

## **Extension Challenges and Requirements of Integrated Rice-Fish Farming in Gilan Province, Iran**

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### **ABSTRACT**

Integrated Rice-Fish Farming requires very little input and provides off season employment to farm labors. It has been observed that combination of rice and fish farming is mutually beneficial. Although, in implementation, it can be faced with several challenges and it demands some requirements. So, this study was conducted to identify challenges and requirements of Integrated Rice-Fish Farming in Gilan. The research population included all the experts in Gilan province (N=272). They include experts who are familiar with integrated Rice-Fish Farming. The initial and follow-up mailing generated 272 useable responses from experts resulting in a response rate of 100%. Using factor analysis, the challenges and requirements have been classified into four factors (Cultural-social, Human, Infrastructure, and Legal) and six factors (Educational methods, Cultural, Facilitating role, participation, Human resource development, and Economic) respectively. Among the variables which build the Cultural-social challenges, operator demographic challenges and farmers' low educational level provides more impact compared to others, while holding field days and establishing demonstration plots provides more impact on the Educational Methods requirements, among other variables.

**Keywords:** Challenges; Requirements; Integrated Rice-Fish Farming; Iran.

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## INTRODUCTION

Rice is the primary food for half people in the world, providing more calories than any other single food. Several pests cause damage and yield loss on this crop (Datta & Khush, 2002). Pesticides can control many of the rice pests, because of environmental risks, crop infection and killing beneficial insects are not efficient and safe method (Khan *et al.*, 1991). Moreover, in many Asian countries, over one half of animal protein comes from fish (Frei & Becker, 2005).

Integrated Rice-Fish Farming regarded as a new technology and sustainable system with a number of ecological benefits such as control of rice pests, weeds and improved rice growth. It also optimized resource use through the complementary utilization of land and irrigation water. Moreover, it has the benefit of supplying rice as a source of carbohydrates and fish as a source of high quality protein. At the farm level, rice-fish integration reduces use of fertilizer, pesticides and herbicides in the field. Such reduction of costs lowers farmer's economic load and increases their additional income from fish sale. With such savings and additional income, the net productivity from rice-fish farming is reported to be higher than rice monoculture. (Neng *et al.*, 1995; Dashu & Jianguo, 1995). Also, many reports suggest that integrated rice-fish farming is ecologically sound because fish improve soil fertility by increasing the availability of nitrogen and phosphorus (Dugan *et al.*, 2006).

Unfortunately, attempts by extension agents and experts have not resulted in increasing Integrated Rice-Fish Farming adoption among local farmers. Statistics reported the total area of rice-fish fields in Gilan province is about 383 ha, but potentially, 23 thousands ha of these lands in Gilan is appropriate for this kind of integrated culture (Azmoodeh Mojdehi, 2010).

It has been observed that combination of rice and fish farming is mutually beneficial. Although, in implementation step, it can be faced with several challenges and this kind of system demands some requirements. So, this study was conducted to identify challenges and requirements of Integrated Rice-Fish Farming in Gilan.

This paper is organized as follows. Section 2 begins with some definitions and then a discussion of requirements and challenges with which Integrated Rice-Fish Farming system will be faced in practice. The previous research for both requirements and challenges are discussed. Section 3 represents research variables and target population. Data are analyzed in section 4 by employing factor analysis (available in SPSS/16).

### Prior studies

Fish culture in paddy field was an ancient farming practice found in several rice-growing areas, in South and Southwest China. In traditional rice-fish culture practice, rice cultivation was the main activity of farmers, while some fish seeds were stocked in paddy fields and looked after extensively, merely for the purpose of having additional animal protein food for household consumption by farmers (Xiuzhen, 2003).

In rice-fish culture system, fish are usually cultured within rice areas. Usually a central or diagonal canal or trench is dug inside the rice farm for holding fish at low water levels or prior to harvest. However presently fish are cultured in rice paddies either concurrently with rice or in rotation (Okoye, n.d.)

Prein (1998) implied to some challenges to rice-fish culture, including (1) requires a significant amount of labor; (2) can be risky (e.g. flooding, drought, poaching, poisoning, etc.) compared to rice monoculture; (3) low fish prices; i.e. other sources of animal protein (e.g. poultry and beef) are often preferred to fish; (4) commonly cultured species (e.g. tilapia and carp) are not highly valued by people who have access to marine species, milkfish, and wild species; (5) farmers unconcerned with the long-term environmental benefits (many tend to focus on the short-term because they are tenants and not landowners); (6) lack of consideration to women, who are decision-makers regarding changes to rice fields and household consumption, when promoting rice-fish culture; (7) poor soil conditions (e.g. sandy soil); (8) the uncertainty of rainfall and limited irrigation water; (9) the possibility of water

contamination by pesticides, herbicides, and chemical fertilizers, which are toxic to the fish and the organisms on which they feed; (10) fish predators such as snakes, which can lower the fish yield.

Sollow (2000) implied to some requirements and challenges to rice-fish culture, including (1) Rice-fish culture requires land. Farmers who cannot manage their plots with sufficient autonomy may face challenges here; (2) Initial plot preparation normally requires a considerable investment of either money or labor; (3) Fish production is unpredictable since the rice field environment is subject to many uncontrollable factors. Rainfall, especially quantity and timing, is foremost among these. Pollution, theft, disease and predators could also lead to losses; (4) Rice yields are very occasionally reduced as a result of rice-fish culture. The most serious problems can be avoided by stocking the fish well after rice has been planted or transplanted. Matching appropriate rice varieties to anticipated water depth would also help avoid this.

Sarker *et al.*, (2006) imply to Poor extension service and lack of information as one of the most important challenges of integrated rice-fish culture. The majority of the fish farmers mentioned that they have to face poor extension service and lack of information. Farmers don't get necessary and useful information and advice from the extension agents.

Geer *et al.*, (2007) indicated to a project about Rice farmers in Guyana and Suriname who used pesticides heavily. This project designed with the FFS (farmer field school) approach to empower farmers use the integrated rice fish farming. The farmers usually met once a week observing and analyzing the rice agro ecosystem, doing experiments in the field, constructing their own tools and implementing and discussing rice and fish-related topics. The Field Days included visits to rice-fish trial plots, a photo exhibition, examination of the trial progress and presentations by Consultants, participating farmers and the trainees themselves. The results obtained at the end of the project are extremely positive. i.e. There was an increased rice yield from the rice-fish plot and there is a major reduction in the use of pesticides after the introduction of the aquaculture/FFS technologies.

Wetengere (2011) implied to Farmer's characteristics that influence the intensification of fish farming as following: (1) Education: A farmer with at least the ability to read, write and calculate is more likely to practice more intensive and market-oriented skills than an illiterate farmer. (2) Age: Young and middle aged farmers tend to move away from home for longer period for other businesses and are less likely to intensify fish farming that needs continuous attention. On the other hand, older farmers are more likely to intensify fish farming because they do not move away for longer period. (3) Gender: Most men tend to move away from home for other businesses and are less likely to intensify an activity that requires their continuous attention. On the other hand, because of their responsibility for children and home crops, and priority they give to food technologies, women are less likely than men to be away from home and can intensify activities that needs continuous attention if are close home steady. (4) Knowledge and skills: Farmers who have acquired knowledge on fish farming are more likely to intensify it than those who have not acquired knowledge.

## **MATERIALS AND METHODS**

The methodology used in this study involved a combination of descriptive and quantitative research. Questionnaire items were developed based on the previous literature and objectives. The questionnaire was revised with the help of experts with significant experience to examine the validity of the research model. A 5-point likert scale ranging from 1 as strongly disagrees to 5 as strongly agree was used for the measurement. A pretest for the reliability of the instrument was conducted with 30 experts randomly chosen from the target population. It summarized requirements and challenges into two single variables, R. and C. The computed Cronbach's alphas for R. and C. are 94.9% and 95.7%, respectively, which indicated the high reliability of the questionnaire.

The Province of Gilan is one of the 30 provinces of Iran, lies along the Caspian Sea. Gilan has a humid temperate climate with plenty of annual rainfall. The city Rasht which is the center of the province is well-known as the "City of Silver Rains" around Iran. The Alborz range provides further diversity to the land in addition to the Caspian coasts. Production of rice accounts for the pivot of agricultural economy in Gilan province.

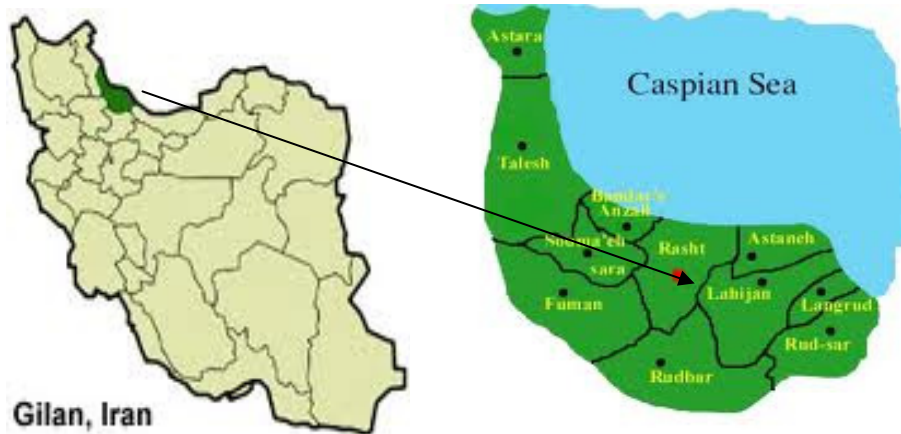


Fig. 1: Site of the research (Gilan Province)

The research population included all the experts in Gilan province (N=272). They include some experts who work in Fishery Organization, Agronomic organization and Extension organization. Moreover, they are familiar with integrated Rice-Fish Farming. The initial and follow-up mailing generated 272 useable responses from experts resulting in a response rate of 100%.

This research applied SPSS Software to analyze the data. Data was analyzed using the factor analysis. KMO index along with the Bartlett test verify appropriateness of the collected data for explanatory factor analysis.

Using previous studies and interviews with some experts in the field of integrated rice-fish farming in agricultural sector, it was considered 28 statements as requirements and 20 statements as challenges.

## RESULTS AND DISCUSSION

Table 1 summarizes the demographic profile and descriptive statistics. As Table 1 illustrates, most of experts are male and under graduated.

<b>Gender</b>	Female (15.2%) Male (84.8%)
<b>Age/year</b>	Mean=41.29 S.D=6.62
<b>Work experience/year</b>	Mean=16/08 S.D=6.99
<b>Education</b>	Under Graduated= 83.2% Graduate=16.8%
<b>Major</b>	Fishery= 25.2% Agronomy= 51.2% Extension= 23.6%

Implementation of factor analysis summarizes all requirements into 6 factors given by Table 2.

**Table 2: Factor Analysis of Integrated Rice-Fish Farming Requirements**

<b>Factor name</b>	<b>Variables included</b>	<b>Explained common variance by factor</b>
Educational Methods	Holding field days; Establishing demonstration plots; Holding conferences in order to introduce integrated rice-fish farming; Educational need analysis; Usage FFS (farmer field school); Presence of experts and farmers in seminars and workshops; Evaluation of educational programs.	21/8%
Cultural	Raising public awareness about Fish nutritional benefits via media; Holding trade fairs and exhibitions to promote awareness about integrated rice-fish farming; positive attitude of experts toward integrated rice-fish farming; Offering a practical education; Farmers' participation in rice-fish farming projects.	7.8%
Facilitating role	Developing the integrated rice-fish farming consultant infrastructure; Promoting farmers to adopt integrated rice-fish farming; Supporting adopter farmers; preparing extension programs to introduce integrated rice-fish farming benefits.	6.1%
Participation	Women participation; Youth participation; Farmers participation; Managers participation in integrated rice-fish farming projects; collaboration between extension, researcher and farmers.	5.7%
Human resource development	Skillful human capital; Innovator farmers; educated farmers.	5.4%
Economic	Financial credit for small farmers; Financial fund for poor farmers; investment in extension rice-fish farming programs; financial facilities for extension staff.	4.0 %
Total	-	50.8%

Table 2 represents components of each factor, as well as, portion of each factor from the total common variance. As one may observe that about 50.8% percent of total common variance explained by these 6 factors, which the majority of it has been explained by the Educational Methods.

Analogous to the Table 2, one may summarize all challenges, into 4 factors given by Table 3.

**Table 3: Factor Analysis of Integrated Rice-Fish Farming Challenges**

<b>Factor name</b>	<b>Variables included</b>	<b>Explained common variance by factor</b>
Cultural-social	Operator demographics challenges comprise older farmers; farmer's low educational level; producer resistance to adopt integrated rice-fish farming projects; farmers' risk averse; low participation of farmers in integrated rice-fish farming projects; lack of culture in fish consuming.	23.2%
Human	lack of qualified and experienced operators; negative attitude towards integrated rice-fish farming projects; lack of extension agents' motivation in transfer integrated rice-fish farming technologies; lack of basic knowledge and skills; lack of awareness about advantages of integrated rice-fish farming in compare with rice monoculture; lack of research and extension personnel who have a good handling of the practical field applications.	7.7 %
Infrastructure	Lack of water resources; lack of research center for integrated rice-fish farming; lack of appropriate infrastructure for marketing products.	7.2%
Legal	low price and easy availability to chemical inputs; lack of supportive policies for integrated rice-fish farming; lack of harmonious among executive organizations involving integrated rice-fish farming; lack of effective extension programs to reduce chemical fertilizers and pesticides; lack of specification integrated rice-fish farming extension programs in developmental plans.	7.1%
Total	-	45.2%

Table 3 represents components of each factor, as well as, portion of each factor from the total common variance. As one may observe that 45.2 percent of total common variance has been explained by these 4 factors, which the majority of it explained by the Cultural-social factor.

## CONCLUSION

The following discussion addresses the research findings according to the research objectives.

### Identify Integrated Rice-Fish Farming Requirements

Table 2 identified the educational methods requirements as the most important requirement in Integrated Rice-Fish Farming extension. This finding supported by Geer *et al.*, 2007.

Based on the results, it can be interpreted that the Integrated Rice-Fish Farming is a complex one. Therefore, its users should be trained, practically. This training approach: (1) provides ability for framers to learn how they may implement Integrated Rice-Fish Farming in practice. Holding field days and using FFS is a kind of practical training that provide opportunities to connect producers with professionals and experts to solve farmers' problems and answer their questions; (2) increases framers' confidence through developing their skills. Results of the survey suggest that educational methods are the most important from experts' point of view while this seems the other requirements are less important. These factors are important, of course, but this research suggests that educational methods are the most important consideration. Findings of this article emphasize, again, on key role of the agricultural extension in efficient implementation of Integrated Rice-Fish Farming.

### Identify Integrated Rice-Fish Farming Challenges

Table 3 identified the Cultural-social challenges as the most important factor in Integrated Rice-Fish Farming extension. This finding supported by Wetengere, 2011. This observation can be interpreted by the facts that most of advisors did not recognize the advantages of Rice-Fish Farming because most of them have only little knowledge about it. Special training courses for

such local advisors could improve this situation. So, efforts should be made to identify institution mechanism designed to disseminate fish farming information among farmers. This entails involvement of the private and public sector in dissemination of the information. Fisheries experts and extension agents must pay attention to socio-personal characteristics of farmers. Since women were less likely to adopt fish farming, deliberate effort should be made to reach out to these women.

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