Int.J.Curr.Microbiol.App.Sci (2019) *8*(3): 1493-1505

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 03 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.803.173

Impact of ATMA (Agricultural Technology Management Agency) in Changing Knowledge, Skill and Adoption Behavior of Farmers in Sikkim

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Keywords

ATMA -Agriculture Technological Management Agency, Changes in knowledge, Changes in skill and changes in adoption of farm

Article Info

Accepted:
12 January 2019
Available Online:
10 February 2019

A B S T R A C T

The evaluation of impact of ATMA involve measuring the relationship between farmers' knowledge, extent of skill with the adoption of better practices or farm technologies, utilization of inputs and ultimately increase farm productivity and profitability and the related improvement in farm. In this respect assessment of knowledge and skill and improvement thereof of ATMA beneficiaries in a particular place as the results of ATMA interventions as well translation of those knowledge and skill in higher level of adoption of farm and animal husbandry technologies is important feedback information for measurement of progress made by the programme. Hence, the present study was conducted purposefully in all four districts of Sikkim. A total of 240 respondents were selected randomly from the participants of ATMA programme as sample for the present study. A pretested and structured interview schedule was prepared for collecting data through personal interview. The data so collected were subjected to statistical analysis using mean, frequency, percentage, index value, t-test etc. and results were interpreted. The findings of the study reveal that after participation in ATMA programme most of the respondents were found to acquire high level of knowledge followed by medium level in agricultural and horticultural farm practices followed by majority of the respondents from livestock production acquire high and medium level of knowledge. It is also found that most of the respondents were having medium and high level of skill about agricultural and horticultural technologies and high and medium level of skill about livestock technologies after participation in ATMA programme. The results obtained from the study also indicate that majority of the respondents were having medium level and high level of adoption regarding agricultural and horticultural farm technologies and high and medium level of adoption of livestock technologies after participating in ATMA.

Introduction

The Agricultural Technology Management Agency (hereafter to be mentioned as ATMA) at district level is becoming increasingly responsible for all the technology dissemination activities. ATMA is a registered society of key stakeholders at the district level, involved in project planning and implementation of various farm activities for sustainable agricultural development in the district. The knowledge and the skill gained

by the farmers through ATMA initiatives is one of the important factors to determine the changes on the adoption of improved farm and livestock technologies and consequent changes in production and productivity in the area because the success of transfer of agricultural technology largely depends on; to what extent the farmers have comprehended the transfer of technology at their fields. On the other hand, for any attempt to be successful it is needless to say that the clients should have a favorable behavior towards it. ATMA is supposed to have a significant impact on the knowledge and skill level of the framing communities which are to be translated into the adoption pattern. Assessment of those impacts would be of great help for the planners, policy makers and extension professional to tailor made the transfer technology programme through ATMA interventions. Considering this, the present study has been conducted in all four districts of Sikkim with the broad objective to study the impact of ATMA interventions in changing knowledge, skill and adoption behavior of farmers in Sikkim.

Materials and Methods

The present investigation has been undertaken in 8 blocks having maximum numbers of active Farm Schools (two from each district) of all four districts of Sikkim. 16 villages (two from each block) having maximum number of 'Farm School' and ATMA beneficiaries were selected purposively. At the next step 15 respondents from each village (Total 30 for each block) were selected totaling to 240 respondents (30 per block X 8 blocks) for the research purpose.

Structured interview schedule was employed to collect data from the respondents regarding the major aspects like, extent and changes in knowledge, skill and level of adoption of farm and livestock technologies. Before-After research design was used in the present research work. Suitable statistical tools like, mean, frequency, percentage, index value and standard deviation; t-test were used to analyze the data. The Index Value for each determinant was calculated by following the formula:

$$\text{Index Value} = \{(\text{Score}_{\text{Max}} - \text{Score}_{\text{Obtained}}) / \text{Score}_{\text{Max}} \times 100\}$$

(Das, 2012; Moktan and Mukhopadhyay, 2012)

Index value (ranging from 0-100) was classified into four different class intervals, like low (with value 0-25), Medium (26-50), Semi-Medium (51-75) and High (with index value 76-100).

Results and Discussion

The results of the present study are presented below under different sub-sections. To ascertain the level of knowledge of ATMA beneficiaries regarding different agricultural/ horticultural and animal husbandry technologies before and after ATMA interventions, two broad areas of technology viz. agricultural / horticultural and animal husbandry technologies have been considered. Under each broad area a set of technologies have been considered**.** Like, under agricultural / horticultural technology there were 18 statement based on 18 technologies have been framed, namely, 'Knowledge about spacing of the crop', 'knowledge about weeding schedule after transplanting', 'knowledge about time of application of manures and fertilizers', 'knowledge about the irrigation schedule for growing the crop', 'knowledge about Mixed cropping', 'knowledge about Intercropping', 'knowledge about Integrated pest management', 'knowledge about Integrated nutrient management', 'knowledge about Organic farming', 'knowledge about

Green manuring', 'knowledge about Bio-fertilizers', 'knowledge about poly house technology', 'knowledge about kitchen gardening', 'knowledge about management of orchards', 'knowledge about preservation techniques of fruits and vegetables', 'knowledge about grading', 'knowledge about packing' and 'knowledge about Storage House' etc.

Similarly, in case of livestock 15 statements based on 15 technologies have been framed. These are: 'knowledge about management of pest in livestock production', 'knowledge about management of disease in livestock production', 'knowledge about vaccination of livestock', 'knowledge quality feed and semen', 'knowledge about high milking breeds of cattle', 'knowledge about Gestation period of livestock', 'knowledge about the insurance schemes for livestock production', 'knowledge about feed management', 'knowledge about milking management as when to milk and for how much time with machine or hand', 'knowledge about the housing pattern of cattle and how it should be?', 'knowledge about the poultry farming', 'knowledge about poultry feed', 'knowledge about timing of feeding birds', 'knowledge about the amount of feed at different age of birds' and 'knowledge about litter management and its uses as manure' etc.

Respondents were asked to mention their responses about extent of knowledge against each statement in before and after joining ATMA programme in a three-point scale containing 'Fully known', 'Partially known' and 'Not known' (Hardikar, 1998) with corresponding score of 2,1 and 0 respectively. Further, Knowledge Indexes (KI) for before and after joining ATMA were calculated for all technology (both farm and animal) taken together by following the formula as mentioned in methodology section. Distributions of respondents on the basis of their knowledge index against each technology as well as all technology together are presented below.

Table 1 represents the distribution of respondents against their Knowledge Index in four class intervals like, Low (Index value 0-25), Semi-Medium (26-50), Medium (51-75) and High (Index value 76-100) taking all the statement together under agriculture / horticulture and animal husbandry aspects separately. The results have been discussed district-wise.

As observed from the table 1, in case of agriculture / horticulture aspect majority of the respondents (71.67%) were found to have medium level of knowledge followed by (23.33%) semi-medium level of knowledge in East-District before participating in ATMA programme which was improved and found that majority (55%) were having high level of knowledge followed by medium level of knowledge about farm technologies (27%) after participating in ATMA programme. In case of animal husbandry, in East-District it was found that (53.33%) of the respondents have medium level of knowledge followed by (46.67%) semi-medium level of knowledge before participating in ATMA programme. Whereas after participation in ATMA programme, it was found that majority of the respondents (68.33%) were having medium level of knowledge and (31.67%) of the respondents could improve their knowledge to high level of knowledge about livestock technologies.

In West-Sikkim, it was found that half of the respondents (50%) were having semi-medium level of knowledge followed by (43.33%) of the respondents having low level of knowledge regarding agricultural and horticultural aspects before participating in ATMA programme which was improved and found that majority (83.33%) were having

high level of knowledge followed by medium level of knowledge about farm technologies (11.67%) after participation in ATMA. In case of livestock production, in West-Sikkim majority (85%) of the respondents were having semi medium level of knowledge followed by (15%) having medium level of knowledge before participating in ATMA programme. However, after participating in ATMA programme, it was found that majority of the respondents (75%) were having medium level of knowledge and 18.33% of the respondents could improve their knowledge to high level about livestock technologies.

In South-Sikkim, majority of the respondents (78.33%) were found to have medium level of knowledge followed by semi-medium level of knowledge (21.67%) in respect to agricultural and horticultural aspects before participating in ATMA programme. And after participating in ATMA programme, the level of knowledge about farm technologies was improved and found that, half (50%) of the respondents were having high level of knowledge followed by medium level of knowledge (46.67%). In case of animal husbandry, it was found that majority (53.33%) of the respondents were having medium level followed by semi-medium level of knowledge (35%) before participating in ATMA programme which was improved and found that majority of the respondents (81.67%) have high level of knowledge followed by medium level (10%) of knowledge about livestock technologies after participating in ATMA.

While in case of North-Sikkim, it was found that majority of the respondents (73.33%) were having semi-medium level of knowledge followed by medium level of knowledge (23.33%) regarding agricultural and horticultural technologies before participating in ATMA programme which was improved and found that majority of the respondents (63.33%) have high level of knowledge followed by medium level (33.33%) after participating in ATMA programme. In case of animal husbandry, it was found that majority (76.67%) of the respondents were having semi-medium level of knowledge followed by medium level of knowledge (16.67%) before participating in ATMA programme. While, after participation in ATMA programme, it was found that majority of the respondents (58.33%) could improve their knowledge to high level followed by medium level about livestock technologies (36.67%).

The pooled results indicate that, majority (45%) of the respondents were found to have medium level of knowledge followed by semi-medium level of knowledge (42.08%) regarding agricultural and horticultural technologies before participating in ATMA programme. Whereas after participation in ATMA programme, it is evident that majority of the respondents (63.33%) could improve their knowledge to high level followed by medium level of knowledge (35%). Which is in contrast with results obtained by Virang *et.al.,* (2016) depicting that majority of the beneficiaries (52.31 %) found to pertaining medium knowledge regarding various components of soybean production technology under ATMA program followed by high knowledge (24.62 %) and low knowledge (23.08 %) respectively. In case of animal husbandry, it can be observed that majority of the respondents were having semi-medium level of knowledge (62.5%) followed by medium level of knowledge (7.92%) before participating in ATMA programme. Whereas after participation in ATMA programme, it was found that majority of the respondents (47.5%) were in high and medium level of knowledge about livestock technologies.

At the next step extent of changes in knowledge among the respondents as the result of intervention of ATMA were

measured. Mean and SD of Knowledge Indexes calculated for the purpose of before and after participation in ATMA programme were taken into consideration.

Change in knowledge (CK) was calculated by using the following formula:

CK= {Mean Knowledge Index (After) – Mean Knowledge Index (Before)} / Mean Knowledge Index (Before)

From the table 2 it can be observed that changes in knowledge about improved farm practices was highest in West-District (1.41) followed by North District (0.77), East-District (0.48) and South District (0.39) in descending order. In case of animal husbandry practices North District recorded highest order of changes in knowledge (0.88) followed by South District (0.61), West District (0.59%) and East District (0.40) respectively in descending order of degree of changes.

Incase of total changes, taking both agricultural / horticultural and animal husbandry practices it was found that West District recorded highest changes in Mean knowledge index (110.28) followed by North District having Mean knowledge index of (94.40), South District (49.89) and East District (47.29) in descending order respectively.

The results amply established that participants of ATMA programme (respondents) could change their knowledge about agricultural / horticultural and animal husbandry practices to a significant level which in turn establishes positive impact of ATMA activities towards changing field knowledge of the respondents. The t-value in the table showed that the changes in knowledge are significant as 1% level in case of agricultural / horticultural and animal husbandry technologies and for all the districts as well as for all districts together.

To ascertain the extent level of skill of ATMA beneficiaries regarding different agricultural/ horticultural and animal farming technologies in before and after ATMA interventions, two broad areas of technology viz. agricultural / horticultural and animal husbandry technologies have been considered. Under each broad areas a set of technologies have been considered. Like, under agricultural / horticultural technology there were 12 statement based on 12 technologies have been framed, namely, **'**Do you know how to manage soil via inter cropping and cover cropping?', 'Do you know how to perform SRI techniques?', 'Do you know how to prepare Azola?', Do you know how to produce Hybrid seeds on farm?', 'Do you know how to prepare Vermicompost?', 'Do you know how to use knapsack sprayers?', 'Do you know how to prepare seed bed?', 'Do you know how to cultivate in Poly House?', 'Do you know how to cultivate in Kitchen gardening?', 'Do you know how to make Bonsai?', 'Do you know how to perform Grafting?' and 'Do you know how to preserve vegetables and fruits through different techniques/methods?' etc.

Similarly, in case of livestock, 12 statements based on 12 technologies have been framed. These are: 'Do you use basic feeding equipment?', 'Do you use hygienic practices when feeding calves?', 'Do you recognize and report sick animals?', 'Do you recognize basic symptoms of ill-health, monitor herd and report?', 'Do you know how to cut naval cord after the birth of a calf?', ' Do you carry out minor and routine animal health treatments?', 'Do you know how to assist Artificial Insemination?', 'Do you know how to vaccinate your livestock?', 'Do you know how to use Chaff cutter machine?', 'Do you know how to use incubator?', 'Do you know how to prevent disease in poultry birds?' and 'Do you know how to prepare deep litter system in poultry' etc.

Respondents were asked to mention their responses about extent of skill against each statement in a three-point scale containing 'Fully skill', 'Partially skill' and 'No skill' (Hardikar, 1998) with corresponding score of 2, 1 and 0 in before and after joining ATMA programme. Further, Skill Indexes (SI) for before and after ATMA interventions were calculated for all individual statement / technology as well as all technology taken together. Distributions of respondents on the basis of their skill index for all technology together are presented below.

Table 1 represents the distribution of respondents against their Skill Index in four class intervals like, Low (Index value 0-25), Semi-Medium (26-50), Medium (51-75) and High (Index value 76-100).

In case of agriculture / horticulture aspect, it can be observed from the above table 3 that majority of the respondents were found to have semi-medium level (85%) of skill followed by medium level (11%) of skill in East-District before participating in ATMA programme. And after participation in ATMA programme, it was found that majority of the respondents were having medium level (63.33%) of skill followed by high level (31.67%) of skill about farm technologies. In case of animal husbandry, it was found that majority of the respondents were having semi-medium level (61.67%) of skill followed by medium level of skill (35%) before participating in ATMA programme and improved in ATMA programme to high level (55%) of skill followed by medium level (38.33%) in respect to livestock technologies after participation.

In West-Sikkim, it was found that majority of the respondents were having semi-medium level (75%) of skill followed by low level (16.67%) of skill regarding agricultural and horticultural aspects before participating in ATMA programme and after participating in ATMA was improved and found that majority were having medium level (91.67%) of skill followed by high level (5%) of skill about farm technologies. In case of livestock production, majority of the respondents were having semi-medium level (95%) of skill followed by low level (3.33%) of skill before participating in ATMA programme and found to be improved to medium level (70%) followed by high level (28.33%) of skill about livestock technologies after participation in ATMA programme.

In South-Sikkim more than half of the respondents were found to have medium level (53.33%) of skill followed by semi-medium level (46.67%) of skill in respect to agricultural and horticultural aspects before participating in ATMA programme. And after participating in ATMA programme, the level of skill about farm technologies was improved and found that, majority were having high level (53.33%) of skill followed by medium level (36.67%) of skill about farm technologies. In case of animal husbandry, it was found that majority of the respondents were having medium level (48.33%) followed by semi-medium level (45%) of skill before participating in ATMA programme. And after participation in ATMA programme, it was found that majority of the respondents could improve their skill to high level (85%) followed by medium level (15%) of skill about livestock technologies.

While in case of North-Sikkim, it was found that majority of the respondents were having semi-medium level (58.33%) of skill followed by low level (33.33%) of skill regarding agricultural and horticultural aspects before participating in ATMA programme. In case of after participation in ATMA programme, it was found that most of the respondents could improve their skill to medium level (56.67%) of skill followed by high level (38.33%) of skill about agricultural and horticultural technologies. In case of animal husbandry, it

was found that more than half of the respondents were having semi-medium level (68.33%) of skill followed by low level (20%) of skill before participating in ATMA programme which was improved and found that majority of the respondents have high level (53.33%) followed by medium level (43.33%) of skill about livestock technologies after participating in ATMA.

The pooled data indicates that, majority of the respondents were found to have semi-medium level (66.25%) of skill followed by medium level (26.25%) of skill regarding agricultural and horticultural aspects before participating in ATMA programme. However, after participation in ATMA programme, majority of the respondents were found to have medium level (62.08%) followed by high level (32.08%) of skill about agricultural and horticultural technologies. In case of animal husbandry, the pooled data reported that majority of the respondents were having semi-medium level (67.5%) of skill followed by medium level (23.33%) of skill before participating in ATMA programme. However, after participating in ATMA programme, it was found that more than half of the respondents could improve their skill to high level (55.41%) followed by medium level (41.67%) of skill about livestock technologies.

At the next step extent of changes in skill among the respondents as the result of intervention of ATMA were measured. Mean and SD of Skill Indexes calculated for the purpose of before and after participation in ATMA programme were taken into consideration.

Change in skill (CS) was calculated by using the following formula:

CS= {Mean Skill Index (After) – Mean Skill Index (Before)} / Mean Skill Index (Before)

Table 5 indicates that changes in skill about improved farm practices was highest in West-District (0.79) followed by North District (0.57), East-District (0.52) and South District (0.32) in descending order of importance. In case of animal husbandry practices North District recorded highest order of changes in skill (1.12) followed by West District (0.82), South District (0.60) and East District (0.37) respectively in descending order of changes.

In case of total changes, taking both agricultural / horticultural and animal husbandry practices it was found that North District recorded highest changes in Mean of skill index (88.78) followed by West District having Mean skill index of (88.13), South District (51.04) and East District (47.43) in descending order of changes.

The results amply established that participants of ATMA programme (respondents) could change their skill about agricultural / horticultural and animal husbandry practices to a significant level which in turn establishes positive impact of ATMA activities towards changing field skill of the respondents. The t-value in the table 6 showed that the changes in skill are significant as 1% level in case of agricultural / horticultural and animal husbandry technologies and for all the districts as well as for all districts together.

To ascertain the adoption level of ATMA beneficiaries regarding different agricultural/ horticultural and animal farming technologies in before and after ATMA interventions, two broad areas of technology viz. agricultural / horticultural and animal husbandry technologies have been considered. Under each broad areas a set of technologies have been considered**.** Like, under agricultural / horticultural technology there were 14 statement based on 14 technologies have been framed, namely, ‘Use of green manure and vermi-composting’, ‘Sowing of seed in line, ‘Adoption of HYV’, ‘IPM in paddy’, ‘Pulse

farming,' 'Adoption of correct type and amount of fertilizer', 'Adoption of scheduled plant protection measures', 'Adoption of seed treatment', 'Adoption of SRI techniques', 'Adoption of Organic farming', 'Adoption of Poly house', 'Adoption of pheromone trap', 'Adoption of fruit fly trap' and 'Adoption of Kitchen gardening' etc.

Similarly, in case of livestock 10 statements based on 10 technologies have been framed. These are: 'Breeding practices', 'Adoption of improved dairy breeds', 'Adoption of artificial insemination', 'Adoption of improved poultry breeds', 'Adoption of improved forages', 'Adoption of improved housing', 'Adoption of improved care and management', 'Adoption of improved feeding practices', 'Adoption of Deworming' and 'Adoption of immunization' etc.

Like previous sections, adoption indexes were calculated for all districts separately and together. The distribution of the respondents according to adoption index is presented in 4 class intervals in table 5.

As observed from the above table, in case of agriculture / horticulture aspect majority of the respondents were found to have semi-medium level (75%) of adoption followed by medium level (11.67%) in East-District before participating in ATMA programme which was improved and found that majority were having high level (48.33%) of adoption followed by semi-medium level (46.67%) of adoption about farm technologies after participating in ATMA programme.

In case of animal husbandry, it was found that majority of the respondents were having medium level (61.67%) of adoption followed by semi-medium level (36.67%) of adoption before participating in ATMA programme which was improved and found that majority of the respondents have high level (60%) of adoption followed by (35%) medium level of adoption about livestock technologies after participating in ATMA.

In West-Sikkim, it was found that majority of the respondents were having semi-medium level (76.67%) of adoption followed by (21.67%) low level of adoption regarding agricultural and horticultural aspects before participating in ATMA programme. And after participating in ATMA, the adoption level of farm technologies was improved and found that majority were having medium level (63.33%) of adoption followed by high level (30%) of adoption of farm technologies. In case of livestock production, majority of the respondents were having semi-medium level (81.67%) of adoption followed by (13.33%) of the respondents medium level of adoption of animal husbandry technologies before participating in ATMA programme. However, after participating in ATMA programme which was improved and found that majority of the respondents have high level (61.67%) of adoption followed by medium level (33.33%) of adoption of livestock technologies after participating in ATMA.

In South-Sikkim most of the respondents were found to have semi-medium level (68.33%) of adoption followed by medium level of adoption (18.33%) in respect to agricultural and horticultural farm technologies before participating in ATMA programme. And after participating in ATMA programme, the level of adoption of farm technologies was improved and found that, majority were having medium level (71.61%) of adoption followed by high level (16.67%) of adoption of farm technologies.

In case of animal husbandry, it was found that majority of the respondents were having medium level (48.33%) of adoption followed by (48.33%) semi-medium level (48.33%) of adoption of livestock technologies before

participating in ATMA programme. And after participation in ATMA programme, it was found that majority of the respondents could improve their level of adoption to high level (61.67%) followed by semi-medium level (33.33%) of adoption about livestock technologies.

While in case of North-Sikkim, it was found that majority of the respondents were having semi-medium level (71.67%) followed by low level of adoption (18.33%) regarding agricultural and horticultural technologies before participating in ATMA programme. However, after participating in ATMA programme, it was found that half of the respondents could improve their adoption to high level (50%) followed by medium level (33.33%) about agricultural and horticultural technologies. In case of animal husbandry, it was found that majority of the respondents were having semi-medium level (70%) followed by low level of adoption (21.67%) before participating in ATMA programme. In case of after participation in ATMA programme, it was found that majority of the respondents could improve their adoption to high level (63.33%) followed by medium level (26.67%) about livestock technologies.

Table.1 Knowledge level about agricultural / horticultural and livestock technologies for ATMA beneficiaries

Broad Area	Category	Distribution of Respondents in frequency and percentage									
		D-1 (East-Sikkim)		D-2 (West-Sikkim)		D-3 (South-Sikkim)		D-4 (North-Sikkim)		Pooled	
		B	A	B	A	B	A	B	A	B	A
Agril. & Horti. Practices	Low (0-25)	03 (5)	-	26 (43.33)	-	-	-	02 (3.33)	02 (3.33)	31 (12.92)	02 (0.83)
	Semi-Med (26-50)	14 (23.33)	-	30 (50)	-	13 (21.67)	02 (3.33)	44 (73.33)	-	101 (42.08)	02 (0.83)
	Medium (51-75)	43 (71.67)	27 (45)	04 (6.67)	07 (11.67)	47 (78.33)	28 (46.67)	14 (23.33)	20 (33.33)	108 (45)	84 (35)
	High (76-100)	-	33 (55)	-	53 (88.33)	-	30 (50)	-	38 (63.33)	-	152 (63.33)
Livestock Production	Low (0-25)	-	-	-	-	05 (8.33)	01 (1.67)	04 (6.67)	-	09 (3.75)	01 (0.42)
	Semi-Med (26-50)	32 (53.33)	-	51 (85)	04 (6.67)	21 (35)	04 (6.67)	46 (76.67)	03 (5)	150 (62.5)	11 (4.58)
	Medium (51-75)	28 (46.67)	41 (68.33)	09 (15)	45 (75)	32 (53.33)	06 (10)	10 (16.67)	22 (36.67)	79 (7.92)	114 (47.5)
	High (76-100)	-	19 (31.67)	-	11 (18.33)	02 (3.33)	49 (81.67)	-	35 (58.33)	02 (0.83)	114 (47.5)

(*B= Before, A= After)

Table.2 Changes in knowledge level about agricultural / horticultural and livestock technologies for ATMA beneficiaries

District	Distribution of Respondents in frequency and percentage								
	Agricultural & Horticultural Practices				Livestock Production				
	B.I	A.I	O.C.I	T Value (P-value)	B.I	A.I	O.C.I	T Value (P-value)	TCI
District-1 East-Sikkim	53.37 (15.96)	78.79 (6.99)	0.48	-11.41 (0.000)	50.72 (6.99)	70.94 (0.67)	0.40	-15.69 (0.000)	47.29
District-2 West-Sikkim	34.44 (12.66)	83.05 (5.28)	1.41	-27.49 (0.000)	42.44 (7.07)	67.5 (8.97)	0.59	-17.01 (0.000)	110.28
District-3 South-Sikkim	54.95 (10.65)	76.60 (9.72)	0.39	-11.40 (0.000)	51.05 (15.41)	82.44 (17.38)	0.61	-10.96 (0.000)	49.89
District-4 North-Sikkim	42.73 (11.79)	75.60 (12.41)	0.77	-14.87 (0.000)	40.83 (13.1)	77.11 (11.79)	0.88	-15.87 (0.000)	94.40
Overall T-Value (P-value)				-24.72 (0.000)				-22.10 (0.000)	

* B.I=Before Index, A.I=After Index, O.C.I= Overall Changes in Index, TCI= Total Changes in Index

Table.3 Extent of skill on agricultural / horticultural and livestock technologies for ATMA beneficiaries

Distribution of Respondents in frequency and percentage											
Agril. & Horti. Practices	**Category**	**D-1 (East-Sikkim)**		**D-2 (West-Sikkim)**		**D-3 (South-Sikkim)**		**D-4 (North-Sikkim)**		**Pooled**	
		B	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**
	Low (0-25)	-	-	10 (16.67)	-	-	02 (3.33)	03 (5)	01 (1.67)	13 (5.42)	03 (1.25)
	Semi-Med (26-50)	51 (85)	03 (5)	45 (75)	02 (3.33)	28 (46.67)	04 (6.67)	35 (58.33)	02 (3.33)	159 (66.25)	11 (4.58)
	Medium (51-75)	07 (11.67)	38 (63.33)	04 (6.67)	55 (91.67)	32 (53.33)	22 (36.67)	20 (33.33)	34 (56.67)	63 (26.25)	149 (62.08)
	High (76-100)	02 (3.33)	19 (31.67)	01 (1.67)	03 (5)	-	32 (53.33)	02 (3.33)	23 (38.33)	05 (2.08)	77 (32.08)
Livestock Production	Low (0-25)	02 (3.33)	01 (1.67)	02 (3.33)	-	02 (3.33)	-	12 (20)	-	18 (7.5)	01 (0.42)
	Semi-Med (26-50)	37 (61.67)	03 (5)	57 (95)	01 (1.67)	27 (45)	-	41 (68.33)	02 (3.33)	162 (67.5)	06 (2.5)
	Medium (51-75)	21 (35)	23 (38.33)	01 (1.67)	42 (70)	29 (48.33)	09 (15)	05 (8.33)	26 (43.33)	56 (23.33)	100 (41.67)
	High (76-100)	-	33 (55)	-	17 (28.33)	02 (3.33)	51 (85)	02 (3.33)	32 (53.33)	04 (1.67)	133 (55.41)

(*B= Before, A= After)

Table.4 Changes in skill on agricultural / horticultural and livestock technologies for ATMA beneficiaries

District	Distribution of Respondents in frequency and percentage								
	Agricultural & Horticultural Practices				Livestock Production				
	B.I	A.I	O.C.I	T Value (P-value)	B.I	A.I	O.C.I	T Value (P-value)	TCI
District-1 East-Sikkim	45.90 (8.89)	70 (12.19)	0.52	-12.41 (0.000)	54.31 (9.64)	74.65 (11.31)	0.37	-10.62 (0.000)	47.43
District-2 West-Sikkim	37.29 (11.91)	66.80 (7.49)	0.79	-16.30 (0.000)	38.26 (6.44)	69.72 (8.77)	0.82	-22.39 (0.000)	88.13
District-3 South-Sikkim	53.96 (11.10)	71.46 (13.24)	0.32	-7.86 (0.000)	52.50 (10.13)	84.09 (7.17)	0.60	-19.93 (0.000)	51.04
District-4 North-Sikkim	47.01 (13.35)	73.75 (9.65)	0.57	-12.58 (0.000)	35.76 (12.45)	75.97 (7.94)	1.12	-21.15 (0.000)	88.78
Overall T-Value (P-value)				-20.40 (0.000)				-25.93 (0.000)	

* B.I=Before Index, A.I=After Index, O.C.I= Overall Changes in Index, TCI= Total Changes in Index

Table.5 Adoption level of agricultural / horticultural and livestock technologies for ATMA beneficiaries

Distribution of Respondents in frequency and percentage											
Agril. & Horti. Practices	Category	D-1 (East-Sikkim)		D-2 (West-Sikkim)		D-3 (South-Sikkim)		D-4 (North-Sikkim)		Pooled	
		B	A	B	A	B	A	B	A	B	A
	Low (0-25)	05 (8.33)	-	13 (21.67)	01 (1.67)	05 (8.33)	-	11 (18.33)	02 (3.33)	34 (14.16)	03 (1.25)
	Semi-Med (26-50)	45 (75)	03 (5)	46 (76.67)	03 (5)	41 (68.33)	07 (11.67)	43 (71.67)	08 (13.33)	175 (72.92)	21 (8.75)
	Medium (51-75)	07 (11.67)	28 (46.67)	01 (1.67)	38 (63.33)	11 (18.33)	43 (71.67)	06 (10)	20 (33.33)	25 (10.42)	129 (53.75)
	High (76-100)	03 (5)	29 (48.33)	-	18 (30)	03 (5)	10 (16.67)	-	30 (50)	06 (2.5)	87 (36.25)
Livestock Production	Low (0-25)	-	02 (3.33)	02 (3.33)	01 (1.67)	03 (5)	-	13 (21.67)	04 (6.67)	18 (7.5)	07 (2.92)
	Semi-Med (26-50)	22 (36.67)	01 (1.67)	49 (81.67)	02 (3.33)	27 (45)	03 (5)	42 (70)	02 (3.33)	140 (58.33)	08 (3.33)
	Medium (51-75)	37 (61.67)	21 (35)	08 (13.33)	20 (33.33)	29 (48.33)	20 (33.33)	05 (8.33)	16 (26.67)	79 (32.92)	77 (32.08)
	High (76-100)	01 (1.67)	36 (60)	01 (1.67)	37 (61.67)	01 (1.67)	37 (61.67)	-	38 (63.33)	03 (1.25)	148 (61.67)

(*B= Before, A= After)

Table.6 Changes in adoption level in agricultural / horticultural and livestock technologies for ATMA beneficiaries

District	Distribution of Respondents in frequency and percentage								
	Agricultural & Horticultural Practices				Livestock Production				
	B.I	A.I	O.C.I	T Value (P-value)	B.I	A.I	O.C.I	T Value (P-value)	TCI
District-1 East-Sikkim	34.40 (9.93)	71.01 (14.44)	1.06	-12.78 (0.000)	36.17 (11.73)	75.92 (18.63)	1.09	-7.55 (0.000)	116.51
District-2 West-Sikkim	42.14 (11.98)	72.08 (13.66)	0.71	-21.63 (0.000)	57.67 (9.33)	76 (16.02)	0.32	-16.39 (0.000)	54.94
District-3 South-Sikkim	33.87 (7.62)	72.79 (11.69)	1.15	-11.70 (0.000)	43.08 (9.21)	79 (14.25)	0.83	-11.21 (0.000)	102.86
District-4 North-Sikkim	43.15 (12.72)	69.23 (11.69)	0.60	-16.19 (0.000)	49.58 (11.43)	77.25 (15.33)	0.55	-14.00 (0.000)	63.92
Overall T-Value (P-value)				-27.18 (0.000)				-21.13 (0.000)	

The pooled data indicates that, majority of the respondents were found to have semi-medium level (72.92%) of adoption followed by low level of adoption (14.16%) regarding agricultural and horticultural technologies before participating in ATMA programme. In case of after participation in ATMA programme, majority of the respondents could improve their level of adoption to medium level (53.75%) followed by high level (36.25%) of adoption regarding agricultural and horticultural technologies. Which is in contrast with results obtained by Matto *et.al.*, (2017) depicting that (31.71 %) of the trained farmers belong to medium adoption category. Near about fifty per cent (47.56%) of the trained farmers belong to high adoption category. In case of animal husbandry, the above pooled data reveal that majority of the respondents were having semi-medium level of adoption (58.33%) followed by medium level of adoption (32.92%) before participating in ATMA programme which was improved and found that most of the respondents were having high level (61.67%) followed by medium level (32.08%) of adoption of livestock technologies after participating in ATMA.

At the next step extent of changes in adoption level among the respondents as the result of intervention of ATMA were measured. Mean and SD of Adoption Indexes calculated for the purpose of before and after participation in ATMA programme were taken into consideration.

Change in adoption (CA) was calculated by using the following formula:
CA= {Mean Adoption Index (After) – Mean Adoption Index (Before)} / Mean Adoption Index (Before)

From the table 6 it can be observed that changes in adoption about improved farm technologies was highest in South-District

(1.15) followed by East District (1.06), West-District (0.71) and North District (0.60) in descending order of importance. In case of animal husbandry farm technologies East District recorded highest order of changes in adoption (1.09) followed by South District (0.83), North District (0.55) and West District (0.32) respectively in descending order of changes.

In case of total changes, taking both agricultural / horticultural and animal husbandry practices it was found that East District recorded highest changes in Mean of adoption index (116.51) followed by South District having Mean adoption index of (102.86), North District (63.92) and West District (54.94) in descending order of changes.

The results amply established that participants of ATMA programme (respondents) could change their adoption of agricultural / horticultural and animal husbandry technologies to a significant level which in turn establishes positive impact of ATMA activities towards changing field adoption of the respondents. The t-value in the table showed that the changes in adoption are significant as 1% level in case of agricultural / horticultural and animal husbandry technologies and for all the districts as well as for all districts together.

In conclusion, the findings of the study reveal that, ATMA interventions are having positive and significant impact on improvement of the knowledge and skill level of the respondents of all the study districts in agriculture / horticulture as well as animal husbandry. Positive impact of ATMA interventions were also observed in case of adoption behavior of the respondents. Changes in respondents' knowledge, skill and adoption pattern were also found to be significant before and after participating in ATMA programme.

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How to cite this article:

Ranjit Subba and Siddhartha D. Mukhopadhyay. 2019. Impact of ATMA (Agricultural Technology Management Agency) in Changing Knowledge, Skill and Adoption Behavior of Farmers in Sikkim *Int.J.Curr.Microbiol.App.Sci.* 8(03): 1493-1505.
doi: https://doi.org/10.20546/ijcmas.2019.803.173