

Economic Uplift of Small and Marginal Farmers Through Paddy-Cum-Fish Farming in Bihar-A Micro Study

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ABSTRACT

The condition of small and marginal farmers in Bihar can be improved through agricultural diversification. Agricultural diversification means producing crops and livestock that are not being produced so far and production should be larger quantities than the current rate. It takes into account economic return from different crops and other allied farming activities of our country. The traditional farming should be out gradually and the farmers should show keen interest to diversify their farming to create regular and constant source of income for small holders, to generate additional employment, to conserve national resources and to supply larger basket for consumers. The present study attempts to delineate the economic feasibility of paddy-cum-fish farming in Koshi region of North Bihar. The low-lying paddy field has a unique aquatic environment. It has standing column of water (15-25 cm) and a plankton growth in it, in addition to insects and molluscs, which serve as natural fish food. Majority of water logged paddy fields of Koshi region of North Bihar can be used through paddy-cum-fish culture system and will be able to provide multiple benefits to the small and marginal farmers and local rural population of the region.

Key Words: Agricultural Diversification, Paddy, Fish Farming, Rural Population, Small and marginal farmers.

Introduction:

Agriculture is changing rapidly from subsistence agriculture to commercial agriculture. In addition to agriculture and animal husbandry, fish culture provides a new commercial avenue, it not only provides easily digestible protein rich food but also helps in

improving nutritional status of the mass, as well as provides additional income to the growers and thus uplifts purchasing power. Fish culture is comparatively easier and less labour intensive than other farming, thus rural people can afford to look after larger production areas compared to other agricultural activities. In rural areas minor irrigation tanks are among several sources of fish production. The farming of commercially aquatic species is considered as a better option than agriculture for utilizing vast inland resources.

The low-lying paddy field has a unique aquatic environment. It has standing column of water (15-25 cm) and plankton growth in it, in addition to insect and molluscs, which serve as natural fish food. Therefore, it has a great potential for fish culture as an additional and simultaneous operation for enhancing production per unit area. Paddy fields are used as fish nurseries.

The paddy fields in North Bihar differ in size from place to place. The area larger than 5 hectares is, however, inconvenient for fish culture. It is mainly because during harvesting the fishes hide between the stalks of rice and refrain from entering the capture channel. The paddy fields of 25X10 m are considered ideal for paddy-cum fish culture. They may be cut on either side of a central line which is dug deep to act as main supply of drain canal. Each field is bordered on all the sides by bundhs (dike) of approximately 0.3 m height and 0.3 m in width. Towards the size of drainage canal, the dike is provided with inlet and outlet devices made suitably of hollowed bamboo pipe or other material. These are placed in the middle of the length of the dike and are fitted with screens to avoid entry of predators and the escape of fishes. Each field is dug along its middle to form a long central canal of 0.5 and 0.75 m width and depth respectively. This canal connects with the main supply through the sluice. It serves as a refuge canal for the fishes not foraging among the plants and as capture canal when the water level in the field goes down. Alternatively, a marginal channel may be dug alongside the bundh bordering the paddy field. This channel may connect with several oblique channels running across the field. At one side of field the marginal channel connects with water inlet pipe, from the main supply channel and at other with the outlet pipe draining into main water collection channel. The space between outlet channel of marginal canal and the collection channel may be dug deep to trap fishes during release of water from the field. Both, the inlet and outlet pipes are fitted suitably with screens. The suitability of fish depends upon their ability to withstand conditions of paddy fields. However, since the water in paddy field is retained for a short time (2-3 months) the fishes selected for cultivation should have faster

rate of growth. Species such as Catla, Rohu, Kabai, Mangur, Singhi. Of these, the air-breathing fishes Kabai, Mangur, Singhi, Garai and Chenga are considered good because of their breathing organs which helps them to breathe when the field gets dry and the water level in capture channel goes down. These fishes can survive well in shallow and tubid water of the paddy field and give better return.

Bihar ranks third in fish production and fifth as regards potentiality. Koshi region produces about 50% of the total output of the state and it is estimated that about 40% of the population of this region are busy in fisheries irrespective of the cast and creed. The air-breathing fishes from this region feed the requirements of not only various parts of Bihar but also to other states. In fact, after division of Bihar, it has left with only two actual resources that are land and water. Bihar is a land locked state and hence it has been deprived of the saline water which can be found only in seas and oceans. The saline water fishes which are available in tidal zones are not found in Bihar. Therefore, Bihar has to depend mainly and wholly on inland catch of fisheries. However, The river basin in Bihar is dominated and occupied by the mighty rivers like Koshi, Ganga and its tributaries likes Sone, Gandak, Burhi Gandak, Bagmati, etc. They do not dry up even during the summer season. The level of water and its flow diminish a great deal during the summer season. At the same time it should be noted that during the rainy season the rivers are swollen and burst through the bank and inundate vast tract of land.

North Bihar is Known as flood prone area due to large number of small rivers which fold the neighboring areas. Flood sweeps through North Bihar every year. The major impediments of fisheries development in Bihar is lack of knowledge about scientific fish culture, illiteracy and disorganized extension linkages among fishermen community. On account of these constraints majority of fish farmers is still practicing fish culture in traditional method. Despite vast resources and demand for consumption of fish Blue Revolution is yet to take off in the state. The State Fisheries Extension Services which is supported by Fish Farmers Development Agencies (FFDAs) have to play an important role to fill the gap of potential production and existing production and augmentation of the fisheries/aquaculture development in Bihar. The present study has therefore been undertaken to elucidate the culture methods and production of air-breathing fishes and socio-economic conditions of small and marginal farmers of this region.

Objectives

The main objective of the study are:

- (a) to study the prospects of paddy-cum-fisheries development in water logged areas and the efficacy of reservoirs for fisheries development.
- (b) to evaluate reorganizing, improving and strengthening the infrastructural components of training and extension programmes so as to improve the socio-economic status of the small and marginal farmers.

Hence, the study aims at

- (i) to examine the socio-economic status of the people of the study area.
- (ii) to investigate the prospects of fish farming in flood affected areas.
- (iii) to estimate the cost of cultivation and production of fish.
- (iv) to identify the various channels and system of fish marketing.
- (v) to identify the existing constraints of fish farming in the area.
- (vi) to suggest policy measures for the development of fish farming in the area.

Methodology

So far the methodological aspect of the study is concerned it relates to the methods adopted in selection of the study area, drawing the sample respondents, schedule-cum-questionnaires used in collecting the desired information both at micro and macro levels to arrive at analytical conclusion.

Research Design and Sampling procedure

A study of socio-economic condition of small and marginal farmers of Saharsa District of North Bihar was conducted in the year Jan. 2014 to Dec. 2014 by help of pretested schedule. The total sample size of small and marginal farmers were selected from five blocks of Saharsa District: (i) Kahra (ii) Mahisi (iii) Nauhatta (iv) Simri bakhtiyarpur (v) Salkhua. 22 small and marginal farmers from the five blocks were randomly selected to make the sample size 110.

Methods of Fish cultivation in Paddy Fields:

Fish cultivation in paddy fields differ from country to country and from place to place depending upon the topography of land, availability of water and the variety of paddy and fish to be cultured. The principal methods are : (i) culture of fishes together with paddy crop (ii) culture of fishes in rotation with the paddy crop. In the first type the fry or fingerlings of fish are introduced in the field after about five days of plantation of paddy crop. The fishes and paddy are thus allowed to grow simultaneously till harvesting. The depth of water in the field is determined by the variety of paddy to be cultivated and the choice of fish species is limited to those able to withstand conditions in the paddy field. The stocking densities are calculated in the same way as for standard rearing in ponds, depending upon the natural productivity of water, duration, production and the size of fish needed at harvesting. During harvesting, the water is released from the field and the fishes shelter in the capture channels of the field. They are caught in hand nets and sold. Alternatively, after harvesting the paddy, the field may be refilled with the water to prolong the period of fish growth. If, during this period of growth the planktons decrease or else the water is poor in fish food, artificial feed may be supplied to the fish. Fertilisers supplied to paddy plants also enhance production of planktons, depending on which the stocking densities may be altered.

Fish culture in rotation (alternately) with the paddy crop may be practiced in areas having agricultural facilities like the availability of water and artificial fish food. Culture of this type enhances productivity and clears weeds from the field by foraging phytophagous fishes together with carp, which consume weed plants. Rearing of grass carp together with the common carp leads to rapid and more complete destruction of weeds, seeds and algae. Intensification (by providing artificial feed) based on the techniques of pond fish farming increases the yield of fish per unit area. Besides these the rotational culture has many more advantages over the simultaneous culture of fishes, i.e. (i) by raising phytophagous fishes the condition of paddy field are improved, (ii) the period of fish culture is not tied to the period of paddy cultivation. This makes possible the increase in vegetative growth period of the fish under cultivation, (iii) as the water in rotational culture may be increased upto a depth of 60 cm or more, the fishes find it less difficult to adjust with the conditions of the field (iv) In simultaneous culture, the pesticides and insecticides are generally used to protect the paddy crop, (v) intensification is not tied to the paddy crop which results in to a higher yield of fish per unit area. Results of experiments conducted in other parts of India are quite encouraging

and give an idea of stocking densities and management of paddy-cum-fish culture. Common carp grow fast in paddy fields giving an average yield of 6.7 kg per acre, provided that the measures are being taken to prevent high rate of their mortality. Among the other carps the Rohu and Catla have better survival rate but poor growth in comparison to the common carp.

In the water logged paddy fields of North Bihar if paddy-cum-fish culture is done in an organized manner it gives lucrative return, generates additional employment and provides better land use pattern. Advantages of such an integrated farming system are the control of mosquitoes, molluscs, mice, terrestrial weeds and some harmful insect pests etc. There are other benefits also like saving of 50% expense on harrowing, utilization of fish excreta as manure, conversion of unproductive swamps into a productive system through proper land shaping and also conversion of mono-cropping paddy fields into multi-cropped ones through augmentation of aqua-crops.

Results and Discussion

Socio-Economic Feature of small and Marginal Farmers in Saharsa District of North Bihar.

The prosperity and development of the paddy-cum-fish farming of any region is naturally dependent on socio-economic conditions of local small and marginal farmers. Out of 110 sampled respondents majority of them were belonging to the caste-Gorhi (67.28%) and mallah (28.19%), Bind (3.63%) respectively. They are considered on the very low stratum of the society. They are highly individualistic in outlook and are in no way connected with the proper marketing and cost-profit calculation of their produce.

Regarding education, it was found that about 62.73% of the respondents were illiterates and 23.64% have nominal education in terms of primary and middle education due to the reason of illiteracy of parents and existing rural environment might have not encouraged them to take formal education.

Table : 1

Socio-Economic characteristics of Sampled Respondents according to education, caste, family size, annual income.

Variable and Category	Number	Percentage
1. Education		
(i) Illiterate	69	62.73
(ii) Primary & Middle	26	23.74
(iii) Secondary	12	10.90
(iv) College	03	2.73
2. Caste		
(i) Gorhi	74	67.28
(ii) Mallah	31	28.19
(iii) Bind	04	3.63
(iv) Others	01	0.90
3. Family Size		
(i) 1-4 members	45	40.90
(ii) 5-8 members	62	56.36
(iii) 9 and above members	03	2.74
4. Annual Income		
(i) Below Rs. 7,500/-	53	48.18
(ii) In between Rs. 7,500- 20,000	57	51.82

With respect to occupation, fishing and fish selling were found as main occupation. It was found that majority (56.36%) of fishermen believe in big sized (5-8 members) family due to high child mortality rate (CMR) in backward community of rural area, but a new trend appears to control the family size in 40.90% of fishermen. Majority of the fisherman (51.82%) families had an annual income in between Rs. 7,500/- to 20,000/- and 48.18% income below Rs 7,500/- respectively. The reason for the poorer socio-economic condition is that since most of them have not their own nets-gears and generally existing under the clutches of money-lenders. There is no hope of ever being freed from debt. Actually, the middlemen are the main problem for the development of this backward community.

Table : 2

Constraints perceived by the sample respondents in attending various training programmes.

Sl. No.	Constraints	Frequency (N=110)	Percentage
01.	Villager's Criticism	29	26.36
02.	Lack of co-operation from group members	19	17.28
03.	Shyness/inhibition of participants	62	56.36
Economic			
01.	Lack of finance to adopt the technique learnt in training	66	60.00
02.	Losing wages	44	40.00
Technical			
01.	Difficulty in understanding	20	18.18
02.	Lack of Interaction	24	21.82
03.	Sometimes more theoretical	21	19.9
04.	Lack of conviction	19	17.27
05.	Skills/ techniques taught always not suitable	03	2.74
06.	Lack of input supply	23	20.90
Others			
01.	More work load/responsibility	15	13.63
02.	Difficult to attend training programmes which are conducted out side	68	61.82
03.	Difficult to attend long duration training programmes	27	24.55

The data are collected on various constraints encountered by the sampled respondents in relation to attend different training programmes and these are categorized as social, economic, technical and others is presented in Table : 2

Table : 3

Benefits/Utility of the training programmes as perceived by the respondents.

Sl.No.	Benefits	Frequency (N=110)	Percent
01.	Opportunity to get together	88	80.00
02.	Shyness/inhibition reduced	63	57.27
03.	Gaining self confidence	44	40.00
04.	Awareness and knowledge level increased	68	61.82
05.	Importance of savings realized	66	60.00
06.	Banking procedure learnt	69	62.73

The respondents were asked to state various benefits perceived by them in attending different training programmes and the same is presented in Table: 3

Majority of respondents (80.00%) reported that they are able to get together due to various training programmes. This is a great opportunity for them to discuss simultaneously various aspects concerning them other than training related matter. Hence, they might have perceived this point as a major benefit. Due to attending training programmes as perceived by the farmers, they have learnt banking procedures, realized importance of savings and small and marginal farmers benefitted economically (by taking the land for lease through obtaining credit from Banks and co-operatives) as reported by 62.73, 60.00 and 80.00 percent of the respondents respectively. Shyness/inhibition reduced to 57.27 percent. About 61.82 percent of the respondents have expressed that training programmes have helped them in increasing their awareness and knowledge level on various agricultural technologies etc. which shows that training programmes are really useful. As reported, about 40.00 percent of the respondents attending training programmes have helped them in gaining self confidence which might be due to their increase in knowledge level.

Table : 4

Pooled Effectiveness Intensity Indices (EII) of extension methods as perceived by farmers, officers of agriculture and fisheries department and extension personnel.

N=110

Extension Methods	Effectiveness of Extension Method (%)		
	Effectiveness Intensity Index by farmers (N=80)	Effectiveness Intensity Index by officers (N=30)	Pooled Effectiveness Intensity Index (N=110)
Individual contact Method			
01. Farm and home visit	2.86	2.76	2.81
Groups contact Methods			
02. Result demonstration	2.70	2.70	2.70
03. Method demonstration	2.20	2.03	2.11
04. Lecture	2.60	2.51	2.55
05. Discussion	2.40	2.71	2.55
06. Study tour	2.66	2.46	2.56
Mass contact Methods			
07. Bulletin	2.23	2.55	2.39
08. Leaflet	1.90	2.06	1.98
09. Newspaper	1.86	2.13	1.99
10. Radio	1.63	2.28	1.95
11. Television	2.10	2.50	2.30
12. Exhibition	2.06	2.56	2.31
13. Documentary film show	2.13	2.66	2.39

(Effectiveness of Extension Methods as perceived by both farmers and officers.)

The pooled effectiveness intensity indices of different extension methods as perceived by farmers and officers of agriculture and fisheries department as well as extension personnel as presented in Table: 4. The high level pooled EII was recorded as 2.81 in case of farm and

home visit in individual contact. In group contact, high level of pooled EII were recorded for result demonstration, study tour, lecture and discussion as 2.70, 2.56, 2.55 and 2.55, respectively. The high level pooled EII were also recorded to bulletin and documentary film show, in mass contact methods as 2.39 each. Therefore, the most effective extension methods as perceived by both farmers and officers were farm and home visit in individual contact, result demonstration in group contact and bulletin and documentary film show in mass contact methods. The highest effective method among all the three kinds of extension methods was farm and home visit with highest EII value 2.81.

Conclusion and Suggestion

Establishment of better and up-to-date agency for the preservation and transport of fishes in main air-breathing fishing centres, this very valuable food could be better utilized and made available in as fresh condition as possible to the large fish eating population of the country. Such changes will reduce losses and deterioration of the products, make available more, regular and larger supplies and while providing an equitable wage to the poor fishermen. Siltation eutrophication of wetland swamps and interference of human habitation surrounding the water bodies present the problem of terrestrialisation of the wetlands in this region. The feeding of swamps/chaurs with water during the drought season is essential. For this a series of reservoirs are to be constructed in the upper reaches of the rivers of this region and dead river channels are to be converted into permanent canals for feeding the chaurs.

In Bihar, fish fauna and the water body in general and flood prone areas in particular are highly mismanaged. It is roughly estimated that nearly 25 percent of the total geographical area of Bihar is flood prone and 6 percent of it falls in North Bihar alone. The river basin of North Bihar is mainly known as Koshi river basin which has the largest flood prone areas and thus there is most common saying that 'Koshi is the sorrow of Bihar.' The present study clearly indicates that if fish farming is managed and organized properly by the inhabitants of the region, their income and employment will be generated at a large scale.

On the basis of the findings of the study the following suggestive measures should be adopted:

- (1) Majority of small and marginal farmers are illiterate. It is necessary that they should be made literate.

- (2) Fish farming is usually done on a small scale or at best on a medium scale. But it must be undertaken on a large scale. This will improve the living standard and increase the income of rural population.
- (3) Emphasis should be laid more on culture fishing than on capture fishing.
- (4) In Koshi region, a package of technology should be introduced to Makhana-cum-Fish culture and Singhara-cum-Fish culture.
- (5) The Government of Bihar should establish at least one 'Fish Market Centre' in each district with proper facilities of cold storage.
- (6) There is need to strengthen the 'extension service system and human resource development' to improve the knowledge, skill, attitude and practice of people engaged in paddy cum fish farming.
- (7) A Comprehensive Aquaculture Policy is to be formulated by the Government for providing extension programme, planning, research, training, education, input supply, credit and marketing system.

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