Limitations in Fish Production in
Yen Chau/Son La Province/Northern Vietnam

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Abstract

In Yen Chau district of Son La Province fish farming is one of the major activities of farmers belonging to the ethnic minority Black Thai. The typical pond system in this area is characterized by polyculture of grass carp, other carp species and tilapia, with continuous water-flow and feeding with mainly grass and leaf material.

Information on factors limiting fish production was gathered by conducting 70 open and 70 structured interviews in the district of Yen Chau and by monthly surveying of six selected fish farmers.

Average fish yields of less than 300 g/m\textsuperscript{2} for a 2-year production cycle must be considered relatively low for a feed-based aquaculture system. Even though most farmers around Yen Chau town own ponds, the demand on the local market can not be covered and fish must be imported from the lowlands.

The low productivity can be partly explained by a lack of training or extension services in the field of aquaculture. Grass carp are frequently affected by diseases leading to a major loss of fish which is considered the main problem of pond farming in that region. The quality of the stocking material is assessed as low, which is probably caused by inbreeding depression in the local hatcheries. As paddy fields and ponds are linked by a common irrigation system, activities in the paddy fields, such as the application of pesticides, may negatively affect ponds. Water shortages in ponds may occur, when paddy fields start to be irrigated. Low water temperatures during the winter frequently lead to mortalities of tropical fish species, such as tilapia. Feed resources become limited in the cold dry season. The general food base in this system seems to be adequate for grass carp, but not for other fish species.

Despite these obstacles, fish farming still contributes enormously to food security, generates income and plays a significant role in farmers’ traditional lives. Small improvements in the system might lead to big increases in fish yields and farmer’s livelihood.
Introduction

Son La province is located in the mountainous region of North-Western Vietnam and is considered one of the poorest provinces in the country. The poverty rate for Son La is the third highest comparing all Vietnamese provinces (Minot et al., 2003).

Yen Chau is a district of Son La province, which comprises around 60,000 habitants, 53.8 % of them belong to the ethnic minority Black Thai (source: Peoples Committee Yen Chau, 2004). Typically, Black Thai settlements are located in the valleys with paddy fields as major stable crop, mainly for subsistence. In addition, maize, cassava and occasionally cotton are cultivated as cash crops on the hillsides. Most farmers own one or more buffalos, some farmers also cattle, poultry or pigs. Fish farming is a typical activity in this region (Steinbronn et al., 2004).

The typical pond system in the research area can be characterized as polyculture of grass carp, other carp species and tilapia. Fish are fed crop residues, including leaf material (e.g. banana, cassava, maize and bamboo leaves) and grass. In general, these ponds have a continuous water flow during most of the time throughout the year, relative high turbidity and low primary production (Steinbronn et al., 2004).

A significant fraction of the fish and most by-products such as shrimps and molluscs are consumed within the household, the remainder is sold at the local markets. Fish is produced at low costs, as it does not require monetary inputs, other than for fish seed. The average price of fish on the local market is approximately 1.4 US $/kg (June 2005). The economic importance can be demonstrated by comparing fish price with the mean monthly per capita income in Son La of approximately 13.4 US $ (= 210,000 VND, GSO 2004, data referring to 2002). Furthermore, fish is well known as an important nutritional product for human consumption and contributes thereby to food security in the region.

The productivity of fish ponds in Yen Chau district can be considered as low. The mean yield is lower than 300 g/m² for a 2-year-production period (Steinbronn et al., 2004). Even though aquaculture is a common activity around Yen Chau town, the local fish production can not cover the demand on the district market and fish have to be imported from the lowlands. This study was designed to identify possible reasons for the low productivity and means to increase it in order to contribute to poverty reduction in this remote mountainous area.

Material and Methods

The study area comprises three communes around Yen Chau town (Chieng Khoi, Sap Vat and Vieng Lan). From January to April 2004 seventy farmers of Black Thai ethnicity were visited and asked about their pond and farming systems.

Six farmers from these communes were selected for further cooperation. From June 2004 to June 2005 these farmers noted all activities related to their ponds in a diary. During monthly visits, researchers collected the notes, asked about the current farm and aquaculture activities and examined the ponds (e.g. dissolved oxygen, water temperature, pH, turbidity, concentration of nitrogenous compounds and phosphate).

Other farmers in this region were observed as reference to crosscheck with findings from the cooperation farmers. In addition, interviews with resource persons, such as fish traders, staff of local extension service, local hatcheries, wholesaler and retailers for agricultural inputs were frequently carried-out.
Based on all those findings a detailed and structured questionnaire was developed and three commune leaders, 22 village headmen and 70 farmers in the three communes were interviewed from May to August 2005. Quantitative data presented in this paper are derived from the structured interviews only, while for general information all interviews are considered.

**Results and Discussion**

In all three communes around Yen Chau aquaculture plays a significant role. More than 50% of all households produce fish in ponds with an average size of almost 1000 m$^2$. Farmers define a lot of obstacles in their fish production system. Some of the following constraints do not derive from farmer’s perceptions but are observed by researchers.

One of the major constraints perceived by farmers and researchers is that the local extension service in Yen Chau has no expertise in the field of aquaculture. In case of problems farmers discuss those with their neighbours, but they lack deep and profound technical knowledge and try to seek solutions for their problems themselves.

The main constraint in fish production are grass carp diseases, which lead to high fish mortalities. More than 70% of the interviewed farmers had to cope with grass carp mortalities in previous years, some farmers even lost their complete stocks. So far little is known about the pathogen. Technologies applied by farmers in order to prevent or cure fish from those diseases have failed so far (e.g. draining of water, use of lime or different leaves). Loosing fish due to mortality means very high monetary losses for fish farmers as the price for grass carp on the local market reaches nearly 1.70 US $/kg for bigger fish (June 2005). The high mortalities of grass carp are considered to be the main obstacle by both farmers and researchers.

Farmers usually purchase small fish from local hatcheries or fish traders. The main source of fish in the region is the hatchery of Son La town. This hatchery obtained the first brood stock in the 1960s from the same province. In the following years they complemented their stock by collecting big fish from farmers and using them as spawners. So far no more brood stock has been obtained from outside. Therefore, it is possible in this hatchery that first-grade relatives are cross-bred as well. Hatchery staff observed a high amount of abnormal fish in offspring, which could point to inbreeding depression. The low quality of fish fry used for stocking is a problem perceived by researchers rather than by farmers.

The forage applied in Yen Chau ponds is mainly consumed by the macro-herbivorous grass carp and only to a small extend by the other fish species within this system. In combination with the low primary production, this means that the food base for the non-macro-herbivorous fish (i.e. all but grass carp) is limited, which is also expressed in low growth rates compared to those of grass carp. The primary production is restricted by high turbidity of pond water especially during the rainy season, which limits the penetration of sunlight into the water column, photosynthesis is possible only on the surface layer. Therefore, plankton which would serve as an important food source for several fish species in this system, is scarce and the concentration of oxygen is very low, often dropping below 1 mg/l during the summer months. This may become harmful or at least a stressing for fish.

Another contribution to a chronic stress of fish may derive from pesticide residues entering the ponds. Ponds are often linked with paddy fields, e.g. by a common irrigation system, which leads water through paddy fields into ponds or vice versa. The use of pesticides for rice crops is
common in this region. Pesticides might enter ponds with the water-flow and through leaching as well as with the weeds and duckweed, which are both collected from rice fields and frequently used as fish feed. However, a direct link between pesticides and acute grass carp mortalities is rather unlikely.

The water temperatures in winter may drop below an acceptable temperature for tropical fish species such as tilapia. Therefore, some farmers loose their tilapia stocks during the winter months. Furthermore, available water resources can become scarce, especially during dry season and when water is used for irrigating paddy fields after transplanting rice. In some ponds the water level decreased so drastically, that farmers had to sell fish ahead of schedule. Feed may become limited in the cold dry season which leads to competition between ruminants and grass carp in terms of leaf material.

Farmers often mention the high labour demand for collecting fish feed. In average farmers spend 2.5 hours/pond/day. Theft is an obstacle in those ponds which are located far from farmer’s houses. In addition, the lack of availability of pond inputs such as fish medicine or lime is perceived as a problem in this region.

**Conclusion and Outlook**

Despite the observed obstacles, fish farming still contributes enormously to food security and generates income. Small improvements may lead to significant increases in fish yields (e.g. better transfer of technical knowledge to farmers, introduction of new brood stock in local hatcheries) and significantly improve farmer’s livelihood. Further research will concentrate on increasing the productivity in ponds of Yen Chau e.g. by improving the feed base for non-grass-carp-species (improving natural food by modified water management and introducing better supplemental feedings) and by determining solutions to combat grass carp mortalities.

**References**


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