Developing Aquaculture of Small Native Species (SNS) in Bangladesh: Village Level Agroecological Change and the Availability of SNS

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Abstract

Small native species (SNS) of fish are an important source of protein and income for rural people in Bangladesh. A rapid rural appraisal study was carried out to explore recent changes in the availability of SNS in relation to agroecology and related issues. Village residents noted that the availability of SNS had declined drastically due to habitat loss related to agricultural intensification and due to the restriction of access to the remaining habitats in the course of aquaculture development. Their perception was that poor people had gained from the intensification of agriculture in terms of rice consumption but had lost in terms of reduced access to fish and other animal products.

Introduction

Small native species (SNS) of fish have played an important role in the livelihood of rural people in Bangladesh. The majority of the 260 species of finfish of Bangladesh described by Rahman (1989) are small or medium sized and are widely distributed in rivers, floodplains, ponds and inundated paddy fields. Traditionally, the small species have been harvested freely from open waters, while the harvesting of large species (in particular the major carps) has often been subject to restrictions. The main period of harvesting small species is from the commencement of the monsoon in June and July until the water dries up in March.

Small native species have high nutritional value, both in terms of protein content and the presence of micronutrients, vitamins and minerals. Small fish less than 10 cm in length are usually consumed whole with the organs and bones and contain large amounts of calcium, iron and zinc. Some of the SNS are also very rich in vitamin A (Ahmed 1981; Thilsted et al. 1997). Apart from their nutritional value, SNS caught from common property resources provide an important source of income for rural landless families.

Rice is the staple food and major source of energy for the people of Bangladesh. Large-scale agricultural development programs, focused primarily on rice production, have been undertaken by the government for over a decade in order to ensure food security for the rapidly increasing population. A major element of these programs is water management for irrigation. For this, a number of flood control and drainage (FCD) and flood control, drainage and irrigation (FCDI) schemes have been implemented. Wetlands and lowlying floodplain areas that previously flooded for prolonged periods have been transformed into agricultural land. As a result, extensive areas of floodplain wetlands that had served as feeding and breeding habitat for small (and large) native species of fish, have been converted and migration routes have been disrupted. The adverse impact of this development on wild fish stocks has been documented (FAP-16 1995). Furthermore, general intensification of agricultural practices in irrigated areas is likely to lead to increased use of agrochemicals. Pesticides in particular are a threat to local fish stocks. Finally, excessively high fishing pressure alone can lead to the declining availability of SNS.

The fact that SNS are important sources of nutrition and income, and the widely held perception that the availability of this resource is declining, have prompted initiatives to develop aquaculture for these species. In a series of articles, the authors explore the context of this development in terms of reasons for the decline in availability of SNS, the views of fish farmers regarding their culture and the markets for small species. This article, the first in a series, reports on an exploratory study of local factors responsible for the decline of SNS availability.

Exploratory Study

An exploratory study of recent changes in agroecology and other factors related to the availability of SNS was conducted in Churomonkathi, Jessore, about 240 km southwest of Dhaka. An area of about four square kilometers, covering the two *mauzas* (village revenue areas) of Ashasonnagar and Dogachia was studied.

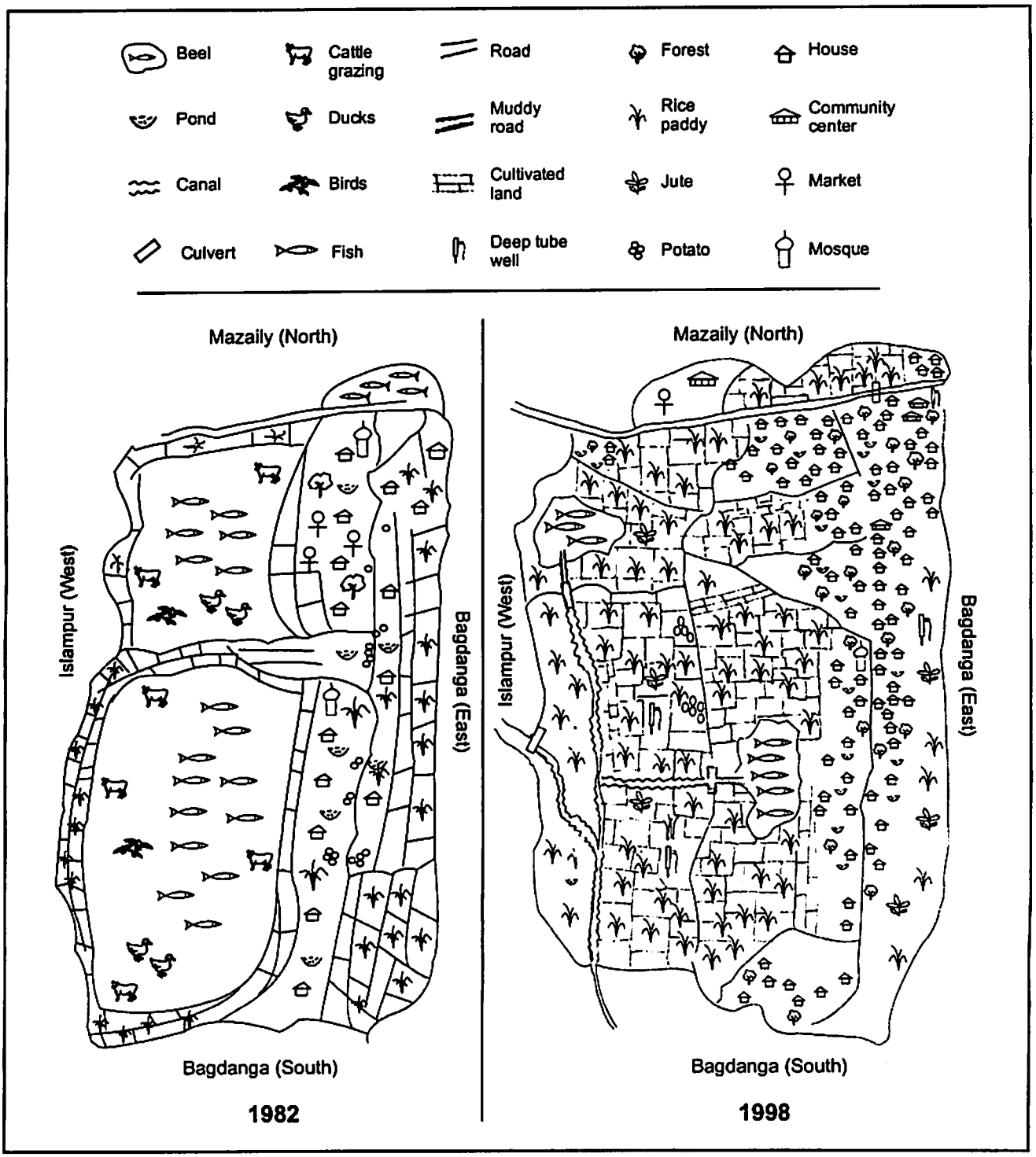

Fig. 1. Maps describing the present (1998) and previous (1982) agroecological situation of Ashosannagar and Dogachia mauzas of Churamonkathi, Jessore, Bangladesh.

Rapid and participatory rural appraisal methods were used to investigate changes in SNS availability and related issues at the village level (Mukherjee 1993). A number of exercises were carried out with groups of randomly selected people from different villages. The group drew a map of the current agroecology of the study area, followed by another map depicting the agroecological situation before the onset of agriculture intensification in the area in 1982. These were used to identify changes. Resource mapping, matrix scoring and semi-structured interviews were conducted to investigate the availability of SNS species and related issues.

Changes in the Agroecosystem

A comparison of the maps revealed significant changes in the physical environment since 1982 (Fig. 1). The 1998 map indicates that the area is dominated by agricultural land, with rice and jute as the main

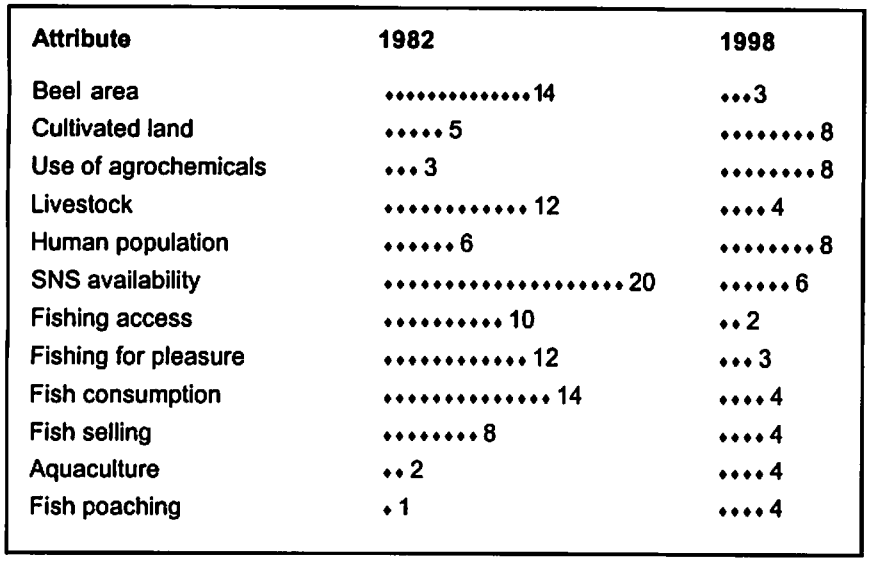

Fig. 2. Scoring of perceived changes in agroecological and fishing related attributes between 1982 and 1998 in Churamonkathi, Jessore, Bangladesh.

crops and a large settlement area with houses, vegetable gardens, fruit trees and fish ponds. There are two *beels* (flooded depressions) of 40 ha and 48 ha, respectively, located in the middle and northwestern part of the area. These two *beels* are linked to a drainage canal system constructed in 1985. The 1982 map, by contrast, shows the area dominated by two large *beels* with a far smaller area of cultivated land. These *beels* not only provided a habitat but also served as grazing land for livestock as the water receded in the dry season. The construction of the drainage canals has significantly changed the agroecology of the whole area, leading to an expansion of crop production with a resultant reduction in the habitat of wild fish and grazing land for livestock. The respondents also noted a substantial increase in the total number of households and the number of fish ponds over the same period.

Availability of SNS

A matrix scoring exercise (Fig. 2) was carried out to explore the perceptions of the villagers about agroecological change and other issues related to the availability of SNS between the years 1982 and 1998 (before and after the implementation of the drainage scheme and related agricultural intensification). Scoring confirmed key results from the mapping exercise, i.e., a drastic reduction in the *beel* area and an increase in cultivated land and human population. Concomitant with the expansion of cultivated land was an increase in the use of agrochemicals, pointing to a general intensification of crop production. Livestock populations, on the other hand, have declined as the *beel* areas formerly used by cattle and ducks have been transformed for crop production. Not surprisingly, the availability of SNS was perceived to have declined drastically. The reasons cited for this decline were the loss of *beel* habitat, loss of access to the remaining *beel* areas due to the development of aquaculture and the increased use of agrochemicals, including pesticides. Villagers reported significant fish, snake and frog mortality following the intensification of pesticide use. Access to fishing grounds, fishing for pleasure (as a social occasion), fish consumption and the selling of fish within the village were scored separately. All these attributes showed a decline from 1982 to 1998. The *beels* in the study area are now used by groups of villagers for the extensive culture of major carps, with regular stocking of fingerlings. As a result, access to fishing in the *beels* is restricted to members of these groups and there are few opportunities for open access to fishing by other villagers. Aquaculture in homestead ponds and the remaining *beel* areas was said to have increased. The loss of opportunities for open access to fishing and the rise of private fish farming have led to an increase in fish poaching.

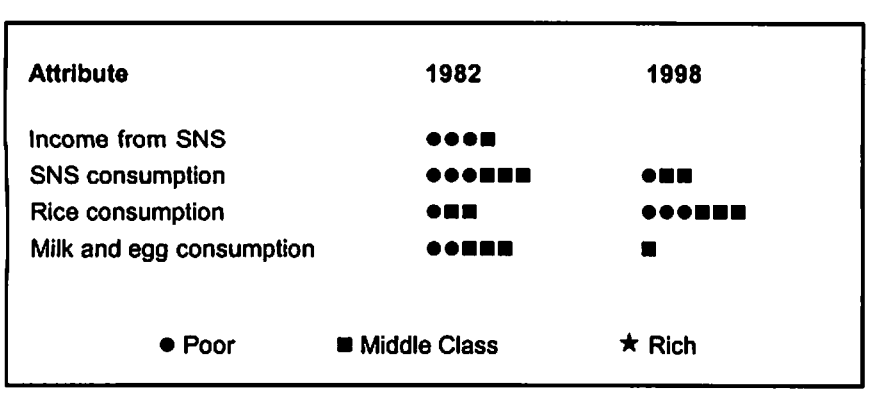

Fig. 3. Perceived impact of agroecological changes on different economic groups in Churamonkathi, Jessore, Bangladesh.

Impacts

To explore the impacts of changes in the availability of SNS on different socioeconomic groups, the changes in key attributes were scored by 'poor', 'middle', and 'rich' categories (Fig. 3). The criteria used for classifying by economic groups were based on indicators selected by the villagers, such as income, type of house, land ownership, irrigation facilities and household items such as television, vehicle, etc. This exercise revealed that in 1982 the poor, and to a lesser extent middle income groups, derived a significant income

from the harvesting and sale of SNS. This is no longer the case. In fact, a poor community of fishers, known locally as the Bagdi, lived in the area in 1982 but have left following the decline in availability of natural fish. Consumption of SNS has declined overall, but this has been particularly marked among the 'poor' and 'middle' groups. Milk and egg consumption showed a similar pattern. On the other hand, rice consumption has increased, particularly among the 'poor' and 'middle' income groups. This suggests that changes in the agroecology of the area have most seriously affected the local poor in terms of rice consumption and availability of fish and animal products.

Discussion

Although exploratory and local in outlook, the brief rapid appraisal study has identified a number of issues relating to the availability of SNS at the village level. Land drainage and associated agricultural intensification have increased the availability of rice but reduced the availability of fish and other animal products in the study area. These changes have been most pronounced for the low income groups. Bangladesh has the highest level of malnutrition in Asia and poor rural children are particularly affected. Fish can play an important role in alleviating nutritional deficiencies, but currently their availability appears to be declining. Both fisheries and the production of livestock such as cattle and ducks relied on areas that were not intensively farmed and were common property. Thus, aquaculture development has contributed to the reduction rather than to an increase in the availability of SNS.

While the development of aquaculture in the *beel* areas has restricted the availability of SNS to the local population, the impact of this development on the total stocks of SNS was not studied. This impact will depend on, for instance, whether or not attempts are made to clear the *beels* of natural species prior to stocking of larger species. Where this is not the case, the restriction of harvesting to large stocked species may effectively create a refuge for SNS. This has been observed in culture fisheries in small waterbodies in Laos, for example, where stocks were characterized by a high abundance of essentially unexploited small native fishes (Lorenzen et al. 1998).

Given the likelihood of further agricultural intensification and expansion of aquaculture, the integration of small native species into aquaculture systems may be an effective method of increasing their availability to the local population and to conserving the reservoir of biological diversity that they represent. Such integration may be in the form of active culture or passively through the conservation and appropriate use of wild stocks that may persist in waterbodies used for aquaculture. This will be discussed in the forthcoming articles in the series.

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