% of Chhattisgarh's population is literate, while 39.55% are illiterate or have informal education. Among them, the majority (16.59%) have primary education, followed by middle (13.66%), secondary (7.12%), higher secondary (4.52%), and graduate or higher education (2.24%). In this study, the respondents' literacy rate was slightly higher at 78.33%, compared to the state average of 70.28% and the national average of 74.04% (GOI, 2011). Similar findings were reported by Meena et al. (2010) [10] in Sriganganagar, Rajasthan, and Patel et al. (2013) [17] in the Narmada Valley, Gujarat, where most farmers had education up to the primary and secondary levels.

Agriculture experience
Agriculture experience of the respondents ranged between 6-32 years with mean experience of KVK and ATMA farmers being 15.41±6.61 and 14.19±6.58 years, respectively. Pooled data in Table 2 reveals that majority of the respondents (48.33%) had low experience of 6-14 years in agriculture followed by medium (43.33%) and high experience (8.33%). Among ATMA beneficiary farmers, a similar pattern was observed with 51.67% having low agricultural experience, 40.00% medium experience, and 8.33% high experience. Most respondents in the study area were in the young and middle-age groups, suggesting that agriculture is often practiced as a traditional occupation, typically passed down from older family members. Pandhare et al. (2012) [16] in Aurangabad and Mankar et al. (2006) [9] in Raigarh district, Maharashtra, also found that most beneficiaries possessed a medium level of farming experience.

Table 2: Distribution of the respondents on the basis of their socio-personal characteristics

Particulars	KVK (N=120)	ATMA (N=120)
Education		
Illiterate	11 (9.17)	7 (5.83)
Can read & write	17 (14.17)	17 (14.17)
Primary school	37 (30.83)	26 (21.67)
Middle school	18 (15.00)	32 (26.67)
High School	27 (22.50)	29 (24.17)
Graduation and above	10 (8.33)	9 (7.50)
Chi-square value	6.854	
Agriculture experience (years)		
Low (6- 14)	58 (48.33)	62 (51.67)
Medium (15- 23)	52 (43.33)	48 (40.00)
High (24- 32)	10 (8.33)	10 (8.33)
Mean ± SD	15.41± 6.61	14.19± 6.58
Z value	1.430	

Figure in parenthesis indicates percentage

Family description of farmers
Family type
Table 3 indicates that majority (60.83%) of the KVK respondents belonged to nuclear families and rest (39.17%) of the respondents represented joint family system, whereas,

majority (63.33%) ATMA respondents were from nuclear families and rest (36.67%) was from joint families in pooled sample. This may be attributed to shared land holdings and a growing reliance on agriculture and related activities. The availability of job opportunities in urban areas has contributed to social mobility, leading many families to adopt a nuclear family structure. Biswas et al. (2008) [2] reported similar findings in Dakshin Dinajpur, where most farmers belonged to nuclear families.

Family size
About 40.83 percent of KVK beneficiary farmers belonged to medium family size comprising of 7-9 members followed by small (34.17%) and large (25.00%) families. Whereas, majority (48.33%) ATMA respondents were from medium size families followed by small families (37.50%) and large families (14.17%) with a family size of 3-6 and 10-12 members, respectively, in the study area. Family size ranged between 3-12 in numbers with mean family size of 7.44 and 6.89 members per family, respectively, for KVK and ATMA respondents. Kumar and Tripathi (2012) [6] in Uttar Pradesh and Patel et al. (2013) [17] in the Narmada Valley of Gujarat also found that most respondents belonged to families of medium size.

Family education status
Table 3 shows that 46.67 percent of the KVK respondents belonged to medium family education status followed by low (28.33%) and high (25.00%) family education status with mean schooling of 1.38±0.58 years and ATMA farmers also reported that 39.17 percent belonged to medium followed by low (34.17%) and high family education (26.67%) status with mean schooling of 1.42±0.58 years, ranging between 0.46-2.23 years. A Z value of -0.151 indicates no significant difference in the average family education levels between KVK and ATMA beneficiary farmers. In both KVK and ATMA groups, respondents from Durg district had the highest average years of family schooling, followed by those from Surguja and Bastar districts. Similar results were reported by Kumar and Tripathi (2012) [6] in Bareilly district, Uttar Pradesh, where most respondents showed a medium level of family education.

House type
Table 3 further revealed that 44.17 percent of the KVK respondents owned mixed house and rest were living in kuccha (43.33%) and pucca (12.50%) houses, whereas, in case of ATMA beneficiary farmers, majority of the respondents (48.33%) owned kuccha house and rest were living in mixed (35.00%) and pucca (16.67%) houses in study area. Chi-square results revealed no significant differences between KVK and ATMA beneficiary farmers with respect to type of house owned. Several rural housing programs, such as the Indira Awaas Yojana/National Gramin Awaas Mission, Prime Minister Housing Scheme, SC/ST housing schemes, as well as housing loans and grants, have assisted rural populations in constructing their own homes. According to SECC (2011) [20], in rural Chhattisgarh, 74.37% of people live in kuccha houses, followed by 13.57% in mixed-type houses and 11.50% in pucca houses.

Table 3: Distribution of the respondents on the basis of their family description.

Particulars	KVK (N=120)	ATMA (N=120)
Family type		
Nuclear	73 (60.83)	76 (63.33)
Joint	47 (39.17)	44 (36.67)
Chi-square value	0.159	
Family size (number of members)		
Small (3- 6)	41 (34.17)	45 (37.50)
Medium (7- 9)	49 (40.83)	58 (48.33)
Large (10- 12)	30 (25.00)	17 (14.17)
Mean ± SD	7.44± 2.61	6.89± 2.47
Z value	1.677	
Family education status (schooling years)		
Low (0.46- 1.05)	34 (28.33)	41 (34.17)
Medium (1.06- 1.64)	56 (46.67)	47 (39.17)
High (1.65- 2.23)	30 (25.00)	32 (26.67)
Mean ± SD	1.38± 0.58	1.42± 0.54
Z value	-0.151	
House type		
Kuccha	52 (43.33)	58 (48.33)
Pucca	15 (12.50)	20 (16.67)
Mixed type	53 (44.17)	42 (35.00)
Chi-square value	2.315	

Figure in parenthesis indicates percentage

Main occupation
Agriculture was found to be main occupation for majority (71.67%) of the KVK respondents followed by labor (10.83%), animal husbandry (10.00%) and business and other (7.50%) as represented in the Table 4. In case of ATMA, majority (70.00%) of the respondents' main occupation was agriculture followed by animal husbandry (14.17%), business and other (10.00%) and labour (5.83%). Agriculture remains the primary source of livelihood for over half of India's population, providing both income and employment opportunities, and Chhattisgarh is no exception. According to SECC (2011) [20] data, casual labor was the main occupation for 52.13% of the rural population in Chhattisgarh, followed by cultivation at 40.15% and domestic service at 1.66%. These findings align with studies by Reddy *et al.* (2013) [18] in Chittoor District, Andhra Pradesh, Biradar (2009) [1] in Karnataka, and Srivastava (2001) [7] in Punjab.

Secondary occupation
Animal husbandry was found to be secondary and subsidiary occupation for majority (50.00%) of the KVK respondents followed by labor (28.33%), agriculture (17.50%), business and others (4.17%) as represented in the Table 4. In case of ATMA also, majority (45.83%) of farmers' secondary and subsidiary occupation was animal husbandry followed by labor (36.67%), agriculture (10.83%) and business and other (6.67%). Animal husbandry provides supplementary family income along with milk, meat, eggs, manure, fuel, and draught power. The current study shows that most farmers were resource-poor, owned low-yielding non-descript breeds, and practiced a low input-low output production system. These results are consistent with findings by Reddy *et al.* (2013) [18] in Chittoor district, Andhra Pradesh, Pandhare *et al.* (2012) [16] in Aurangabad, and Meena & Bhati (2010) [10] in Sriganganagar district, Rajasthan.

Gross family income (in ₹`)
Forty-seven percent of the KVK respondents in study area belonged to low income group followed by medium (32.50%) and high (20.00%) income group. ATMA respondents also reported similar trend in study area that majority (40.00%) belonged to low income group followed by medium (37.50%) and high (22.50%) income group, irrespective of the districts. The annual income of the respondents ranged from ₹50,000 to ₹2,00,000, with average incomes of ₹1,10,800 for KVK beneficiaries and ₹1,18,825 for ATMA beneficiaries. According to SECC (2011) [20], in rural Chhattisgarh, 90.78% of individuals earn less than ₹5,000 per month, 5.94% fall in the ₹5,000-10,000 range, and only 3.20% earn above ₹10,000 monthly. Similar trends were observed by Pandhare *et al.* (2012) [16] in Aurangabad and Gautam *et al.* (2014) [3] in Barabanki district of Uttar Pradesh, where most farmers had an annual income between ₹50,001 and ₹1,00,000.

Table 4: Distribution of the respondents on the basis of their family description

Particulars	KVK (N=120)	ATMA (N=120)
Main occupation		
Agriculture	86 (71.67)	84 (70.00)
Animal husbandry	12 (10.00)	17 (14.17)
Labour	13 (10.83)	7 (5.83)
Business and others	9 (7.50)	12 (10.00)
Chi-square value	2.178	
Secondary occupation		
Agriculture	21 (17.50)	13 (10.83)
Animal husbandry	60 (50.00)	55 (45.83)
Labor	34 (28.33)	44 (36.67)
Business and other	5 (4.17)	8 (6.67)
Chi-square value	4.074	
Gross family income (in Rs)		
Low (Rs 50000- 100000)	57 (47.50)	48 (40.00)
Medium (Rs 100001- 150000)	39 (32.50)	45 (37.50)
High (Rs 150001- 200000)	24 (20.00)	27 (22.50)
Mean ± SD	110800± 42763	118825± 44711
Z value	-1.4210	

Figure in parenthesis indicates percentage

Land holding (hectares)
Table 5 revealed that majority (38.17%) of KVK respondents belonged to small farmer category followed by marginal (33.33%), medium (18.33%) and landless (10.00%). Similar trend also revealed among ATMA beneficiaries, that majority (48.33%) belonged to small farmer category followed by marginal (25.83%), medium (17.50%) and landless (8.33%). Land holding of the KVK and ATMA respondents in study area ranged from zero to 4 ha with mean land holding of 1.48 and 1.59 hectare, respectively. The classification of the respondents into different category was followed based on the Government of India's classification. As per NSSO (2014) [14] data, most rural households (75%) are marginal farmers, followed by small (10%), landless (7.4%), semi-medium (5%), medium (1.9%), and large (0.24%) farmers. SECC (2011) [20] reports that 53.27% of rural households in Chhattisgarh own land, while the remaining 46.73% are landless. Similar patterns were observed by Kumar *et al.* (2012) [6] in Bareilly district (U.P.), Nazir *et al.* (2012) [13] in the Kashmir Valley, and Patel *et al.* (2013) [17] in Gujarat's Narmada valley, where

the majority of farmers held small landholdings (1-2 hectares).

Livestock holding (Animal Unit Equivalent)
It can be observed from the Table 5 that 32.50 percent of the KVK respondents had medium size of livestock holding comprised of 1.94-2.61 AUE followed by small (30.00%), no livestock (25.00%) and large (12.50%) livestock holding. ATMA respondents reported both no livestock and medium livestock holding category had 29.20 percent respondents, each followed by small (25.80%) and large (15.80%) livestock holding. The livestock holding of the respondents ranged between 1.26 to 3.28 AUE with mean of 1.57 for both KVK and ATMA beneficiary farmers. Kumar *et al.* (2012) [6] in Bareilly district of Uttar Pradesh, reported that majority of their farmers had medium sized of herd consisting mostly of *desi* or non-descript species of livestock.

Material possession
A perusal of Table 5 reveals that majority (40.83%) of the KVK respondents had medium material possession category followed by high (35.00%) and low (24.17%). ATMA respondents also revealed that majority (50.83%) fell under medium material possession category followed by high (31.67%) and low (17.50%), category of material possession. Each material was assigned one score and total score of each respondent was calculated by summing up of obtained score that ranged between 3-12. Respondents were classified on the basis of score with equal class interval method. Bicycle, metal plough, bullock carts, fan, mobile and seed driller were most common material possessed by the respondents and tractor, washing machine and refrigerators were least possessed by them. There is no statistically significant difference in material possessions between KVK and ATMA beneficiary farmers. A similar observation was made by Gautam *et al.* (2014) [3] in Barabanki, Uttar Pradesh, where most respondents owned items like radios, followed by mobile phones, televisions, newspapers, VCD/DVD players, agricultural books, general magazines, and telephones, indicating a medium level of material possession.

Table 5: Distribution of the respondents on the basis of their family description

Districts	Pooled	
Particulars	**KVK (N=120)**	**ATMA (N=120)**
Land holding (hectares)		
Landless ($\leq$ 0.002ha)	12 (10.00)	10 (8.33)
Marginal (>0.002- $\leq$1ha)	40 (33.33)	31 (25.83)
Small farmer (>1- $\leq$2)	46 (38.33)	58 (48.33)
Medium farmer (>2- $\leq$4)	22 (18.33)	21 (17.50)
Mean $\pm$ SD	1.48$\pm$ 0.99	1.59$\pm$ 0.97
Z value	-0.856	
Livestock holding (Animal Unit Equivalent)		
No livestock	30 (25.00)	35 (29.20)
Small (1.26- 1.93)	36 (30.00)	31 (25.80)
Medium (1.94- 2.61)	39 (32.50)	35 (29.20)
Large (2.62- 3.28)	15 (12.50)	19 (15.80)
Mean $\pm$ SD	1.57$\pm$ 1.00	1.57$\pm$ 1.08
Z value	-0.037	
Material possession (score)		
Low (3-6)	29 (24.17)	21 (17.50)
Medium (6.1- 9)	49 (40.83)	61 (50.83)
High (9.1- 12)	42 (35.00)	38 (31.67)
Mean score$\pm$ SD	7.78$\pm$ 2.57	7.82$\pm$ 2.35
Z value [#]	-0.051	

Figure in parenthesis indicates percentage, [#]Calculated by Mann- Whitney test

Conclusion
This study examines the Extension Services Utilization Pattern of farmers associated with KVK and ATMA in Chhattisgarh, showing that the majority are young to middle-aged men from OBC groups with education ranging from primary to high school. While agriculture is their primary livelihood, many also engage in animal husbandry. The results reflect households with moderate family sizes, average education levels, and generally low incomes. Although extension services play a vital role, their reach is still limited. These findings underscore the importance of developing more inclusive and targeted agricultural extension approaches by strengthening technical support and addressing demographic challenges to improve outreach and effectiveness in rural areas.

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