

Economic Analysis of Paddy-Fish Farming System in Bishnupur District of Manipur

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ABSTRACT

The study was carried out in Bishnupur district of Manipur with an objective to calculate the economics of the Paddy-Fish farming system. The research is based on the data collected by using proportionate sampling from a total of 110 farmers comprising of 76 Rotational, 24 Concurrent, 5 each of Paddy and Fish monoculture system farmers. In the study area, four different types of Paddy-Fish farming system were identified. There were basically the two main Paddy-Fish production systems, Concurrent culture – growing the fish together with the paddy in the same area and rotational culture – where the paddy and fish are grown at different times. And other two were Paddy and Fish monoculture system. Per hectare cost was highest in Concurrent Paddy-Fish farming system among the four different systems. While the per hectare net income estimated was found to be highest in Rotational Paddy-Fish farming system indicating that in the study area Rotational system of Paddy-Fish was more economical as compared to Concurrent system and also that of Fish and Paddy monoculture.

Key words: Concurrent system; Cost and Return; Rotational system;

Paddy-Fish farming system constitutes a unique agro-landscape system across the world especially in tropical and sub-tropical Asia. In the strictest sense Paddy-Fish farming means the growing of paddy and fish together in the same field at the same time also called Concurrent culture. However, it is also taken to include the growing of paddy and fish serially one after another within the same field (Rotational culture) or the growing of rice and fish simultaneously side by side in separate compartments, using the same water. Among the North eastern States, Manipur is the most suitable site for paddy-fish farming system as the region has 79,360 hectares of water body. Out of the total paddy cultivated area of 3.39 million hectare only 0.03% is under paddy-fish cultivation. In the year 2017-18 total production of main paddy is 431.02 million tonne/ha. In fiscal year 2017, the production of fish in the state amounted to about 32,000 metric tons, a significant increase from about 18.6 thousand metric tons in fiscal year 2008. *Kacha dani* (2016) reported the culture of fish in mountainous paddy fields with varieties of

indigenous paddies in ziro valley north eastern part of India. And attempt to analyse the fish culture with different varieties of paddy which are most suited to the fish growth in line with the maturity of crops. It has been observed (*Khoo and Tan, 1980*) that introduction of herbivorous fish in rice fields controlled weeds and reduced feeding cost. They also reported that integration of fish farming with agriculture in Malaysia that the income from fish culture constituted 22 to 60 per cent of farm income in single cropped area of rice and 4 to 19 per cent in double cropped area. *Saikia et al., (2015)* reported that although some production in rice growing areas are meant for rice plants is lost from construction of trenches, overall rice yield are reported to increase by 7-30% in integrated rice-fish culture. The net income from rice- murrel culture is about Rs 17,500/ha/100 days and the net profit/cost ratio from rice cum fish culture has been worked has 1.304). *Smiji (2018)* reported that the farmers who are following Rice-Fish rotational farming had improved their economic position than that of rice mono-cropping farming. The net profit from

paddy mono-cropping is of Rs. 25000/ha, Paddy-Fish is Rs. 75000/ha, whereas Paddy-Shrimp-Fin Fish earned Rs 1.32 lakh/ha. Moreover, the rotational farming of rice and fish improve the soil conditions and thereby increasing rice yield in the next season up to 15-20%.

METHODOLOGY

The period of enquiry was related to the agriculture year 2018-19. The study was conducted in Bishnupur district of Manipur. A three stage sampling design was employed. In the first stage, Bishnupur and Nambol block were selected for the study using simple random sampling technique. At the second stage six villages viz. Leimapokpam, Sanjenbam, Wahengkhuman from Nambol Block and Hameiban, Laishoi and Chingmai villages from Bishnupur Block were selected purposively. In the final stage, from the prepared list, using proportionate random sampling technique a total of 110 respondent farmers were drawn for collection of relevant data and information with respect to Paddy-Fish farming system. Both primary and secondary data was collected for analysis and interpretation. The primary data was collected on pre-tested schedule by adopting personal interview method from 110 respondents. Based on the data collected the cost of and returns and profitability of Paddy-Fish farming system were worked out using different cost concepts viz. Cost A_1 , Cost A_2 , Cost B and Cost C. For the purpose of analyzing the returns from Paddy-Fish farming system various types of farm income were worked out which includes gross income, net income, farm business income, family labour income, farm investment income and net return over total variable cost. The benefit cost ratio was also worked out.

Cost concept: The different cost components used in the analysis were as follows.

- i. *Variable cost:* It includes labour cost, seed cost, fingerlings cost, machinery cost, fertilizer cost, feed cost, insecticide cost, weedicide cost, irrigation cost, interest on working capital and other miscellaneous cost.
- ii. *Fixed cost:* It includes interest on fixed capital, land revenue and other taxes, rental value of owned land and depreciation on farm implements and farm buildings.
- iii. *Cost A_1* = (includes Value of seed, Value of fingerlings, Value of human labour, Value of owned machinery, Value of hired machinery, Value of feeds, Value of insecticide, Value of weedicide, Value of

manures, Irrigation charges, Depreciation on farm implements, Interest on working capital, Land revenue and Other expenses)

iv. *Cost A_2* = Cost A_1 + Rent paid for leased-in land
 v. *Cost B* = Cost + interest on value of owned fixed capital (excluding land) + imputed rental value of owned land

vi. *Cost C* = Cost B + imputed value of family labour

Return Analysis: The following types of farm income were considered for analyzing the returns from Paddy-Fish farming system

- i. *Gross income (GI)* = Total value of main product
 = (Quantity of main product X price of main product)
- ii. *Farm business income* = GI – Cost A_1
- iii. *Family labor income* = GI – Cost B
- iv. *Net income* = GI – Cost C
- v. *Farm investment income* = Farm business income – imputed value of family labour
- vi. *Net return over variable cost* = Gross income – total variable cost
- vii. *Benefit : Cost Ratio*

RESULTS AND DISCUSSION

The present study aimed to work out the cost and return of Paddy-Fish farming system adopted by the respondent farmers in two blocks of Bishnupur district of Manipur. The different Paddy-Fish farming system adopted in the study area are presented in Table 1.

The study revealed that (Table 1) on an average about 69.09 per cent adopted the Rotational Paddy-fish farming system followed by Concurrent (21.81%) Paddy-Fish farming system, Fish monoculture and Paddy monoculture with coverage of 4.54 per cent each. The fingerlings species cultured are *rohu*, *mrigal*, *common carp*, *grass carp*, *silver and catla*.

The cost for Paddy-Fish farming system on per hectare basis for different system of Paddy-Fish farming system was presented in Table 2. From the study, the per hectare total cost of Paddy-Fish farming system was found out to be Rs 177784.05 and Rs 182243.45 for Rotational and Concurrent farming system and Rs 178812.93 on Fish monoculture and Rs 88511.49 for Paddy monoculture. The cost of cultivation was highest in concurrent system as compared to rotational system

and even from fish and paddy monoculture also. The analysis revealed that the fixed cost were highest in rotational system (49345.39) which has maximum average farm size and lowest in paddy monoculture (39659.50) having lowest farm size exhibiting direct relationship with the farm size. It accounts for 27.75 per cent of the total cost on rotational system, 27.03 on concurrent system while fish and paddy monoculture accounts for 24.82 and 44.80 per cent of the total cost. Among the fixed costs, rental value of owned land was the highest cost factor for both rotational and concurrent farming system as well as on fish and paddy

monoculture. It was highest at Rs 28553.51 (16.06 per cent) on rotational system and lowest at Rs 27001.01(30.50 per cent) on paddy monoculture system indicating positive relationship with the size of holding. The possible reason for higher rental value on large farms might be the higher productivity. On all farming systems of the sample, it was found out that variable costs, accounted for major part of the total cost. The total variable cost ranged from Rs 128438.66 on rotational farming system to Rs 132978.92 on Concurrent farming system and Rs 134421.02 on Fish monoculture to Rs. 48851.99 on paddy monoculture. Among the

Table 1. Different Paddy-Fish farming system adopted.

Particulars	Farming system				Total
	Rotational system	Concurrent system	Fish Monoculture	Paddy Monoculture	
No. of farmers	76(69.09)	24(21.81)	5(4.54)	5(4.54)	10(100)

Note: Figures in parentheses are the percentage to the total

Table 2. Cost of paddy- fish production for different paddy-fish farming system (Rs/ha)

Particulars	Farming System			
	Rotation System	Concurrent System	Fish Monoculture	Paddy Monoculture
Variable cost				
Feeds	10273.65(5.77)	11162.09(6.12)	65796.61(38.09)	.....
Hire Labour	20867.16(11.73)	23152.62(12.70)	10338.98(5.98)	19853.49(22.43)
Fingerlings	57561.62(32.37)	59088.02(32.42)	41847.46(24.22)	.....
Seed	1673.65(0.94)	1819.45(0.99)	.....	3137.49(3.54)
Irrigation Charges	11535.94(6.48)	12150.62(6.66)	2983.89(1.72)	1423.45(1.60)
Fertilizer	1153.83(0.64)	1099.43(0.60)	.....	9744.19(11.00)
Lime	.....	.....	5745.76(3.32)	.....
Insecticide	239.70(0.13)	0	.....	1023.25(1.15)
Weedicide	258.59(0.14)	0	.....	930.23(1.05)
Interest on work capital	13625.08(7.66)	14235.43(7.81)	4641.38(2.68)	2388.93(2.69)
Machinery Charge	10290.04(5.78)	9024.43(4.95)	474.57(0.27)	10211.43(11.53)
Other Expenses	959.40(0.53)	1246.83(0.68)	2542.37(1.47)	139.53(0.15)
Total Variable Cost (TVC)	128438.66(72.24)	132978.92(72.96)	134421.02(77.83)	48851.99(55.19)
Imputed value of family labour	14759.82(8.30)	15441.38(8.47)	9779.66(3.92)	9127.53(10.31)
Land Revenue	466.02(0.26)	478.80(0.26)	169.49(0.09)	465.11(0.52)
Depreciation on farm implements & farm building	1753.50(0.98)	1615.96(0.88)	3050.84(1.76)	1465.11(1.65)
Rental value of owned land	28553.51(16.06)	28000(15.36)	27883.45(16.14)	27001.01(30.50)
Interest on fixed capital	3812.54(2.14)	3728.39(2.04)	3508.47(2.03)	1600.74(1.80)
Total Fixed Cost (TFC)	49345.39(27.75)	49264.53(27.03)	44391.91(24.82)	39659.5(44.80)
Total Cost(TCV + TFC)	177784.05(100)	182243.45(100)	178812.93(100)	88511.49(100)
Cost A ₁	130658.18	135073.68	137641.35	50782.21
Cost A ₂	130658.18	135073.68	137641.35	50782.21
Cost B	163024.23	166802.07	169033.27	79383.96
Cost C	177784.05	182243.45	178812.93	88511.49

Note: Figures in parentheses are the percentage to the total cost

Table 3. Returns from different paddy-fish farming systems

Particulars	Farming Systems			
	Rotational System	Concurrent System	Fish Monoculture	Paddy Monoculture
Gross farm income	363328.4	358289.3	354237.3	100465.1
Net farm income	185544.4	176045.9	175424.4	11953.63
Family labour income	200304.2	191487.2	185204	21081.16
Farm business income	232670.2	223215.6	216595.9	49682.91
Farm investment income	217910.4	207774.2	206816.3	40555.38
Net returns over variable cost	234889.7	225310.4	219816.3	51613.13
Benefit-Cost Ratio based on Cost A ₁	2.78	2.65	2.57	1.97
Benefit- cost ratio	2.04	1.96	1.98	1.13

variable costs, the share of fingerlings was higher than the other inputs accounting for 32.37 per cent (57561.62) and 32.42 per cent (In fish monoculture feed expenditure was the highest cost factor accounting for 38.09 per cent (65796.61) 59088.02) per cent of the total costs on Rotational and Concurrent farming system and for Paddy monoculture the share of hire labour was the highest taking 22.43 per cent (19853.49). The data analysis reveals that as compared to Paddy monoculture, fish monoculture is highly capital intensive.

The table shows that the value of Cost A₁ and Cost A₂ were equal indicating no leased in and leased out land. The value of Cost A₁, Cost A₂, Cost B and Cost C for Rotational and Concurrent farming system were estimated as Rs 130658.18, Rs 130658.18, Rs 163024.23, Rs. 177784.05 and Rs 135073.68, Rs 135073.68, Rs 166802.07, Rs 182243.45. And for Fish monoculture it was estimated as Rs 137641.35, Rs 137641.35, Rs 169033.27, Rs 178812.93 while that of Paddy monoculture was observed as Rs 50782.21, Rs 50782.21, Rs 79383.96, Rs 88511.49 respectively.

The returns were measured in relation to different cost concepts such as gross farm income, net returns, farm business income, family labour income, farm investment income and net returns over variable cost were analysed. The benefit – cost ratio were worked out based on Cost A₁ and total cost for all the four paddy-fish farming system. The contents of the Table 3 reveal that Rotational system obtained higher gross income per hectare (Rs 363328.4) as compared to concurrent system (Rs 358289.3) and as well as from both Fish (Rs 354237.3) and paddy monoculture (Rs 100465.1) establishing direct relationship with size of the farm. The net income per hectare was Rs 185544.4 on

Rotational system which was the highest against Rs 176045.9 on concurrent system, Rs 176404.4 on Fish monoculture and lowest on Paddy monoculture (Rs 11953.63). Rotational system realised more farm business income per hectare (Rs 232670.2) as compared to concurrent system (Rs 223215.6), Fish monoculture (Rs 216595.9) and Paddy monoculture (Rs 49682.91). The reason attributable for this trend might be higher gross income and lower variable costs (Cost A₁) on Rotational system as against lower gross income and higher variable cost (Cost A₁) on the other three systems. It is evident from the table that rotational system had obtained higher benefit cost ratio (2.04) compared to Concurrent system (1.96), Fish monoculture (1.98) and paddy monoculture (1.13). This implies that for every rupee investment in rotational system, net income realised was Rs 2.04, in concurrent system net income realised was Rs 1.96 and Rs 1.98 in fish monoculture while that of paddy monoculture was Rs 1.13.

CONCLUSION

From the study it may be concluded that Paddy-Fish farming is profitable. The net return was higher in Rotational Paddy-Fish farming system as compared to Concurrent system and even from Fish monoculture and Paddy monoculture. Thus, Rotational farming system was found to be more profitable and economical. It is supported by the highest ratio of benefit cost ratio from among the four different systems. Fish monoculture was more profitable as compared to Concurrent system. And Paddy monoculture was the less profitable farming system in the study area which has the lowest net return and benefit coat ratio. Therefore in order to improve Paddy-Fish farming system, it can be concluded from the present analysis that if modern inputs and production

technology can be made available to farmers in time, yield and production of Paddy-fish may be increased which can help the farmers to increase income and improve livelihood conditions. Arranging training programme to upgrade the knowledge on scientific fish

culture; educating the people to develop social consciousness by strengthening local security service through private and public initiatives. The government should also take some measures for ensuring availability of inputs at reasonable prices at proper time.

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