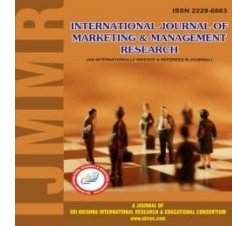




The Journal of Sri Krishna Research & Educational Consortium
**INTERNATIONAL JOURNAL OF
 MARKETING AND
 MANAGEMENT RESEARCH**
 Internationally Indexed & Listed Referred e-Journal



COST BENEFIT ANALYSIS OF PADDY-CUM-FISH CULTURE IN ZIRO VALLEY OF ARUNACHAL PRADESH, INDIA

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ABSTRACT

Rice and fish go together as food in many parts of the world and in our country also. However, the practices of growing paddy and fish do not go together in many parts of the world. Paddy cum fish culture makes multiple use of the paddy field to maximize the utilization of land and water resources and also increase the production value of paddy fields. These practices are mostly carried out in a country like China, India etc.

In respect of Arunachal Pradesh, the practices of paddy cum fish culture started in the year 1964. Under the dynamic of the dean fishery officer of fishery department in Apatani plateau. Since then paddy cum fish culture has become a part and parcel of Apatanis agricultural system. Over the last three decades it has been observed that lots of improvement has been taken place in paddy cum fish culture practices in Apatani plateau. By virtue of these practices the farmers could able to generate additional income for their family members. The benefits obtain from this practices are not only limited to household purposes but also extend to socio-cultural and economic purpose ranging from education of children to socio-cultural welfare measures like festivals, contribution to village development etc. When compare with

cost, the ratio of benefit to cost is more than 1:5 which implies that the benefits acquires from paddy cum fish culture is immense.

The present study aimed to work out the economic efficiency of the paddy-cum-fish culture system practiced by farmers in three selected village of Lower Subansiri districts of the State of Arunachal Pradesh.

KEYWORDS: Arunachal Pradesh, benefits, costs, Paddy cum Fish Culture, Ziro Valley.

INTRODUCTION

Ziro valley, the district headquarters of the Lower Subansiri lies approximately between the latitude 27⁰32'N to 27⁰37'N and longitude 93⁰48'E to 93⁰52'E situated at an altitude of about 1,524 metre above the sea level. Ziro, a scenic valley, is the home of the Apatani tribe whose unique land use pattern, resource management and culture of conservation have made them a focal point of attraction (Haimendrof, 1962; Kumar and Ramakrishnan, 1990). It is the district headquarters of the Lower Subansiri, and is popularly called as "Rice Bowl of Arunachal Pradesh". It has 35 villages, with a population of 24,650 and a density of 23 people per km². The Valley has an area of more than 1058 km², of which 33 km² is cultivated land while the rest is under forest, plantations and settlement.

Apatanis are agriculturists in nature and have good numbers of traditional ecological knowledge on sustainable management of their limited resources. The exact date and time of initiation of wet rice cultivation is still untraceable but through mythology, it is believed that it might have been started at Pega-Sarang (name of place). It was the sincere and hard working effort of their ancestors to make it suitable for wet rice cultivation. Due to suitable geographical condition, people of this valley have been practicing rice-cum-fish cultivation as the main source of livelihood. However, during the last many years the farmers have started giving commercial touch to paddy-cum-fish culture and thereby earn additional income for the family.

Based on farming system performance in Apatani Plateau, paddy cum fish culture agro-ecosystem is highly productive(400-500 kg p/hac), 3 to 4 time of the average yield of the paddy in the state, economically variable cost of cultivation being low with minimal external inputs making it a organic agriculture. Inputs include only labor, organic manure and seeds; draft animal power is not used widening plots by digging adjacent higher ground down to an irrigable level seems to be successful responses to population increase and new market opportunities.

The benefits obtain from this practices are not only limited to household purposes but also extend to socio-cultural and economic purpose ranging from education of children to socio-cultural welfare measures like festivals, contribution to village development etc. When compare with cost, the ratio of benefit to cost is more than 1:5 which implies that the benefits acquires from paddy cum fish culture is immense.

REVIEW OF RELATED LITERATURE

Many research and study have been conducted over the year regarding the pisciculture or fisheries pertaining to economy development in Arunachal Pradesh. But no study has been conducted regarding the cost and benefit analysis of paddy cum fish culture in Apatani plateau. Therefore to make the present report more informative some of the important works having a great impact on the present study have been reviewed. Haimendorf CVF (1962) studied on the Apatani's and their neighbors. Choudhery P.C (1990) integrated rice-fish culture in Asia with special reference to deep water rice. Ghosh, A (1990) has studied rice cum fish culture and its economic feasibility. Kumar A, Ramakrishna P.S (1990) Energy flow through an Apatani village Ecosystem of Arunachal Pradesh in North-East India. Dr. K. P. Biswas (1995) has made a detail study on the fish, fisheries and technology and its production in India and world fisheries and method of fish culture. Mr. R. N. Pradhan (1996-1997) has made case study on similar area how it is help to increase the income or added the income of the plateau and comprehensive study on harvesting of fish. Sinha V.R.P and Ramachandra V (1997-1998) in their research paper entitled, "Fresh water fish culture". A study on basic principles of fresh water fish culture and their application which are essential to make culture a success. Ramakrishnan (1997) has focused on scientific basis of traditional wet rice cultivation of the Apatanis. Duarah (1997) has studied the traditional agricultural system of the Apatanis. Nair (1985) and Choudhury (1996) have narrated the socio-economic life of the Apatanis with emphasis on their agricultural practices. Behera (1996) has given a descriptive account of the cultural dynamics through his study of inheritance system to understand the enterprising nature of the Apatanis as apparent in recent years in the process of economic development. Kani (1993) has discussed the different aspects of socio-economic and cultural life of the Apatanis on the basis of sacred lord, myths and legends. Mukherjee (1976) and Kojeen (1999) have highlighted the practice of paddy cum fish culture among the Apatanis. Bayan (1995) has focused on unique soil properties of the Apatani valley and the reasons for its high agriculture value.

Alikunhi, K.H. (1955) Rice Field Fish Culture outside Indonesia, has focused on International Inland Fisheries Training. Ardiwinata, R .O. (1957) Fish Culture on Paddy Fields in Indonesia, has studied regarding such practices in Indonesia and proceedings of the Indo-Pacific Fisheries Council. Choudhury, P.C. (1995) Integrated rice-fish culture in Asia, had taken account with special reference to deepwater rice. M.P. (eds) (1992) Rice-fish Research and Development in Asia, has pointed out the International Center for Living Aquatic Resources Management, Manila, Philippines. Eapen, P.K. (1956) Japanese fish cultivation in paddy fields, has highlighted the practices of fish with the paddy field among the Japanese farmers. Felix. S, Henry.X. & Nanjaiyan, K. (1992) Integration of paddy and fish farming system. They had made the detailed study of the integration of paddy and fish farming system in general.

OBJECTIVE

The main objective of the study is to determine the costs and benefits of paddy cum fish culture practices in Ziro Valley of Arunachal Pradesh.

METHODOLOGY

In order to achieve the stated objective as well as to arrive at logical conclusion, a field survey was conducted during the month of July and August 2011. It may be mention that the peak season for paddy cum fish culture is July and August. During the course of the field survey 30 sample respondents/farmers were selected form Ziro valley viz., Bula (Tajang), Duta and Hija through using random sampling technique. The selected respondents were interviewed using pre-designed interview schedule (both close and open ended). The primary data obtained through field survey as well as secondary data have been elicited through discussion, tabulation, interpretation, using financial statement analysis ratio like Break Even Point, Profit/Volume Ratio. These are supplemented by the information obtained from Inputs from formal and informal discussion with Fisheries Officials, village Panchayat leaders.

COSTS AND BENEFITS

A technology, to be accepted by, farmers should match the farmer's socio-economic circumstances including the farm environment. The present study aimed to work out the economic efficiency of the paddy-cum-fish culture system practiced by farmers in three selected village of Lower Subansiri districts of the State of Arunachal Pradesh. It is to be mention that 100 per cent of respondents adopted rice-fish culture. During the time of field survey it was found that the average weights of fish in gram (gm) at harvest after sowing i.e. after 120-150 days was as follows:

- Common carp (*Cyprinus carpio*) : 450gm
- Silver carp (*Hypophthalmichthys molitrix*) : 500gm

The cost benefit analyses of Paddy cum fish culture in the Apatani Valley have been determined using the following indicators:

- a. Break Even Point (BEP) in Sales and units
- b. Profit-Volume Ratio (P/V Ratio)

The cost and benefit analysis have been calculated based on the data obtained from 30 respondents during the time of field survey. It may be noted that while computing the cost benefit analysis, the annual average production of fish and paddy of the three sample villages have been taken into account. Further, it has also been assumed that the variation of costs and selling price of rice and fish during the study period were insignificant.

The various cost involved in fish culture as well as the benefits thereof is given in Table 1

TABLE 1

**ESTIMATES OF COST BENEFITS ANALYSIS OF FISH CULTURE PRACTICES IN THE
SAMPLE VILLAGES**

(N=30)

Particulars	Bulla	Hija	Dutta	Average
Land use (in Sq.m)	59.4	48.6	50.5	51.6
Average annual production (in kg)	63	54	60	59
Selling price per kg	160	155	165	160
Cost of Production:				
a. Variable Costs per unit (Rs):				
Fish Seed	.50	.50	.50	.50
Labor cost	3.70	3.65	3.90	3.75
Others	2	1.80	2.20	2.00
Total Variable cost	6.20	5.95	6.60	6.25
b. Fixed Cost:				
Culture and maintenance	3200	1800	3000	2667
Harvesting	500	500	650	550
Total fixed cost	3700	2300	3650	3217
*BEP (in units)	46.6	45.1	42.1	43.6
*BEP (in sales)	3496.7	3535	3496.7	3496.7
*P/V ratio	.92 or 92%	.91 or 91%	.92 or 92%	.92 or 92%

Source: Field survey

During the course of study it was found that the variable cost comprises basically the fish seeds, labor cost and other carriage expenses and costs of stationeries. It can be observed from the table 1 that the total variable cost of fish culture in the three sample villages are found to be Rs 6.20, Rs 5.95, Rs 6.60 (in average) respectively and with the total fixed cost of Rs 3700, Rs 2300, Rs 3650(in average) respectively of three sample villages viz., Bulla, Hija and Dutta towards the fish

farming. The table 1 also reveals that, both the variable as well as fixed cost of Hija village is lowest as compare with the two other sample villages because the area under the fish cultivation is only 48.6 in sq.m whereas the Bulla has an area of 59.4 and Hija with 50.5 respectively. However, the contribution of Hija village is 45.1BEP (in unit) and BEP (in sales) 3535 which is maximum among the sample villages, also its P/v ratio is .91 or 91%. Therefore is the benefits to the farmers of Hija village is lowest among the three sample village. The reason may be due to low in selling price of fish i.e. Rs 155 per kg. Hence, it is recommended to increase the selling price of the fish in Hija village. The P/v ratio of both the Bulla and Dutta village shows same percentage with the 92% whereas the P/v ratio of Hija viilage is 91%. This clearly shows that the farmers of Bulla and Dutta village are more benefited. This is due to higher selling price and more area under cultivation. Further, the overall cost benefit analysis of the three village shows that fish culture in Apatani plateau is highly profitable.

The various cost as well benefits analysis from the paddy cultivation can be clearly understood from the above given table no.2.

TABLE 2

ESTIMATES OF COST BENEFITS ANALYSIS OF PADDY CULTIVATION IN THE SAMPLE VILLAGES (N=30)

Particulars	Bulla	Hija	Dutta	Average
Land use (in Sq.m)	12582	24484	10850.8	15972.2
Average annual production (in kg)	1466.6	4638	3600	3234.6
Selling price per kg	27	27	27	27
Cost of Production:				
a. Variable Costs per unit (Rs):				
Seed	16	16	16	16
Labor cost	3.70	3.65	3.90	3.75
Others	2	1.80	2.20	2.5
Total Variable cost	21.7	21.45	22.1	22.25
b. Fixed Cost:				
Paddy plot preparation	2250.00	3129.09	2678.67	2686
		247.27		

Seeding cost	305.00	3078.00	317.11	288
Paddy cleaning	2224.00	2800.00	2334.00	2545
Paddy harvesting	3222.00		2312.67	2778
Total fixed cost	8001	9254.36	7642.45	8297
*BEP (in kg)	1509.6	1682.6	1559.6	1746.7
*BEP (in sales)	42110	46271.8	42458.05	48805
*P/V ratio	.19(19%)	.20(20%)	.18(18%)	.175(17%)

Source: Field Survey

The above table shows that Dutta village has cover more area under the paddy cultivation with 10850.8 sqm and average annual production (in kg) 3600. From the table it is clear that the Bulla village has an area with 12582 in sqm which is smallest of three sample village due to more area is cover under fish cultivation as given in table 1 and its annual average production is also less.

During the course of study it was found that the variable cost comprises basically the paddy seeds, labor cost and other carriage expenses and costs of stationeries. It can also be observed from the table 2 that the total variable cost of paddy culture in the three sample villages are found to be Rs 21.7, Rs 21.45, Rs 22.7 (in average) respectively and with the total fixed cost of Rs 8001, Rs 9254.36, Rs 7642.45(in average) respectively of three sample villages viz., Bulla, Hija and Dutta towards the paddy cultivation. However, the contribution of Hija village is 1682.6 BEP (in unit) and BEP (in sales) 46271.8 which is maximum among the sample villages, also its P/v ratio is .20 or 20%. Therefore the benefit to the farmers of Hija village is highest among the three sample village. The P/v ratio of both the Bulla and Dutta village shows percentage with the 19% whereas the P/v ratio of Hija village is 18%. This clearly shows that the farmers of Bulla and Dutta village are less benefited.

Besides specific cost and benefits analysis of fish and paddy, the details of the estimated costs and benefits analysis of paddy cum fish culture can be seen from the table 3 given below.

TABLE 3

**ESTIMATED COST BENEFIT ANALYSIS OF PADDY CUM FISH CULTURE PRACTICES
OF THE SAMPLE VILLAGES**

(N=30)

Particulars	Fish	Paddy	Total
Land use (in Sq.m)	51.6	15972.26	16023.86
Average annual production (in kg)	59 (1.79)	3234.60 (98.21)	3293.60
Selling price per kg	160 (85.5)	27 (14.5)	187
Cost of Production kg (Rs):			
a. Variable Costs per	6.25	22.25	
b. Fixed Cost:	3217	8297	
Total cost	3223.25	8319.25	11542.5
*BEP (in units)	38.41	1746.7	1553.2
*BEP (in sales)	3459	48805	45636
*P/V ratio	.93 or 93%	.175 or 17%	.252 or 25.23%

Source: Field survey

Note: Figures in the bracket indicate the percentage of the total.

The above given table shows the Estimated Cost Benefit Analysis of Paddy cum Fish Culture practices of the sample villages (n=30). A total cost of Rs 3223.25 and Rs 8319.25 were incurred towards the fish and paddy cultivation respectively. It is can be seen that a cost of Rs 3706.2 and Rs 8012.03 was incurred for the fish and paddy cultivation in Bulla village. In Hija, the amounts were Rs 2305.95 for fish farming and Rs 9265.14 for paddy whereas the amount for the Dutta village was Rs 3656.6 for fish and Rs 7653.88 for paddy cultivation. According to the above table the p/v ratio of fish cultivation is much more than that of paddy cultivation in the Apatani valley and therefore the farmers can avail more benefit from fish cultivation as compare with the paddy cultivation.

CONCLUSION

Given the importance of rice and fish in the national economy, the decline in wild fish stocks and the growing need for fish protein, the feasibility of integrating fish culture with rice cultivation has been attracting increasing attention and could result in fish becoming available to a substantially greater number of rural households. The present study has clearly indicated that paddy-cum-fish culture is a viable, environment friendly, low-cost, low-risk additional economic activity with multiple benefits including increased incomes and greater availability of fish to rural farming community. Further work is needed in other regions of the country with different agro ecological conditions. Extension and development agencies should pay due attention to bring the benefits of the technology to marginal farmers.

To conclude, considering the huge benefits from paddy cum fish culture in Ziro valley, this practice is expected to be an emerging area for rural marketing in near future.

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