# Coastal Livelihood Transitions: Socio-Economic Consequences of Changing Mangrove Forest Management and Land Allocation in a Commune of Central Vietnam

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**Abstract**
This paper reviews the evolution of land use and mangrove forest management in a coastal commune in Central Vietnam from its early period of environmentally sound management under a common property regime, through State and cooperative management, to individual household allocation under the economic reforms of the 1990s. It analyses in particular the introduction of shrimp culture and its environmental and socioeconomic consequences. The case study demonstrates that, while opening up many economic opportunities, Vietnam's economic reforms have had uneven impacts on income inequality. Like many cases in Asia and Latin America, the disruption of common property resources – through the introduction of aquaculture as a livelihood opportunity and producer of an export crop – leaves farmers indebted and natural resources polluted. But, ironically, it was the financially better-off aquaculture farmers, who had more capacity for risk-taking and investing, who ended up most indebted, in comparison with poorer farmers who had already sold their ponds. The latter were less integrated into the market economy and relied more on marine product collection. This paper suggests that attention to local contexts and histories can contribute to a better understanding of the causes and consequences of environment-poverty interfaces.

KEY WORDS *Vietnam; economic reforms; land; mangroves; income inequality; social differentiation; privatisation; aquaculture; shrimp; environmental problems*

## Introduction

Vietnam's coastal zones are areas of complexity, opportunity and conflict. They are naturally rich in resources but also fragile ecologies; they are narrow transition zones between land and ocean, and fresh and salt water, and are home to over half of Vietnam's people. There are thus numerous opportunities to manage the coastal zone to support the country's goals of economic growth, poverty reduction, and sustainable development. At the same time, unless managed well, the complex overlays of different interests, resource uses and ecological processes will lead to conflict, and to environmental, socio-economic and cultural deterioration. Equitable and sustainable coastal zone management is thus


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a primary challenge for public policy (Bailey, 2006).

Since the market-orientated economic reforms (known as *doi moi* or renovation) were introduced in Vietnam in the late 1980s, countries in Asia, Europe, and the United States have become major importers of Vietnam's marine products. Shrimp and other marine products began to fetch high prices. Motivated by large export profits, both the central and local governments have encouraged farming of shrimp (*Penaeus monodon*).

Vietnam's economic reforms have included the elimination of collective agriculture and forestry, the introduction of short-term, individual land-use rights (up to 20 years for agriculture and 50 years for forestry), and encouragement of privatisation and market liberalisation. The reforms have been considered 'one of the greatest success stories in economic development' in the world (Joint Donor Report, 2003, 11). However, while opening up economic opportunities for many, the economic reforms have resulted in an increasingly stratified distribution of income (Luong, 2003; Le, 2004). Despite a relatively equitable distribution of land, rising inequality in rural areas is associated with non-agricultural activities such as commercial aquaculture in lowland coastal North Vietnam (Adger, 1999; Lutrell, 2002; Le, 2004).

This paper presents the findings of a case study on the impact of land privatisation on mangrove forest use and management in Central Vietnam. Fieldwork was conducted in Phuoc Son commune, Tuy Phuoc District, Binh Dinh Province, in Central Vietnam between November 2004 and June 2006. The research examined how policy reforms and other factors affected the villagers' management of mangrove forests. The analysis pays attention to

1. changes in access to and control over mangrove resources from State and collective to individual allocation;
2. gender differences in resource use and management, and
3. conflicts between those who have been able to capture nearly exclusive access and those who lost access as a result of the privatisation of coastal aquaculture resources;

and explores how differing levels of access to and control over mangrove resources have caused inequality in household incomes.

The paper is organised as follows. The first section reviews briefly the unsustainable nature of much aquaculture development around the world and its adoption as a poverty alleviation strategy. Second, we provide an overview of research methods and the study site. The next section reviews the evolution of mangrove management in Phuoc Son commune over different periods. The fourth section investigates how social differentiation has affected the ways in which different social groups – defined by gender, income and social status – use and manage mangrove resources within the community. The final section provides some overall conclusions and recommendations.

## Global experiences with shrimp aquaculture expansion

A review of the literature on shrimp aquaculture around the world reveals recurrent ecological and social crises. Taiwan was the leading exporter of shrimp from the 1970s until 1987 when a disease outbreak occurred and production plummeted, never to return to its peak levels. China took its place as a leading exporter until 1993, when it too faced serious problems with shrimp diseases and production losses. China was in turn surpassed by Thailand.

The World Bank began to provide loans for shrimp ponds in the 1970s, especially to Thailand, Bangladesh, Indonesia and the Philippines. By the 1980s, loans had been extended to China, India, Venezuela, Colombia and Brazil. The rationale for promoting shrimp expansion was to support food security, poverty alleviation, and broader rural development objectives. Global aquaculture has been expanding by 10% per year since 1984, at a much higher rate than the growth of livestock meat (3%) and capture fisheries (1.6%). Close to 85% of world aquaculture production comes from developing countries. Over seventy percent of cultured shrimp for export is produced in Asia, particularly Thailand, Indonesia, China and India (Jana and Jana, 2003, 286).

Shrimp production began its global boom – the 'blue revolution' – in the 1980s. The market price for farmed shrimp rose substantially as demand from wealthier countries grew and the volume of capture fishery production began to level off (Neiland *et al*., 2001). But a host of environmental problems is associated with intensive aquaculture practices. The problems range from landscape destruction, soil and water pollution from pond effluents, species invasion, depletion of biodiversity, and loss of fragile mangrove ecosystems. Wastewater from seafood

processing plants and aquaculture areas is not well treated.

An equally serious range of socio-economic problems has plagued the development of aquaculture: equity issues relating to distribution of benefits; conversion of common property to private property; land-use conflicts; production of a luxury export food instead of food for the poor; and over-reliance on imported fishmeal (Davy and MacKay, 1999; Williams, 1999; Jana and Jana, 2003). The adoption of technology for intensive shrimp production is greater in higher income groups, and tends to displace the livelihoods of lower income groups. This phenomenon has particularly grave consequences for loss of employment and income in high density coastal areas of developing countries (Williams, 1999). Seafood exporters have suffered significant financial losses and damaged reputations due to chemical and antibiotic residues in exported Vietnamese seafood. All of those problems are hindering socially and ecologically sustainable aquaculture.

The intensification of shrimp production – akin to the green revolution in agriculture – has led to disease outbreaks in shrimp cultivation across many countries of Asia and Latin America. The consequences for the livelihoods of small-scale producers have often been devastating. In 1996 and 1997, for example, Thailand experienced a 30–40% drop in overall shrimp production due to disease outbreaks. Such crises are compounded by low educational levels of farmers, lack of farmer experience in aquaculture, poor technical support, and lack of access to capital to make improvements and reduce risk (Chanratchakool and Phillips, 2002). The repetition of these problems in site after site and country after country has contributed to an 'image problem' for aquaculture as a means of poverty alleviation (Davy and MacKay, 1999). It is striking how little has been learned from past problems in other countries by government authorities and extension agents to avert subsequent economic and environmental catastrophes.

**Research methods and case study site**

The study involved ethnographic fieldwork in Phuoc Son commune and a review of secondary sources, used to understand the physical and social structure of Phuoc Son. These included government records and maps, and project reports of the Ministry of Agriculture and Rural Development and the Ministry of Natural Resources and Environment. The field research was carried out in Con Chim island hamlet, one of 36 hamlets in Phuoc Son commune (Figure 1). Con Chim was selected because it seemed representative, being of average size, average income status, and among the hamlets most dependent on shrimp farming as a source of income (Figure 2). It is an off-shore island and is also close to newly planted mangroves and the Thi Nai Lagoon.

In 2005 Con Chim had 180 households with a total population of 1176 people. Based on the results of a participatory wealth-ranking exercise which considered annual income, household assets and the house itself, the villagers developed a scheme to classify the 180 households into four groups consisting of 35 rich, 20 upper middle, 105 middle and 20 poor households. The rich were those who had concrete houses with good furniture and other consumer goods. The poor had temporary houses with palm leaf roofs. Their members had incomes of less than US$13 per person per month. A sample of 36 households, accounting for 20% of all households in Con Chim, was randomly selected to include seven rich, three upper middle, 22 middle, and four poor households.

Semi-structured interviews were conducted with the head of household or his/her spouse, for each of the 36 households sampled. The questions covered information about household assets, income sources, demographics, health and nutrition, social organisation, cultural identity, gender relations and environmental conditions. In addition, interviews were conducted with local government and cooperative officials in Phuoc Son commune, the director and the deputy director of the Provincial Fisheries Department, and the manager of the Ecological Thi Nai Lagoon Project, to provide insights into the local implementation of national policy on land allocation (and specifically mangroves), the institutional setting, and local power relations.

Phuoc Son commune is a largely Buddhist community located in Tuy Phuoc District, Binh Dinh Province in Central Vietnam. It covers an area of 2582 ha, of which agricultural land accounts for 1210 ha (47%) and commercial shrimp farming 304 ha (12%) of the total commune area. This agricultural community supports a population of 24 853, including 5500 rice-farming households, of which 322 were allocated shrimp ponds in the 1990s.

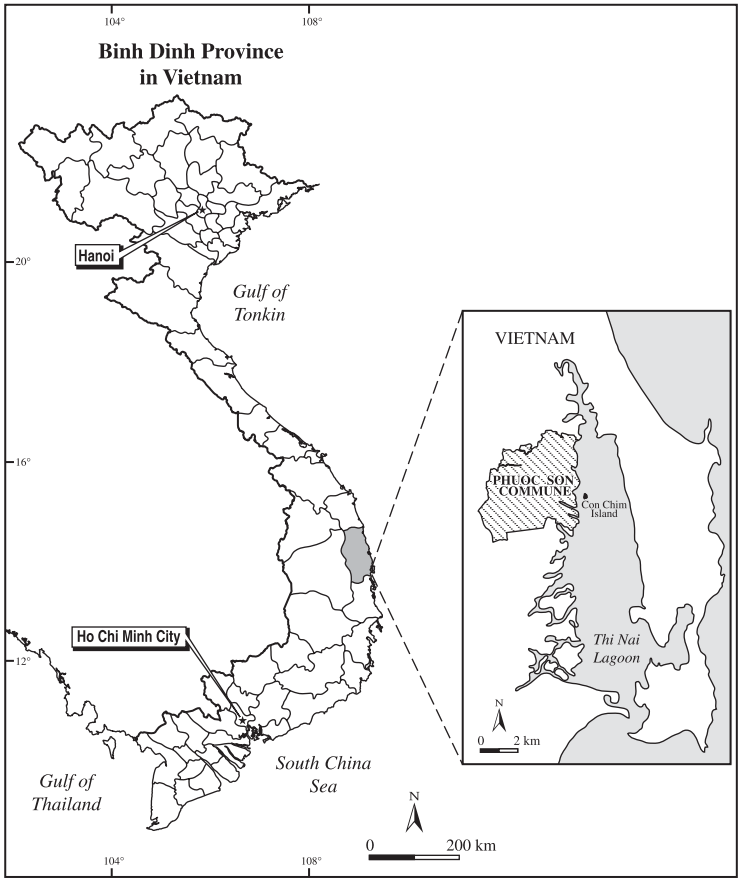


Figure 1 Phuoc Son commune, Binh Dinh Province, Vietnam.

Figure 2 Shrimp pond with mangroves in Con Chim hamlet, Phuoc Son commune.

## Evolution of mangrove management in Phuoc Son commune

Phuoc Son commune is a community with a long and rich history. The commune was established more than 100 years ago, when many mangrove islands were within several kilometres of the commune. According to elders, Phuoc Son is thought to have had about 300 ha of mangroves at that time. The trees were 4–6 m tall and *Avicennia marina (Forssk.) Vierh., Rhizophora apiculata Blume*, and *Rhizophora mucronata Lam.* dominated the forests (Phan and Hoang, 1993).

In previous times, according to the commune elders, the mangroves were open to all villagers. Later, these islands were owned by and named after those who first claimed them, and these names continue today. Owners went to their forests to catch birds and collect bird eggs, honey, crabs, fish, shrimp and bivalves, either to eat themselves or to sell at the local market. They also collected dry branches for firewood and cut mangrove trees for timber and dike construction during the rainy season. People used mangrove wood to make rafts, which provide shade and food for fish, thus making the

fish easier to catch. When the season was over, the mangrove wood was used for cooking fuel.

Those who did not own an island were not allowed to cut mangrove trees, but could collect crab, fish and shrimp, and dry branches for firewood. In addition there were open waterfronts and an open inter-tidal area where villagers collected marine products. In this way, the poor were not excluded from the mangrove and marine resources. Elderly people reported that these owners also replanted mangroves at the places where they had harvested. According to these accounts, local practice amounted to effective resource management, although there was no law on forest exploitation and management.

*Post-1975 collectivisation and State enterprise formation*

During the French and American occupations (1883–1975), the mangroves of Phuoc Son were maintained. In fact, these resources served as protection from enemy forces during these two conflicts. On 31 March 1975, the commune was liberated from American occupation. After the reunification of North and South Vietnam, the Province of Binh Dinh reconstructed a 3.7 km long dike, located adjacent to Thi Nai Lagoon, which was originally built in 1948–1949 but was heavily damaged during the war. Mangrove trees were once more used to build the dike, separating one area for rice production and another for shrimp farming.

In the period following 1975, the model of collectivised agriculture from northern Vietnam was applied in the south. In 1977, Phuoc Son's first agricultural collective was established. Farmers pooled their agricultural land and tools, and farmed in common. Every person's labour contributions were measured in work points. After each harvest, members of the collective received a share of the crop according to the work points they had accumulated.

In 1978, the State-owned Thi Nai Lagoon Shrimp Farming Enterprise was established under the provincial Fisheries Department. An area of 140 ha, consisting of Trang, Chim, and Gia Islands, was set aside for the enterprise. Residents who owned these islands were asked to donate their land, while those who were unwilling to give up their land were forced to do so, according to local accounts. For the first time, villagers witnessed outsiders coming in to cut mangrove trees that formerly belonged to the villagers, in order to practise commercial farming using extensive shrimp aquaculture. The enterprise also set out a rule that villagers were not allowed to log mangrove trees or to catch any marine produce within its territory. Natural resources that previously belonged to the villagers then became the property of the State. According to interviews with local residents, villagers were not allowed even to pass through the enterprise's shrimp farming area or they would be arrested and brought to the commune People's Committee. Many were fined for having stolen what they perceived as their own fish, shrimp and bivalves. This resulted in resentment between the enterprise workers and the villagers. Since the enterprise did not have sufficient personnel to guard the mangroves and no one had real responsibility, villagers would illegally harvest the forests, hiding long knives and cutting down even large mangrove trees for firewood. The mangrove forests were severely depleted as a result.

*1980s: the household-based economy and a new aquaculture cooperative*

During the 1980s, a household-based economy increasingly displaced the collective and State enterprise economy (Le and Rambo, 1999). The Government of Vietnam shifted responsibility for the management of natural resources – both land and water – away from commune collectives and into the hands of individual farm households (Nguyen, 1995). Generally speaking, rural living conditions improved greatly (Ngo, 1993) and people diversified their sources of income; but market liberalisation also led to greater social differentiation (Adger, 1999; Le, 2004; Scott and Truong, 2004).

In 1985, the Phuoc Son Aquaculture Cooperative was established and pooled villagers' mangrove forests. All the commune's remaining island owners or those who inherited land from their parents or grandparents were encouraged to pool their lands and join the cooperative. Farmers then constructed ponds to farm shrimp. The cooperative leased shrimp ponds to groups of five or six households. Household contractors were responsible for hatching shrimp fry, labour, pond management, and even marketing. At that time, a production quota for each pond was fixed for a period of one year, and shrimp had to be repaid to the cooperative. Cooperative members who exceeded their quotas were allowed to keep the surplus for home consumption or to sell to private traders. Conversely, in cases of natural calamities and other extenuating circumstances, they were required to make up for all deficits. The implication of farmers

becoming owners of the resource was that they sought to exploit its potential to maximise their own returns, often ignoring sustainable practices that would bring them long-term benefits.

More than 10 out of 51 ha of land in Phuoc Son were set aside in 1988 for an intensive shrimp farming joint venture with an Australian shrimp farming company. The land was converted from rice paddies to shrimp ponds. By 1990, the attempts at shrimp farming failed due to acidification of the shrimp ponds, so the company left.

*1990s: economic liberalisation, expansion of aquaculture and mangrove deforestation*

In 1991, households were able to lease shrimp ponds for a period of 20 years. This policy was also applied to the Thi Nai Lagoon Shrimp Farming enterprise. Its workers, who were not local residents, were allocated land for shrimp farming. Conflict increased between villagers who did not have enough aquaculture land and the enterprise's workers. In 1991 villagers' complaints were addressed to the enterprise's Board of Management. The Provincial Party Committee Secretary was assigned to go to Con Chim to solve the villagers' problem. In 1992, the enterprise had to return 54 ha to the commune, which then allocated the land to households.

On 21 December 1994, the Prime Minister issued National Decree 773-TTg, which stipulates that open coastal areas and waterfronts could be used for shrimp and crab farming. Since then, government policy has continued to explicitly encourage aquaculture and export of aquatic products. Households that cleared the mangroves for shrimp ponds after 1994 were exempted from paying tax to the cooperative for the first five years. During this time, those who cleared the forests for shrimp pond construction were nominated as heroes of the 'uncultivated land encroachment' movement. This policy, which was applied extensively across coastal Vietnam, encouraged shrimp farmers to clear all the commune's remaining mangrove forests for shrimp farming and resulted in great demand for aquaculture land.

In 1993, the commune's aquaculture reserve of 51 ha was auctioned to individuals for shrimp farming. The proceeds from the bidding process were spent on the commune's infrastructure, such as roads, schools and health clinics. Although the bidding process was nominally open to everyone, only the rich who had sufficient capital, management skills and, more importantly, connections, were able to participate in the process. Between 1993 and 1997, extensive aquaculture was applied to the 51 ha. Between 1996 and 1997, modified extensive aquaculture (stocking densities of one to five shrimp per square metre with additional artificial stocking of crab, fish, and shrimp) was applied in Phuoc Son. Using this method, a one-hectare pond could bring in US$5000, a much higher amount than could be earned from rice farming. Hatcheries were established in the area for the first time, partly because natural shrimp fry were no longer available. Then, between 1998 and 2005, intensive aquaculture was applied to two thirds of the 51 ha, while modified extensive aquaculture continued to be practised in the remaining area.

In 1995 and 1999, households that had received land were issued land-use right certificates. During this period, shrimp farmers tried to extend the area of their ponds illegally by encroaching on the open waterfronts. These were the areas used by the villagers, mostly women and girls, to collect marine products (Figure 3). Consequently, the area of open waterfronts shrunk. Some women participated in bivalve collection in their ponds and others traded shrimp and other coastal products. However, most women are confined to the private sphere and household duties. Thus, men have better opportunities to earn much more than women who, because of the persistence of certain patriarchal norms at the village level, were virtually excluded from the aquaculture resources.

*2000s: land allocation and the shrimp farming boom*

In May 2000, the Ministry of Fisheries hosted a Scoping Meeting on Sustainable Aquaculture for

Figure 3 Girls collecting bivalves in Con Chim.

Poverty Alleviation, attended by representatives from various government ministries and donor agencies. The meeting consolidated the role of aquaculture development (in freshwater, brackish and marine environments) in the government's Hunger Eradication and Poverty Reduction program. This contrasted with the industrial- and commercial-scale aquaculture development that had been promoted previously. The initiative to promote small-scale aquaculture for poverty alleviation in Vietnam parallels a global trend supported by the Food and Agriculture Organization and other donors.

Between 2000 and 2001, semi-intensive aquaculture and intensive aquaculture were applied in the commune, except on Con Chim Island. Semi-intensive aquaculture means use of small, 1–5 ha ponds, where supplementary stocking and feeding are routine. Intensive aquaculture refers to the use of 0.1–1.5 ha ponds with high stocking densities of more than 300 000 post larvae (or fry) per hectare, around-the-clock management, heavy feeding, waste removal and aeration. Con Chim's shrimp ponds were located in the low-lying land of the Thi Nai Lagoon and therefore difficult to drain. This made it too difficult to apply intensive aquaculture, which requires high water exchange rates daily. In 2001, modified extensive aquaculture was applied to Con Chim.

During the time of the field research in 2005, 210 of 322 households across the commune were practising shrimp farming. The rest had either sold or leased their ponds (117 ha in total) to better-off households that had capital, management skills and political power in the commune. They then worked for these households as waged labourers. Some leased rights to their land for five years, others for 10 or even 15 years – at the price of 1.4 taels of gold (US$886) for 1169 $m^2$ of pond. They then worked for these wealthy households as waged labourers. These men (not women) were paid no more than US$28 per month to guard the shrimp ponds of the rich.

Usually two or more people shared a pond. This was the case even for wealthier shrimp farmers. In this way, they shared the costs and the risks of shrimp production. Most local authorities had shrimp ponds, but this was always kept in the background. They either shared the pond with someone else or hired someone who was poor to work for them.

For the first two years of semi-intensive and intensive aquaculture, many farmers earned large profits from raising shrimp. An area of 0.8 ha could yield US$13 000. In 2002 and 2003, Con Chim Island was considered across the Province as a second Hong Kong, due to the large profits earned from shrimp culture. All old houses were knocked down and brick houses with flat concrete roofs were built. These wealthy shrimp farmers spent money 'like water' and their children spent considerable amounts of money on clothing. The government believed that shrimp culture had great potential and that this was the only local occupation capable of generating large profits within a short period of time.[1] Due to the large profits, all banks, including the Vietnam Bank for Agriculture, the Go Boi Bank and the Phuoc Son Aquaculture Cooperative Bank, made loans available to shrimp farmers in the area, sometimes even before farmers received their land-use right certificates.

*Shrimp farming boom ... and bust*

Since 2002, when all mangroves were cleared to construct shrimp ponds and raise shrimp using modified extensive aquaculture, shrimp production has dropped off dramatically. Between 2002 and 2003, the spread of shrimp disease caused almost all shrimp farms to fail. At the request of the Provincial government, scientists investigated and found that loss of the mangroves was the main cause of the degraded environment for shrimp. Mangroves in the ponds provide space for shrimp to escape into the cooler, shaded water. They also absorb the food residue in the pond. The loss of mangrove trees which absorb pollutants results in water pollution, which in turn leads to shrimp disease (CRES, 2004). The large area of semi-intensive and intensive shrimp ponds in the commune enabled the disease to spread.

As a result, many people lost large amounts of money and could not repay their bank loans. From an area of 0.8 ha one could now earn only US$3000, or about one fourth of the revenue during 2000 and 2001. According to a village leader, in 2004 the Phuoc Son shrimp farmers owed the banks VND 8 billion (US$506 329) and it would be very difficult for them to pay back their debt. While pressure from the Province prevented banks from confiscating shrimp farmers' ponds when defaulting on loan repayments, many local leaders and a number of large shrimp farmers sold their ponds to outside shrimp farmers as shrimp farming became less lucrative. In contrast, if a household owed the cooperative US$6 for not paying their irrigation

fees for rice paddy land, their land would be auctioned or confiscated until the loan was repaid.

*Protecting local resources from outsiders*

As a result of this disaster, the Provincial government recognised that the planting of mangroves was necessary to restore the environment. At the end of 2002, the old enterprise was dissolved because of its mismanagement. But while waiting for the legal documents, the manager and vice-managers of the enterprise decided to rent its land to outside shrimp farmers for six months in order to earn some extra income. This once again created resentment between the enterprise and the villagers, who again sent their complaints to the leaders of the District and the Province, and asked the Province to give them the enterprise's land that had been rented to outsiders. According to an official of the Provincial Fisheries Department, the director of the department was criticised for allowing the enterprise leaders to act as they had done, and the leaders were asked to retire.

In 2003, the management committee of the ecological Thi Nai Lagoon Project was established under the jurisdiction of the Provincial Fisheries Department. Its headquarters were based on Con Chim Island. In June 2003, four hectares of inter-tidal mudflats were set aside for mangrove plantation. Although the director of the Fisheries Department promised the villagers that they would be informed when the planting took place, this did not happen. Instead, outsiders were hired to plant the mangroves. Villagers were furious that they had been excluded from the decision-making process, and that outsiders instead of local people were hired to plant mangrove trees on the land that formerly belonged to their parents and grandparents. Despite the fact that villagers were supportive of the project, since they would benefit from the newly-planted mangroves, villagers from Con Chim protested on July 28, 2003, by burning the headquarters of the management committee. Many newly-planted mangroves were uprooted. Afterwards, the Provincial and District officials came to meet the villagers and an agreement was reached in which the villagers would be involved in the decision-making process and would be hired by the project. In January 2004, the villagers of Con Chim replanted the mangroves they had uprooted. This experience showed the fragility of local rights over local resources in Phuoc Son. It also revealed that villagers were not passive, but rather acted collectively to exclude outsiders – the ecological Thi Nai Lagoon Project and the outside guards – who threatened to abolish their rights over their local resources.

## Social differentiation and the harvesting of coastal products

This section analyses the household income from the mangroves and mangrove-related resources earned by the four different groups of households. The analysis focuses on the main factors that cause differentiation, including capital, labour, management and entrepreneurial skills, and age of the household heads (White, 1989; Ngo, 1993). These factors, in turn, affect access to and control over mangrove resources and the ways in which different groups of people use the resources. With respect to gender differences, men were in charge of activities that had great commercial value, such as shrimp farming. This left women to handle those activities that had less commercial value, such as trading of coastal products. Men could assist their wives to do the job, however. During the time of the field research there were five traders in Con Chim, all of whom were women.

*Distribution of households by shrimp pond area*

Table 1 shows the areas of shrimp ponds held by different groups of households. As the table demonstrates, none of the poor households had shrimp ponds, while 13 of 22 middle income households also lacked ponds. All of the rich and upper middle income households had ponds. The average pond size for the rich income group

Table 1 Areas of shrimp ponds among households by income group in 2005 (*Source*: Authors' field survey, 2005).

| Area (ha) | Rich ($n$ = 7) | Upper middle ($n$ = 3) | Middle ($n$ = 22) | Poor ($n$ = 4) | **Total ($n$ = 36)** |
|---|---|---|---|---|---|
| 5.1–7 | 2 | 0 | 0 | 0 | **2** |
| 5 or less | 5 | 3 | 9 | 0 | **17** |
| None | 0 | 0 | 13 | 4 | **17** |

was 3 ha, the upper middle 2 ha and the middle 1 ha. In Thailand, having fewer than 1.6 ha is considered small-scale shrimp production (Chanratchakool and Phillips, 2002): thus, the households that are called 'upper middle' or 'middle' in the Phuoc Son commune – according to local criteria – might be considered small farmers in an international context.

The poor households initially received ponds as did other households in Phuoc Son commune that were allocated agricultural land. But since the majority of these poor households were not able to invest in commercial shrimp farming and they needed cash to cover household expenses, they leased or sold their ponds to those who had capital resources, management skills and political power. In Con Chim, some 30% of households, of which the majority were poor, sold or leased their ponds.

*Household cash income from mangroves and mangrove-related resources*

After the failure of the shrimp crop, the majority of the shrimp farmers in Con Chim were afraid that they could lose their ponds and houses if their attempts at shrimp farming continued to fail. In 2004, the rich and the upper middle income households lost the most from shrimp farming, followed by the middle households. The poor group did not own any ponds, and thus avoided becoming indebted, unlike the other three groups.

Table 2 illustrates household cash incomes gained by four groups of households from the mangroves and the mudflats. To calculate these figures, total incomes from mangroves and mangrove-related resources – including sales of wild shrimp, bivalves, wild crabs, fish collected from the inter-tidal mudflats, and farmed shrimp and crabs from the households' own ponds – were divided by the total number of people from the households sampled in each group. These income differences indicate that the poor became least indebted based on their incomes from mangroves and mangrove-related resources. This is because they did not invest in shrimp farming and were instead engaged in collecting natural crabs from the intertidal mudflats. Meanwhile, the rich, upper middle and middle income households who were engaged in shrimp farming lost their investments, plunging them into serious debt. The rich households fared better than the upper middle and the middle income households, since they had additional income from collecting natural crabs and shrimp, using systems of nets.

*Sources of income*

The poor had no ponds or service activities, depended mostly on mangrove resources, and received some government pensions. In contrast, the middle households earned the most from grocery and tailor shops, and commercial ice production. The upper middle households had no government salaries, and engaged in some service activities. The rich households were the only group that earned income from trading shrimp. Without capital resources, labour, entrepreneurial skills and social networks, the other three income groups were constrained in joining the trade.

Table 3 shows the sources of household income and the distribution of that income per capita for the four income groups in 2005. Income gained from trading shrimp and other sources of income is also included to show how much each group of households earned from specific sources. Since Con Chim is an off-shore island, it does not possess any agricultural land. This explains why no households in the sample earned income either from sales of paddy rice or livestock, unlike other hamlets in Phuoc Son commune. Six households in the sample – one sixth of the total – received a government salary

Table 2 Mean annual cash income (in US$) per capita for each income group from mangroves and mangrove-related resources in 2005 (*Source*: Authors' field survey, 2005).

| Type | Rich | Upper middle | Middle | Poor |
|---|---|---|---|---|
| Sales of wild shrimp | 83 | | | |
| Sales of bivalves | | | 2 | |
| Sales of wild crabs | | 7 | 20 | 28 |
| Sales of shrimp from own pond | –89 | –163 | –36 | |
| Sales of crabs from own pond | | 1 | –2 | |
| **Total** | **3** | **–155** | **–16** | **28** |

Table 3 Net income sources of each income group per capita per year in 2005 (*Source*: Authors' field survey, 2005) (in US$).

| Source of income | Rich | Upper middle | Middle | Poor |
|---|---|---|---|---|
| Mangroves | 3 | −155 | −16 | 28 |
| Trade of shrimp | 10 | 0 | 0 | 0 |
| Waged labour | 3 | 16 | 38 | 16 |
| Government salary and pensions | 16 | 0 | 11 | 76 |
| Service | 6 | 11 | 24 | 0 |
| **Total** | **38** | **−127** | **57** | **120** |

or pension income. The rich had government jobs, such as teaching, or received retirement pensions of US$16 per person per year. The middle received retirement pensions and veteran's pensions, and on average received almost US$11 per person per year. The poor received pensions such as 'families of war dead' at almost US$76 per person per year. According to the Ministry of Labour, Invalid and Social Affairs poverty line, a poor household has an income of less than US$12.50 per capita per month (US$150 per year). Although poor households in Con Chim had pensions, their houses were in poor condition. They did not have valuable assets in the house. In addition, they suffered from health problems, and were burdened by a higher dependency ratio (1.0) than is seen in the other income groups.

This table reveals that, in the year of the crisis in shrimp production, the highest cash incomes from all sources were in the poor households (US$120 per person per year), followed by the middle households (US$57) and the rich (US$38). The upper middle group ended up with an income of negative $127 per person per year. Selling their shrimp ponds and engaging in wage labour helped the poor avoid becoming indebted, while buying and leasing shrimp ponds from the poor and engaging in shrimp farming made the rich and the upper middle income households become more indebted. However, the rich, upper middle and middle income households still had more valuable assets. That means they had access to alternative sources of income compared with the poor. Thus, although lack of capital resources, labour, and management and entrepreneurial skills forced the poor to sell their ponds, which in turn helped them avoid the risk of farming shrimp, this was only over a short time span. Although the poor households did not experience the debt of wealthier households, they are likely to face other shocks, such as crop failures and medical bills, that undermine their security.

*Indebtedness*

Of the four poor households sampled, only one was in debt. Table 4 shows that, compared to the other income groups, poor households borrowed the least amount of money (US$63). The proportion of poor households in debt (from all sources) was the smallest, followed by the middle group (who borrowed an average of US$4519), the rich (US$5424), and then the upper middle (US$12 772). The poor were indebted by one fifth of their annual income, the middle group by almost 16 times their average annual income, and the rich income households by more than 26 times their annual income. The annual income of the upper middle household from all sources in 2005 was negative US$671. Note that Table 3 is calculated for each household member, while Table 4 is calculated for each household in each income group.

In 2005, the majority of the households in debt in Con Chim wrote letters to the banks to inform them they could not pay the interest, but only the principal. However, only a few households (of the middle group) in extreme situations were allowed to do so. The rest were still expected to

Table 4 Extent of indebtedness of households by income group in 2005 (*Source*: Authors' field surve, 2005).

| Categories | Rich | Upper middle | Middle | Poor |
|---|---|---|---|---|
| Number of households in debt | 7 (100%) | 4 (100%) | 15 (71%) | 1 (25%) |
| Average amount of debt per household (US$) | 5424 | 12 772 | 4519 | 63 |

pay both the interest and the principal. It is likely that their house, valuable assets and shrimp ponds will eventually be confiscated by the banks. This has already happened in parts of northern and southern Vietnam where indebted shrimp farmers became homeless. They would effectively become tenants on their own plots of land.

The loss of livelihood not only affected shrimp farmers themselves but families dependent on their income, especially women and girls. The women, who are responsible for feeding the family, were the most worried members of the household. Many became sick. Husbands and wives often fought with each other over the debt, and girls were asked to leave school and give food to their male siblings. Over the last few years to 2006, no boys in Con Chim completed 6th grade and many girls across all income groups did not finish 4th grade. Many girls married early. At the end of the 1990s and at the beginning of the 21st century, when shrimp farming was a profitable industry, their spouses, the majority of whom were not from Con Chim, moved to Con Chim to be involved in shrimp culture, leading to a rapid increase in Con Chim's population. But by 2005, many women were concerned about their daughters not finding husbands, since no one would be interested in a girl who comes from a household in debt. One male shrimp farmer stated:

> In Con Chim, except for the poor households everyone is worried about his debt. I could not sleep at night and that is how I have been ill all the time. I cannot concentrate on doing anything. I would be very grateful if the bank could allow me to pay the principal only, not the interest. I would then look for another job and in that way I hope I could pay back the loan.

## Conclusions

Phuoc Son is not exceptional in its experience of a crisis shortly after the boom in shrimp production. Similar situations have been reported across Vietnam and other countries where mangrove destruction and environmental degradation, particularly water pollution, have played havoc with the shrimp, killing large numbers and resulting in severe poverty in farming communities. The shores and lagoons had been considered a kind of 'gold rush', as farmers and their financial backers sought to become rich through shrimp production and export. This no longer holds true.

No one knows how long the socio-economic and environmental crises of shrimp production in Phuoc Son will last, unless local authorities devise a scheme to reschedule farmers' debts and help those who convert to less intensive shrimp farming pay off their debts and plant new mangroves. Due to their low level of education, it is unlikely that shrimp farmers in Phuoc Son can switch to other employment. Other recommendations for shrimp to become a more appropriate means of poverty reduction include providing better extension services and information, and technical support to prevent disease outbreaks.

With the introduction of commercial coastal aquaculture came inequitable access to and control over sources of non-agricultural incomes. Those with management skills, capital to invest in aquaculture, willingness to take risks, and connections to powerful local bureaucrats gained access to these resources. The poor, a social group who traditionally have been the most dependent on the local mangrove resources, became the social group with the least access to these resources, despite the fact that they did initially receive an allocation of ponds.

After 2003, a range of environmental problems and disasters – shrimp diseases, pollution problems and typhoons – changed the entire picture in Phuoc Son. After this point, the poor earned the most from the mangroves and the inter-tidal mudflats, because they were not engaged in commercial shrimp farming, an unreliable industry that has driven the majority of shrimp farmers in Phuoc Son and elsewhere in Vietnam to bankruptcy. Even so, the poor were not necessarily better off; they just did not experience the significant decline of those who had the capital to invest in aquaculture. They are more likely to face other shocks that undermine their capacity. Moreover, they lack access to the wider range of alternatives sources of income that other social groups may have.

The market liberalisation period opened up new opportunities for households that were ready to work hard and willing to take risks, but also had management and entrepreneurial skills and capital. As the case of Phuoc Son commune illustrates, after the introduction of commercial aquaculture, the households that were most integrated into the market economy experienced the biggest financial shocks. Nevertheless, although the commune is stratified and individual households have responded differently to market demands, they acted collectively to exclude

outsiders – the ecological Thi Nai Lagoon Project and the outside guards – who threatened to abolish their rights over their local resources.

The development of commercial aquaculture exacerbated the problem of resource degradation and over-exploitation, and the impacts on different groups of villagers have been uneven. This study has shown that rapid changes in local land-use systems, ownership, management practices of mangrove resources, and institutional arrangements in response to *doi moi*, have weakened the livelihoods of many shrimp farmers in the community. Moreover, they have bypassed women, while opening up economic opportunities for others.

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NOTE

1. In contrast to the experience in central Vietnam, Le's (2004) research in 2000–2001 in Giao Lac village, a coastal community in Nam Dinh province in the Red River Delta, showed that government authorities considered shrimp farming a risky occupation in the north of Vietnam. The government was afraid that shrimp farmers would not be able to pay back their loans, so instead they had to borrow from local moneylenders.

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