

# Strengthening Linkage System in Aquaculture

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**Abstract:** The study was fulfilled in five districts which had the highest inland fish farmer population in Kerala. Primary data was collected from 165 staff of Department of Fisheries (DoF) and 80 Management Committee (MC) members of Agricultural Technology Management Agency (ATMA) that provided extension support to farmers. Garrette ranking, indexing and weighted scoring method was used for assessing the existing linkages. Through Garrette ranking method, it was observed that inter departmental linkages ranked first, followed by, research extension linkages, linkages with farmers organizations, GO-NGO linkages and Public Private linkages. The average DoF staff linkage proficiency was calculated to be 1.24 (out of 5). Weighted scoring for level of agreement of MC members' for various MC functions were carried out to rank the functions so as to perceive the significance of linkage. Finally, policy suggestions were proposed, for improving the existing linkage systems in aquaculture.

**Keywords:** Perception, Aquaculture, Linkage proficiency, Index, Agricultural Technology Management Agency

## 1. Introduction

Around 520 million people worldwide, 98 per cent of whom in developing countries thrived on fisheries and aquaculture for their livelihood (World Bank and FAO, 2009). Due to overfishing, the rate of capture production had become relatively stable over the past decade (20 MT in 1950 has reached 90 MT in 2010), while culture (18 MT in 1950 has scored up to 150 MT in 2010) was showing an increasing trend (Pauly, 2009). Thus, with languishing capture production, expectation on culture production was increasing, in order to meet growing demands of the human population (Rana *et al.*, 2009). According to the appraisal done by the Food and Agriculture Organisation of the United Nations, in order to feed the world in 2050, agricultural output, arising from crops, livestock, fisheries and aquaculture, must increase by over 60 per cent (FAO, 2014a). India is blessed with diverse resources and more than 10 per cent of global biodiversity in terms of fish and shellfish species (NFDB, 2007). Aquaculture production in India is mounting at an increasing rate compared to that of capture with a production of 4.2 MT in 2012, from a mere production of 0.2 MT in 1950 (FAO, 2014b). India ranks second in farmed fish production after China (DAHD, 2012). Kerala state in India witnessed 149.1 MT of inland fish production with a growth rate of 6.47 per cent and 530.6 MT of marine fish production with a negative growth rate of 4.07 per cent during 2012-13 (DAHD, 2013). Presently aquaculture bears the distinction of being one of the fastest growing food production sectors in the state (Harikumar and Rajendran, 2007).

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, which later was expanded to 252 districts/UTs all over India during the X five year plan (Planning Commission, 2007). Through ATMA, the officials in agriculture and allied departments in association with the Department of Fisheries (DoF) staff started encouraging aquaculture. There were no perfect linkages within the aquaculture extension system because of inadequacies in departmental staff, fund allocation *etc.* ATMA had opened up opportunities to integrate extension approaches and strategies emerging in aquaculture. In this background, a study was conducted among the staff of Department of Fisheries (DoF) and ATMA Management Committee (MC) members to assess the existing linkage systems in aquaculture. Linkage was important as technology transfer components like research, extension, client and input system (Jaiswal and Arya, 1981; Sen, 1984; and Kishore, 1986) could not function in isolation as suggested by Singh *et al.* (1975) and Rao (1972).

## 2. Materials and Methods

Primary data was collected through administering schedule among DoF staff and ATMA MC officials in five districts, which had the highest inland fish farmer population, namely Kollam, Alappuzha, Kottayam, Ernakulam and Thrissur (DoF, 2010). A total of 33 staff of Department of Fisheries (DoF) and 16 ATMA Management Committee (MC) members were selected from each district, thus, making the total sample size to 245.

Brief description and measurement of variables selected for respondents was presented in Table 1.

**Table 1:** Brief description and measurements of variables selected for DoF staff

| Variables             | Description                                        | Measurement (scores/codes are indicated in parentheses)                                         | Justification                                                  |
|-----------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Linkage perception of | Perception of DoF staff on different linkages like | Score: Each linkage score (1): interdepartmental linkages (1); research extension linkages (1): | The relative importance of each information linkage type could |

|                                       |                                                                                                                        |                                                                                                                                                                                                                                                             |                                                                                                                                                                              |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DoF staff                             | interdepartmental linkages, research extension linkages, linkage with farmer organizations and public private linkages | linkage with farmer organisations (1) and public private linkages (1): GO NGO linkages (1). Further the level of satisfaction for each linkage was scored as - Highly Satisfactory (4): Satisfactory (3): Not Satisfactory (2): Not at all Satisfactory (1) | not be differentiated and so an equal score of 1 was given for it. Those linkages which resulted in higher satisfaction level were given higher score                        |
| DoF staffs' linkage proficiency index | The proficiency of DoF staff for establishing linkages                                                                 | Score: Each proficiency factor score ranged between 0 and 1. Elaborated in Table 4                                                                                                                                                                          | Those factors which were used more regularly, perceived to be more relevant, perceived to be more satisfactory and perceived to be highly agreeable was given a higher score |

## 2.1 Linkage Proficiency

The linkage proficiency of the DoF staff was checked by asking several questions (through a schedule) like their perception on the level of satisfaction with respect to linkages existing in between allied departments, Research - Extension linkages, Public Private linkages, linkages with farmers organisations and GO-NGO linkages. The statements for testing linkage proficiency of DoF staff, its response categorisation and the respective scores for each statement response are indicated in Table 2. The maximum score obtained for each statement is 1 and the minimum score is 0. As there are a total of 5 statements under linkage proficiency, the total obtainable score for the same should be 5 and minimum score should be 0.

**Table 2:** Questions asked for testing the linkage proficiency of DoF staff

| S. No. | Questions                               | Response categorisation | Score |
|--------|-----------------------------------------|-------------------------|-------|
| 1      | What is your perception on the level of | Satisfactory            | 1     |

|   |                                                                                                          |                  |     |
|---|----------------------------------------------------------------------------------------------------------|------------------|-----|
|   | satisfaction with respect to linkages existing in between allied departments?                            | No opinion       | 0.5 |
|   |                                                                                                          | Not Satisfactory | 0   |
| 2 | What is your perception on the level of satisfaction with respect to research extension linkages?        | Satisfactory     | 1   |
|   |                                                                                                          | No opinion       | 0.5 |
|   |                                                                                                          | Not Satisfactory | 0   |
| 3 | What is your perception on the level of satisfaction with respect to Public-Private linkages?            | Yes              | 1   |
|   |                                                                                                          | Sometimes        | 0.5 |
|   |                                                                                                          | No               | 0   |
| 4 | What is your perception on the level of satisfaction with respect to linkages with farmers organisation? | Nothing          | 0   |
|   |                                                                                                          | * A              | 0.5 |
|   |                                                                                                          | All              | 1   |
| 5 | What is your perception on the level of satisfaction with respect to GO-NGO linkages?                    | Yes              | 1   |
|   |                                                                                                          | Sometimes        | 0.5 |
|   |                                                                                                          | No               | 0   |

\*A- Improved culture practices/ Stocking density/ Management practices/ tackling disease outbreak

## 3. Results and Discussion

The linkage perception of DoF staff in all districts was ranked using Garrette method and presented in Table 3.

**Table 3:** Linkage perception of DoF staff

| Linkages            | Kollam (n <sub>1</sub> =33) | Alappuzha (n <sub>2</sub> =33) | Kottayam (n <sub>3</sub> =33) | Ernakulam (n <sub>4</sub> =33) | Thrissur (n <sub>5</sub> =33) | Average (n=165) |
|---------------------|-----------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|-----------------|
| Inter departmental  | 97.2 (1)                    | 96.92 (1)                      | 96.97 (1)                     | 96.65 (1)                      | 96.97 (1)                     | 19.39 (1)       |
| Research Extension  | 96.96 (2)                   | 96.65 (2)                      | 96.56 (2)                     | 96.51 (2)                      | 96.65 (3)                     | 19.33 (2)       |
| Farmer organisation | 96.5 (4)                    | 96.51 (3)                      | 96.51 (3)                     | 96.37 (4)                      | 96.74 (2)                     | 19.31 (3)       |
| GO NGO              | 96.74 (3)                   | 96.42 (4)                      | 96.28 (4)                     | 96.51 (3)                      | 96.51 (4)                     | 19.29 (4)       |
| Public Private      | 96.42 (5)                   | 96.19 (5)                      | 96.19 (5)                     | 96.09 (5)                      | 96.28 (5)                     | 19.25 (5)       |

(Ranks are indicated in parenthesis)

DoF staff ranked linkages among the departments to be the first, followed by Research Extension linkages, linkages with Farmers Organisations, GO-NGO linkages and Public Private linkages. An embodiment of DoF staffs' linkage proficiency index could be viewed in Table 4.

**Table 4:** DoF staffs' linkage proficiency index

| Districts                      | Linkage proficiency index (out of 5) | Percentage |
|--------------------------------|--------------------------------------|------------|
| Kollam (n <sub>1</sub> =33)    | 1.19                                 | 23.75      |
| Alappuzha (n <sub>2</sub> =33) | 1.20                                 | 24.09      |
| Kottayam (n <sub>3</sub> =33)  | 1.22                                 | 24.41      |
| Ernakulam (n <sub>4</sub> =33) | 1.19                                 | 23.92      |
| Thrissur (n <sub>5</sub> =33)  | 1.39                                 | 27.97      |
| Average (n=165)                | 1.24                                 | 24.83      |

The average proficiency in linkage was 1.24 in the study area. The highest linkage proficiency (index of 1.39) was observed with DoF staff in Thrissur district. and lowest (1.19) in Kollam and Ernakulam districts. Weighted scoring for level of agreement of MC members' for MC functions were carried out to rank the functions which was presented in Table 5.

**Table 5:** Level of agreement by MC members on MC functions (n=80)

| Functions | No opinion | Don't know | Not at all agree | Dis-agree | Agree | Strongly agree | Total score | Rank |
|-----------|------------|------------|------------------|-----------|-------|----------------|-------------|------|
| *1        | n          | 0          | 0                | 0         | 0     | 21             | 59          | 379  |
|           | %          | 0          | 0                | 0         | 0     | 26.3           | 73.8        | -    |
| *2        | n          | 0          | 0                | 0         | 0     | 25             | 55          | 375  |
|           | %          | 0          | 0                | 0         | 0     | 31.3           | 68.8        | -    |
| *3        | n          | 0          | 0                | 0         | 0     | 28             | 52          | 372  |
|           | %          | 0          | 0                | 0         | 0     | 35             | 65          | -    |
| *4        | n          | 0          | 0                | 0         | 0     | 30             | 50          | 370  |
|           | %          | 0          | 0                | 0         | 0     | 37.5           | 62.5        | -    |
| *5        | n          | 0          | 1                | 0         | 0     | 26             | 53          | 369  |
|           | %          | 0          | 1.3              | 0         | 0     | 32.5           | 66.3        | -    |
| *6        | n          | 0          | 0                | 0         | 0     | 33             | 47          | 367  |
|           | %          | 0          | 0                | 0         | 0     | 41.3           | 58.8        | -    |
| *7        | n          | 1          | 0                | 2         | 2     | 21             | 54          | 363  |
|           | %          | 1.3        | 0                | 2.5       | 2.5   | 26.3           | 67.5        | -    |
| *8        | n          | 4          | 0                | 0         | 0     | 32             | 44          | 360  |
|           | %          | 5          | 0                | 0         | 0     | 40             | 55          | -    |
| *9        | n          | 0          | 0                | 5         | 0     | 26             | 49          | 354  |
|           | %          | 0          | 0                | 6.3       | 0     | 32.5           | 61.3        | -    |

\*1. Prepared annual work plans that would be submitted to the ATMA GB; \*2. Carried out PRA to identify the problems and constraints; \*3. Initiated action on policy direction and investment decisions received from the GB; \*4. Prepared Block Action Plans that would be submitted to ATMA GB; \*5. Prepared SREP for the district; \*6. Provided annual performance reports to the GB, \*7. Coordinated the execution of annual work plans through line departments, ZRSs, KVKs, NGOs, FIGs /FOs, allied institutions and private sector firms, \*8. Established FIAC, \*9. Maintained project accounts for submission to technology dissemination unit for audit.

‘Preparing annual work plans for submission to the ATMA GB’ was the primary function recognised by MC members

while the lowest rank (rank 9) was obtained for ‘maintaining project accounts for submission to technology dissemination unit for audit’. ‘Forming FIAC’ was ranked low (rank 8) by MC members. The functions like ‘Initiating actions on directions and decisions received from GB’ and ‘providing performance reports to GB’ is ranked low (ranks 3 and 6 respectively). The low ranking of these two functions was significant in the context of the constraint ‘delay in decisions carried out in GB meeting’ expressed by GB and MC members.

The activities, constraints related to the activity and most likely solution to overcome the constraint, for ATMA, was explained under ‘Linkage’ in Table 6.

**Table 6:** Constraints observed and solutions proposed under ‘Linkage’ for ATMA

| Category                      | Activity                                                                                                                                                         | Constraint                                                                                                       | Solution                                                                                                                                                                                                                                                                                             |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Linkage types                 | Different types of linkages like interdepartmental linkages, Research extension linkages, GO NGO linkages, Public Private linkages and linkages with FOs existed | Linkages with public private organisations, GO NGO linkages and linkages with input providers were not so active | Should encourage more participation from public, private, para technicians, input providers and NGO counterparts for effective results. Input/seed suppliers and marketing agents could be invited to different meetings and training programmes to share their experiences with aquaculture farmers |
| Contact with resource persons | Had adequate contact                                                                                                                                             | The farmers were not engaged in much farmer scientist interactions                                               | They should concentrate more on engaging farmers in more farmer scientist interactions                                                                                                                                                                                                               |
| KVK and ZRS                   | There was proper linkage with Krishi Vigyan Kendra (KVK) and Zonal Research Station (ZRS)                                                                        | KVKs were observed to be oriented towards agricultural practices rather than aquaculture                         | DoF should take initiatives towards OFT in aquaculture in KVK and they could appoint SMS in aquaculture                                                                                                                                                                                              |

#### 4. Policy Suggestions

1. Agricultural universities and state departments should coordinate their efforts to develop technology useful for farming community as reported by National Commission on Agriculture (1976). Since Havelock *et al.* (1969) stated that linkages could be connected to dissemination and utilisation of knowledge, DoF staff should encourage partnership with private entities and NGOs (Martin and Sherington, 1997; Laowdermilk, 1985) for extension initiatives as staff support at block level was less. BTM, extension agent and coordinator should involve themselves in identifying fish farmers in a block so as to mobilise them to form fish farmers’ organisation. They should prevent interdepartmental conflicts which would hamper flow of service to fish farmers. Staff should encourage research extension linkages as it could make technologies accessible to farmers as studied by (Wuyts, 1996; Kaur & Kaur, 2013).
2. The linkage proficiency of the DoF staff should be effectively increased as it could ease exchange of information, skill, knowledge and resources (Dimelu and Anyanwu, 2008) by making SAMETI trainings mandatory for all middle level extension functionaries. Such training should be given to all middle level extension functionaries especially in Kollam and Ernakulam district having the lowest linkage proficiency of 1.19.
3. As aquaculture development was limited by non existence of integrated development planning framework (Bozoglu *et al.*, 2006), preparation of annual work plans was important. Though preparing work plans was the chief function identified by MC members, the function of

- ‘coordinating the execution of work plans through various entities involved’ was ranked (rank 7) to the rear. This required proper linkage between DoF and various line departments.
4. The FIAC constituted by line department officials and farmers, for its formation, thus required effective participation from the side of line department officials and farmers for its smooth functioning. Participation from the side of line department officials was possible through proper interdepartmental linkages which could occur only through proper communication efforts and less egoistic behaviour.
5. Participation of farmers is possible only through their awareness on role of such committees that could serve as a podium to prioritise and voice their needs. The middle level extension functionaries who received training from State Agriculture Management and Extension Training Institute (SAMETI) could deliver the existence and purpose of such committees to farmers to increase farmers’ awareness on the subject.
6. Hence, the directions and decisions received from ATMA Governing Board (GB) were to be promptly carried out by MC. MC has to prepare performance reports which should consist of properly sequenced actions, both ongoing and implemented and should submit timely report to ATM GB.
7. DoF staff should encourage partnership with private entities and NGOs for extension initiatives as staff support at block level is less. BTM, extension agent and coordinator should involve themselves in identifying fish farmers in a block so as to mobilise them to form fish farmers’ organization

8. Proper linkage should be established between BDOs and agriculture and allied departments to ensure support to farmers through advisory services, training and financial support as said by Sivanna (1988).

## 5. Conclusion

A study was conducted among 165 staff of Department of Fisheries (DoF) and 80 ATMA Management Committee (MC) members in five districts of Kerala, India, to assess the existing linkage systems in aquaculture. The linkage perception of DoF staff was ranked using Garrette method to observe that interdepartmental linkages ranked first followed by research extension linkages, linkages with farmers organisations, GO-NGO linkages and Public Private linkages. The average DoF staffs' linkage proficiency index was 1.24. The highest linkage proficiency was observed with DoF staff in Thrissur district with an index of 1.39 and the lowest in Kollam and Ernakulam districts, with an index of 1.19 each. Weighted scoring for level of agreement of ATMA MC members' for different MC functions were carried out to rank the functions, so as to arrive at the importance of linkage necessary for the smooth functioning. 'Preparing annual work plans for submission to the ATMA GB' was the primary function recognised by MC members while the lowest rank (rank 9) was obtained for 'maintaining project accounts for submission to technology dissemination unit for audit'. Functions like 'initiating actions on directions and decisions received from GB' and 'providing performance reports to GB' was ranked low (ranks 3 and 6 respectively). The functions which ranked low, in order to improve its position, need to have a proper linkage between DoF and various line departments. The activities, constraints and most likely solution to overcome the particular constraint, for ATMA, were explained and policy suggestions were proposed for improving the existing linkage system.

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