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Aquaculture Development through Agricultural Technology Management Agency

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Abstract: ***Agricultural Technology Management Agency (ATMA) as a decentralised extension approach, aimed at supporting farmers, gained momentum in Kerala in India since 2010. The present study was conducted in five selected districts in Kerala. Primary data was collected from 225 fish farmers, engaged in ornamental and food fish culture and who availed various kinds of support through ATMA. Demographic characteristics of fish farmers were studied. ATMA provided support to fish farmers in the form of training, demonstration, exposure visit, farmer scientist interaction, farm schools, rewards and incentives, agriclinics, district level training institutions, farmer interest groups and farm information dissemination activities. The perceived changes gained through ATMA were studied, to find that fish farmers were in need of marketing and financial support.***

Keywords: ATMA, Aquaculture, Awareness score, Communication Facility

1. Introduction

Since India's independence, several extension initiatives were implemented with the goal of agriculture and rural development. Most of these programmes failed to meet the needs as well as to utilise opportunities required for majority of people (MANAGE, 2007). Thus, in order to tackle the different constraints as well as to meet the emerging challenges in our extension system, the Innovations in Technology Dissemination component of National Agricultural Technology Project (NATP) implemented Agricultural Technology Management Agency (ATMA) as a pilot project from 1998 to 2005 in seven states in India. Based on the ATMA experiences , Department of Agriculture and Cooperation, Government of India on 29 March, 2005 established ATMA in 252 districts/ UTs all over India during the X five year plan (Planning Commission, 2007). ATMA is a registered society of key stakeholders responsible for technology dissemination at the district level, involving in agricultural and allied activities, for its sustainable development (MANAGE, 2007). Through ATMA, the officials in agriculture and allied departments in association with Department of Fisheries (DoF) staff started encouraging aquaculture, with new projects and schemes, supporting the fish farmers by means of training, demonstration, exposure visit, rewards and incentives and other innovative activities.

2. Materials and Methods

Since ATMA and aquaculture extension were emerging concepts in Kerala, it was assumed that ATMA would have initiated its work in aquaculture in the districts dominated by fish farmers. Accordingly, the top five districts, with the highest number of fish farmers, were purposively selected. The districts selected were Kollam, Alappuzha, Kottayam, Ernakulam and Thrissur in the state of Kerala based on the following reasons. Inland fish farmer population was the highest in Ernakulam district (28%) followed by districts like Alappuzha (27.1%), Kollam (14.9%), Kottayam (10.9%) and Thrissur (8.7%) (Harikumar and Rajendran, 2007; DoF, 2010). Primary data was collected through administering schedule among selected fish farmers who availed ATMA support. Statistical tools available in SPSS 16.0 and MS Excel were used.

3. Results

Demographic characteristics of fish farmers were presented in Table 1.

Table 1: Demographic characteristics of fish farmers (n=225)

	Kollam	Alappuzha	Kottayam	Ernakulam	Thrissur	Total
Age						
20-40	11(24.4)	12 (26.7)	3 (6.7)	12 (26.7)	18 (40)	56 (24.9)
40-60	34 (75.6)	29 (64.4)	41 (91.1)	30 (66.7)	27 (60)	161(71.6)
Over 60	0 (0)	4 (8.9)	1 (2.2)	3 (6.7)	0 (0)	8 (3.6)
Gender						
Male	26 (57.8)	33 (73.3)	38 (84.4)	24 (53.3)	42 93.3)	163(72.4)
Female	19 (42.2)	12 (26.7)	7 (15.6)	21 (46.7)	3 (6.7)	62 (27.6)
Educational qualification						
Primary	1 (2.2)	2 (4.4)	3 (4.4)	4 (4.4)	1 (2.2)	8 (3.6)
Secondary	20 (44.4)	18 (40)	17 (37.8)	20 (44.4)	20 44.4)	95 (42.2)
Higher secondary	16 (35.6)	17 (37.8)	15 (33.3)	10 (22.2)	16 35.6)	74 (32.9)
Under Graduate	8 (17.8)	9 (17.8)	11 (24.4)	11 (24.4)	8 (17.8)	46 (20.4)
Post Graduate	0 (0)	0 (0)	0 (0)	2 (4.4)	0 (0)	2 (0.9)
Religion						

Hindu	27 (60)	29 (64.4)	30 (64.4)	23 (51.1)	34 75.6)	142(63.1)
Muslim	2 (4.4)	2 (4.4)	1 (2.2)	3 (6.7)	5 (11.1)	13 (5.8)
Christian	16 (35.6)	14 (31.1)	15 (33.3)	19 (42.2)	6 (13.3)	70 (31.1)
Marital status						
Single	6 (13.3)	11 (24.4)	11 (24.4)	5 (11.1)	11(24.4)	44 (19.6)
Married	39 (86.7)	34 (75.6)	34 (75.6)	40 (88.9)	34(75.6)	181(80.4)
Primary occupation						
Non skilled job+ Aquaculture	4 (8.9)	3 (6.7)	2 (4.4)	5 (11.1)	2 (4.4)	16 (7.1)
Private job+ Aquaculture	4 (8.9)	7 (15.6)	7 (15.6)	3 (6.7)	4 (8.9)	25 (11.1)
Govt. job+ Aquaculture	9 (20)	9 (20)	9 (20)	8 (17.8)	3 (6.7)	38 (16.9)
Student+ Aquaculture	2 (4.4)	2 (4.4)	2 (4.4)	1 (2.2)	4 (8.9)	11 (4.9)
Aquaculture	26 (57.8)	24(53.3)	25(55.6)	28(62.2)	32(71.1)	135(60)
Income (per month in Rs.)						
<1,000	17 (37.8)	4 (8.9)	4 (8.9)	11 (24.4)	0 (0)	36 (16)
1,000-5,000	1 (2.2)	6 (13.3)	2 (4.4)	4 (8.9)	6 (13.3)	19 (8.4)
5,000-10,000	13(28.9)	11 (24.4)	7 (15.6)	9 (20)	10(22.2)	50 (22.2)
>10,000	14 (31.2)	24 (53.4)	32 (71.1)	21 (46.6)	29(64.4)	120(53.3)
Communication facility utilised						
Post office- Yes	45 (20)	45 (20)	45 (20)	45 (20)	45 (20)	225 (100)
Post office- No	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mobile phone- Yes	41 (18.2)	38 (16.9)	42 (18.7)	42 (18.7)	38(16.9)	201(89.3)
Mobile phone- No	4 (8.9)	7 (15.6)	3 (6.7)	3 (6.7)	7 (15.6)	24 (10.7)
Internet- Yes	14 (6.2)	11 (4.9)	16 (7.1)	17 (7.6)	7 (3.1)	65 (28.9)
Internet- No	31 (68.9)	34 (75.6)	29 (64.4)	28 (62.2)	38 (84.4)	160 (71.1)
Television- Yes	44 (19.6)	42 (18.7)	40 (17.8)	37 (16.4)	35(15.6)	198 (88)
Television- No	1 (2.2)	3 (6.7)	5 (11.1)	8 (17.8)	10 (22.2)	27 (12)
Radio- Yes	22 (9.8)	19 (8.4)	20 (8.9)	20 (8.9)	32(14.2)	113(50.2)
Radio- No	23 (51.1)	26 (57.8)	25 (55.6)	25 (55.6)	13 (28.9)	112 (49.8)
KCC- Yes	7 (3.1)	5 (2.2)	10 (4.4)	5 (2.2)	12 (5.3)	39 (17.3)
KCC- No	38 (84.4)	40 (88.9)	35 (77.8)	40 (88.9)	33 (73.3)	186 (82.7)
Family size						
Two	1 (2.2)	1 (2.2)	1 (2.2)	1 (2.2)	0 (0)	4 (1.8)
Three	1 (2.2)	1 (2.2)	3 (6.7)	1 (2.2)	5 (11.1)	11 (4.9)
Four	32 71.1)	32 (71.1)	31 (68.9)	27 (60)	35 77.8)	157(69.8)
Five	11 (24.4)	11 (24.4)	10 (22.2)	16 (35.6)	2 (4.4)	50 (22.2)
Six	0 (0)	0 (0)	0 (0)	0 (0)	3 (6.7)	3 (1.3)

(Corresponding percentages are indicated in parenthesis)

A majority of 72 per cent of fish farmers were middle aged (age 40-60), 25 per cent were young (age 20-40) and 4 per cent were old (over 60). The middle aged farmers were active in aquaculture. Younger farmers were few as they showed less interest in taking up aquaculture. The fish farmers were mostly male (72%) as women were reluctant to take up heavy farm work. Most of the fish farmers (42.2%) had an education up to secondary level and very few (0.9%) were post graduates which indicated their lack of interest in gaining education. Eighty per cent of farmers were married. Maximum fishers (60%) were engaged in fish culture while non skilled workers (7%), private job holders (11%), government workers (17%) and students (5%) were doing fish culture as a secondary activity. Most of the farmers (53%) were earning more than Rs.10,000 per month because besides aquaculture they were involved in other income generating activities (Ahmed and Lorica, 2002; Bouis, 2000). Those who earned less than Rs.1,000 and Rs.1,000-Rs.5,000 monthly were students and women who did ornamental fish culture as their hobby. All the farmers in the study area used post office for communication because it stood closest to the farmers as opined by Chaminuka *et al*., (2008) in Africa. A total of 89.3 per cent used mobile phones, as cheap handsets were available and 88 per cent viewed television through which they saw visuals in local language as reported by Chhachher *et al*., in Pakistan (2012). Only 29 and 17 per cent used internet and Kisan Call Centre (KCC) respectively, due to low awareness. All farmers had nuclear families and most (69.8%) with four members and only 1.3 per cent had more than 6 family members, and this was also reported by Ali *et al*., (2008) in Bangladesh.

Table 2: Aquaculture practices followed by farmers (n=225)

	Kollam (n_1=45)	Alappuzha (n_2=45)	Kottayam (n_3=45)	Ernakulam (n_4=45)	Thrissur (n_5=45)	Total (n=225)
Type of fish cultured						
Ornamental fish	28 (62.2)	28 (62.2)	15 (33.3)	24 (53.3)	10 (22.2)	105 (46.7)
Food fish	11 (24.4)	11 (24.4)	12 (26.7)	13 (28.9)	15 (33.3)	62 (27.6)
Both	6 (13.3)	6 (13.3)	18 (40)	8 (17.8)	20 (44.4)	58 (25.8)
Land area owned (in cents)						
0 - 10	4 (8.9)	3 (6.7)	0 (0)	5 (11.1)	9 (20)	21 (9.3)
10 - 20	26 (57.8)	22 (48.9)	6 (13.3)	23 (51.1)	18 (40)	95 (42.2)
20 - 30	11 (24.4)	6 (13.3)	3 (6.7)	9 (20)	5 (11.1)	34 (15.1)
30 - 40	3 (6.7)	1 (2.2)	6 (13.3)	4 (8.9)	1 (2.2)	15 (6.7)
> 40	1 (2.2)	13 (28.9)	30 (66.7)	4 (8.9)	12 (26.7)	60 (26.7)
Type of ownership of land area						
Lease	5 (11.1)	5 (11.1)	0 (0)	4 (8.9)	1 (2.2)	15 (6.7)
Own	40 (88.9)	40 (88.9)	45 (100)	41 (91.1)	44 (97.7)	210 (93.3)
Aquaculture experience (in years)						
Two	24 (53.3)	24 (53.3)	10 (22.2)	23 (51.1)	12 (26.7)	93 (41.3)
Three	9 (20)	9 (20)	5 (11.1)	5 (11.1)	17 (37.8)	45 (20)
Four	6 (13.3)	6 (13.3)	0 (0)	7 (15.6)	7 (15.6)	26 (11.6)
>Four	6 (13.3)	6 (13.3)	30 (66.7)	10 (22.2)	9 (20)	61 (27.1)
Type of fish farming practiced						
Monoculture	2 (4.4)	2 (4.4)	5 (11.1)	2 (4.4)	33 (73.3)	44 (19.6)
Poly culture	41 (91.1)	41 (91.1)	40 (88.9)	41 (91.1)	11 (24.4)	174 (77.3)
Both	2 (4.4)	2 (4.4)	0 (0)	2 (4.4)	1 (2.2)	7 (3.1)
Number of workers employed						
Zero	30 (66.7)	30 (66.7)	5 (11.1)	28 (62.2)	19 (42.2)	112 (49.8)
One	1 (2.2)	1 (2.2)	2 (4.4)	1 (2.2)	8 (17.8)	16 (5.8)
Two	7 (15.6)	7 (15.6)	9 (20)	8 (17.8)	7 (15.6)	38 (16.9)
Three	7 (15.6)	7 (15.6)	4 (8.9)	8 (17.8)	8 (17.8)	34 (15.1)
Four	0 (0)	0 (0)	7 (15.6)	0 (0)	0 (0)	7 (3.1)
Five	0 (0)	0 (0)	18 (40)	0 (0)	0 (0)	18 (8)
Way of utilisation of yield						
Sold	25 (55.6)	25 (55.6)	18 (40)	19 (42.2)	11 (24.4)	98 (43.6)
Sold and own use	20 (44.4)	20 (44.4)	27 (60)	26 (57.8)	34 (75.6)	127 (56.4)
Way of marketing produce						
Word of mouth	20 (44.4)	17 (37.8)	27 (60)	13 (28.9)	9 (20)	88 (38.2)
Sign boards	17 (37.8)	17 (37.8)	11 (24.4)	19 (42.2)	24 (53.3)	86 (39.1)
Advertisements	2 (4.4)	3 (6.7)	2 (4.4)	3 (6.7)	3 (6.7)	13 (5.8)
Coordinators	6 (13.3)	8 (17.8)	5 (11.1)	8 (20)	9 (20)	38 (16)

(Corresponding percentages are indicated in parenthesis)

Around 47 per cent and 28 per cent respectively were doing ornamental and fish culture and 26 per cent were engaged in both. Most farmers (42%) owned 10-20 cents and only 27 per cent owned >40 cents. 9.3 per cent owned up to 10 cents and 7 per cent owned 30-40 cents, which showed that farmers were not engaged in intensive fish culture. A total of 93 per cent of farmers owned land area and remaining leased ponds for aquaculture, similar to a report by Ali *et al*., (2008 & 2010) in Bangladesh. Forty one per cent had 2 years of experience in aquaculture whereas 27 per cent had more than 4 years, 20 per cent had 3 years and 11.6 per cent had 4 years. A total of 77 per cent were doing polyculture as it was less expensive as given by Ahmed *et al*., (2010) in Bangladesh. Only 20 per cent were doing monoculture and 3 per cent were doing both. A total of 50 per cent were not employing workers and only 8 per cent employed maximum workers, which showed lack of intensive culture. Those having large pond area were employing 4 to 5 workers, which increased their income (Boserup, 1993). A total of 56 per cent used and sold their yield simultaneously and so they restricted need for marketing information as declared by Molnar and Hanson (1996). Remaining farmers entirely sold their product by keeping signboards near to their ponds/home, a bulk of 39 per cent marketed their produce, while 38 per cent marketed through word of mouth, 6 per cent advertised their venture in social gatherings like festivals and 16 per cent were helped by coordinators. Initial capital for starting aquaculture was more than Rs.20,000 for all farmers and they were learning practices from progressive farmers.

Table 3: Important farmer oriented activities benefitting individual farmers

*FOA	Kollam	Alappuzha	Kottayam	Ernakulam	Thrissur	Kerala	Awareness score	**Awareness
*A	45 (100)	45(100)	45 (100)	45 (100)	45 (100)	225 (100)	225	H
*B	36(80)	37(82.2)	45 (100)	40 (88.9)	39 (86.7)	197(87.6)	197	H
*C	28 (62.2)	28(62.2)	45 (100)	27 (60)	39 (86.7)	167 (74.2)	167	M
*D	21 (46.7)	21(46.7)	45 (100)	27 (60)	40 (88.9)	154 (68.4)	154	M
*E	10 (22.2)	10(22.2)	45 (100)	45 (100)	40 (88.9)	150 (66.7)	150	M
*F	6(13.3)	6(13.3)	45 (100)	45 (100)	42 (93.3)	144 (64)	144	M
*G	3(6.7)	5 (11.1)	11 (24.4)	35 (77.8)	40 (88.9)	94 (41.8)	94	L
*H	4 (8.9)	4 (8.9)	6 (13.3)	40 (88.9)	31 (68.9)	85 (37.8)	85	L
*I	1 (2.2)	0 (0)	0 (0)	3 (6.7)	2 (4.4)	6 (2.7)	6	VL
*J	0 (0)	0 (0)	0 (0)	1 (2.2)	4 (8.9)	5 (2.2)	5	VL

(Percentages are indicated in parenthesis) ***** FOA- Farmer oriented activities, *A-Training, B- Farmer to farmer technology dissemination at demonstration plot, C- Exposure visit, D- Farmer Interest Group, E- Farmer Scientist interaction, F- District level training institution, G- Farm school, H- Agriclinics, I- Awards are given to best farmer at state level and J- SREP, ****** Awareness - Awareness on FOA (based on score range: 5-60 – Very Low awareness (VL), 60-115 - Low awareness (L), 115-170 - Medium awareness (M), 170-225 - Highly aware (H)

All farmers were aware of training organised for them but they were least aware of SREP and awards given to the best farmer at state level. Extrinsic motivation in the form of rewards and incentives should be awarded to farmers so that they would work hard to get more yields, to get such rewards as asserted by Tilman *et al*., (2002). Although provisions existed under innovative activities in ATMA, to give awards to best performing ATMA district, to the best organised group, and to the best farmer at block level, this was not currently practiced, and if such award could be given to deserving farmers, it could serve as a motivational factor to other farmers.

Table 4: Perceived changes gained by farmers from ATMA (n=225)

Changes gained	*Strongly Disagree*	*Disagree*	*Agree*	*Strongly Agree*	*Total score*	*Rank*	** Changes gained (based on score range)*
Knowledge on BMPs	3 (1.3)	1 (0.4)	99 (44)	122 (54.2)	790	1	High
Skill development	5 (2.2)	2 (0.89)	122 (54.2)	96 (42.7)	759	2	High
Knowledge on improved farming practices	7 (3.1)	8 (3.6)	111 (49.3)	99 (44)	752	3	High
Support based on farming needs	15 (6.7)	7 (3.1)	112 (49.8)	91 (40.4)	729	4	High
Increased income	19 (8.4)	4 (1.8)	144 (64)	58 (25.8)	691	5	Medium
Increased financial support	32 (14.2)	13 (6.7)	117 (52)	61 (27.1)	653	6	Medium
Marketing support	98 (43.6)	75(33.3)	33(14.7)	19(8.4)	423	7	Very Low

(Percentages are indicated in parenthesis)
* Score range: 423-515- Very Low, 516-608 – Low, 608-700- Medium, 700-792 – High

The foremost change perceived by farmers through ATMA was knowledge on best management practices, improved farming practices and skill development. They expected more marketing support from officials as it ranked least (rank 7). Adequate knowledge on BMPs could lead to better yield and improved income. ATMA should organise training programmes on BMPs in association with each district DoF, led by an aquaculture expert. As knowledge on BMP could be increased through information dissemination as affirmed by Rahelizatovo *et al*., (2004), dissemination through leaflet, exhibition and internet was to be promoted. Awareness programme should be organised for farmers by SAMETI, ATMA and state DoF on skill development activities like measuring water and soil quality parameters, breeding, feed manufacturing, net making and mending, as skill development and training, could increase understanding of formal research among farmers as opined by Martin and Sherington (1997). Training programmes should be organised by ATMA in coordination with state DoF for women/men SHGs and women/men fish farmer groups in making value added fish products like fish fingers, fish burgers and fish pickles. Concentrating on developing inherent skills in the farmers would increase confidence and improve income. Applying improved farming practices like administering supplementary feeds in a specified ratio, polyculture practices using compatible species in a ratio specified by aquaculture experts and using genetically modified crop varieties that claimed high growth rate could lead to better production and income, as mentioned by Yu *et al.,* (2011) in China. So extension agents, coordinators and BTMs should focus on extending improved farming practices to fish farmers based on different pond characteristics like size of the pond, type of culture, fish species cultured and financial sustainability. A total of 16 per cent farmers opined that ATMA did not provide sufficient marketing support and, this may be because, women and farmers engaged in small scale ornamental fish culture in homestead ponds and glass tanks reported that ATMA did not contribute to increase income. This perception could be changed by advising the farmers to mobilise and organise fish farmer groups and thereby identifying marketing channels. Around 30 per cent of farmers opined that financial support is not provided according to the necessity to the deserved fish farmers. So a survey of resource poor fish farmers should be done through participatory methods while formulating BAP. Financial

support is to be given to the identified farmers to start aquaculture activities to increase their income and food security. Technology specific financing programs and micro financing efforts could be promoted as revealed by Fisher (2006). Farmers are to be made into groups to get more funds as funds are more for farmers groups. Farmers are not aware of forming groups to get more benefits and such farmers are to be educated by BTM on benefits of joining such groups. Brown (2002) added on Farmers' markets by saying that it could create secondary employment opportunities by supporting farming. If fish farmers were provided adequate support based on their farming requirements it could lead to increase production and income. Around 20 per cent of farmers did not agree with ATMA support based on farming needs, primarily because they perceived that officials seemed to be not interested in identifying their needs. So farmers should be motivated to approach resource persons and such visiting farmers should be identified as potential fish farmers for attending ATMA training programme, demonstration and exposure visit. Stoop *et al*., (2002) suggested that production systems were to be developed, keeping in mind location specific production constraints, faced by farmers.

4. Conclusion

ATMA provided support to aquaculture farmers through training, demonstration, exposure visit, farmer scientist interaction, farm schools, rewards and incentives, agriclinics, district level training institutions, farmer interest groups and farm information dissemination activities. It was observed that aquaculture farmers in the study area were in need of marketing and financial support and they gained considerable change with respect to knowledge on Best Management Practices through ATMA. Therefore, farmers should be made aware of adequate marketing channels. Ongoing as well as past studies conducted on different marketing channels and opportunities by researchers should be brought to the attention of farmers. The officials should timely intimate the farmers on different financial provisions they could avail through extension agents.

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