



Impact on Development of Farmer Beneficiaries Through ATMA: A Study in Mayurbhanj District of Odisha

Swaraj Preetam Das¹, B.K. Mohanty² and Saumyesh Acharya³

1.PG Scholar, 2. Asso. Prof., Agril. Ext. & Comm., IAS, S'O'A Deemed to be University, Bhubaneswar, Odisha, India

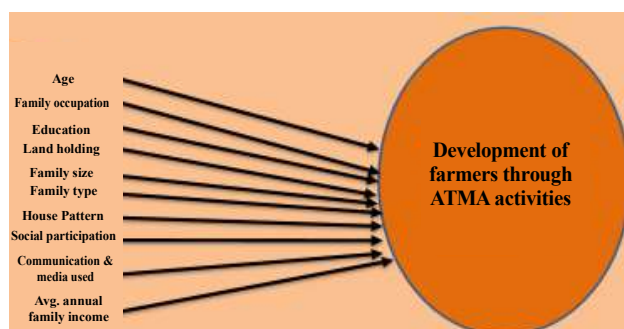
3. Ph.D. Scholar, Agril. Ext., Visva-Bharati, Sriniketan, West Bengal, India

Corresponding author e-mail: acharyasaumyesh@gmail.com

HIGHLIGHTS

- The research analyzed the relationship between socio-economic variables of the ATMA beneficiaries and their development through ATM Activities.
- The study acts as a vital medium to generate policy for betterment of the farmers through ATMA.
- The study also revealed that 10 independent variables collectively contributed 49.4% variance in the dependent variable, development

GRAPHICAL ABSTRACT



Multiple Regression Analysis of Development of farmers through ATMA activities

ARTICLE INFO

Editor:

Dr. K.K. Jha

Key words:

ATMA, Communication media used, Development,

Received : 14.01.2024

Accepted : 02.03.2024

Online published :
01.04.2024

doi: 10.54986/irjee/2024/
apr_jun/86-91

ABSTRACT

Introduction: Agricultural Technology Management Agency (ATMA) is a field-level extension organisation that promotes widespread technology adoption and dissemination as well as the scaling up of successful breakthroughs and technologies through extensive testing and validation. ATMA was started to advance agrarian development, improve farmers' comprehension of various developmental programmes, and attain greater competency in those programmes.

Context: Low level of education among rural poor makes it difficult for them to deal with the intricacies of agricultural technology management. As a result, there are few realistic options for enhancing production efficiency and attaining rapid and sustainable agricultural development, such as vocational training and technology distribution.

Objective: The present study aims to analyse the impact of socio-economic determinants on farmers' development through various ATMA activities.

Methodology: *Ex post facto* research design was chosen to conduct the study. The sampling procedure used for selecting the state, district, and blocks was purposive sampling method. A random sampling method was used for selecting the gram panchayats and villages. Using the purposive sampling method, a hundred respondents (100) were selected from twenty villages of five blocks i.e., Karanjia, Jashipur, Bangiriposi, Baripada, and Shamakhunta of Mayurbhanj district, Odisha respectively. Further the data was analyzed through different statistical tools; correlation coefficient, regression analysis and path analysis.

Results & Discussion: The results of the correlation coefficient revealed that socio-economic variables i.e., social participation, communication media used, average annual family income had a significant impact on development of the farmers through ATMA activities. The multiple regression model revealed that 10 independent variables collectively contributed 49.4% variance in the dependent variable, development of farmers through ATMA activities..

Agricultural Technology Management Agency (ATMA) has become the most important institutional mechanism at district level for implementation of agricultural extension reforms. Capacity building of farmers through organization of training is one of the most important strategies for implementation of ATMA (Ananth *et al.*, 2019). The State of Odisha derives more than a quarter of its revenue from agriculture. More than 40 per cent of the people in the state of Odisha depend on farming as their primary source of income and way of life, making up more than 53 per cent of the state's work force whereas agricultural technology has developed into a logical extension of the traditions, conventions, knowledge, and skills that date back to the early days of human civilization and have continued to evolve over time (Odisha Economic Survey, 2020-21). However, numerous developmental projects in rural areas are yet to address the uncertainties regarding the socio-economic status of tribals. Tribal economies face challenges such as poverty, inefficient resource exploitation, and a lack of cash for investment, leading to a lack of food security (Singh and Sadangi, 2012).

The rural population, which is illiterate and ignorant, having small land holdings which are largely prevalent is unable to cope with the complexities of agricultural technology management. As a result, vocational training and technology dissemination are few viable options for increasing production efficiency and achieving rapid and sustainable agricultural development (Dhanaraju *et al.*, 2022; Shrivanthi and Sahoo 2022; Barua & Wason, 2014 and & Bihari *et al.*, 2012). 'Extension Reform' involves facilitating communication, information, and advocacy services, rather than simply transferring technology. The extension system is facing challenges in implementing 'extension reform' to strengthen farming communities during this time of upheaval (Bortamuly and Das, 2017). A majority of trainees perceived that knowledge and skills were enhanced as a result of training. The overall 16 effectiveness of training was found to be 54.6 per cent which came under medium effectiveness category (Singh, 2014). To provide the necessary acceleration to the agricultural development, Agricultural Technology Management Agency (ATMA) Scheme was launched during 2005-06 in order to enrich farmer's skills, knowledge and competency several developmental programmes/projects, in agriculture and allied sectors. Additionally, ATMA served as a link between individuals in need and those with the means necessary for undergoing rapid technological change.

It is also critical to evaluate various stakeholders of ATMA in order to enhance both its organisational and functional approach. This includes various parameters such as efficiency of skilled professionals of ATMA, availability of resources and feedback from farmer beneficiaries among other factors. It was also reported that mass contact had significant and positive relationship with the Block Supervisors' perceptions of on-the-job training (Hoque and Koichi, 2007; Kirar and Mehta, 2009). Moreover, coordination in organizing and coordination in execution of various programmes were associated closely with coordination process of ATMA (Kumar and Eswarappa, 2010). The indigenously developed concept of ATMA for innovative transfer of technology in an integrated manner can be adopted in the state and national policy and implemented with full governmental support after comparing it with pre-intervention and post-intervention scenarios (Singh *et al.*, 2013). With this background, this study aimed to analyze the relation between socio-economic variables of the ATMA beneficiaries and their development through ATMA activities and generate policy for betterment of the farmers through ATMA.

METHODOLOGY

The present study was conducted in the Mayurbhanj district (Latitude: 22.0087°N, Longitude: 86.4187°E) of Odisha. Mayurbhanj is inhabited by a larger chunk of the tribal population following indigenous farming practices till today. Ex post facto research design was



Fig. 1. Location of this study area in Mayurbhanj district

used to conduct the study. Purposive sampling technique was followed to select the state, district, and blocks. For selecting the gram panchayats and villages, a random sampling technique was applied. A total of hundred respondents were selected from twenty villages of five different blocks (four villages from each block) of Mayurbhanj district namely, Karanjia, Jashipur, Bangiriposi, Baripada, and Shamakhunta following the purposive sampling method as ATMA beneficiaries were needed for the study. The selected variables for this study were measured in the following manner: 1) Independent variables and 2) Dependent variables. Independent variables selected for the study were age (x_1), major family occupation (x_2), education (x_3), land holding size (x_4), family size (x_5), family type (x_6), housing pattern (x_7), social participation (x_8), communication media used (x_9), average annual family income (x_{10}). The dependent variable selected for the study was the Development of farmers through ATMA activities (y).

The dependent variable was operationalized based on statements related to the following parameters, viz., understanding of ATMA activities, involvement in ATMA activities, technological development, ecological development, social cohesiveness, social development, cultural development, material possessions, input used, harvesting & post-harvesting farm activities and extension activities. The scale was arranged in a four-point continuum of always, sometimes, rarely, and never with a scoring pattern of 4,3,2 and 1 respectively. A multivariate analysis was carried out for this study using suitable statistical tools, such as the correlation coefficient, multiple regression analysis, and path analysis.

RESULTS

Co-efficient of correlation: Socio-economic variables (x_1-x_{10}) vs development of farmers through ATMA activities (y): Table 1 indicated that the following socio-economic variables i.e., age, major family occupation, education, land holding size, family size, social participation, communication media used and average annual family income had a significant impact on development of the farmers through ATMA activities. The negative co-relation of the variable age implies that younger respondents are more involved in developmental work through ATMA activities. This may be due to the fact that young farmers are willing to do more innovative work in association with ATMA. The variable major family occupation has positive impact on development of farmers through ATMA activities which implies that

Table 1. Co-efficient of Correlation: Socio-economic variables vs development of farmers through ATMA activities

Independent variables	'r' value
Age(x_1)	-.244*
Major family occupation (x_2)	.269*
Education(x_3)	.319**
Land holding size (x_4)	.233*
Family size (x_5)	-.259*
Family type (x_6)	-.153
Housing pattern (x_7)	.196
Social participation (x_8)	.242*
Communication media used (x_9)	.324**
Average annual family income (x_{10})	.307**

when a greater number of family members are involved in farm activities, higher impact on the development through various activities of ATMA can be obtained. Similarly, the independent variable education & land holding size have a positive impact on development of farmer through ATMA activities. The variable family size has a negative impact on development of farmers through ATMA activities. The variable social participation has a positive impact with the dependent variable. This may be due to the fact that higher is the mobility of famers and involvement with fellow farmers such as cooperative society, panchayat society, social organization, cultural organization, religious organization, educational organization & training exposure more on the development of farmers through ATMA activities. The variables communication media used & average annual family income have positive impact on development of farmers through ATMA activities due to exposure towards various information sources and multiple sources of income respective.

Multiple Regression analysis: Socio-economic variables (x_1-x_{10}) vs development of farmers through ATMA activities (y): Table 2 presents the full model of regression analysis. All the 10 independent variables collectively contributed 49.4% variance in the dependent variable development of farmers through ATMA activities. It is evident that the independent variables age, Education, Social participation, Communication Media used, Average annual family income has significant contribution on the dependent variable, development of farmers through ATMA activities.

Path analysis: Decomposition of Total Effect into Direct, Indirect and Residual Effect: Socio-economic variables (x_1-x_{10}) vs development of farmers through ATMA activities (y):

Table 2. Multiple regression analysis: Socio-economic variables vs development of farmers through ATMA activities

Model	Unstandardized coefficients		Standardized coefficients	t-value	Sig.
	B	Std. Error	Beta		
(Constant)	325.137	14.657		22.183	.000
Age(x ₁)	-2.128	1.782	-.128	-5.194	.006**
Major family occupation (x ₂)	1.301	.749	.169	1.736	.086
Education (x ₃)	-.171	.919	-.026	-9.186	.013*
Land holding size (x ₄)	.932	2.056	.049	.453	.652
Family size (x ₅)	-4.062	2.936	-.188	-1.383	.170
Family type (x ₆)	.168	2.247	.010	.075	.941
Housing pattern (x ₇)	3.707	2.491	.161	1.488	.140
Social participation (x ₈)	.292	.238	.143	6.226	.023*
Communication media used (x ₉)	.259	.266	.136	7.974	.003**
Average annual family income (x ₁₀)	1.099	1.082	.129	8.017	.012*

a. Dependent Variable: Development of farmers through ATMA activities

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate
1	.703 ^a	.494	.250	9.34314

a. Predictors: (Constant), Average Annual Family Income, Family Size, Major Family Occupation, Housing Pattern, Age, Social Participation, Land Holding Size, Family Type, Communication Media Used and Education.

Table 3. Path analysis: Decomposition of total effect into direct, indirect and residual effect: Socio-economic variables vs development of farmers through ATMA activities :

Variables	Total effect	Total direct effect	Total indirect effect	Substantial effect		
				I	II	III
Age(x ₁)	-.244	-.128	-0.116	0.157 _{x8}	-0.139 _{x2}	-0.059 _{x9}
Major Family Occupation (x ₂)	.269	.169	0.100	-0.242 _{x2}	0.086 _{x5}	-0.041 _{x4}
Education (x ₃)	.319	-.026	0.345	-0.144 _{x6}	0.105 _{x7}	-0.069 _{x8}
Land Holding Size (x ₄)	.233	.049	0.184	-0.206 _{x7}	0.167 _{x11}	0.088 _{x3}
Family Size (x ₅)	-.259	-.188	-0.071	-0.223 _{x5}	-0.172 _{x8}	-0.074 _{x6}
Family Type (x ₆)	-.153	.010	-0.163	-0.081 _{x4}	0.077 _{x7}	-0.062 _{x5}
Housing Pattern (x ₇)	.196	.161	0.035	-0.195 _{x11}	0.114 _{x5}	-0.023 _{x3}
Social Participation (x ₈)	.242	.143	0.099	-0.256 _{x5}	0.186 _{x3}	-0.042 _{x9}
Communication Media Used (x ₉)	.324	.136	0.188	-0.144 _{x6}	0.105 _{x10}	-0.042 _{x12}
Average Annual Family Income (x ₁₀)	.307	.129	0.178	-0.206 _{x7}	0.167 _{x9}	0.088 _{x13}

Residual effect: 0.22; Highest indirect effect: 0.345

Table 3 presents the path analysis and reveals that the family size of the respondents had exhibited highest total direct effect followed by housing pattern. Similarly, the variable education exhibited highest indirect effect. Other variables having significant effect are communication media used, land holdings size annual income and family type. The variable education had association with family size, social participation, family occupation, housing pattern and family typeable to influence various aspects of development through ATMA activities.

Hence the extension officer involved in process of implementation of ATMA activities may use all these variables resulting for better adoption activities for the development of the respondents. The residual effect being 0.22 showed that 22% of the variation in this relation could not be explained.

DISCUSSION

As the tribal-dominated district of Mayurbhanj is still in the process of development and struggling

with the menace of illiteracy and poverty, ATMA has the full potential to alleviate the farmers' condition across the district. The previous section elaborated on the relationship between the socio-economic characteristics of the farmers and the development achieved by ATMA. The latter plays a convincing role in catering to various technological and on-ground support for primary and secondary agricultural operations.

A similar study related to the present one found that educational status and extension agency contact had shown positive and significant association with participation at a one percent level of probability. The variables such as age, sex, and farm size had shown a positive and significant association with participation at a one percent level of probability. However, the remaining variables such as occupational status, farming experience, annual income, and social participation showed no significant relationship with participation (Pauline & Karthikeyan, 2015).

It has also been found that the representative farmers of the Aurangabad district of Marathwada region, possessed 100 per cent knowledge about the ATMA headquarters, the grassroots planning process, and the chairman of the governing board. Additionally, they knew 100 per cent about the programs organized by the ATMA, the year of establishment (73.75%), the type of membership (70.00%), the goals of the ATMA (56.75%), the ATMA's long-form (53.75%), and the FIAC established at the block level (52.50%). Also, 93.75 percent of the representative farmers were found to have benefited from collective farming (Rajeshwar *et al.* 2019). Thus, farmers are showing significant readiness towards various initiatives of ATMA and utilizing them thoroughly.

A similar study related to ATMA beneficiaries found that there was a relationship between age, education, family type, family size, social participation sources of information utilized, and knowledge level of beneficiaries about beekeeping (Prakash & De, 2008). It is also imperative that the mass media exposure had a positive and highly significant correlation with the perception of the farmer toward the technical capability of the public extension personnel (Chand, 2012).

The social participation among tribal women helps in proper decision-making and get adequate information about agriculture and allied activities which is found to be significant in similar studies (Das *et al.*, 2018).

However, few studies show that adequate steps are needed to be taken. In the three consecutive years, 2013–14, 2014–15, and 2015–16, the trend of cafeteria activity achievement as per ATMA guidelines in the state of Assam, was below 50.00 per cent, except for a few activities where the achievement of activities under the heads "Agriculture Technology Refinement, Validation and Adoption (R–E–F–Linkage)", "Administrative/Capital Expenses," and "Innovative Activities" were 62.50 per cent, 59.39 per cent, and 50.03 per cent, respectively, in 2013–14. However, in 2014–15, 100.00 percent of the activities under the heading "Other Innovative Activities" were completed. Thus, a few lacunae are to be addressed through proper steps (Deka and Mishra, 2020). The majority (95.83%) of the farmers' groups organized under ATMA were effective followed by 4.17 per cent less effective in the overall sample (Borah *et al.* 2015).

CONCLUSION

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 gamechanger. As policy formulation takes place at district level, ATMA has strengthened the farming ecosystem at local level. The present study came up with a strong revelation in eliciting the fact that family size, education, communication media used, land holding size, annual income and family type are of immense importance to serve the emerging needs of the participating farmers and beyond. Keeping these variables in mind, there is also a gradual need to gear up the managerial reforms among ATMA professionals, proper resource mobilisation, timely sharing of information as well as precise decision making to attain the goals of farmer beneficiaries. Due to this, it is necessary to assess ATMA functionaries across India in order to determine local needs and ensure the organization's seamless operation. This also opens the way for the development of pertinent policies in future and deal with the future challenges in Indian agriculture. *Funding:* There was no funding support for conducting this research.

Declaration of competing interest: Authors have no competing interests.

Data availability: Data would be made available on request.

Appendix: Supplementary data: The supplementary data, table, graph in jpeg format for online visibility to the readers are submitted as an appendix.

Author's contribution: The first author collected and collated the data and helped in analysing the data. The second author participated in contributing to text and the content of the manuscript, including revisions and edits. The third author contributed in analyzing and interpreting the data and also enriching the text of the article. The authors approve of the content of the manuscript and agree to be held accountable for the work.

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