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Nutritional and food security for rural poor through multi-commodity production from a lake of eastern Uttar Pradesh

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Introduction

India's population of more than 1 billion people may reach more than 1.4 billion by the end of 2020 AD, necessitating an intensive search for alternative and more efficient ways to produce food. In this search for new food supplies and their more equitable distribution, attention is naturally centred on the basic agricultural commodities. However, it is clearly recognised that these commodities should be supplemented by high quality protein food. In this context, aquatic food reserves can make an important contribution to supplies of protein. The natural water resources of Uttar Pradesh, India, consist of approximately 180,000 ha in the form of lakes, oxbow lakes, seasonal water logged areas, marshes and swamps[1]. Since time immemorial the flood plain lakes have provided man with many sources of livelihood. In eastern Uttar Pradesh, the lakes Bakhira, Ramgarh, Chilwa, Suraha, Reoti, Dah, Konar, Parvati and Leond Tal are some of the larger flood plains providing lucrative sources of multi commodity production.

Leond Tal is a perennial natural lake in the Siddharthnagar District, which forms a kind of no mans land. During the Mugal Empire period this lake and 80 others were awarded to the King of Bansi as 'Amir-UL-Bahar' by the Mugal Emperor Jahangir, and were know as 'Nankar' (the People's nourishment) during that period, in the area of Sarju River Basin and foot hills of Himalayas.

Topography and morphometry

The Leond Tal is surrounded by roads on eastern, western and south western sides, with its principal catchment area lying in the north and west. The tal lies in a clay-loamy soil region of the district and has a thick clayey mud deposition of 0.6-1.0 m depth at the bottom. The actual water surface area of the lake as per the Tahsil map is 327 ha. However, during flood conditions its surface area can increase 1.5 to 2.0 times. The lake is surrounded by the Sohna, Nathar-Deoria villages in the north; the Rajawapur, Burhoon and Duferia villages in the east; Kathautiaram, Mahua-Buzang villages in the south and Kataria, Babu and Leondi villages in the west. The main outlet of the lake is Ashadi Nullah, which receives water from

Rapti River and nearby catchments during monsoon floods via Kumahwa and Enwar Tals. However, after the monsoon this nullah remains dry with intermittent water patches of low lying area such as Kunahwa Tal, Enawar Tal, Ashadhi Tal. The total length of the nullah is over 12 km. The main outlet from the Tal is the Parasi Nullah which drains water from the Tal to river Rapti through Phajihatwa Nullah after travelling over 36 km from the Tal.

Mode of lake exploitation

The water of the lake is primarily used for irrigation, live stock bathing, drinking and for fishing in particular. While the peripheral land area of the tal provides grazing grounds for cattle, the shallow and weedy zones of the lake provide shelter and habitation for a wide variety of aquatic birds.

Lotus leaves harvested from the lake are also used by local population as plates for serving food. The lotus flowers are used in temples for worship and decoration, and the roots of this plant are also consumed by farmers locally. Lotus is auctioned yearly, depending on the lotus crop harvested from the lake by the Leond Tal Fishermen Co-operative Society. The fruit cover (thalamus), unripe seeds and shoots are consumed as vegetables. Seeds are also used for making garlands.

The wild paddy or tinni rice (*Oriza rutipogon*) is 1 or 2 m tall annual grass with creeping and erect stem. This rice plant grows naturally in the tal. Its edible grains form the staple food in the locality and are exported to other parts of the country. On auspicious occasions, Tinni rice is used for consumption. At times, it becomes very expensive and is sold at higher rate of Rs. 60 /- kg. The straw is used as fodder for the cattle. The cost of this rice varies from Rs.15-30 /- kg at the lake site.

Multi-commodity production

Leond Tal has great local significance as a multi-crop production system. The major commercially important aqua crops are fish, tinni rice and lotus (*Nelumbo nucifera*). The commercial cropping systems involved in the Tal are undertaken with special reference to socio-economic conditions of the co-operative societies of Sohna and Siddharthnagar.

The mean annual return from fishing activities, based on data collected from fisher surveys in 1996, is Rs. 136,000. The overall fish yield was between 5.7 tonnes and 93.8 tonnes between 1987 and 1996. The highest production was recorded in 1991 (28.7kg/ha) while the lowest production was recorded during 1993. Overall the mean fish production contributed to a mean of 36.7% of the lake's production volume during the period 1987-1996, although it comprised 62.3% of the total value.

The tinni rice production in the tal was in the range 902 kg to 8.27 tonnes from 1987 to 1996. During 1991 and 1996 due to damage of crop through flood water entry, the tinni production was severely affected. The highest productivity was recorded during the year 1992 and lowest in 1990. Mean production of tinni was 38.7% of the total crop volume of the tal, and represented 31.1% of the total value. Lotus seed production in terms of Kamalgatta output in the tal was 400kg to 7.5 tonnes with the minimum occurring in 1989 and maximum in 1996. The overall mean production of lotus seed was a mean of 29.6% of total lake crop production, whereas it comprised only 6.6% of the total value. There was not much production of lotus during the year 1987 and 1992 due to severe drought in the tal area.

Nutritional security

These crops provide not only income and employment, but also supplement the food of the rural poor in the area. The economic importance of lotus (seed, stem and root) is due mainly to its nutritional value. According to National Institute of Nutrition (1996), the nutritional composition of lotus (green matured) seed is 84.01% moisture, 3.9% protein, 0.7% fat, 1.1% mineral, 0.9% fibre, 8.8% carbohydrate along with 57 Kcal energy, 49.0 mg calcium and 151 mg phosphorus. Lotus root contains approximately 85.9% moisture, 1.7% protein, 0.1% fat, 0.2% minerals, 0.8% fibre, 11.3% carbohydrate along with 53 Kcal energy, 21 mg calcium, 74 mg phosphorus and 0.4 mg iron; while dry lotus seed contains 10.0% moisture, 17.2% protein, 2.4% fat, 3.8% nitrate, 2.6% fibre, 64.0% carbohydrate along with 346 Kcal energy. 36 mg calcium, 294 mg phosphorus and 2.3 mg iron.

Conclusion

The major cause of nutritional deficiency in our country is that a large number of people simply do not have the resources to buy enough food. They are poor and can neither afford sufficient quantity or quality of food. To an extent, this problem of deprivation can be solved by selecting and eating simple, inexpensive wholesome foods naturally available in lakes such as Leond Tal and other water bodies. For the local people, the lake is synonymous with nutritional security, by providing several crops that are accessible to the poorest of poor.

The gap between present and potential yield is high, in terms of fish production. High priority should hence go to bridging the productivity gap through a mutually reinforcing blend of technologies, services and public policies. Mainstreaming the nutritional dimension in the design of aquaculture based lake fish production (farming) systems is also essential. There is no time to relax on the food production front as pointed by the Commission on the "Nutrition challenges of the 21st century" in its respective publication entitled Ending Malnutrition by 2020 A.D. Considering the importance of above aquatic crops it seems to be worthy to undertake management and conservation of similar water bodies with an integrated approach to help secure the future nutritional security of the poor.

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Emerging boost in Sri Lankan reservoir fish production: a case of adoption of past research findings

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Background

Sri Lanka is well renowned for its irrigational reservoir construction dating back to at least 2,000 years. There are also stone inscriptions indicating the levy of taxes on reservoir fishery landings dating back to first century A.D.[1]. However, in the modern era, the Sri Lankan inland fishery is almost totally confined to the large number of reservoirs in the country and is known to be characterized by three features, viz. (a) it is primarily based on the exotic cichlids (mainly *Oreochromis mossambicus* and *O. niloticus*), (b) it is an artisanal fishery using non-motorized canoes with an outrigger, and (c) the gear is uniform, consisting of gill nets of 8.5 – 12.7 cm mesh[2]. The Sri Lanka reservoir fishery is also perhaps one of the best documented in the region[2,3,4].

The observations that the reservoirs contain sizeable populations of many small sized indigenous, cyprinid (minor) species, that grow to a maximum size of about 8-10 cm led to research on the possibilities of harnessing these resources for human benefit. The research was conducted by three independent groups[5,6,7,8,9,10] to estimate fishery potential of minor cyprinids in Sri Lankan reservoirs. All these studies demonstrated that the minor cyprinid stocks in perennial reservoirs could be harnessed using small meshed gillnets resulting in significant catch per unit effort, and that such a fishery will not directly and or indirectly impact on the existing fishery, the mainstay, for exotic cichlids. The researchers showed that the recruitment of cichlids is not impacted upon as the young inhabit the littoral and sub-littoral areas, as opposed to the fully grown minor cyprinids that inhabit the open waters, as much as the adult exotic cichlids. Based on the biomass and total biological production, it was found that there is scope for an approximately a 100% increase of the total yield in Sri Lankan reservoirs through introduction of a subsidiary gillnet fishery for minor cyprinids[11].

Mass-balance trophic models have shown that exploitation of minor cyprinids in Sri Lankan reservoirs is advantageous to the existing cichlid fisheries through relaxing competition for plankton food resources in juvenile cichlids[12]. Also on global scale, the exploitation of untapped fishery resources in reservoirs such as minor cyprinids is recognized as a potential avenue for intensification of reservoir fisheries, especially in tropical and sub-tropical countries[13].

Dislodging the catch from the nets, a tedious task.