Indian Research Journal of Extension Education
RESEARCH ARTICLE

Effectiveness of Agriculture Technology Management Agency (ATMA) in Extension Service Delivery in Chhattisgarh State of India

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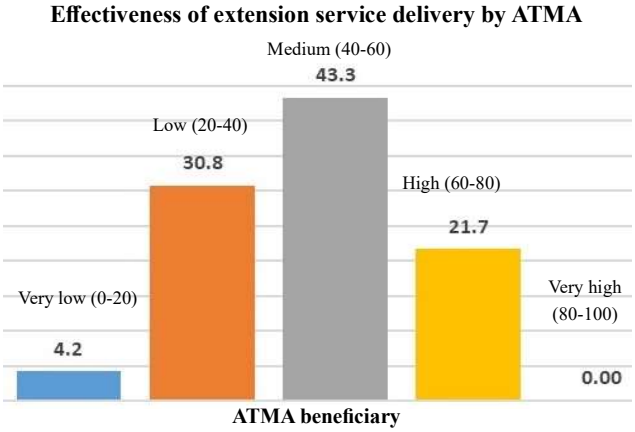
HIGHLIGHTS

- The effectiveness of extension service delivery was measured based on index developed by using viz. type of services, input delivery, extent of adoption, increase in yield and income of framers and satisfaction level.
- The majority of ATMA farmers (43.30%) revealed that their extension services were medium level of effectiveness in the Chhattisgarh State of India.
- The overall mean effectiveness of 45.68±13.92 for the extension service delivery rendered by the ATMA

GRAPHICAL ABSTRACT



ARTICLE INFO

Editor:
Dr. T. Rajula Santhy
Dr. Zakia Himeur

Key words:
ATMA, Effectiveness, Extension, Service delivery, Chhattisgarh.

Received : 30.06.2024
Accepted : 10.08.2024
Online published : 01.10.2024

doi:10.54986/irjee/2024/oct_dec/20-27

IRJEE METRICS

Google citations	- 9424
h-index	- 44
i10-index	- 304
NAAS rating	- 4.99

ABSTRACT

Context: In the current environment, ATMA is a vital organisation for providing district and block-level farmers with technology-based consulting services. An extension organization's performance is assessed by how well it carries out its operations in order to achieve the pre-established goals

Objective: To assess beneficiary farmers' perceptions of the Agriculture Technology Management Agency's efficacy in terms of utilization and accessibility of extension service delivery in the state of Chhattisgarh

Method: There are three distinct agro climatic zones in Chhattisgarh. A sample size of 120. For this study, an *ex-post facto research design* was adopted. An effectiveness index created specifically for this purpose was used to gauge the extension organization's (ATMA) performance in providing technology advice and delivery services.

Result and Discussion: The majority of ATMA farmers (43.30%) claimed that their extension services were medium effective, followed by low (30.80%), high (21.70%), and only 4.20 per cent who reported very low effectiveness, with a mean effectiveness of 45.68±13.92. A significant portion of farmers rated the effectiveness of the extension services provided by ATMAs as medium in effectiveness. ATMAs are the primary district-level extension organisations for technology transfer, revolutionizing the country's agricultural and other industries. Improved technology adoption results from ongoing extension and advisory support, which also raises yield and revenue and, in the end, increases farmers' happiness with the extension programme.

Agriculture Technology Management Agency (ATMA) is a key extension organization that acts as a channel for the dissemination of technological innovations and the provision of information and tools to farmers (Shamshadunnisa *et al.*, 2018). In the Indian state of Chhattisgarh, where agriculture and allied sector still constitutes the primary source of income, the efficiency with which ATMA provides extension services has a substantial impact on rural livelihoods and sustainable agricultural development (Singh *et al.*, 2018). With a mostly agrarian area and a variety of agro-climatic conditions, Chhattisgarh has a wide range of difficulties, from low agricultural output to restricted access to modern farming methods.

The effectiveness of the ATMA model in extension service delivery has been widely recognized (Singh, 2008). It has been proven to facilitate a paradigm shift from a top-down approach to a bottom-up planning and implementation of agricultural development programs. By empowering local communities and involving them in the decision-making process, the ATMA model has shown significant improvements in research-extension-farmer interfaces, levels of diversification, adoption of technology, and crop yields (Singh and Meena, 2011). This has resulted in a more market-oriented approach, leading to increased farm income and rural employment (Singh, 2008). The success of the ATMA model in extension service delivery can be attributed to its innovative and decentralized approach (Singh and Meena, 2011).

Furthermore, ATMA works in a convergence framework, collaborating with government agencies, non-governmental organisations (NGOs), academic institutions, and businesses to pool resources and knowledge for comprehensive agricultural development (Chandra and Kadian, 2016). ATMA works to guarantee the sustainability and scalability of agricultural extension services in Chhattisgarh by utilising synergies and matching interventions with state-specific goals and local requirements.

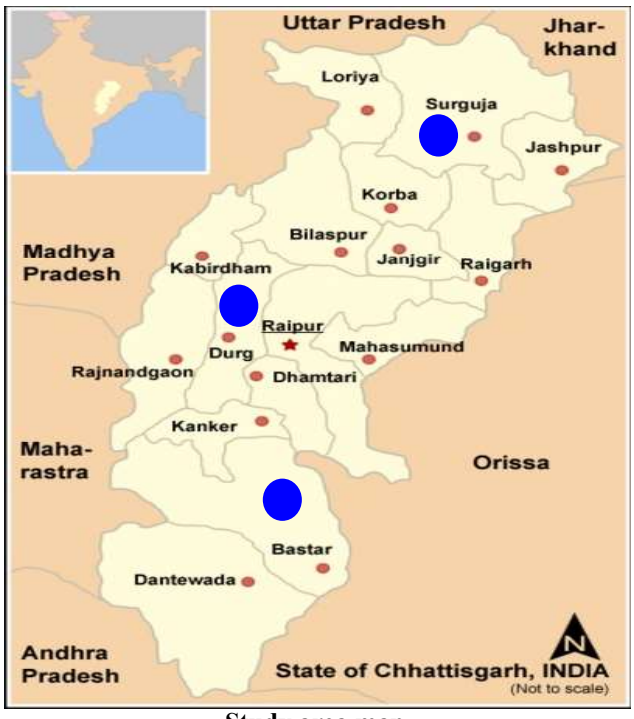
In order to assess ATMA's efficacy in providing extension services in Chhattisgarh, a critical evaluation of its effects on agricultural productivity, farmer livelihoods, and socio-economic development is undertaken in this research. Therefore, it is necessary to assess the effectiveness of extension organization working at ground level. Keeping this in view, the study was conducted to assess the effectiveness of Agriculture Technology Management Agency (ATMA), in technology advisory and delivery services.

METHODOLOGY

Purposively, the study was conducted in the state of Chhattisgarhlatitude (21°25′N to 31°12′N and longitude 80° 60′E), which is divided into three agro climatic zones: the Bastar Plateau, the Northern Hill Regions, and the Chhattisgarh Plains. From each of these agro climatic zones, one district (Surguja, Durg, and Bastar) was randomly selected, and 40 ATMA beneficiary farmers were selected out of each selected district, for a total sample size of 120 (3×40 nos.). An ex-post facto research design was employed for this study, and pretested semi-structured interview schedules were created to gather data from respondents.

For the purpose of measuring effectiveness, an index was developed. The effectiveness index comprises of i) Type of services provided, ii) Input delivery system, iii) Extent of adoption of technology disseminated by them, iv) Increased yield of farmers who had adopted the technologies delivered by the organization v) Increase income of farmers, and vi) Farmers perception about the ATMA performances which reflects their satisfaction. These indicators are described below:

Types of service provided : Under the first indicator *i.e*. Types of service provided, three sub classes of service *viz.* Advisory services, Diagnostic services and Extension services were analyzed. Here also nature of problem solving, timeliness and availability of service were studied. Among this, availability was studied in



Study area map

three-point scale rest two in two point. Respondents were then categorized into five classes, according to category of services as Very low (0-20), Low (20.1-40), Medium (40.1- 60), High (60.1-80) and Very high (80.1- 100) on the basis of equal intervals between maximum and minimum possible scores.

Input delivery system : Under the second indicator *i.e.* Input delivery system, availability of inputs, accessibility, quality, cost of inputs etc. were studied in three-point continuum scale. The highest was scored as 2 and lowest 0. Timeliness of service was scaled in two-point continuum Yes-1 and No-0. Respondents were then categorized into five classes, according to category of inputs as Very low (0-20), Low (20.1-40), Medium (40.1- 60), High (60.1-80) and Very high (80.1- 100) on the basis of equal intervals between maximum and minimum possible scores

Extent of adoption of technology : The extent of adoption was measured for the recommended cultivation practices of rice in which the ATMA was rendering integrated services. The extent of adoption was measured as per cent of adoption of recommended practices as given below.

$$\text{Extent of adoption} = \frac{\text{Actual practice}}{\text{Recommended practices}} \times 100$$

Respondents were then categorized into five classes, according to category of adoption as Very low (0-20), Low (20.1-40), Medium (40.1- 60), High (60.1-80) and Very high (80.1- 100) on the basis of equal intervals between maximum and minimum possible scores.

Increased yield of farmers : Increased yield was calculated by subtracting the earlier yield before intervention of technology from present yield after intervention of technology by ATMA. Following formula was used:

$$\% \text{ increase in yield} = \frac{\text{Increase in yield/acre}}{\text{Earlier yield/acre / year}} \times 100$$

Respondents were then categorized into four classes, according to category of per cent increase in yield as 0- 10, 10.1- 20, 20.1- 30 and 30.1- 40 on the basis of equal intervals between and maximum achieved per cent increase in yield.

Increased income of farmers : Increased income was calculated by subtracting the earlier income per acre of the crop before intervention of technology from present profit after intervention of technology by ATMA. The following formula was used:

$$\% \text{ increase in income} = \frac{\text{Increase } in \text{ } incom \text{ /acre}}{\text{Earlier income/ acre}} \times 100$$

Respondents were then categorized into four classes, according to category of per cent increase in yield as 10- 20, 20.1- 30, 30.1- 40 and 40.1- 50 on the basis of equal intervals between and maximum achieved per cent increase in income.

Satisfaction index : The farmers' satisfaction of extension service based on the index prepared by Kumar, 2005 was used with appropriate modifications. There were 7 statements which had been scored in five-point continuum strongly agree-4, agree-3, undecided-2, disagree-1 and strongly disagree-0. The highest score one can obtain is 28 and lowest 0. The responses were added to get satisfaction score. The satisfaction index was calculated below.

$$FSI = \frac{Individual\ score\ obtained}{Maximum\ score} \times 100$$

FSI=Farmers satisfaction index

The respondents were classified into five categories from very low to very high level by dividing the score into five classes of equal interval, with a score value of (0-5.6), (5.7-11.2), (11.3-16.8), (16.9-22.4) and (22.5-28), respectively, on the basis of equal intervals between maximum and minimum possible scores.

Effectiveness index (EI) : The effectiveness index prepared based on the above mentioned parameters is calculated by the following equation.

$$EI = \frac{IDS \times W1 + DS \times W2 + EA \times W3 + IY \times W4 + II \times W5 + FS \times W6}{W1 + W2 + W3 + W4 + W5 + W6} \times 100$$

Where, IDS – Mean of Input delivery system

DS – Mean of delivery of services

EA – Extent of Adoption

IY - Per cent increase in yield

II – Per cent increase in Income

FS – Farmers' satisfaction

W_i are respective weight as per mean of experts rating to the above components.

Respondents were then categorized into five classes, according to category of inputs as Very low (0-20), Low (20.1-40), Medium (40.1- 60), High (60.1-80) and Very high (80.1- 100) on the basis of equal intervals between maximum and minimum possible scores.

RESULTS

The effectiveness of ATMA includes, type of services provided, input delivery system, extent of adoption of technology, increased yield and increase

Table 1. Distribution of respondents according to delivery of services by ATMA (N=120)

Category of services	Availability	Timeliness	Problem solving capacity
Very low (0-20)	10 (8.30)	2 (1.70)	0 (0.00)
Low (20.1- 40)	17 (14.20)	35 (29.20)	24 (20.00)
Medium (40.1- 60)	42 (35.00)	20 (16.70)	13 (10.80)
High (60.1-80)	44 (36.70)	40 (33.30)	60 (50.00)
Very high (80.1- 100)	7 (5.80)	23 (19.20)	23 (19.20)
Mean± SD	53.89±18.75	56.94±26.51	65.65±23.49

Figure in parenthesis indicates per centage

income of farmers, and farmers' satisfaction towards extension service.

Type of services provided : The delivery of different services like crop advisory services, services to farm machinery, entrepreneurial services, communication services, diagnostic services etc. of ATMA was further sub categorized under availability, timeliness and problem solving in nature. Table 1 depicts the services rendered by ATMA, which indicate high (60.1-80) in availability by majority (36.70%) of farmers followed by medium (35.00%), low (14.20%), very low (8.30%) and very high (5.80%) respectively. Timeliness of services by ATMA was found to be high (60.1-80) by 33.30 per cent of farmers followed by low (29.20%), very high (19.20%), medium (16.70%) and very low by 1.70% of farmers.

In case of problem solving nature, ATMAs were found to be high (60.1-80) in problem solving by majority (50.00%) of farmers followed by low (20.00%), very high (19.20%) and medium (10.80%).

Input delivery system : Under input delivery system provided by ATMA, based on availability of inputs, accessibility, quality and cost of input delivery as perceived by beneficiary farmers in Table 2 revealed that the inputs delivery system of ATMA was found to be medium (40.1-60) in availability by majority (68.30%) of ATMA farmers followed by high (12.50%), very low (10.00%) and low (9.20%), respectively. The inputs were found to be low in accessibility by majority (34.20%) of ATMA farmers, followed by high (26.70%), medium (20.00%), very low (15.80%) and very high (3.30%). As per ATMA farmers' response about timeliness of input delivery was found to be very high by majority (38.30%) of farmers followed by high (20.00%), low (18.30%), medium (10.00%) and very low (8.30%), respectively.

In case of quality of inputs, it was found to be medium by majority (31.70%) of ATMA farmers followed by very high (30.80%), high (19.20%), very low (11.70%) and low (6.70%), respectively. The cost of inputs was perceived as to be medium by majority (41.70%) of ATMA farmers followed by very low (21.70%), high (15.00%), low (13.30%) and very high (8.30%), respectively.

Adoption of practices: The adoption was measured for the recommended practices in which the ATMA rendering integrated services as perceived by beneficiary farmers. The extension organizations were promoting different region specific practices. In the study area almost cent per cent farmers were cultivating rice as a main crop. That's why rice crop was selected to study the extent of adoption. There were several recommendations in rice cultivation prescribed by the scientists and extension personnel of ATMA. The recommended practices were categorized under broad heading as High yielding varieties (HYVs), seed treatment, sowing time, seed rate, spacing, use and dose of bio-fertilizers, time of irrigation and effective weed management.

Table 2. Distribution of respondents according to category of inputs delivery of ATMA (N=120)

Category of inputs	Availability	Accessibility	Timeliness	Quality	Cost
Very low (0-20)	12 (10.00)	19 (15.80)	10 (8.30)	14 (11.70)	26 (21.70)
Low (20.1- 40)	11 (9.20)	41 (34.20)	22 (18.30)	8 (6.70)	16 (13.30)
Medium (40.1- 60)	82 (68.30)	24 (20.00)	12 (10.00)	38 (31.70)	50 (41.70)
High (60.1-80)	15 (12.50)	32 (26.70)	30 (25.00)	23 (19.20)	18 (15.00)
Very high (80.1- 100)	0 (0.00)	4 (3.30)	46 (38.30)	37 (30.80)	10 (8.30)
Mean± SD	47.01±15.40	44.38±19.57	61.11±22.80	61.67±23.75	46.04±21.31

Figure in parenthesis indicates per centage

Table 3. Distribution of respondents according to extent of overall adoption of recommended practices of rice cultivation (N=120)

Extent of adoption	No. (%)
Very low (0-20)	8 (6.70)
Low (20.1- 40)	20 (16.70)
Medium (40.1- 60)	41 (34.20)
High (60.1-80)	15 (12.50)
Very high (80.1- 100)	36 (30.00)
Mean± SD	58.93±24.29
Percentage increase in yield	
0- 10	15 (12.50)
10.1- 20	56 (46.70)
20.1-30	36 (30.00)
30.1- 40	13 (10.80)
Mean± SD	20.89±7.52
Percentage increase in income	

The Table 3 describes majority (34.20 %) of ATMA farmers had medium level of adoption followed by very high (30.00 %), low (16.70 %), high (12.50 %) and 6.70 per cent of farmers reported very low extent of adoption of recommended practices under rice cultivation.

Increase in yield : Extension personnel were providing some recommended practices and innovative technologies to farmers and promoting rice production in the study area. Therefore, it was necessary to find out increase in yield. The Table 3 revealed that majority (46.70 %) of the farmers reported that rice yield had increased between 10.1 to 20 per cent followed by increase 20.1 to 30 per cent (30.00 %), 0-10 per cent increase (12.50%) and 30.1-40 per cent increase in yield of rice (10.80%) through effective utilization of recommended practices proposed by ATMA.

Increase in income of farmers: Increase in yield, has to be translated into increased net profit which is most important from the effectiveness point of view. The Table 3 depicted the increase in income of the farmers of ATMA, majority (48.30 %) of the farmers' income was increased to 20.1 to 30 per cent followed by 30.1-40 per cent (28.30 %), 10-20 per cent (12.50 %) and only 10.80 % of farmers reported 40.1-50 per cent increase in their earlier income by rice cultivation.

Table 4. Distribution of respondents according to categories of farmers based on satisfaction score (N=120)

Satisfaction category	Class	ATMA (N=120)
Very low (0-20)	0 -5.6	13 (10.80)
Low (20.1- 40)	5.7- 11.2	22 (18.30)
Medium (40.1- 60)	11.3- 16.8	34 (28.30)
High (60.1-80)	16.9- 22.4	30 (25.00)
Very high (80.1- 100)	22.5- 28	21 (17.50)
Mean± SD		56.43±22.23
Mean score± SD		15.80±6.25

Figure in parenthesis indicates per centage

Table 5. Distribution of respondents according to perceived effectiveness of extension service (N=120)

Category of effectiveness	ATMA (N=120)
Very low (0-20)	5 (4.20)
Low (20.1- 40)	37 (30.80)
Medium (40.1- 60)	52 (43.30)
High (60.1-80)	26 (21.70)
Mean± SD	45.68±13.92

Figure in parenthesis indicates percentage

Satisfaction of farmers towards extension services : The objective of extension services is to increase farmers' yield, income and other attributes which leads to increase in farmers' satisfaction. The Table 4 showed majority (28.30 %) of the ATMA farmers had medium level of satisfaction followed by 25.00 per cent of farmers having high level of satisfaction, low level (18.30%), very high (17.50%) and 10.80 per cent of ATMA farmers have very low level of satisfaction toward the extension services.

Effectiveness of extension service delivery : The effectiveness of extension service delivery was measured based on index developed by using viz. type of services, input delivery, extent of adoption, increase in yield and income of framers and satisfaction level. The data in Table 5 showed that the effectiveness of extension services rendered by ATMA farmers, reported that majority (43.30%) were found to be medium in effectiveness followed by low (30.80%), high (21.70%) and only 4.20 per cent of farmers under very low in effectiveness, with a mean effectiveness of 45.68±13.92. No farmers found extension services of ATMA under very high level of effectiveness. Extension services rendered by ATMA were found to be medium in effectiveness by major share of the farmers followed by low in effectiveness.

Chaturvedani *et al.,* 2023 reported that the extension services rendered by KVK in the state of Chhattisgarh were found to be medium and low in effectiveness by majority (39.17 %) of the farmers each followed by high (11.70%) and 10.00 per cent of farmers under very low in effectiveness, with a mean effectiveness of 41.19±14.36. Extension services rendered by ATMA and KVK were found to be medium in effectiveness by major share of the farmers

followed by low in effectiveness. Mann-Whitney test employed among farmers of KVK and ATMA (Z value = -2.541*), showed significant difference with respect to effectiveness.

DISCUSSION

Type of services provided : The type of services provided by ATMA was further sub categorized under availability, timeliness and problem solving in nature. The result suggested that the services rendered by ATMA, which indicate high in availability by majority of farmers followed by medium and low. Timeliness of services by ATMA was found to be high by majority of farmers followed by low and very high by farmers.

In case of problem solving nature, ATMAs were found to be high in problem solving by majority of farmers followed by low and very high. The need based and high quality services were mainly responsible for better performance. ATMAs were providing different need based services to utilize diagnostic, communication and advisory services.

The delivery of services by the Agricultural Technology Management Agency has shown promising results in improving agricultural productivity and sustainability. Through its various programs and initiatives, ATMA has been successful in disseminating modern farming techniques, providing access to high-quality inputs, and offering training and capacity building to farmers (Singh *et al.*, 2009).

Input delivery system : Under input delivery system provided by ATMA were further sub categorized under based on availability of inputs, accessibility, quality and cost of input delivery as perceived by beneficiary farmers. The result suggested that inputs delivery system of ATMA was found to be medium in availability by majority of ATMA farmers followed by high and very low. The inputs were found to be low in accessibility by majority of ATMA farmers, followed by high, medium and very low. As per ATMA farmers' response about timeliness of input delivery was found to be very high by majority of farmers followed by high and low.

In case of quality of inputs, it was found to be medium by majority of ATMA farmers followed by very high and high. The cost of inputs was perceived as to be medium by majority of ATMA farmers followed by very low and high. In inputs delivery, the availability, accessibility, quality and timeliness of inputs were high denoting the effectiveness in delivery mechanism. Though the costs of inputs were high as compared to the other organization but for the sake of quality products and availability many farmers were ready to pay for that.

Similar finding also reported by Borah *et al.*, (2015) in Jorhat district of Assam with a view to study the effectiveness of the farmers' groups organized under Agricultural Technology Management Agency (ATMA) revealed that ATMA programme is running successfully because farmer is the centre of focus for development in the ATMA programme and majority of the selected farmers' groups developed by ATMA were effective. It is well known that farmers have not only technological but also other needs namely inputs, credit, marketing, social facilitation for group action, conflict resolution, community organization etc. (Dympep *et al.,* 2018).

Manjusree *et al.,* (2022) assessed the farmers' perception towards agro-met advisory services in Thiruvanantapuram district of Kerala, revealed that nearly half of the farmers in the study area had an unfavorable perception towards the agro-met advisory services and perceived that agro-met advices were not relevant for the management of farm operations. The study also arrived at a conclusion that farmers with more mass media exposure, social participation and extension contact had a favorable perception towards the services (Singh *et al.,* 2019).

Singh *et al.* (2011) and Sahoo and Rout, (2023) assessed the farmers' perception regarding private extension services in Khordha district of Odisha revealed that the farmers' readiness to pay for extension services was discovered to depend on the seriousness and urgency of the issue. About 96 per cent of the respondents stated that government agencies have failed to provide required technical information and need-based extension advisories to the farmers.

Adoption of practices The result suggested that majority of ATMA farmers had medium level of adoption followed by very high and low extent of adoption of recommended practices under rice cultivation. The reason for moderate level of adoption of rice cultivation practices in case of beneficiary farmers might be due to periodic field visits by extension personnel's (BTMs and ATMs), provision of adequate supply of inputs, and seasonal field demonstration in selected villages. Kumar and Jahanara (2021) also indicated that training have major impact on farmers to adoption of newer technologies and knowledge than those farmers who have not undergone any training.

Similarly, Lalthamawii *et al.,* 2022 reported knowledge and adoption level of rice growers in Mizoram, India on improved cultivation of rice revealed that the overall mean for the knowledge index

was 61.54, while the mean for the adoption index was 53.83. With respect to the overall knowledge and adoption level were in the medium category.

Rutsa and Jha, 2023 evaluate the extent of the adoption of System of Rice Intensification (SRI) technology for sustainable rice production in Nagaland, revealed that most (73.33%) of the farmers had a moderate level of adoption of SRI technology. Meshram *et al.,* 2015 reported the adoption pattern of SRI technology in Balaghat district of Madhya Pradesh, revealed that among the seventeen practices the extent of adoption was higher in case of irrigation management. The lower level of adoption was found in case of field preparation.

Increase in yield : The results of increase in yield suggested that majority of farmers reported that yield had increased between 10 to 20 per cent. Similarly, Shanmugasundaram *et al.,* 2021 and Shanmugasundaram & Helen 2015, reported that the System of Rice Intensification (SRI) as a method of demonstration revealed a yield increase of 17 per cent and net returns compared to the conventional rice cultivation method in Kerala.

Increase in income of farmers: The results suggested that the increase in income of the farmers of ATMA, majority of the farmers' income was increased to 20.1 to 30 per cent followed by 30.1-40 per cent and 10-20 per cent in their earlier income by rice cultivation. This can be attributed to the high level of adoption of improved practices as recommended by ATMA providing proper marketing facilities and value addition initiatives.

Krishna, 2016 reported effectiveness of behaviour of rice farmers in propagating system of rice intensification technology in Andhra Pradesh, indicated that framers have developed positive attitude towards SRI technology. However, majority of the farmers feel that many of the operations of SRI method are labour intensive and time consuming.

*Satisfaction of farmers towards extension service*s: The result revealed that the majority of the ATMA farmers had medium level of satisfaction followed by high level of satisfaction and low level of satisfaction toward the extension services. Agricultural Technology Management Agency (ATMA) has been instrumental in bringing significant changes in bringing revolution in farming society of our country. Over the years, ATMA has evolved its structure and function in order to serve the needs of various stakeholders involved in the production chain of agricultural commodities. From availing various timely inputs to assisting the farmers in providing them need based training, ATMA has proven to be an absolute game changer.

Borthakur *et al.,* 2015 reported that the extent of adoption of rice production technology recommended by Assam Agricultural University in Assam. Different rice production technologies like 'Harvesting methods', 'Puddling', 'Ploughing' and 'Age of uprooting of seedlings' had the highest number of full adopters among all the 25 practices recommended by AAU. However, 'Bio-fertilizers' had the highest per centage of 'no adopters' (98.05%).

Effectiveness of extension service delivery : The results showed that extension services rendered by ATMA were found to be medium in effectiveness by major share of the farmers. Likewise, Kharade and Patel, 2022 conducted study to assess the effectiveness of ATMA in Ahmedabad district of Gujarat State also revealed that participant farmers had high to very high level of their perceived effectiveness of ATMA which is attributed to favorable attitude towards ATMA, high level of benefits derived by them, excellent extension activities implemented, good quality training provided, proper implementation of demonstrations and its horizontal spread and good performance of FIGs and farm schools through ATMA.

Similarly, Mukherjee et al., 2011 studied private extension organisation i.e. Tata Kisan Sansar (TKS) in Aligarh district of Uttar Pradesh to measure the effectiveness of public, private and collaborated public-private organization, which revealed that the extension services rendered by Tata Kisan Sansar were medium in effectiveness by majority of the farmers (54.00 %). About 46 per cent of farmers found the extension service as highly effective.

CONCLUSION

It is concluded that effectiveness of ATMA extension works found to be medium level and are able to bring substantial changes in the level of knowledge and adoption of improved rice cultivation practices with increased level of productivity, enhanced net income, self-confidence and satisfaction level. To enhance the effectiveness ATMA do require re-orienting their trainings based on these findings for effective transfer of technologies among the farmers is more effective to motivate the farmers for adoption of new technology.

Funding: The financial assistance was bestowed from the University Grants Commission (UGC)-Junior Research Fellowship (JRF) and Senior Research Fellowship (SRF) during the degree programme.

Declaration of competing interest: There was no conflict of interest among the authors.

Data availability: The data is available in the public

domain and if demanded will be made available.

Acknowledgment: Acknowledge Division of Extension Education, ICAR- IVRI, Izatnagar, Bareilly (U.P.) for providing the support required for the research study.

Authorship contribution: First author performed the data collection, statistical analysis of the study, managed the literature searches and the wrote the first draft of the manuscript. The second author performed editing, guiding and supervising the process. Both authors read and approved the final manuscript.

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