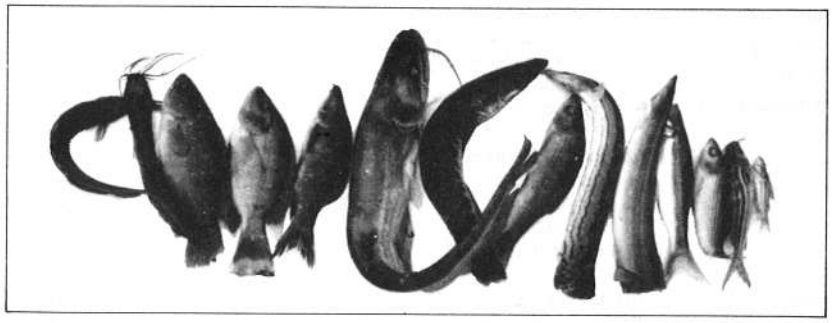
INTEGRATED RICE-FISH CULTURE

Increased Productivity from Deepwater Ricelands in West Bengal



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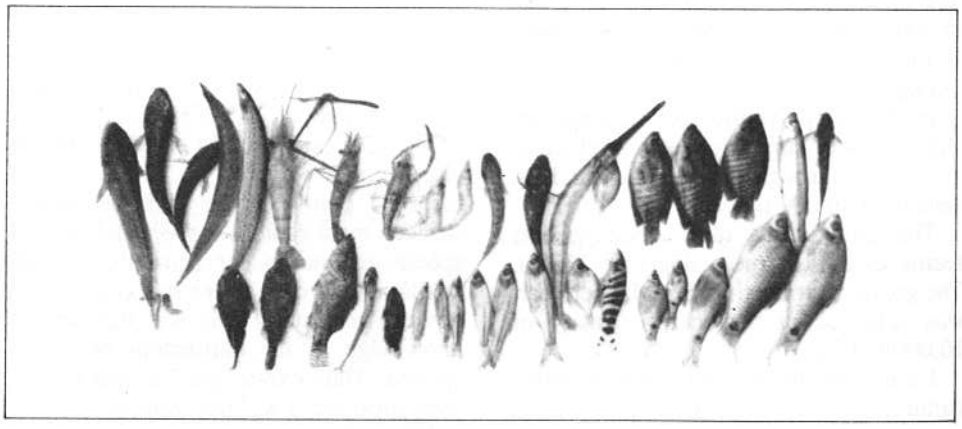
Above and below, a variety of wild fish and prawns from a typical deepwater ricefield environment.



India has the largest land area planted both ordinary rice and deepwater rice. significant portion of the deepwater e areas is in the state of West Bengal, ering at least 0.46 million ha.

For five to six months a year, deepter rice lands hold huge amounts of ile water with depths ranging from 0.5 2.0 m. Deepwater rices are adapted to h environments by their ability to ngate and endure submergence.

The carrying capacity of the water in se lands could be utilized to contribute stantial quantities of animal protein human consumption in the form of and prawns. Integrating fish culture n deepwater rice appears to be a viable tem which can help alleviate the short- of fish from inland waters.

Although the practice of collecting d fish from deepwater ricefields is bably as old as rice cultivation itself, e have hardly been any aquaculture lies with the objective of augmenting yields from such areas. The few data fish production reveal that the figure dly exceeds 100 kg/ha/season.

ntegrated farming systems designed small farmers and involving aquacul- with deepwater rice cultivation ld go a long way, not only in easing the production of animal ein, but also in generating income for l residents.

The distribution of deeply flooded rice-ls and potential deepwater rice areas e been estimated through an extensive survey undertaken by the Deepwater Rice Project in 1986-87 to be at least 0.46 million ha.

Deepwater Ricefield Ecology

In order to develop a rice-fish culture system, an understanding of the ecology of the aquatic ecosystem of the deepwater ricefield is essential. Such information however, is grossly lacking. Comprehensive studies on biotic and abiotic features of a representative deepwater ricefield were undertaken in 1986 and are still underway.

A field, located in the village of Pearapur, 15 km south of Chinsurah (Hooghly), has been extensively studied through weekly observations of physico-chemical characteristics of water, studies on plankton and benthos, various algal production on the stems of the deepwater rice plants, the changing pattern of water depth, rainfall record, dominant aquatic flora and fauna including wild fish and prawn species, solar radiation, etc. The studies conducted so far reveal that the environmental conditions are suited to the development of integrated rice-fish farming.

Development Potential

Today's farmers have a growing interest in the new aquaculture techniques for cultivating fish in ricefields. Utilizing their excess water to produce food fish such as carp and the freshwater prawn *Macrobrachium rosenbergii* holds exciting promise for farmers who want to maximize their resources and reduce their investment risks through crop diversification.

Water in the deepwater ricefield comprises several ecological niches. Through judicious stocking and improved management, the entire food chain may be advantageously used for increased fish production.

The synergistic relationship between fish and rice has been little studied. Culture trials in progress in the districts of Hooghly, Burdwan, Midnapore, South 24-Parganas and West Dinajpur, support the idea that fish provide a better growing environment for rice.

The increasing awareness of the need for judicious use of pesticides and the development of integrated pest management techniques (with fish as a biological control agent) has led to the rediscovery of rice-fish culture. This practice, in fact, was interrupted in the early 1970s with the introduction of high-yielding rice varieties which required the use of pesticides toxic to fish.

Recent Approach Towards Development

The IRRI/ICAR-Government of West Bengal Cooperative Project, called "Strengthening Research on Integrated Pest Management for Deepwater Rice Farming Systems and Development of Rice-Fish Culture," has been conducting investigations since 1986 based on a farming systems research approach both in farmers' fields and research stations. The aims are to:

- Standardize and improvise a culture system of important food fish with deepwater rice suitable for two main types of deepwater ricefields available in the state. (One type is the bunded field with a small to large area; and the other is the large open area.)
- Find the deepwater rice varieties suitable to a specific flooding pattern so that a rice-fish system with improved production may be recommended.
- Determine fish species and stocking sizes suitable to environmental conditions in the field in order to improve the recovery percentage during harvest. Various fish species may form a compatible combination during culture.
- Work out a suitable field design with the trench/sump dug in such a way that the maximum field space is used for rice cultivation. (Farmers still emphasize rice rather than fish.)
- Conduct aquaculture studies to improve fish production under various treatment conditions using supplementary feed compounded from locally available, inexpensive ingredients and on the efficacy of using dried poultry manure and composted cow dung.
- Monitor fish health under ricefield conditions through appropriate sampling techniques. Suggest remedial measures for diseases that may occur in cultured fishes.
- Find out whether fish species like the carnivores *Clarias batrachus*, *Heteropneustes fossilis* and the murrels are useful in the control of insect pests; and whether herbivores like grass carp can be used for the control of aquatic weeds in deepwater ricefields.
- Develop a multiple cropping system to make year-round production possible by profitably utilizing the bunds for growing vegetables and the fields for other crops and some air-breathing fish during summer rice *(boro rice)* cultivation.

Farmers weigh a haul of fish from a deepwater rice-fish culture experiment at Chinsurah, West Bengal.

Conclusion

Increased crop production and reduced production costs are important benefits which farmers may expect from research on integrated farming systems involving deepwater rice and fish.

Our survey revealed that, although considerable knowledge on rice production is common among farmers, there is a lack of systematic knowledge on fish farming. In many places, we met progressive farmers who, out of their own interest, initiated deepwater rice-fish farming but were soon discouraged because of poor fish recovery during harvest. It was later discovered that stocking fish fry (about 4-5 mm) directly into the field led to mortalities due to predation and/or outbreak of diseases.

Unfortunately, a communication gap exists between scientists and farmers. This needs to be bridged by reorienting the extension set-up. Even in the remotest villages, government agencies and private entrepreneurs are setting up fish hatcheries; it is hoped that these, along with the package of practice now available, will generate momentum among farmers to adopt fish culture with deepwater rice cultivation as a means of livelihood.

It is estimated that if only 10% of the existing 0.46 million ha of deepwater rice area can be brought under rice-fish farming, fish production can sizeably contribute to improving nutrition and income among deepwater rice farmers. ●