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Rice Field Sumps: Indigenous Technology for Catching Fish in Rice Field

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Abstract: Catching fish in rice field is an age old traditional practice in Asian countries. In Assam farmers have a unique technique of catching fish in the rice field without disturbing the rice. Almost all farmers have sump in their rice field. An investigation was conducted in Goalpara district of Assam for exploring the technique. A total of 80 rice farmers of 16 villages of 8 rural development blocks were interviewed using a structured and validated questionnaire. Nine independent variables and seven critical dependent variables were selected for designing the questionnaire. The study revealed that all the farmer still use the technique for catching fish in the rice field. They use Kapau Dhekia (*Lygodium flexuosum*) and Saora tree (*Lygodium flexuosum*) as fish attractant. The study suggest that blending of this ITK with newly generated integrated rice fish farming shall help achieving the goal of sustainable agriculture along with food and nutritional security.

Keywords: Sump, Saora, Kapau dhekia, rice, fish.

INTRODUCTION

The state of Assam (24^0-28^0 N latitude and $89^0 50^/$-$97^0 4^/$ E longitude) has about 2.6 million ha of seasonal floodplains, which are traditionally rice-farming areas associated with fish trapping. The water remains for 4-6 months in these [1]. Due to abundant water in rice field, many fish species prefer these areas for reproduction and growth [2-6]. Catching fish from rice fields is an extensive system of fish production without control of fish population, sex and size[7]. Rice fields are still promising sources of fish for the rural poor of the state. People of the state have their indigenous technology for catching fish in rice field. A study was conducted in Goalpara district of Assam to explore the ITK related to catching fish in rice field.

MATERIALS AND METHODS

The study was conducted in Goalpara district (25^0 $5^/$ N to $60^0 10^/$ N Latitude and $90^0 00^/$E to $91^0 15^/$ E Longitudes) of Assam. Both primary and secondary data were used in this study. Secondary data were collected from the published literature such as project reports, official documents etc. Primary data were collected through structured and validated questionnaire to elicit information from the respondents. The rice fields were visited personally. The sampling procedure consisted of purposive selection of 80 rice farmers from 16 villages of all the eight rural development blocks of the district for investigating the ITK related to catching fish in rice fields. Seven critical practices related to traditional fish catching techniques *viz.*, (i) Construction of bund around the rice plot to prevent escape of fish, (ii) Breaking of internal bund for free movement of fish, (iii) Renovation and repairing of sumps, (iv) Use of fish attractant in sump, (v) Supply of extraneous feed in sump, (vi) Dragging net for catching fish and (vii) Complete dewatering of sump for catching fish, were included in the questionnaire. Test schedules were developed to study the extent of practice. Weights of the practices were decided by the judge's rating. Extent of adoption was measured as done most often (MO), often (O), seldom (S) and never (N) with assigned scores of 3, 2, 1 and 0, respectively. Final adoption scores were attained by multiplying the weights of a practice with the corresponding extent of adoption scores. A total of nine socio-economic variables were selected to study the profile of the respondents. These were - (i) age (X_1), (ii) education (X_2), (iii) marital status (X_3), (iv) family type (X_4), (v) main occupation (X_5), (vi) operational holding (X_6), (vii) annual income (X_7), (viii) economic motivation (X_8), (ix) knowledge on integrated rice-fish farming (X_9) (Table-1). Various descriptive and inferential statistical methods were employed to analyze the data following Panse and Sukhatme [8]. The main statistical techniques and tools employed were – analysis of Frequency, Percentage and Mean score.

RESULTS

The results of the independent variables are as follows. Majority (76%) of the respondents belonged to middle age category (29 to 58 years) followed by old (above 58 years) 22% and young (below 29 years) 2%. While 92% of the respondents belonged to high category of educational status i.e., above high school standard, only 8% belonged to medium education level i.e., between primary and high school standard. None of the respondents were illiterate. Most of the respondents (96%) were married and only small portion (4%) was unmarried. While 68% of the respondents were member of joint family, 32% respondents were from nuclear family. Main occupation for 78% of the respondents was rice cultivation. Rest of the respondents had govt job (12%) and other occupation (10%). Operational holding was low (up to 2 ha) for 54%, medium (2.0 to 3.33 ha) for 38% and high (above 3.33%) for 4% respondents. Data on annual income revealed that 56% of the respondents had middle level of annual income (INR 150000.00 - 250000.00) followed by high category (more than INR 250000.00) for 24% and low and (less than INR 150000.00) for 20%. Economic motivation of the respondents showed that 68% were in medium level and 32% were in low level category. Only 30% of respondents were aware of integrated rice-fish farming and the rest 34% never heard of it. Most of the rice farmers of the district traditionally have sumps measuring 25-30 m^2 with 0.8-1.0 m depth, in their rice fields. These sumps are popularly known as *kon pukhuri* (Fig.1). These sumps are used to harvest rainwater for irrigating land for puddling during rice transplantation [9] and to trap wild fish that enter with the flood waters. Yield of fish from rice fields depends on maintenance of these sumps. Findings on the dependent variables are summarized in Table-2. Details of the findings are described below.

1. Renovation and repairing of sump: While majority of the farmers (90%) renovate and repair the sumps regularly during land preparation for the rice crop, rest farmers (34%) often and seldom renovate and repair the sumps.
2. Use of fish attractant in sump: Kapau dhekia (*Lygodium flexuosum*) (Fig. 2) and branches of Saora (*Lygodium flexuosum*are kept submerged in the sump to attract the fish from the rice field. The present study revealed that 43, 30 and 23% respondents use attractants most often, often and seldom, respectively.
3. Supply of extraneous feed in sump: Extraneous feed, normally mustard oil cake and rice bran, either mixed or separately, is applied in the sump few hours before harvesting the fish. Majority of the farmers (63%) often use feed, 30% farmers seldom uses and 14% farmers most often apply feed.
4. Dragging net for catching fish: Fish in the sump are caught several times during the season by dragging a small net. The present study revealed that 81% farmers most often and 19% farmers often practice this method for catching the fish in the sump.
5. Complete dewatering of sump for catching fish: When water recedes in the rice field, the sump is dewatered to catch the last haul of fish. Depending on availability of fish, 86% farmers most often and 14% farmers often dewatered the sumps.
6. Breaking of internal bund for free movement of fish: The internal bund normally prohibits the movement of the fish in rice fields. Breaking of the bund intermittently allows the fish that enter the rice field with flood water to move freely from rice field to the sump. While, majority of the farmers (96%) do not adopt this practice, only 4% farmers seldom adopt this practice.
7. Construction of bund around the rice plot to prevent escape of fish: After transplanting the rice seedlings fish enters the rice field with flood water. Those fish can be retained in the rice field if the bund around the rice field is constructed slightly higher than the water level to prevent escaping of the fish. The present investigation revealed that only 11% farmers seldom construct the bund for this purpose.

Fig. 1: A sump in rice field

Fig.2: Kapau Dhekia (*Lygodium flexuosum*)

Table 1: Independent variables for the study on ITK related to Catching Fish in Rice field

Sl. No.	Variables	Empirical measures	Methods
1	Age (X_1)	Chronological and rounded off to nearest year	Pareek and Trivedi [14]
2	Education (X_2)	Socio-economic status scale-Rural	Pareek and Trivedi [14]
3	Marital status (X_3)	Structured schedule	
4	Family type (X_4)	Structured schedule	
5	Main occupation (X_5)	Socio-economic status scale-Rural	Pareek and Trivedi [14]
6	Operational holding (X_6)	Structured schedule	
7	Annual income (X_7)	Structured schedule	
8	Economic motivation (X_8)	Structured schedule	
9	Knowledge on integrated rice-fish farming (X_9)	Structured schedule	

Table 2: Frequency and percentage distribution of respondents in different response categories (N=80).

Sl. No.	Practices	MO (3)	O (2)	S (1)	N (0)	Mean	SD
1	Renovation and repairing of sump	60 (90.00)	6 (8.00)	8 (10.00)	6 (8.00)	0.6250	0.2387
2	Use of attractant in sump	34 (43.00)	24 (30.00)	18 (23.00)	4 (5.00)	0.5250	0.2306
3	Use of extraneous feed in sump	11 (14.00)	42 (53.00)	24 (30.00)	3 (4.00)	0.4406	0.1833
4	Harvesting by dragging a net	91 (81.00)	9 (19.00)	0 (0.00)	0 (0.00)	0.7031	0.0982
5	Complete dewatering of sump for catching fish	69 (86.00)	11 (14.00)	0 (0.00)	0 (0.00)	0.5188	0.2445
6	Breaking of internal bundhs for free movement of fish	0 (0.00)	0 (0.00)	5 (6.00)	75 (94.00)	0.0156	0.0609
7	Construction of bundh around the rice plot to prevent escape of fish	0 (0.00)	0 (0.00)	9 (11.00)	71 (89.00)	0.02813	0.079494

(Data in parentheses are percentage of frequencies.)

DISCUSSION

An inscription - There is rice in the fields, fish in the water, on a 700 years old stone of from the Sukhothai reign in Thailand depicts a scene that must have been as idyllic then, as it continues to be now in Goalpara, Assam. Having rice in the fields and fish in the rice field water is an epitome of abundance and sufficiency. No other combination would seem to be so

fundamental and nutritionally complete in the Asian context. The agro-ecosystem structure of a rice field illustrates two potential descriptors: system components and their interactions [10]. Fish is the major component of the rice-ecosystem, where rice and fish complement each other, utilize different ecological niches and function together. Fish plays the major roles in this ecosystem by (i) controlling weeds and pests, (ii) releasing locked up phosphorus, (iii) supplying faecal matters as organic manures and (iv) combating iron toxicity.

In Assam, sumps are provided in the rice field as the only refuge for fish without any trench and it can't be called integrated rice-fish system as it involves uncontrolled entry of fish into the rice field. These fish refuges in the sump and they are caught by the farmers. To attract the fishes to the sump Kapau dhekia (*Lygodium flexuosum*) and Saora tree (*Streblus asper*) are kept submerged in the sump for the entire culture interval. Kapau dhekia is a slender and graceful, climbing fern, which is expectorant and antibacterial; infusion and traditionally used in menorrhagia. Its juice is applied to insect bites as an antidote, after squeezing out a little blood. The fresh root boiled with mustard oil is applied externally in rheumatism, sprains, scabies, ulcers, eczema, cut, wounds and carbuncles. Saora, also known as toothbrush tree, is traditionally used for treatment of ailments like filariasis, leprosy, toothache, pyorrhoea and cancer. A small twig of about eight inches length with a mashed end had been used as tooth brush in Asian countries until the plastic brush and toothpaste came into being. This tree has antibacterial property which helps preventing oral and nasopharyngeal infections especially against *Streptococcus mutans*. The active ingredient in these two plants which attracts the fish is not known yet. Rice field having sumps can only be called rice fish culture system if the fish once entered the rice field are prevented from escaping by constructing a strong bund or erecting some enclosures around the plot. The common farmers of the district do not take any measures for preventing the fish from escape. They supply extraneous feed not to grow them but to lure to the sump before harvest.

CONCLUSION

The study suggests validation of this ITK and its blending with research generated integrates rice-fish farming technology for increasing yield, income and farm integration[11]. Integrated rice-fish system is a sustainable form of agriculture[12-13] providing carbohydrates and animal protein for the farmers at subsistence level.

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