Feeding cities - Dong My, a peri-urban community in Ha Noi, Vietnam, involved in the cultivation of fish

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1. Introduction

Dong My commune is located in a lowland area 15 km Southeast of the centre of Ha Noi with a population around 6000 from just over 1500 households. It is part of Thanh Tri district, one of the industrial peri-urban districts of Hanoi, where agricultural and aquacultural activities integrate with more conventional 'city industries'. The commune itself accommodates relatively few industrial facilities with its main economic activities based on agriculture systems including rice cultivation, fish farming, terrestrial and aquatic vegetables and subsidiary crops, as well as the rearing of livestock.

In Dong My's predominantly agricultural economy approximately 63% of the labour force are engaged in farming activities, where women represent the bulk of those working on rice and vegetable production and men being predominant in aquaculture (which is only 5% of the total). The rest of the commune's work force (about 37%) is distributed to other occupations, including construction workers, carpenters, small traders, businessmen, basket makers and administrative employment (Nguyen Van Lien, 2003). However, because of its location and low income from seasonal agricultural work, many farmers, especially the young and middle-aged groups are now involved in both farming and factory work.

Urban waste water is pumped from the Kim Nguu river as an input for the farmers aquatic production systems. In previous years this was used for cultivating rice in Dong My, but now it is mainly used for fish farming. From 2001, farmers began converting low-lying rice growing areas into aquaculture as they could earn higher returns per unit land area.

Figure 1: Location of Dong My commune

2. Methodology

Data was collected as part of the PAPUSSA project (see www.papussa.org for more details) using key informant interviews and household baseline and monitoring survey questionnaires (April to July 2004) carried out with 66 households involved in aquatic production in the commune, as well as secondary data collection sources.

2.1 Analysis

All the information and data produced were entered into an Access database and then initially analysed using Microsoft Access and Microsoft Excel.

3. Production Systems

From our baseline survey it was found that there are five pond based aquatic production systems in Dong My:

Nursing ponds

In Dong My 24% of households surveyed produce only market fish for food, whilst 64% produce both fingerlings and market fish, with 6% involved solely in nursing fish. Fry are bought from neighbouring communes such as Duyen Ha, or from wholesalers in Hanoi. The main species produced are grass carp, silver carp, and mud carp. The fingerlings and larger fish produced are all sold to local households for on-growing.

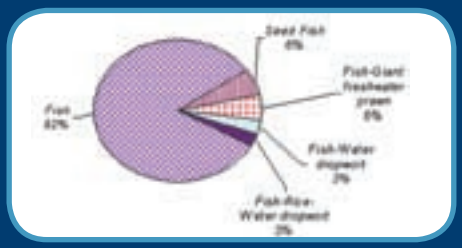

Figure 2: Aquatic production systems in Dong My

There are two stocking periods - one February - March and the second September – October – when farmers begin nursing to prepare seed for stocking into on-growing market ponds. The farmers who have a large area of ponds usually come to RIA1 (Research Institute of Aquaculture No.1, Hanoi) or the Ha Noi Fish Seed Center to buy fingerlings. First time buyers of prawn *Macrobrachium rosenbergii* can get them at 250 VND/shrimp (size 1.5-2 cm), at a 50% subsidized rate from the Thanh Tri Extension Center.

On-growing fish

Farmers empty and dry the ponds once per year and stock with larger fish twice. Farmers normally stock a polyculture of species (tilapia, mud carp, silver carp, *Colossoma*, grass carp and common carp) in February/March and after 3-4 months (June/July), they can grade and harvest the larger fish and add more fingerlings from the nursing ponds. Depending on price, size of fish and the weather, households may grade larger fish off to sell more frequently, or harvest all fish in

Figure 3: Pond, which has been harvested – note factory in the background.

the pond at one time. In general, aquaculture in Dong My is semi-intensive, with harvesting two or three times per year.

Overall 73% of households surveyed used pelleted fish feed, with those who intensively culture tilapia or macrobrachium only using pellets whilst other farmers use pelleted feed as a supplement to the maize flour, brewery waste, rice bran and food processing company waste.

Almost all households surveyed (98%) used grass or morning glory (a commonly cultivated edible aquatic vegetable) for feeding grass carp whilst 80% integrate their fishponds with growing livestock (pigs, ducks, chickens and cows) using the organic waste to fertilise their ponds and the pond dikes to grow vegetables and fruit. This overall integration of fish ponds, fruit and vegetables and livestock is known in Vietnam as the VAC system.

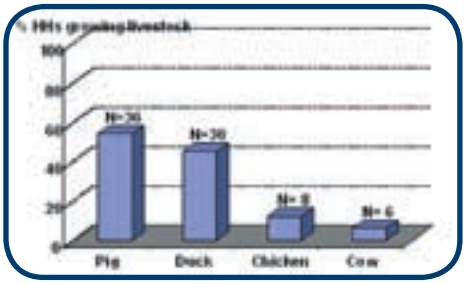

Figure 4: Livestock reared in aquatic households in Dong My.

82% of households directly use chicken, cattle manure or poultry house waste for fertilising their ponds. Those who also cultivate fruits and vegetables can get 2.5-5 million VND extra income by rotation between banana, orange, guava, papaya, morning glory and medicinal plants in the warm season months, and vegetables including onion, garlic, kohlrabi and cabbage in the winter. Twenty percent of households still grow rice in the higher land areas where there is not enough water for fish farming. People said that they prefer fish farming to growing rice because it is more profitable and is little affected by insects and mice which cause considerable damage to their rice crops.

Farmers also have problems with fish diseases primarily with grass carp, silver carp and mud carp and thought that poor water quality and water pollution were the main causes. Only 6% of those surveyed said that they used medicine to treat their fish e.g. "KN04-12",

Figure 5: Woman using pelleted feed for integrated fish culture (VAC system) in Dong My (see ducks and banana trees)

which is a herbal remedy including garlic made at RIA1 for treating "red spot" disease in grass carp, or "Health Fish" which is bought in from China to treat fish disease. The farmers said that they did not know locally where to buy chemicals to treat the fish so when a serious fish disease happened they were often forced into harvesting all of the fish in a pond.

Shrimp culture

Only four households interviewed (6%) cultured the giant freshwater prawn *Macrobrachium rosenbergii*; with an average production area of 7000m^2. These farmers also have other ponds for culturing fish. Shrimp seed is imported from China to Thanh Tri Extension Service, where farmers can buy at a subsidized rate of 50% of the original price. Farmers use petrol or electric powered aerators and biochemicals to maintain good water quality in their ponds, whilst for feed they use pelleted shrimp-feed, which is high in protein. Stocking densities range from 10-15 prawns per m^2. They nurse seed (size 1.5 - 2 cm) from April to October. Farmers have no problem selling their harvests but water pollution and reuse of water between some ponds were the most important factors that were negatively affecting their productivity.

Figure 6: Using pelleted feed for the culture of *Macrobrachium rosenbergii*. Note mechanical electric powered aerators in the pond.

Rotation between Fish-Rice and Water Dropwort

Two (3%) of the households surveyed practiced rotation of fish-rice and water dropwort (another popular cultivated aquatic vegetable) with an average production area of 1800 m^2. Different species of fish (polyculture of tilapia, grass carp, mud carp and silver carp) are stocked in February and grown in one pond, with rice grown in the field next to the pond. By May, farmers keep the water in the fish pond at a high level so that it overflows into the rice field. One month later in June they can harvest the rice and continue to keep fish in the total area of rice field and fish pond until harvesting the fish in November. Households buy water dropwort seedlings in August from neighbouring Vinh Ninh commune and nurse them in the corner of the field/pond whilst they are growing their fish. The plants are then transplanted into the empty fish pond in November, and after 30 - 45 days (depending on the weather), they can begin to harvest them. With plant re-growth from November-February farmers can harvest 3-4 times. This system can produce (per ha) 3.8 tonnes of fish in 8 months, 5.5 tonnes of rice in 4 months and a total income from the 1800m^2 plot of 50-69 million VND for water dropwort in 4 months.

Rotation Fish-Water Dropwort

There are 2 households which practice rotation between fish polyculture and water dropwort, a system in which they have been working since the 1980s. From this polyculture they can achieve 3.8 tonnes of fish per ha in 8 months (from March - November) and 50 - 61 million VND benefit from water dropwort in 4 months (November-February).

Both of these rotational fish/aquatic plant systems work well in making the best use of the land area and water supply in relation to Hanoi's seasonal climate. During the colder period between November and February temperatures in Hanoi can drop to 12° C, which can severely limit the growth of most of the fish species cultured - even causing mortalities. Therefore cultivating water dropwort, which has an optimum temperature for growth of between 15 and 20°C, at this time helps towards optimising farmers' incomes under different seasonal conditions.

Productivities, equipment and selling fish

From our survey the overall average productivity for fish culture in Dong My is 5.8 tonnes/ha/year. This is 0.2 tons per ha higher than the system described by Vo Quy Hoan (1996) which at that time only used wastewater and no other inputs. Aquatic production households in Dong My have invested considerably in aquaculture related equipment to help increase their production. Almost all households own a water pump, small boat and fishing net, but only 15%

have aerators since they are only used by the households who practice intensive tilapia and shrimp culture in the commune.

Farmers in Dong My said that they can sell fish quite easily. 100% of the households surveyed sold their fish through one or more middle-men who have the role of arranging for different retailers to come to the pondside to buy the fish (see case study box). There was not much seasonal price variation between our two surveys. Fish farmers in Dong My are faced with issues of accessing credit, dry season water supply, poor roads limiting trade effectiveness, limited electricity supply and lack of information on marketing, new technology, fish diseases and equipment – which are all limiting their chances to develop production.

4. Conclusions and the Future

The policy of converting low-lying land used for growing rice into farming fish has proved a good way for households in Dong My to improve their standard of living. Fish culture in Dong My is generally semi-intensive integrated polyculture with the overall average production of fish being 5.8 tonnes/ha/year and their average profit from fish farming 28 million VND (US$1765)/ha/year. Aquaculture contributed 12 - 56% of the total household income for those households we surveyed. Farmers can get additional income from rearing livestock, growing fruit and vegetables on the dykes of their ponds and also cultivating aquatic vegetables. Some of the fish farmers are presently joining together into a co-operative, which they hope will help them to buy good quality fish seed and help with increased technical support in aquaculture, marketing and selling their products.

Figure 7 Government investment in infrastructure in Dong My: new roads and provision of electricity

In the future the area of fish farming in Dong My is likely to increase as the commune will receive 15 billion VND (US$94,500) from the government in order to improve its local infrastructure. This will include electricity supply cables and poles, concrete roads, and a new pumping station to pump fresh water 1km from the nearby Red River to supply fish farmers in Dong My who have up to now had to rely on the deteriorating quality of waste water from the Kim Ngue River. Further to this investment the senior urban planning level People's Committee of Ha Noi plans to develop Dong My into "An Ecology Area/ Nature Reserve" where people from the city and further afield can come to relax for leisure on weekends e.g. fishing, swimming, eating, and observing local nature. The future will tell whether this concept can be successful and whether the fish farmers will be able to benefit and also develop their activities further. Fish farmers are generally positive about the future of culturing fish in the area, however some expressed worries about the new improving infrastructure in Dong My raising the value of land and attracting outsiders to buy up areas of land for construction of residential housing. With this scenario if the People's Committee of Ha Noi are serious with their "Ecological Area" development plans for the commune then the implementation of effective planning restrictions in order to prevent future land encroachment by developers will be necessary. Time will also tell whether the considerable investment proposed to pump water from the Red River will be beneficial to Dong My's fish farmers and perhaps more importantly whether farmers in the commune will be able to afford the future regular pumping costs which this will entail..

Acknowledgments

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The Dong My case study is the first of a series that will look at how people in Asia are using ponds and other waterbodies around their cities to help feed an increasing urban population. To find out about what's happening with regards to feeding cities in Africa take a look at the next article.

CASE STUDY 1:

Mr Hung is a fish farmer and Fish Farming Co-operative co founding member who farms the largest area of fish ponds (6 ponds at a total of 4 hectares) in Dong My. He also cultures freshwater prawns and grows and sells ornamental trees on the banks of his fish ponds. Previously he has been selling his fish and prawns through a middleman to local Ha Noi markets (often via Yen So wholesale market) as well as further afield to Lang Son and Cao Bang which are mountainous provinces around 200km from Ha Noi. However he has recently signed a contract with the newly opened Thang Long supermarket in Ha Noi which is French and Vietnamese jointly owned. His contract involves him each day supplying live fish and prawns by 7am to the supermarket. These are sold live from aerated tanks in the supermarket. He said that the price per kg he receives is higher than through the present system of middlemen. The requirements from the supermarket are that they are informed of the sources of fingerlings and that there are no toxic ingredients in the fish feed he uses. Apparently the supermarket is not concerned about the fish and prawns being grown using waste water or if livestock waste is used as fertiliser in his ponds. Last year he used to rear pigs (up to 400 piglets and breeding stock) however he stopped after encountering problems with high prices of pig feed and the corresponding low price of pork in the market. He said that he will have to change his production methods and pond management in order that he will be able to supply the supermarket on a regular basis e.g. by rotating the ponds he harvests from, and increasing the frequency that he grades his stock.

Mr Hung is optimistic for the future of fish farming in Dong My following the government's investment in developing new infrastructure in the commune, particularly the new supply of fresh water from the Red River for fish farmers.

CASE STUDY 2:

Ms Coi is a fish farmer as well as a retailer who sells fish in a central Ha Noi market. In her capacity as a retailer she buys and collects fish from other fish farmers in Dong My to sell. At times when she is not able to buy fish in Dong My she goes to Ha Noi's main fish wholesale market in Yen So in order to buy fish which she can sell. She said that sometimes farmers in Dong My have big harvests and are unable to sell all of their fish in Ha Noi; in these cases middlemen arrange for buyers from outside provinces (Bac Ninh, Bac Giang and Cao Bang) to come and collect the fish. These buyers then transport the fish live and on ice in lorries from Dong My to the provinces. She commented that it was the larger, better quality fish which were sold from Dong My into retail markets in the centre of Ha Noi whilst the smaller, lower quality fish were sold to local markets in and around Dong My and also to the outside provinces.

Tilapia over 300g are the fish she is always able to sell fastest to customers in the retail market. Customers quite often ask about the origins/sources of the fish she sells and are content to buy fish from Dong My, however they are not keen to buy fish which come from Yen So – (this is a commune where fish are grown using full strength waste water from the Kim Ngue river). Some of her customers believe they can identify fish grown in Yen So by their "dark appearance". Most of her customers cook their fish well, very few of them eat raw fish although she knows some people in Dong My who eat raw grass carp and snakehead.