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Survey of Farmer Awareness Towards Rice-Fish Farming Systems in the Indian Villages

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Abstract
A survey under the theme of Science and Technology Ecosystem and Ecosystem services was conducted to identify the awareness towards the rice-fish farming system.

A rice growing village in the Goradih block Bhagalpur district (Bihar, India) was selected for the survey of farmer awareness towards rice-fish farming systems in the Indian village. During the survey (2018-2019), it was observed that whenever water is stagnated within boundaries for rice growing, fish which naturally occur in the irrigation water and water tanks enter the paddy fields and grow there until harvest along with the rice. This happens naturally and none of the farmers in this region were aware of this, nor do they take interest in harvesting fish. The data concluded that the farmers mostly rice as monoculture (93.3%) and use "unconventional" along with some chemical pesticide (53.3%), which causes negative effect on fingerlings. Rice monoculture alone cannot provide a sustainable food supply while rice-fish farming is more "efficient" in terms of cost effective utilisation, productivity and food supply. However, a number of significant challenges exist for the adaptation of rice-fish farming, particularly the lack of technical knowledge of farmers. Thus it is necessary to provide technical support and training facilities for sustainable rice farming.

Attempts were made to explore the potential of organic rice-fish farming from seasonally waterlogged areas for the overall improvement of water and to draw the attention of strong government support to it in the form of subsidies and research. In this method of farming no pesticides, fungicides or any sort of chemicals are used. Rice fish farming is a duo culture farming system in which rice is the sole enterprise and fish are taken to initiate extra additional income in the form of animal protein.

Keywords: Rice-fish farming awareness, Goradih, sustainability, conventional farming methods, non-conventional farming methods.

Introduction

Rice-fish duo culture farming system is a popular practice in many countries worldwide, particularly in Asia (Pullin 1989; Halwart M. 2003). The potential of rice-fish farming for combating poverty and malnutrition has been globally recognized (Ruddle K.1982; Das and Saikia 2007). India is an agriculture based developed country where rice is taken as staple food and culturing fish along with rice gives extra income in the form of animal protein. The future development of the country is very much related to the agricultural sector. Fisheries as the major sub sectors play a significant role in terms of nutrition, employment, foreign exchange earnings and more importantly, socio- economic stability in rural areas. India is the land of water with several rivers and the country is very rich in natural water resources in the form of reservoirs, ditches, lakes, ponds, flood plains and large areas of rice fields. The rice-fish farming culture involves the simultaneous production of fish in irrigated rice fields so as to obtain added production of fish along with the rice. The production of fish in the rice field is almost as old as the practice of rice farming itself. Rearing fish along with rice is an older farming practice adopted in India. Thus fish grown in rice fields will be an ideal use of land and would also be an easy source of cheap and fresh animal proteins. Rice is grown in 37 districts of Bihar, in which Bhagalpur comes under the category of low productivity group despite having large cultivated land area, thus fish can greatly contribute to the social economic welfare of rural populations. An added advantage is that unlike marine fish or other animal proteins, the fish cause no transportation cost problem as it can be sold in the local market and would be fresher and healthier.

Traditionally, wild fish have been harvested from the rice field as many fish species prefer rice fields for reproduction. The natural aggregation of fish in rice fields inspired the combination of rice-fish farming to increase productivity. Many reports suggest that integrated rice-fish farming is ecologically sound because fish improve soil fertility by increasing availability of nitrogen and phosphorus (Giap etal 2005, Dugan etal 2006). Furthermore, feeding behaviour of fish in rice fields causes aeration of water. Fish play a significant role in controlling aquatic weeds and algae that would otherwise act as a host for pests and compete with rice for nutrients. Moreover, fish eat flies, snails and insects and help to control waterborne diseases. Rice fields provide fish with planktonic and benthic food. Shading by rice plants also maintains the water temperature favourable to fish during summer. The aim of the study was to assess the awareness among farmers about rice-fish farming methods.

To assess farmers' awareness towards unconventional rice-fish farming system, the following objectives were identified during the survey

1. To identify the profile characteristic of farmers using unconventional methods of rice farming.
2. To study the existing knowledge level of farmers regarding different farming practices.
3. To study the existing knowledge level of farmers regarding rice-fish farming.
4. To elicit the problem and suggestion in unconventional farming systems and strategies to promote organic farming.

Survey methodology

The survey was delivered through a questionnaire in the rice growing areas of the Goradih block, Bhagalpur (Bihar, India Fig 1). During the survey, it was observed that most of the rice fields were flooded with rain water where small fingerlings were observed naturally during the rainy season where rice seedlings were transplanted.

2.1 To study the profile characteristic of farmers using unconventional methods of rice farming.

2.1.1 Age: The respondents were categorised into three groups: young, middle and old. The maximum and minimum age range were 24-35, 36-45 and 46-55, respectively.

2.1.2 Education level of the respondents: The respondents were classified into 7 categories as follows:
1. Illiterate
2. Can read and write
3. Primary school level education
4. High school level education
5. Higher secondary level education
6. Undergraduate level education
7. Graduate level education

2.1.3 Farm size:
The respondents were grouped under four categories namely
1. Marginal (below 1 hectare)
2. Small (1-2 hectares)
3. Medium (2-4 hectare)
4. Large (4 hectares and above)

2.1.4 Farming experience: The respondents had all been farming for a number of years. The minimum and maximum years of farming were 6 and 30, respectively. The respondents were grouped into three categories on the basis of farming experience as follows:
1. Less farming experience (5-10yrs)
2. Medium farming experience (10-15yrs)
3. High farming experience (15-30yrs)

2.2 To study the knowledge level of farmers towards different farming practices:

Respondents were asked the method of farming techniques used during rice cultivation. Their responses were categorised as follows:
1. Conventional farming (chemical fertilizer and pesticides used along with organic manure)
2. Unconventional farming (without chemical used)
3. Conventional and unconventional farming

2.3 To study the knowledge level of farmers towards rice-fish farming:

The respondents were asked about rice-fish farming practices and their interest in the duo farming culture system were categorised as follows:
1. Only rice as monoculture
2. Rice and fish as duo farming culture
3. Rice in one season and fish in another season / rice and fish taken as alternate crop

2.4 To elicit the problem and suggestion in a nonconventional farming system and strategies to promote organic farming:

The problems faced by farmers in using unconventional farming were recorded. Respondents were also requested to give their suggestions in order to improve their existing knowledge and adoption of chemical-free organic farming in order to promote the natural balance of the ecosystem.

Observations: Survey data is based on total no. of respondents N=30

Table1. Age of respondents:

Sl.No.	Category	Class Interval (yrs	Frequenc	Percentage %
1.	Young age farmer	25- 35 yrs	3	10
2.	Middle age farmer	36-45yrs	12	40
3.	Old age farmer	46-55yrs	15	50

Graph1. Distribution of respondents according to their age

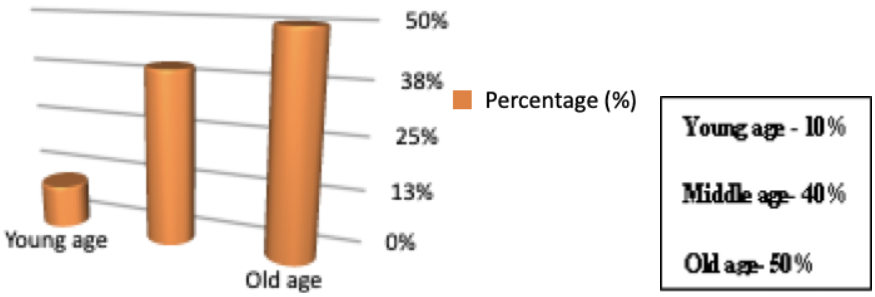
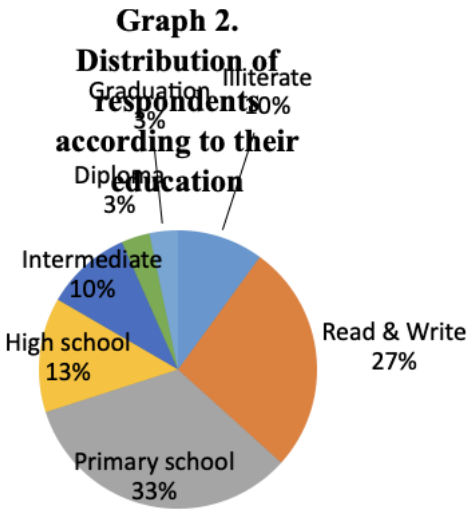


Table 2. Education level of respondents:

Sl.No.	Category	Frequency	Percentage %
1.	Illiterate	3	10
2.	Can read and write	8	26.6
3.	Primary school education level	10	33.3
4.	High school education level	4	13.3
5.	Higher secondary level of education	3	10
6.	Diploma education level	1	3.3
7.	Graduate education level	1	3.3



Graph 2. Distribution of respondents according to their education

Table 3. Farm size of respondents:

Sl.No.	Category	Frequency	Percentage %
1.	Marginal farmer	8	26
2.	Small farmer	12	40
3.	Medium farmer	7	23.3
4.	Large farmer	3	10

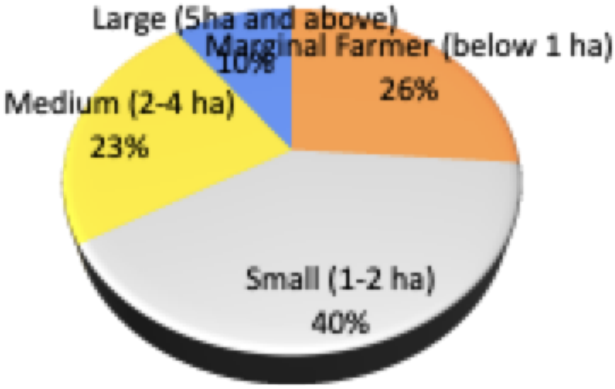
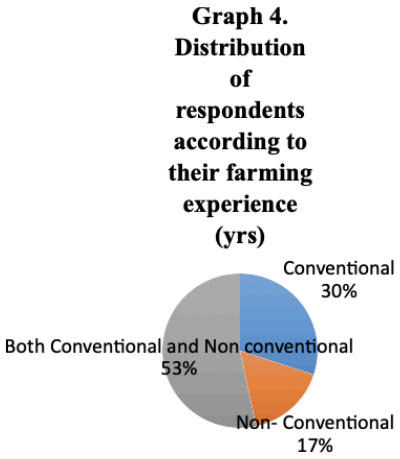


Table 4. Farming experience of respondents:

Sl.No.	Category	Class interval	Frequency	Percentage %
1.	Low farming experience	5-10 yrs	10	33.3
2.	Medium farming experience	10-15 yrs	16	53.3
3.	High farming experience	15-25 yrs	4	13.3

Table 5. Distribution of farmers based on the level of knowledge:

Sl.No.	Category	Frequency	Percentage %
1.	Conventional farming	9	30
2.	Unconventional farming	5	16.6
3.	Both	16	53.3



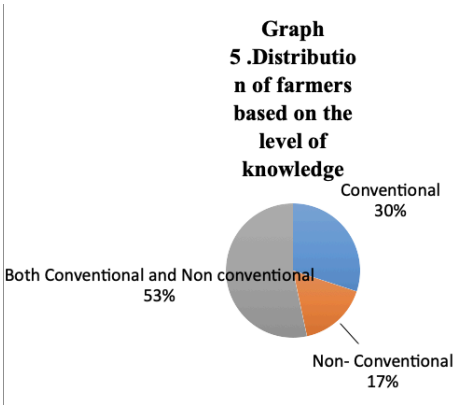
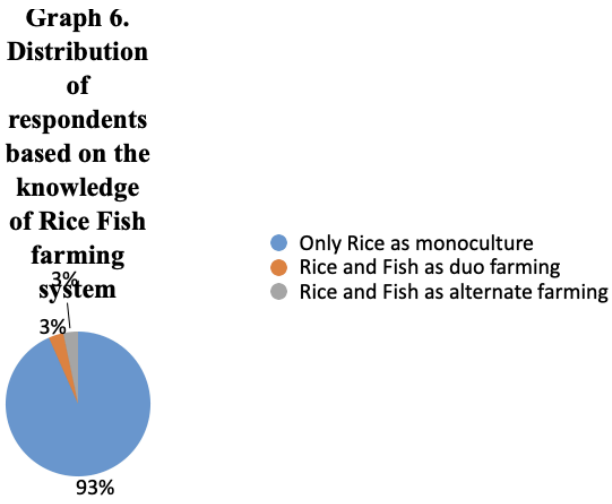


Table 6. Knowledge level of respondents regarding rice-fish duo culture:

Sl.No.	Category	Frequency	Percentage %
1.	Rice as monoculture	28	93.3
2.	rice-fish duo culture	1	3.3
3.	Rice and fish as alternate farming	1	3.3



Results and Discussion

3.1 To study the profile characteristic of farmers using unconventional methods of rice farming

3.1.1 Age:

Regarding the distribution of farmers according to their age, it was observed from Table 1 that the majority of the rice growing farmers belong to old age (50%) followed by middle age (40%) and young age (10%) respectively. Hence from the result it could be concluded that the majority of rice growing farmers were in the old age group. The younger generation did not show much interest in the farming profession because of low profitability and these farmers were attracted to the government job sector.

3.1.2 Education:

Regarding the education of the respondent it could be observed from Table 2 that the majority of farmers were educated up to primary school level (33.3%), followed by read and write (26.6%) only, and high school level (13.3%). Very few farmers possessed diploma and graduation (3.3%).

3.1.3 Farm size:

The findings regarding farm size of respondents in Table 3 revealed that the majority of the farmers had a small farm (40%), followed by marginal (26%), medium (23.3%) and large farms (10%), respectively.

If the farmers use unconventional methods, results can be observed with minimum risk. The finding also reveals that farm size is one of the important factors which influences the adoption of the farmers' behaviour.

3.1.4 Farming experience:

The result in Table 4 indicates that the majority of the farmers have medium farming experience (53.3%), followed by low (33.3%), and finally, high farming experience (13.3%). Most of the farmers have medium farming experience which influences the farming system to accept and evaluate the innovative technologies in the farm.

The profile characteristics of the farmer reveals that old and middle age farmers with primary school level of education were engaged in farming, and their level of farming experience was medium. Accepting new farming practices definitely requires farmers' experience so as to adapt to new agricultural technologies.

3.2 The knowledge level of farmers towards farming practices:

The respondents were asked which farming methods were used during rice cultivation. The result in Table 5 reveals that 53.3% farmers were using both conventional and nonconventional methods whereas 30% farmers were using only conventional methods of farming. Very few farmers (16.6%) adopt unconventional methods. This shows that farmers have a lack of awareness of the hazardous effects of chemicals. Research and agriculture extension workers should contact the farmers and organise special training programs on nonconventional farming practices to encourage all groups of farmers to participate in seminars, study tours and gain knowledge on rice-fish farming without using chemical pesticides which harms both rice and fish.

3.3 To study the knowledge level of farmers towards rice-fish farming:

The result in Table 6 reveals that respondents growing rice have less knowledge about rice-fish farming; though fish were present in the rice field, due to lack of knowledge of the rice-fish farming system, they just ignored the presence of the fish on the farm. The majority of farmers (93.3%) use rice as a monoculture farming system followed by rice-fish as duo farming or alternate rice and fish farming system (3.3%) respectively.

The farmers had enough knowledge regarding nonconventional methods ie organic farming but it seems they have limited knowledge of organic or bio pesticide. Some respondents didn't know the method of application for bio pesticide or use of neem cake, vermicompost, as fewer training facilities were given by the government to make farmers aware of nonconventional farming systems and interest in producing rice-fish together. This type of farming system has been declining in recent years because of the use of toxic pesticides that kill the fish in the rice field.

3.4 To elicit the problem and suggestion in nonconventional farming systems and strategies to promote organic farming:

It was observed that 93.3% of respondents prefer rice monoculture along with 3.3% both conventional and nonconventional methods of farming. Therefore it is necessary to motivate farmers towards unconventional farming practices which is a sustainable farming system without adversely affecting soil health and the environment due to use of toxic chemicals. This duo farming system allows the production of fish from the same rice field area without causing a reduction in rice yield. This source of animal protein may be important for household nutrition and farm income.

Conclusion

In order to meet the natural balance of ecosystem and ecosystem services, there is a need to adapt to the unconventional farming system. Our survey data and results conclude that the farmers mostly adopt rice as a mono culture and use organic methods along with chemicals which cause negative effects on fingerlings. Sustainable food supply cannot be obtained by rice monoculture while rice-fish farming is best in terms of resources utilisation, productivity and food supply. A number of significant challenges exist for the adoption of rice-fish farming, particularly the lack of technical knowledge. Thus, it is necessary to provide technical support and training for sustainable rice-fish farming.

Solutions to problems

Bhagalpur (Bihar, India) comes under a low productivity district with 1000 to 1500 kg per hectare as production and 1240 kg per hectare as productivity (source –PA-Table-04 Bihar). As this production per unit area is very less due to lack of awareness of unconventional farming systems and imbalanced dose of fertilizer for the rice cultivation which gradually deteriorates soil fertility and productivity. Therefore there is a need to change the farming system from conventional to unconventional farming. Farmers should be educated through awareness, training demonstrations and exposure to organic farming procedures.

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References

Agripedia (2017) Guide for Rice cum fish farming.
Das, D. N., Saikia, S. K. and Das, A. K. 2007. Periphyton in rice-fish culture system: A case study from Arunachal Pradesh, India. Renew Agric Food Sys 22(4), 316-319.

Dugan P, Dey MM, Sugunan VV (2006) Fisheries and water productivity in tropical river basins: enhancing food security and livelihoods by managing water for fish. Agric Water Manag 80(1):262–275.

Halwart M. 2003. Rice-field fisheries and rice–based aquaculture-underestimated and undervalued resources, 36-47. In: FAO Inland Water Resources and Aquaculture Service. Review of the State World Fisheries Resources: Inland Fisheries. FAO Circular No. 942, Rome, FAO, pp. 60.

Giap DH, Yi Y, Kwei Lin C (2005) Effects of different fertilization and feeding regimes on the production of integrated farming of rice and prawn Macrobrachium rosenbergii (De Man). Aquacult Res 36(3):292–299.

Pullin R. S. V. 1989. Third-world aquaculture and the environment. Naga, ICLARM12: 10-13
Rice production and productivity in Bihar PA Table-04 Bihar Internet source.

Ruddle, K. (1982). Traditional integrated farming systems and rural development: the example of ricefield fisheries in Southeast Asia. Agric. Adm. 10, 1–11. doi: 10.1016/0309-586X(82)90036-X.