Prospects of paddy-cum-fish culture in the north eastern region of India

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INTRODUCTION

Paddy - cum - fish culture is an age-old custom, practiced in India and many of the Far - East Asian countries. According to Tamura (1961), the practice had its origin in India and was later adopted by the Far - East Asian countries, where it reached a high degree of technical perfection. Presently in India, due to various reasons, this culture practice is being neglected and is conducted mainly in some parts of Kerala, Tamil Nadu and West Bengal.

In the North - Eastern Region, rice forms the staple food of the people and is cultivated in hill terraces and valleys. Many paddy fields in this region remain flooded almost throughout the year because of the characteristic high rain fall encountered. Further, due to the constant water stagnation many paddy fields have also become swampy in the lowlying valley areas.

The heavy pressure for the paddy cultivating land in the hilly areas and the difficulties encounted in constructing fish ponds in the hilly terrains have limited to a considerable extent the area available for fish culture. Due to this and the lack of proper fish culture technology for the hilly areas, the present fish production of the region remains far below than the actual requirements. The low production and supply has contributed to the exorbitant cost of fish flesh. Increasing the water areas for fish culture by planned projects, developing suitable fish culture technologies for the hilly areas etc., and their outcome would take a lot of time to yield the expected results and by then the demand for fish would also increase to many folds. In order to immediately cope-up with the high demand of fish, it becomes imperative to divert considerable attention to utilise the long - term water - retaining paddy fields of the region for fish culture.

2. COMMON METHODS OF EXPLOITATION

There are principally two methods of utilising the flooded paddy fields, the first being the ',capture'' system in which there is no selective stocking; the fields being used initially to trap

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the wild fish which may gain entry into it. The fish populate and grow in nature and are harvested for consumption. The second one is the "culture" system in which fishes of the desired species are stocked in the paddy fields as that of a pond. Among this "culture" system also there are two methods of exploitation. One is the 'simultaneous culture system' in which the paddy and fish are grown together and harvested together. The other is the 'alternate culture system' in which rice alone is harvested in time and fish is allowed to grow to the desired size. In addition in this system, paddy alone is allowed to grow in one season and fish alone is cultured in the other season. Further, in general in the culture system, it is possible to (i) produce fingerlings from fry or (ii) table size fish from fingerlings and (iii) table size fish from fry.

3. PRESENT STATUS OF PADDY-CUM-FISH CULTURE IN THE NORTH EASTERN REGION:

Almost all the states/Union Territories of the North Eastern Region have plenty of areas under flooded paddy fields. In some of the fields, the wild fishes get entry and are "captured" or harvested along with paddy. However during recent years, there have been instances of selective stocking of fish in the paddy fields. The areas under such cultivation, the production available and area of flooded paddy fields which may be available for the 'culture' system are given in table 1.

Table 1

SHOWING THE POTENTIAL PADDY-CUM-FISH CULTURE AREAS OF THE NORTH EASTERN REGION*

Sl. No.	State/UT	Scope for cultivation in ha	Area under cultivation in ha	Total	Average production Kg/ha/year
1.	Arunachel Pradesh	2,650	150	2800	125
2.	Assam	15,000	Not available	15000	N.A.
3.	Manipur	1,600	400	2000	200
4.	Meghalaya	2,200	50	2250	380+
5.	Mizoram	400	N.A.	400	N.A.
6.	Nagaland	400	120	520	250
7.	Tripura	5000	N.A.	5000	300++
		27,250	720	27,970	251

* Modified from Choudhury (1977).
\+ Experimental observations (Ghosh, 1981).
\+\+ Experimental observations (Lipton, 1982).

It may be seen from table 1 that the area utilised at present for rising fish in the paddy fields constitute only about 2.6% of the total available area, whereas vast potential areas are practically untapped so far. Assam constitutes the largest area; but adequate information is not available about the extent of utilisation.

In Arunachel pradesh, paddy-cum. fish culture is being practiced in hilly terraces for many years (Nath 1981)- The climatic conditions prevaling there favours the growth of exotic carps like the common carp, *Cyprinus carpio* to a great extent.

In Manipur state, fish culture is being carried out in paddy fields and nearly 20% of the available area is being utilised (Table 1). Apart from the conventional stocking of the common carp, *Cyprinus carpio,* the air breathing fish margur *(Clarius batrachus)* which also acts as a biological control for insects in the paddy field is also being tried.

Though in Nagaland, the potential paddy-cum-fish culture areas are limited, fish production from them is comparatively better than the other states/union territories. Nearly 23% the total available area is being at present covered by this culture.

SCOPE OF DEVELOPMENT OF PADDY-CUM-FISH CULTURE

4.1. IMPROVED PADDY-CUM-FISH CULTURE METHODS:

4.1.1. OBJECTIVES

The broad objectives of the programme include:

a) to maximise the extent or utility of the excess water in the paddy fields by way of cultivating fish in them either simultaneously or alternatively.

b) to produce animal protein food simultaneously with the paddy crop or alternatively.

c) to maximise the utility of a limited piece of land, by way of integrating fish culture. This objective holds good particularly for the North Eastern Region as the pressure for agriculture land is much more than in the other regions of India.

d) to provide additional income and off-season occupation to the farmers and to keep them engaged in agriculture and fish culture activities.

4.1.2. GENERAL PRINCIPLES

Some of the general principles involved in the scientific paddy-cum-fish culture are:

i) Strong and impervious bund in the paddy field is required. The height of the bund should be atleast 25 cm from the level of the field.

ii) channels are to be provided all along the sides of the field or across the field which would help the fish in taking shelter and to migrate there in case if water gets heated in the shallow areas of the field.

iii) The paddy variety to be planted should.
   a) tolerate 2 high column of stagnant water
   b) posses multiple resistance to pests and diseases (as pesticides should not be applied in fish bearing waters)

iv) the fish for this culture should
   a) tolerate turbidity b) low oxygen conditions, c) thrive well in shallow water conditions.

4. 1. 3. EXPERIMENTAL OBSERVATIONS

Results of the experiments conducted at Meghalaya and Tripura based on scientific principles of simultaneous paddy-cum-fish culture have indicated that by adopting proper management practices, rice yield as well as fish yield can be enhanced to a greater extent (Ghosh 1981, Lipton 1982). The paddy varieties found suitable under the agroclimatic conditions of these states and the fish yield obtained from them are given in table 2.

Table 2: Showing promising varities of paddy, their performance, stocking density of fish, their yield etc. in paddy-cum-fish culture fields.

Meghalaya *			Tripura**			
Paddy var.	Yield Kg/ha		Paddy var.		Yield Kg/ha	
					Rabi	*Kharif*
Ngola (local)	4316	CR	189-1		3136	3883
		BG	34-8		3516	2895
CRM 10-3630	4900	CR	11-4		3242	2925
		PAIJAM			–	3579
		CR	1009-1		–	3658
Fish	Stocking No/ha	Yield Kg/ha	Fish	Stocking No/ha	Yield Kg/ha	
Common carp	7,000	343	Common carp	6,000	158.5/ season	
C. carpio	10,000	420	*C. carpio*			

* Ghosh (1982).
** Lipton (1982).

It could be seen from table 2 that the paddy var. CRM 10-3630 is most suited under Meghalaya conditions and the yield obtained was 4.9 tonnes/ha. Amoung the stocking densities tried, 10,000 nos/ha of common carp was found to yield 420 Kg/ha. Under Tripura conditions, during the 'rabi' season BG 34-8 variety was found to yield 3.5 tonnes/ha and during the 'Kharif' season CR-189-1 was found to yield 3.88 tonnes/ha. Among the stocking densities tried, 6000 nos/ha was found to be the most suitable and economical, and the yield obtained was 158.5 Kg/ha/ season. The yield is lesser than from Meghalaya state which may be due to the increased water temperature prevailing in Tripura. However if this culture is being tried in the available 5,000 ha of long term water retaining paddy fields during 'Kharif' and 'rabi' seasons, then nearly 300 kg/ha/year of fish can be harvested from them.

4. 1. 4. PRACTICAL APPLICATIONS

It is seen that the present level of fish production from paddy fields of the North Eastern Region is only about 180.0 tonnes/year. If proper

scientific technology is practiced in all the available long term water retaining paddy fields, increased yield to about 7020 tonnes of fish can be harvested from them. This can further be increased by way of adopting scientific culture practices and by manipulating suitable paddy varities and fish species. According to the North Eastern Council's (NEC) estimate, the fish requirements for 1983-84 would be 2,06,720 tonnes whereas the supply at present is only about 50,000 tonnes. Therefore, ways to bridge the gap in supply of 1,56,720 tonnes are to be worked out. The long-term water-retaining paddy fields available in the N.E. Region seem to offer scope for integrating fish culture in them and help in supplementing fish production without incurring much initial expenditure. Further the paddy-cum-fish culture ventures help in compromising the agriculturists and aquaculturists in view of the expanding pressure for arable land. The economic of paddy-cum-fish culture (Lipton 1982) under Tripura conditions also suggest that a farmer can earn a net profit of Rs. 6,775.00 per year of which fish contributes about 24.8% speaks itself the viability of the programme. Therefore more emphasis should be given for propagating paddy cum fish culture as an agricultural practice at appropriate areas.

5. ADVANTAGES OF PADDY-CUM-FISH CULTURE

Paddy - cum - fish culture has got evident advantages. According to Coche (1966), this is an almost ideal method of land use. In general the advantages are:

1. Fishes act as a biological control against harmful insects, molluscs and weeds. It was noticed that the paddy fields in which fish was stocked were totally weed free, and this helped in otherwise high-cost weeding operations. Thus they provide a congenial condition for the crop.

2. Tillering of the paddy has increased than in control fields wherein no fish was stocked, resulting in more paddy production. As fishes search for food in the mud, the surface layer of mud is being turned and this helps in the aeration of the microhabitat of the paddy plants.

3. Nearly 7.5% increase in paddy yield was observed in fields in which fishes were stocked. This could have been possible by the utilisation of fish excreta which contains nitrogenous wastes by the paddy plants and by combined actions of other factors like biological control of pests and increased tillering.

4. The presence of fish in paddy fields elicits keen interest in farmers to visit their field often. Therefore more management for the paddy crop as well is being obtained from the farmer.

5. In case if the paddy field remains flooded even after paddy harvest, fishes can be reared there for weight increment. This system as well as the alternate type of culture system offer an off-season occupation for the farmers and thus help in keeping them engaged and provide economic benefits also.

SUMMARY

The demand for fish in the North Eastern Region in general is quite high owing to the food habits and the social customs of the people, whereas

its supply at present is very low due to various specific problems of the Region. By virture of its heavy rainfall, the NE region provides a number of long-term water retaining paddy fields. These paddy fields would be of immediate use in utilising them for the contemporaneous production of padpy and fish. Therefore the agriculturists and aquaculturists can work together to find out ways for enhancing the unit area production. When fish culture will be taken up at a large scale in the paddy fields, some input bottlenecks such as seed supply and financial problems may crop up. The various Developmental agencies and States / union Territories can provide the necessary assistance to make the paddy cum fish culture system a viable agricultural practice.

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