Access to Natural Resources for Whom?

Aquaculture in Nam Dinh, Vietnam.

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Abstract Against the backdrop of the effects of global climatic change and large infrastructural works in upstream parts of the Red River delta, the main interest of this article is the history of the imposition of property rights in an area which was long time dominated by state policies towards the use of coastal resources. In this article I will deal exclusively with aquaculture in three coastal districts of Nam Dinh and look at the important changes that occurred over time in this region. A major conflict between state agencies and individuals or groups about the property transfer of coastal mud fields is analysed in order to discuss communal and open access forms of property rights in an area plagued by over-exploitation and resource degradation. The case enables the author to comment upon Hardin's model of the tragedy of the commons and the relevance for a specific Vietnamese geographical and historical case.

Introduction

Hardin's classic 'common property theory' asserts that 'rational' individuals tend to exploit a common resource on such a scale that over-exploitation affects all the other users (Hardin 1968: 1243-1248; see for a comment Feeney 1990). The model has been critically challenged by various authors since its inception (for example Ruttan 1998). According to these authors, Hardin has ignored the geographical and historical prevalence of institutions for communal management of common property, especially those designed to prevent 'free riding' (ibid.; also Jentoft *et al.* 1998: 432ff). Hardin and his followers felt that in a situation where there is no agency with the power to coordinate or to enforce rational use, collective action could be disastrous. Resources should be either privatised or controlled by central government authority to ensure sustainable use (Berkes 1989: 8). However, neither nationalization nor privatisation prevented resource degradation and overexploitation and, in many instances, this deprived a large portion of the population of their livelihood (Pomeroy 1992).[1] The expression 'the tragedy of the commons' became part of a model in which common-property resources under conditions of low-population density are really seen as open-access, not owned or operated by anyone, but increasingly leading to overexploitation and to resource depletion.

Before 1986, when Vietnam embarked upon a course of economic renovation, the state re-allocated all its common natural resources under 'central management' and still claims to do so in many sectors like fisheries or forestry. However, access to natural resources was under state management not open to all. Heavy claims on open access resources were often met by a failing centralized control and regulation. The consequence was that these claims temporarily created open access

resources where limited-access common property resources have previously existe (see also Ostrom, 1990; Van Ginkel 1993, Adger and Luttrell 2000; Allison and Elli 2001; for a summary of some recent publications, see Taylor 1998).

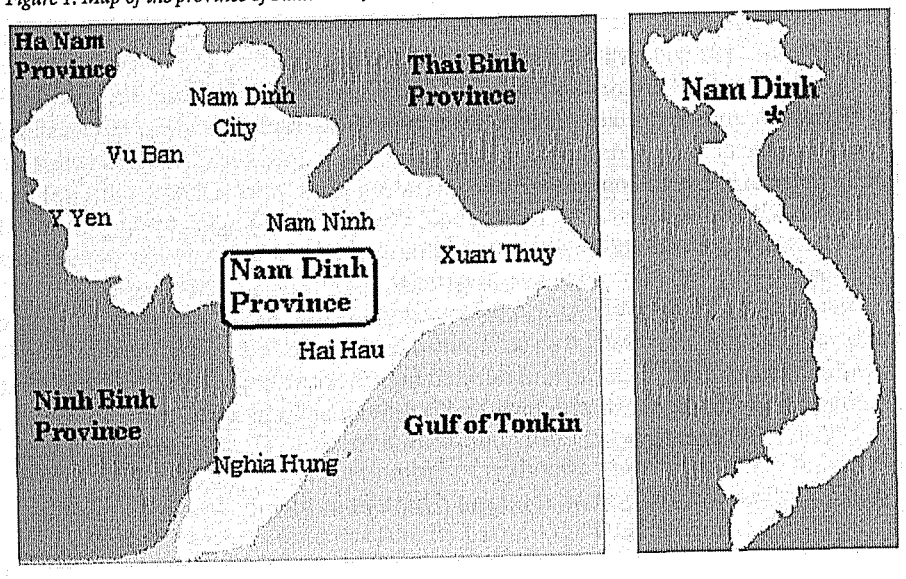
Free rider behaviour results not from a lack of respect for common property but as a result of opening up market activities in a former collectivized economy Vietnam's economic renovation policies since the mid-1980s not only create conflicts about land, but also affected coastal areas that until now are regarded a common property managed by the state. The district and village authorities rep resent the state. On the one hand they try to prevent privatisation of the commo pool resource, but on the other hand they eagerly show a 'private' interest of thei own. The common pool resource we encounter here is a resource for which there ar multiple stakeholders or at least a large number of people who claim rights to us the resources, and where one or a set of users can have adverse effects upon the inter ests of other users. Adger (*et al.*) added to this argument that state appropriation o common pool resources can contribute to unsustainable utilization or conversio to other uses (2000: 75-89). From identical situations in e.g. China, it is known tha collective ownership is not abandoned as a result of the post-Mao rural reforms i the early 1980s, but resulted in conflicts over the management of collective propert (Jian Zhang 2002:102-121).

McCay and Acheson (1987) underscore the argument that a group ma restrict access to its members by the use of custom and tradition. In their vie communal forms of resource use do not necessarily lead to over-exploitation an resource degradation. Privatization of the commons is often regarded as the optima solution for all common-pool problems. Privatization rationalises costs and benefits reduces uncertainty, and thereby increases individual responsibility for the environ ment and rational use of resources. Individuals, however, try to develop the resourc potential to maximize their own net return and therefore ignore sustainable prac tices, which will bring them long-term benefits, when they become the owner of the resource. Ostrom (1990) warns against a situation in which privatisation means tha one actor acquires the exclusive right to harvest from a resource system. The imposi tion of private property also can lead to a situation in which the costs of excluding non-owners from access are neglected and conflicts over rights are not settled. Lastly, from a livelihood perspective it is argued that users can readily adapt to fluctuat ing resources if access to multiple resources is ensured. Limiting ownership to one resource will preclude such strategies potentially to the potential detriment of the resource (Ellis 1998; Allison and Ellis 2001; see also Le 2002, 2004).

Co-management, being an arrangement between the state and local com munities in the management of natural resources, is increasingly viewed as the most appropriate way to promote sustainable development of natural resources (for exam ple Jentoft *et al.*, 2000; Kurien 2002). With co-management, I mean the cooperative or joint management of the resource by a user community and a central government (see also Taylor 1998: 252). The question remains how co-management should be established, when property rights are not well defined in terms of residence (land tenure regimes granted to individuals by the state; or unclear distinctions between private versus common property relations) or legality (for an overview, see Adger *et al*, 2001: 79-92). I will argue in this paper that the legacy of state policies created an unclear and unsure situation, which developed into the mass privatization of common pool resources. The claims by state agencies led to an open confrontation with private users who based their use of natural resources on the assumption of free access. As a consequence a social dilemma arose about the question who 'owns' the common property of the shallow sea. In this case, factors such as 'land scarcity, population pressure, and the absence of alternative income opportunities, long-term insecurity, greed, and disdain for any legally imposed restriction which contributed to over-exploitation' are more important than the type of property rights (F. and K. von Benda-Beckmann 1999: 37-8).

I will begin this article with an introduction to the region and the role of a major estuary, shaped by the rivers Day, the Ninh Co and the Red River is described (see map). In the next section, the role and production of aqua- and mariculture and its effects on maritime livelihood is dealt with. By presenting two case studies, one on shrimp breeding and another one on clam-culture, I will argue that the commercial ization of the coastal zone requires an adequate management system that, however, is not provided by the Vietnamese state in a rational and impartial manner.

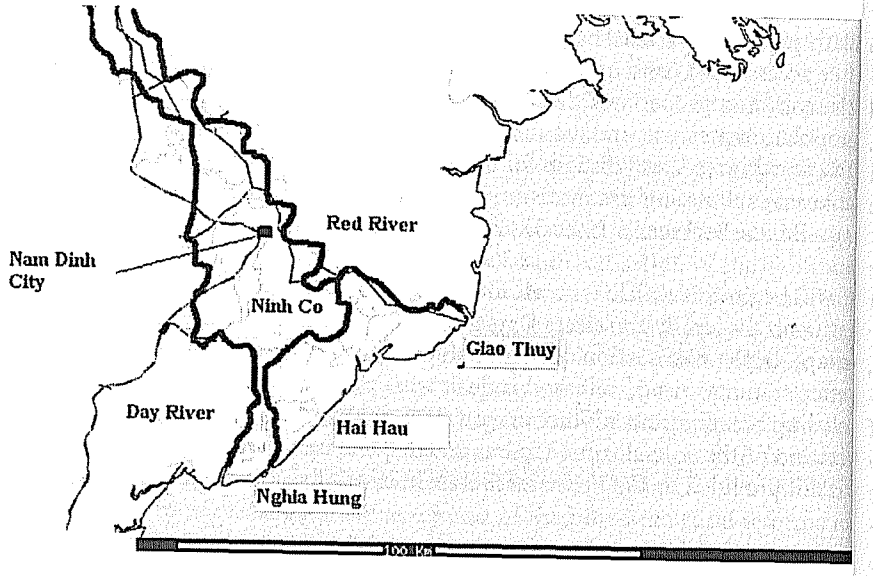
Figure 1: Map of the province of Nam Dinh, with the three coastal districts



Introduction to the region

The area upon which this research is focused is composed of three adjacent coastal districts on the fringe of the province of Nam Dinh (formerly known as Nam Ha (1996) and Ha Nam Ninh) in the Red River delta (RRD). The province is part of the coastal area of northern Vietnam. Three coastal administrative districts located 45 km southeast of the Nam Dinh provincial town and 110 km southeast of Hanoi are surrounded by a dyke system that protects the land. The Red River in the north and the Day River in the south border the province and the estuary. A third river, the

Figure 2: The three major rivers



Ninh Co, separates Nghia Hung from Hai Hau. The total area of the three districts is about 72 km² (72,000 ha). The total population of Giao Thuy, Hai Hau and Nghia Hung is almost 0,5 million, with a population density of more than 1000 per km², a figure that comes close to what is average in the densely populated areas of the Red River Delta plain. Coastal population growths in the North range between 0,6 and 1,7 percent due to continuous out-migration since 1984 (UNDP 2001: 96) in a situation where already in 2000 1150 people per km² live, with an average income of 244 US$ GDP per capita.[2] The net outflow of (spontaneous or voluntary) migrants mirrors the pattern at the provincial level.

As elsewhere in Vietnam, these areas have caught up with the economic reforms since the mid-1980s. The economy of the three districts is based on rice cultivation, aquaculture, fisheries and salt making. Tourism is becoming an important income generator for those who invest in facilities along the coast.

Dykes and estuaries: the claim for land *(chinh phuc bien)*.

The general pattern of the coastal zone along the districts is a combination of small dunes, beaches, mudflats and wetlands, partly planted with Phi-lao trees (*Casuarina*) and naturally growing mangroves.[3] Sea dykes protect the coast against flooding and storms. Dyke length is approximately 80 kilometres as the crow flies, but due to sectors of double embankments the total length is about 90 kilometres. The Red River - Day estuary is a combined wave and tide-dominated type of coastal environment with a high vulnerability to the storm induced incursion of high seas. A diurnal tide rises and falls twice each day with a range of 4 m in the north of the delta down to 2 m in the south. Tidal currents are characterized by a short period of strong southward flow and a long period of weak northward flow (Van Maren 2002). Around the river estuaries mud and silt is deposited in the form of mudflats, salt marshes, and mangroves. Sand and shingle beaches are the results of wind and wave activity. Between the large river mouths, wave-dominated coasts appear that are open to the sea and have little protection from wave activity. Erosion takes places south of the Balat mouth due to changes in sediments and water streams and along the coast of Hai Hau district due to the incursion of the sea during storms (Weering and Van den Berg 2002; see also French 1997: 26-53). Typhoons bring about extreme storm surges reaching between 1 and 1,5 meters.

Two of the three districts have a generally accreting coastline and suffer from seriously consistent and widespread erosion problems, which are most dramatically visible in the district of Hai Hau (13 percent of the coastline is affected). The Red River and its arteries were fixed in the mid-fifties by river and sea dykes, with the result that sediment was discharged over a small number of main branches instead of a large number of small branches. This caused sites of major accretion at the various mouths of the large branches of Red River delta, such as the Ba Lat estuary on the border of Nam Dinh and Thai Binh provinces, at the mouth of the main course of the Red River (Song Hong) (see Government 1995: 13). The coast accretes here by 5 to 7 meters annually. The district of Nghia Hung, located at the mouth of the Day River equally has a 'depositional' coastline with a fast increase of sand and silt estimated at between 10 and 24 meters annually (for this type see French 1997: 13).[4] Erosion takes place at the same pace: a mean rate of 6 meters a year between the Balat and the Day mouths, with an exceptional rate of 30 meters a year in front of Van Ly and Hai Trieu in Hai Hau district. The consequences for the development of aquaculture and other activities like tourism are visible in the way the coastline changes rapidly over time.

Although a 1994 country report estimated that in Giao Thuy and Hai Hau only an estimated 3, 5 percent of the land surface is directly subjected to flooding and typhoons, the volume of floods combined with spring tides, however, occurs at an increasing rate. Very large floods occur within periods of 25-30 years (with disaster years 1945, 1971 and 1996), but the number of large floods has increased between 1905 and 1960 compared to earlier periods. That number has even doubled between 1960 and 1991 compared to the years before 1960 (Nguyen The Tuong 1995; reports quoted in Tran *et al* 1997). About eight to ten typhoons struck the coast in this decade, generating wind forces of a magnitude from between 9 to 10 (72-108 kilometres per hour). This average number of typhoons which puts Nam Dinh in the top ten of 29 coastal provinces affected by typhoons (see also Imamura *et al* 1997).

Two of the three estuaries (the Ba Lat and the Day) are surrounded by high sea dykes (6 m heighth) and divided into three major zones: (1) inner dyke-land; (2) coastal marshland, mudflats and beaches beyond the sea dyke and (3) islands. The largest estuary, the Ba Lat, has an area recognised as a wetland of international importance based on the Ramsar-convention.[5] Its present surface accounts for 3,000 hectares. The coastal area between de Ninh Co River and the Day River is called 'sea marsh land' (*bai bien*). It is part of a tidal plain, which encompasses an area of 8,800 ha. The mud flats partly covered with mangroves (including newly planted areas) cover an area of 4,900 ha.[6] An estimated expansion of land towards the sea at a rate of 80 to 100 meters a year in Southwest-Northeast direction (Nghia Hung) and a similar loss of land where dykes (Hai Hau) are badly repaired or where mangroves no longer create any protection (Hai Hau; large parts of Giao Thuy), make the

coastal area of Nam Dinh rather volatile.[7]

Nowadays, coastal zone management procedures consider several strategies t protect the vulnerable coastal regions ranging from protection to retreat strate gies. Another strategy, accommodation, is also considered in order to use the lan between the dykes and the housing settlements for salt production and aquaculture Accommodation also means that the coastline will be kept in the present positio and that flooding and salt intrusion is acceptable at a level that the settlements ar not endangered (see Government 1995; for a general view see French 1997).

Sea dyke management and building date back to the 11th century, but th extent of the dyke system that existed around the last quarter of the 18th and the firs half of the 19th century was more or less the same as today. Since then five majo dyke-building operations have been carried out between 1892-1900, 1934-193 1957-1962, 1962-1971 and 1975-1980. Historical records in French and Vietnam ese archives show an ongoing concern with the construction and maintenance o the dykes to establish land claims for agricultural settlement. Local mandarins wh retired to their native villages obtained considerable amounts of land along th coastline, which they occupied as concessions, often in conflict with local admin istrations.[8] Archival documents often show candour about these types of conflicts which remind the contemporary spectator of the unremitting land struggles in a frontier area. Nowadays the methods used by outsiders to regain use-rights fo shrimp-ponds do not differ much from the actions these local elites accomplished in the 19th century. The '*bai bien*' is still regarded as coastal communal land (*da bai cong*) that developed from being under customary law and codified in villag charters into statuary law under state management. In the (pre)-colonial period conflicts arose over the appropriation of these marshlands by local mandarins wh claimed land that was regarded by the local population as 'communal land' (*ba cong; cong dien*), which was seldom bestowed by the Royal Court or its local serv ants (for a general discussion about fluvial bai-land in the Red River, see Kleine 1999: 59ff.).

Land use, economic activities and effects on the coastal zone

Land reclamation is a centuries' old practice, but since the early 1980s this practice has clearly been determined by commercial instead of purely subsistence motives: the construction of shrimp ponds at the expense of existing mangrove forests. A great part of the mature stands of mangrove on the inner-dyke land and on the island of Con Ngan in the Ba Lat estuary has been removed and cleared for shrimp production. To a lesser degree this also occurred in the other estuaries. Mangroves on tidal mudflats, straddling river mouths and near estuarine islands are threatened as well. Mangroves prevent shoreline erosion. They act as buffers not only for waves, but also against pollutants. Mangrove root systems are also of direct use to communities for the provision of fuel wood, food, medicine and construction materials. In recent years, mangroves are subjected to various changes of management, resulting in large-scale shrimp farming and illegal logging. The human impact on mangroves threatens not only the natural protection of the coast, but also deprives the area of a natural habitat of birds and other wild life species.

The rapid agricultural and ecological conversion in the area where the coastal marshland, mudflats and beaches beyond the sea dyke are located has led to immense changes: major dyking operations to protect agricultural land, degradation of mangroves and the conversion of tree covered areas have now been converted into recreational spots while the mudflats are used for shrimp ponds. This follows a trend from elsewhere along the coast where mudflats have been transformed into pasture and cropland. The environmental consequences are felt in the rapid decline of the mangrove forests in Nam Dinh: of the estimated 8,400 ha mangrove area only 50 percent is still covered by various species of plants, especially the *Kandelia candel.* The total land estimated available for planting is 18,107 ha, but activities in this regard are slowly developing (Nguyen *et al.* 2001).[9]

Economic activities in the districts are quite diverse. Rice cultivation remains the main economic activity[10], but various forms of aquaculture, fishing, salt making, the production of fish sauce (*nuoc mam*) and net making supplement the incomes of the households (Adger 1999, 2001). Commercial aquaculture does increase income inequality, whereas fishing and utilization of the mangrove areas is a relatively equitable activity in terms of its impact on income distribution (Adger 2000: 87; Kleinen 2001).[11] In spite of many attempts by foreign donors to conserve and to expand planting areas, privatization of mangrove areas is underway through the construction of aquaculture ponds. With the extraction of timber and firewood, the mangroves are now critically endangered and conservation is not being met by measures like the loosely protected Ramsar site, or the insufficient inspections of the mudflats by the understaffed and underpaid Forestry Service. The acceptance of the Ramsar Convention on January 20, 1989 by the Vietnamese government, underlines its willingness to protect the area against further deterioration. The division into five' management zones' of the Xuan Thuy site (its former name) is an indication of the concern by the local authorities (Asian Wetland Bureau Publication No. 44; Le 1994: 45a). Posters displayed in public buildings and at press campaigns underline the importance of the Ramsar site and mangrove conservation in general. Past research in a number of communes (especially in Giao Thien and Giao Lac) reveals, however, a token awareness by the local authorities and a growing concern among the population about the access to the mangroves for gaining livelihood. A survey by the Asian Development Bank (ADB) among members of the local Commune People's Committee notices a lack of 'awareness raising activities about environmental protection and biodiversity, regulations and laws'. Communal leaders are quoted as saying that 'shrimp breeders and fishers know about harmful practices, regulations and laws of marine resource management through television and local radio loud speakers, but many are not aware of their responsibilities regarding the protection of the natural environment. They want the State to take measures to prevent the use of dynamite and electricity for fishing.' (ADB 1999: A3-14).

Aquaculture

Aqua- or mariculture has recently developed rather quickly in several communes along the coast, in particular to meet the rising demand for aquatic products for export. Shrimp farming and the cultivation of bivalves belong to the latest develop-

ments since the introduction of the market-economy in the mid 1980s. In Vietnam clams and cockles became a valuable commodity since a demand was made from various sources. Central and local governments have encouraged crab and shrimp farming as is indicated by the special decree issued by the Prime Minister on December 21, 1994 have encouraged crab (*Ostrea*) and shrimp farming. The development of a new freezer plant to produce the fodder to feed the shrimps is another indication of the attitude of the district authorities to promote shrimp production for export. A special Xuan Thuy Development Project has been created for the execution of these activities.[14] In Nam Dinh, farmers diverted to aquaculture through investment in land and ponds to cultivate shrimps. Conversions of salt fields, intertidal areas and mangrove forests into shrimp ponds have proven highly profitable, at least in the short term (Adger *et al.* 2001: 86). [15]

The small town of Mong Cai at the Chinese border in Quang Ninh province opens the gateway to the Chinese market and is a lucrative destination for shrimps but also for other marine products from the area such as cockles and dried red and white jellyfish. At the local level three categories of (mainly female) fish traders operate, divided along their volume of buying and selling.[12] Apart from a few big traders (*buon lon*), the majority operates at local markets where cash amounts between 1 and 5 million VND a day change hands.[13] Factors like working capital, investment capabilities and ranges of action determine the classification. Like big traders, medium-sized traders invest in fish and shrimp farms, but on a less modest scale than the investments in small scale fishing activities

Aquaculture in coastal Nam Dinh mainly refers to shrimp and mud crab ponds. Comparisons between the three districts are difficult due to lack of reliable data. Table 1 gives an indication of aquacultural production (in tons) of Nghia Hung district compared with aggregate data of the province as a whole.

The number of people involved in catching crabs in Nielsen *et al's* 1994 survey was around 260. National and international demand led to the construction of ponds, but the surface of the area is small compared to the area designated for shrimp ponds. In 2002, the tidal area between the Day and the Ninh Co encompassed 8,800 hectares out of which an area of 4,900 ha was shallow water between 0,4 and 0,8 meters at low tide. Of this surface between 1,040 hectares has been allocated to the development of shrimp breeding, while 300 ha have been assigned for breeding clams or 'oysters' as they are called locally. At present, around 4,700 to 5,000 people live from aquaculture (70 percent) and fishing (30 percent). More importantly is that the area has been leased to individual households and commercial enterprises, including the Ministry of Defence, to exploit respectively 850 and 180 hectares respectively, leaving 131 to 235 hectares unaccounted for (see Bao Cao Tom Tat, 2 January 2003). The background of this development will be discussed in detail below. It illustrates the importance of shrimp breeding and other aquacultural activities in the coastal zone of Nam Dinh.

Shrimp-Breeding

Aquaculture mostly takes place in intertidal areas. The conversion of salt fields into shrimp ponds is also increasing, locating the shrimp ponds on the landside of the dykes. Shrimp farming has also developed on mudflats outside the main dykes

Table 1: aquacultural production in Nam Dinh and Nghia Hung

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Nam Dinh									
Shrimps	450	587	565	617	721	750	731		
Mud crabs	168	287					279		
Fish	5,545	5,654	5,692	9,403	10,567	12,789	15,050		
Vang [clams]	2,000	3,000							
Nghia Hung									
Shrimps	150	125	180	204	380	416	526	585	
Mud crabs	116	127	124	115	128	139	188	350	250
Fish	655	830	855	896	923	820	850	800	
Vang	1,600 *	630*	650*	780*	2,000	2,500	2,850	2,500	1,500

Sources: Statistical Office Nam Ha (Nam Dinh) province, 1996 (in Vietnamese); Master plan for land use in the tidal area of Nghia Hung (in Vietnamese), March 2003. Viet Nam 1975-2000. Statistical Data of Vietnam. Hanoi: 2000 (in Vietnamese).

* All kinds of bivalves, including vang (Nielsen *et al.* 1998)

within ponds serviced by a drainage system for the supply and drainage of brackish and salt water.[16]

In general, the farming of shrimp and crabs is still done extensively, that is with low stocking densities of shrimp larvae and a minimal use of artificial feeds and chemical products.[17] The seed of these two species are collected naturally with rising tides through sluices in the dykes around the ponds. Shrimp yields in 2000 and 2001 were as low as 185 to 300 kg/ha.[18]

The total area of shrimp ponds in the three districts amounts to 5,200 hectare out of which Giao Thuy has 2,957 ha, Hai Hau 1,250 ha and Nghia Hung 1,040 ha. The estimated total area for aquaculture is 12,500 ha, which means that only 41 percent is used for shrimp cultivation.[19] According to an official provincial document dating back from 1997, a lease unit of bai-land (*dat bai*) was calculated on 3,452,5 m^2 (something less than the usual surface measurement of one Vietnamese mau (3,600 m^2) of land). The term of lease is 50 years. The minimum fee to pay is 150,000 VND per unit, which amounts to around 100 US$ per ha. Per square meter the price comes close to the cheapest price of city land (Huong Dan 1997). These guidelines have recently been altered and the price of bai-land has increased. The acquisition of the pond areas is now based on a bidding procedure, which requires that down payments of 40 percent of the total value of the land have to be made, while 30 percent has to be paid after 3 years of cultivation. The final 30 percent again is repaid back much later. In some cases, different procedures are upheld, *for example* by giving the area for free, with the stipulation that after a certain number of years land and productivity taxes had to be paid to the communal authorities to whom the area belonged.

In principle, everybody with capital resources and the management skills necessary for investing in shrimp farming can partake in a public bidding process to claim land for ponds. Although the bidding is open to all, only rich households with well established connections within the local political configurations succeed in overcoming the many obstacles of poor planning and haphazard decision-making. Nowadays, a small shrimp farm of *for example* 10 ha can attract initial bids of at least VND 500 million (US$3,500) and everyone who takes part has to put down VND30 million in advance. Local shrimp pond owners stated in interviews that they mostly leased the land with co-owners for a period of ten years. When they leased the land ten years ago, they were not required to pay compensation, but nowadays they are required to pay a price of the equivalent of between 250 and 300 kilos of rice (at a total value of 60 and 75 US dollars). In the commune of Giao Lac in Giao Thuy district the bidding capital is augmented by an investment of at least VND150 million (US$1,050) is required to build embankments and sluice gates. The productivity in these extensive shrimp ponds is strongly dependent on climatic circumstances: a former farmer, Doan Van Son, from Giao An commune in Giao Thuy who invested in ponds, made clear that he acquired 40 ha in 1997, against the price of 4,000 US$. After two years he was able to earn VND 300 million (around 2,000 US$), but the next season in 2000, a cold spring wiped out his stocked shrimps. Thanks to modest loans from the bank and friends and from the Hai Van Company (located in Nam Dinh town), the region's biggest supplier of breeding shrimps, he was able to recover.

An illustrative example is taken from a case study in Gia Lam, a small village near the Ha Lan estuary of the river So in Giao Thuy district. The area used for aquaculture in Giao Lam is about 40 hectares, between the sea dykes and the sand dunes. The area was not distributed to every household as in the case of bai-land along rivers, which is regarded as non-rice land for secondary crops. Tenders who are entitled to buy the use rights of a certain area to construct a pond can do so for a certain period, from 5 to a maximum of 10 years at a cost of 1,5 million VND a year. The amount is added to the community budget. There is no policy to apply land taxes. Shrimp breeding is nowadays preferred to the raising of ducks which was once seen as profitable in Giao Lam. There is no source of young shrimp for breeding in the region, and tenders have to buy young shrimp from nurseries in Da Nang at a price of 800 to 1 million VND for 10,000 young shrimp. Salt water is supplied directly from the sea. Only 50 to 60 percent of young shrimps survive and mature. The high mortality rate of shrimp is attributed to the polluted sources of water, but also because of the simple breeding techniques used. Though shrimp breeding has been introduced into Giao Lam only recently and its development still depends heavily on nature, it tends to become competitive. Local people are rarely given information about plans to develop the area for shrimp breeding. The local authorities keep this information hidden in order to attract potential clients who are willing to pay the highest price. Rumours circulated around the village saying the authorities hide the information to force potential buyers and shrimp breeders to deal exclusively with them in stead of leaving open access to the business of aquaculture..

The intensification of shrimp farms and the exclusion of local stakeholders is demonstrated by a recent development, due to the activities of a firm, which has operated in Giao Thuy and Hai Hau since early 2000, *Vietnam -American Technologies Inc. (Viet-My).*[20] The province agreed to lease the considerable area of 2,000 hectare in Giao Thuy to the company for 50 years. The area includes not only the mudflats in Giao Xuan and Giao Lac communes, but also part of Lu Island next to the RAMSAR Site office. Viet-My is planning to invest 90 billion VND in intensive shrimp farming with a production of 1- 3 tons/ha/year. For others to acquire shrimp ponds in these two zones, the provincial authorities have requested the district to assign lease contracts exclusively to potential clients who will work with the company by procuring their post-larvae from the hatcheries, built by Viet My. This means that third parties are excluded. No other firms can offer post-larvae, while households who are not willing to deal with Viet-My are not able to participate in a bidding process, as is the case in Giao Lam.

In October 2000 a hatchery of 3 hectares was opened near Hai Ly in Hai Hau with a prospected capacity of 30 million shrimps per year. The farm uses the premises of the former Centre for Fisheries Breeding of Hai Hau, which collapsed in 1999. In Giao Thuy and Hai Hau, around 200 households are supported by Viet-My. It is a clear betting-on-the-strong strategy because average investments of 50-60 million VND for each household are standard. Loans will be provided by local banks on the condition of a contract between Hiep-My and the household that will engage in shrimp breeding. Prospects are yields of two tonnes per hectare. The province guarantees support from the Agricultural Bank. At this stage of the project, Viet-My offers support in terms of technical advice and equipment.[21]

The marine services and markets for marine products are poor, so the prices of the marine harvest are unstable: fish farmers must find markets for local products, but according to the Ministry of Fisheries only 20 to 25 per cent of the total product can be sold within the province. Community leaders also complain about unstable market prices and the monopolistic activities of capricious traders, but offer no alternatives partly because of lack of money to improve the local infrastructure. Two processing factories in the district town of Xuan Thuy and the provincial capital of Nam Dinh buy at prices 20 percent lower than those offered by private business enterprises. Hau Hau district built cooling-facilities and an ice-factory near its principal port in Tinh Long, while Nghia Hung authorities are considering development of food-processing enterprises and aquatic products processing factories in the master plan they recently (2003) presented. This plan recommended, not only the shift from rice cultivation to aquaculture, but also that a complete dyking, irrigation and drainage system to serve aquaculture at a cost of nearly 56 billion VND (3,6 million US$) should be put into place to develop the area. (So Ke Hoach 2003).

The 'Gold' Rush for Bivalves

As elsewhere along the coastal area of the Red River Delta bivalves and other shellfish nowadays are collected on the mudflats in the inter-tidal zone both for local consumption and export.[22] An overview of eight commercially important species of bivalves (out of 23 species representing 17 families) is given by Nielsen *et al.* (1998), based on their research in 1994.[23] Bivalves live in mudflats in estuaries and bays where winds and waves are weak and tidal currents as well as influx of fresh water are unimpeded. Though important for the livelihood of many, only a minor part of this catch appears in the official fishery statistics. The collection of bivalves, shellfish and mud crabs in the intertidal area of around 5,000 ha between the Cua Day and the Ninh Co River was as follows: In 1994 local people spent 200,000 labour days

during low tide collecting an estimated 1,600 ton of eight species of bivalves and 30 tons of mud crabs (*Scylla serrata*). Nielsen *et al.* (1998) found at least one bivalve species (*Meretrix sp.*) heavily affected by human exploitation.

The fishery statistics of the Nghia Hung district notes a catch of around 400 ton of all kind of fish only on average over the period of 1992-1994 (Fishery Statistical Report, Nghia Hung District, 1994, cited in Nielsen *et al.* 1998). Between 1995 and 2002, this effort was doubled. Four bivalve species were used for human consumption, with an estimated annual yield of 630 ton. Two clam species, *Abrina* cf. *declivis* and *Aloides laevis* were used for feeding domestic ducks and pond reared mud crabs (800 ton). The high valued clams Asiatic hard clam or Venus clam *Meretrix* sp. (107 ton) and *Cyclina sinensis* (20 ton) were collected for export to China and Japan. Mud crabs are caught for subsequent breeding in ponds.

A very recent development in Giao Thuy and Nghia Hung districts is the deliberate culture of the clams species *Meretrix meretrix* (in Vietnamese *con ngao vang tron do or trang*, 'red' and 'white' clams' a second smaller species, the *ngao vang meo* which is imported from other areas[24] and blue mussels (*hen bien* in Vietnamese; *Modious philippinarium* or *atrata*). In Nghia Hung all these species are indicated with the generic name '*vang*', but locally differences in quality are made between 'red vang' and 'white vang (or '*meo*' which means 'being out of shape') to determine export quality. Nielsen *et al.* (1994) describe this activity in their extensive study on the shellfishery and shrimp and mud crab aquaculture, but only recommend it as an option to be investigated to release pressure on the natural populations. This is consistent with our findings that local people mentioned the start of the *vang*-culture around the mid 1990's. The district began to calculate the output in 1998 and found an increase from 2000 tons in 1998 to 2,500 tons in 2001 (see table 1).
In 1994 Nielsen (*et al.* 1998) observed the reclamation of new land not only for planting mangroves to accelerate sedimentation and stabilizing newly accreted mudflats, but also for the construction of shrimp ponds and conversion to rice fields as salinity declines. The described collection of naturally occurring bivalve molluscs is nowadays matched by cultured species. In Giao Thuy an area of 450 ha at the Lu and the Xanh sandbanks near the Ramsar side is used for breeding vang, while Nghia Hung has an area of 400 hectares at the mouth of the Day River.[25] *Vang* culture is an extensive semi-culture based on natural productivity of the estuary. The breeding period begins in the spring (around February) and the harvest takes place in September or October. Entrepreneurs, however, buy breeding stock that is released in shallow waters twice a year, after which it can be harvested in 12 to 18 months in spring and autumn. Most of the *vang* culture is still carried out in the traditional way whereby seeds of these bivalves are collected from natural spat and then reared in enclosures on the mud flats. Thinning and transplanting require the constant presence of the breeders who build small huts on large poles to guard over their area of mud fields fenced with small stakes. [26]

In Nghia Hung, but also elsewhere along the coast where mudflats have developed, women and children collect these aquatic animals and generally they specialize in one or a few different kinds. Using relatively simple techniques, it is difficult to gather enough aquatic animals for sale, but in the past few years some species have become the main source of income. Aquatic animals like molluscs, clams and crab are sold at either a local market or to middlemen. Subsequently they are consumed locally or distributed to the many hotels and restaurants in Nam Dinh or Ha Noi, or are exported to China depending on the market demand for specific species, especially breeder 'red' *vang*. Although Venus-clams are raised in Shandong, Zhejiang, Fujian and Guangdong, the demand from Vietnam is high. Rising consumer demands and changes in the natural condition of the coastal mud flats due to environmental and geographical factors like building activities are the causes of this (see the overview by Nie Shong-Qing 1982). According to the head of the provincial Sea Product Department of Nghia Hung, the *vang* breeding in Nam Dinh is quite unique compared to other regions in Vietnam. The industry has engendered a 'gold'-rush in Nghia Hung, since the demand for shellfish in China has increased dramatically and local families became rich from these exports. Like shrimp, seed clams are imported from other areas such as Nghe An, Thanh Hoa and Quang Binh. It is easily bred, but also easily infected by disease.

The mudflats around the mangroves are known as the 'alluvial plain where *vang* lives' (*bai tha ngao vang*) from which nowadays 400 people take natural *vang*, while 500 people work in enclosed areas with cultivated *vang*. Local *vang*-cultivators still hire women and children for the collection of the bivalves from the enclosures. They use rakes and small wooden boards to dig the bivalves at low tide. The women are hired in groups and work in shifts. Payments are made by the kilogram ranging between 2,000 and 5,000 VND for ordinary *vang* and 8,000 to 10,000 VND for export quality (*vang do*), while the sales price varies between VND10,000 and VND12,000 per kg (1 US $=14,000 VND in2002). About 500 to 600 people conduct the trade in *vang*. Thus, a total of about 1500 workers are involved, but largely they do not figure in the official statistics because of the type of work done by women and children.[27] The daily income from collecting red *vang* is between 120,000 and 200,000 VND based on an average of 15 to 20 kilogram (i.e. the number of kilograms of collected aquatic animals per day times the value per kilogram). Nielsen and her team calculated in 1994 between 0,4 - 7 kilograms per person per day of naturally occurring *Meretrix* spp., involving 203 people collecting per day with a total catch of 106,6 tons a year. The value of the harvest per hectare was estimated at approximately 120,000 VND (1998:24, table 6). Nowadays, the collection has sped up to 15 to 20 kilogram a day per person, which has led to an increased production of 2,850 tonnes in 2000 to 2,500 tonnes in 2003 (Bao Cao Nghia Hung 2002; So Ke Hoach 2003). Even if we take into account that our numbers are based on information provided by local informants, press accounts and statistics from the district, and not on close observation like Nielsen *et al.* did, the difference in collecting effort is striking, while total output at least doubled in weight.

Quick transportation to the Chinese border is essential for the survival of the live bivalves: blue mussels have to reach the border within two days, while the *vang* can exceed this period by two or even four days. Compared to the earnings received by women and children in the mudflats (Nielsen *et al.* 1998), which are not yet occupied by *vang*-breeders, the work in the enclosured mudflats is more remunerative but also more demanding and competitive. Because women are barred from gainful employment in active fishing, their households are dependent on the availability of

land to raise small livestock, knitting and repairing fishing nets, small trading and work in fishpond and shucking clams on the mudflats. Many of the *vang*-collectors belong to families where the husbands and sons are engaged in fishing activities: many households in the three districts have at least one or two members who is/are involved in the fishery (harvesters of fresh fish), but also as post-harvester (marketing/trading/ distributing. The collectors of the Day estuary come from coastal communes, especially Nam Dien, to hire themselves to vang-breeders. The self-appointed owners of these mudflats guarantee a better marketing of clams, which expresses itself in higher wages paid to the collectors.

The Conflict

The origins of the *vang*-culture in Nghia Hung date back to the early nineties, when a local trader and his wife, Mr. and Mrs. Lam, started to breed *vang* instead of just collecting the clams. A visit to Southern China where they first saw the industry enabled them to introduce *vang* breeding at home. Soon, the culture in the intertidal zone between the Day River and the sea had to be protected against outsiders because, after the initial success, others followed mainly on the invitation of the pioneers who lent money and gave assistance. By monopolizing contacts with Chinese trade networks near the border, this was an easy task. An area of about 1,000 hectares between the estuaries of the Ninh Co and the Day River came under cultivation. Access to the area was free, because nobody claimed it at the time. After five or six years the economic success of the Lam couple and their dependents did not remain unnoticed. Local authorities tried to regain control over the area, which they treated as a common property matter. It was argued that co- management (*cong quan ly*) of the mudflats was necessary because of pollution and diseases. In 1997, the couple was offered a contract based on the estimated harvest of the previous year. In the proposal it was stipulated that an amount of 200,000 to 300,000VND per hectare would suffice as a compensation for the production of the last 5 or 6 years. Furthermore, Mr. and Mrs. Lam received an offer of an area of 64 ha, while 5 other operators received permission to cultivate *vang* on another 64 hectares. It is not clear whether the Lam's ever paid the requested lease sum, but in 1999 the district through its chairman Nguyen Van Du requested a new contract and a sum of 1 million VND per hectare. At the same time the area assigned to the Lams was reduced to 3 ha. Needless to say, this situation brought about conflict. The obvious reaction of the Lam family was that the district wanted to capitalize on their initial success and that its argumentation that the area was a common property was a pretext for its own purposes. Soon accusations of corruption were aired. By assigning a limited area to the Lams and another five families, the district authorities tried to curb the Lam's influence. At least another 24 families were offered contracts in order to regulate their activities on the mudflats. A special management working-unit, called the *Dong cua Day*, was created. The contestants mobilised their supporters and demanded a public meeting, which took place near the mudflats. A provisional settlement was reached, but after some new contracts were signed, it turned out that the Lam's were not enabled to sign a contract that would acknowledge their initial efforts. The local press became interested in the case, partly because a reporter from the Nam Dinh provincial newspaper had relatives in the area. Other newspapers and magazines followed. The Lam family won national attention when their picture appeared on the front cover of the March 11, 2000 issue of a magazine that reports on activities of the Catholic community in northern Vietnam, 'The Catholic' (*Nguoi Cong Giao*). Nam Dinh and its adjacent province Ninh Binh belong to the cradle provinces of Catholic conversion since the 17th century. Both provinces have the highest number of Catholics of northern Vietnam. There was, however, no clear religious dimension in the case, but the fact that a considerable number of Catholic households worked in the *bai* combined with Mrs. Lam's Catholic background, made the case interesting for the editors. The dispute got bogged down on the question of whether Lam and their followers should receive compensation and extra land. A smear campaign accusing the Lams of the use of physical force aggravated the matter. Accusations of corruption and a public complaint by Mrs. Lam against the Chairman of the district, divided the advocates and opponents, including the regional and provincial press. At the time of our research, May and June 2001, no settlement had been reached and new press publications appeared. Headlines like ' Stormy life in the sea- bai of southern Nam Dinh '(*Song gio o bai trieu dong Nam Dinh*) and 'Some cockles keep people bound!' (*Nhung con vang co nguoi!*) suggested bitter personal conflicts based on financial interests. Lam and his allies have been accused of offering bribes to people who worked for them ('*Kich xu?*' i.e. How to flush money?), while other newspapers voiced concerned about the closed access (*khong duong ra bai*) to the mudflats.

In the course of 2001, a compromise was reached which at least left options open for the main protagonists. Being linked to district authorities by family ties the Lam couple abstained from legal action and decided to make the best of a bad job. The district authorities, who had the legal powers on their side, proposed a settlement which left the villages bordering the '*bai vang*' the choice between investing in fishing rights or the leasing of bai-land.[28] A 1991 decree by the central government enabled the district authorities to regain the disputed tidal area and leaving no options for those who regarded the seashore as a common pool resource. Administrative management was 'temporarily' assigned to the communes bordering the mudflats (Decision 1917, issued on 14 September 2001). Several communes executed the order. In Nam Dien commune, the mudflats were divided in plots of about 250 to 400 m^2 and these were offered for lease at an average price of 2 million VND (about 120 US$ in mid 2002). 23 Families profited from the deal and acquired annual rights for breeding *vang* at a total price of 39 million VND. In another commune, Nghia Loi, the bidding was offered at a price per hectare between 2 to 3 millions, depending on the quality of the soil: 20 families received 31,3 ha (interview with the chairman of the People's Committee). In total, 125 households obtained leaseholds on the mudflats on an area of 240 hectares. This time, village authorities obtained the sums of money and regulated the bidding process by limiting the period of leasehold (two to five years). The flipside of the coin, however, was the limited access to the mudflats for those women whose households were un able to bid for leaseholds. As one of them said, 'We don't sell *vang* anymore, because we are small businesswomen; we can't compete with the 'stable dealers'. Their capital is big, so that they can buy and sell at a lower price to take more customers (....) Everyday we meet, we salute, talk and smile, but whenever they find out that we compete, they will decrease the price and drive us out of the market' (interview with a *vang* collector and trader from Nam Dien, May 10, 2002). With the small traders gone, many collectors had to turn to

the leaseholders of the enclosures to hire themselves out as a workforce. The results are mixed: in some communes the regulation of the mudflats is seen as beneficial for the inhabitants, while in others complaints are still heard about the lack of free access to the coastal zone and the higher degree of competition among the poorer segments of the population. The district authorities regard it as their duty to regulate the situation. With the help of the provincial authorities, they hope to attract national and international investors. The presentation of a master plan is a case in point. At least 5 projects are proposed including the construction of an irrigation canal to serve shrimp culture (60 billion VND) and a sea dyke embankment in one of the communes (10 billion VND). With the addition of a rehabilitation project for mangroves, concern for a better environment is shown, but it is clear that the tidal plain of Nghia Hung district will be developed as an area for aquaculture. The Lam family is, in spite of their demise, still in control of the lucrative market: one of the daughters operates a selling point near the dyke to buy clams from everybody who wants to sell.

Conclusions

As I stated at the beginning, at first glance the '*vang*-affair' resembles a local variation of the classic 'tragedy of the commons' type of conflict: shrimp cultivation and a common stock of bivalves is exploited by 'free riders' who create a social dilemma about the question of who 'owns' the common property of the shallow sea (Hardin 1968; see also McCay 1987; and Jentoft *et al.* 1998). A closer look, however, revealed that the 'commons' never have been an open-access resource. The state regulated the mudflats in terms of communal land (*dat cong bai*), which meant that usufruct rights belonged to communes and not to individual households. The quick economic developments, however, created factors, which had less to do with property rights per se, but with differences in social and economic power. Already in 1994, Nielsen and others pointed to a polarization process within local communities which benefited better-off households and reduced the livelihood of poor and marginal people, 'every time an intertidal area is converted into aquaculture ponds' by tightening the area's natural production. With the increasing claims on the mudflats, this process accelerates. The quest for property rights and the regulation for utilisation of the mudflats and the wetlands have been taken over by state agencies. The mangroves and the mudflats are indeed 'owned' by the state as symbolised by the authority of the People's Committees of districts and commune, assisted by Forestry Protection Management bodies and the special protection forces that operate in the area. The district People's Committee allocated specific property rights for mangrove and mudflat areas including rights to fish and rights to convert areas to aquaculture ponds. (People's Committee of Nghia Hung district, 1994; see also Nielsen *et al.* 1998: 41). Regulations regarding the special use of the Cua Day estuary have been set in motion since the early 1990's, but the rapid expansion of the *vang*-culture has confronted the district authorities with a dilemma. The fast accretion of the coastline does not allow effective state management while state control of 'open access resources' only takes place when user groups comply with state management.

The question remains how co-management has to be reached when local political and economic interests conflict with each other, especially between local authorities and ordinary households of people. Local autonomy in Vietnam has a long tradition, but the existence of 'free riders' in this case entrepreneurial outsiders have shown a strong countervailing force that is encouraged by the recent economic 'renovation' process. 'Renovation' means liberalization of market forces and privatisation of natural resources. The government apparatus at the village and district level has not changed dramatically. The absence of clearly defined individual rights has led to an encroachment of the mudflats (see also Jian Zhang 2002). People's Committees are still the most important representations of state power, but their local autonomy has sometimes been increased with negative consequences. The realities of the exploitation of the common property have changed, as our *vang* example shows. 'New winds of change' have forced local authorities to yield to privatisation, but will this also benefit the poor sections of the population? Struggles such as these about access to the resources of the sea, can become a litmus test for the so often praised autonomy of local communities, even at a time when the global market will take its toll. The questions remains whether or not the activities of the different actors will also lead to a better control of the natural resources and with it, a better control of negative ecological consequences which have not yet been taken into account.

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Notes

[1] Since its publication in *Science* (1968:1243-1248), the model received a large interest in environmentalist studies and is matched by biologists, social scientists and even computer specialists and Internet guru's (see http://citeseer.nj.nec.com/context/50290/0). See also 'The Revolutionary Import of Garrett Hardin's Work' by Herschel Elliot, July, 2003.Tributes to Garrett Hardin. In *Managing the Commons*, Edited by Garrett Hardin and John Baden; Indiana Univ. Press, 1998. See for the latest contribution Ostrom et al. (2003).

[2] Red River Delta 300 GPD per capita; whole Vietnam 305 GPD per capita (UNDP 2001: 108-109).

[3] Beaches are located in Giao Phong and Giao Lam in Giao Thuy; Tan Thien, southern part of Hai Hau; Mudflats and wetlands in Gia Lac (Giao Thuy) and the Ramsar site; in Nam Dien , Nghia Hung. Trees in Cua Quat Lam in Giao Thuy and Hai Dong and Cua Ha Lan in Hai Hau. Mangroves in Giao Lac in Giao Thuy, Hai Dong in Hai Hau, Nghia Bien in Nghia Hung.

[4] A 1997 report mentions mean deposition rates of high tidal flats of 27 meters a year (Tran Duc Thanh et al.., 1997).

[5] The Ramsar Convention derives its name from the city of Ramsar along the Caspian Sea north of Teheran where, in April 1971, 114 countries recognized 977 sites for their economic, cultural, scientific and recreational value and pledged for the wise use of wetlands. Around 1999 the area counted 71 million ha.

[6] Scientific name: mangroves swamps (mangals). Tree species in Vietnam: *Rhizophora spp.; Kandelia candel, Sonneretia caseolaris, Aegiceras comiculatum, Acanthus ilicifolius.* Use: protective and productive interface between land and sea. Toponym: in estuarine , deltas and open coasts: *Rhizophora spp.* (back swamps); Nipa palm in deltas ; open coasts: Avicenna, succeeded by *Bruguieara spp.* (van Santen et al, 2002)

[7] The total area of mangroves is according to provincial data 8,400 hectares, while 18,107 ha are estimated to be available for planting. District authorities claimed lower surfaces, which brings the total area down to 2,450 ha constituting 34 percent of total mangroves in the North.

[8] National Archives of Vietnam, Depot # 1 - Nam Dinh, files 1644, 1721, 1733 and 1734.

[9] Between 1990 and 2000, 738 Ha of protected forests disappeared as a result of cutting trees for fuel wood and timber and the digging of ponds for shrimps and other fish species. Two economic zones (Dong Hai and Nam Phu) encompassing 124 ha, have been created in this district.

[10] Nam Dinh province produced together with its northern neighbour Thai Binh the highest gross output of paddy (952 against 968 k tons in 1998). The three districts produced in 1999 105,852, 152,223 and 132,945 tonnes respectively (Cuc Thong Ke 1999).

[11] For aspects of social vulnerability and resilience in Giao Thuy district, I refer to W.Neil Adger et al. (2001), chapter 2.

[12] For an in-depth report, see Nguyen Thu Huong (2002).

[13] For a detailed field study regarding fish trading activities, see the paper by Nguyen Thu Huong (2002).

[14] The Project was titled 'Investment on Seafood Rearing and Processing Owned by Xuan Thuy District Seafood Processing Enterprise for Export'. Xuan Thuy is the former name of Giao Thuy before its was split into Giao Thuy and Xuan Truong. It aimed at the expansion of shrimp cultivation area by 510 hectares on top of the 2,000 already existing hectares. Other sources (district statistical data) show a number of 80 coastal aquaculture enterprises (mainly shrimp ponds). Interesting is however that the production of shrimps has not seriously increased in 1998 and 1999 (240 tons in 1998 and 250 tons in 1999).

[15] See the reports by the Environmental Justice Foundation (EJF 2003a and 2003b).

[16] Here, unlike the Mekong Delta, the maintenance of traditional agricultural practices, particularly rice cultivation during the dry season is not stalled by salt-water intrusion. Rice lands are situated at the landside of the dykes.

[17] The shrimps are known in the area under the name of *tom he* and *tom bop (Penaeus merguiensis* and *Metapenaeus affinis* or Jingo shrimp) and *tom su* (*P. monodon* or giant tiger prawn): most are imported from hatcheries around Da Nang and Nha Trang, but all appear as well as a result of the fisheries of the Cat Ba-Ba Lat bottom-trawlers operations. No in-depth research on coastal Nam Dinh shrimp cultivation has been conducted yet. Most of the technical information for comparative purposes is taken from studies conducted in the Mekong delta. The Nam Dinh shrimp breeding can be called extensive or semi-extensive because of the extremely low inputs also in comparison to these areas (see Tran Thanh Be 1999; Johnston et al, 2000). Rosenberry (1997) reports on the extensive nature of shrimp breeding in North Vietnam. He defines extensive as one shrimp per 2 m^2.

[18] Economists use a TFP-index or Total Factor Productivity Index to compare productivity ratios. The index is the ratio of an index of total output to an index of all factor inputs. Vietnam s extensive shrimp farming scores lowest of Asia in terms of average annual production value labour use, feed application and seed stocked (Rosenberry 1997). Vietnam's average annual production value is 1989 US$ per ha and 492 person-days/ha. For an overview see Johnston *et al.* 2000.

[19] A 1998 ADB study mentioned a brackish water area of 5,500 ha. Vietnam News Service December 2, 2000.

[20] This company was established in 1998 and has branches in Haiphong, Thai Binh, Quang Ninh, Nam Dinh, Ha Tay, Sai Gon, Hai Phong and Vinh Phu. In Vinh Phu, Viet-My operates commercial fruit farms, but the company shows also interests in electronic services, offshore and environmental projects.

[21] Interview with the local director of Viet My, Tran Van Hong, in June 2001 and information gathered in Hanoi and Giao Thuy.

[22] Bivalve culture is Asia is documented in McCoy and Chongpeepien (1988) for Thailand. For a more general overview see Lovatelli (1997).

[23] In 2002, the local population has identified the following bivalves: *vang tron (nhot) do, trang (Meretrix meretrix), sam (Hiatula dipos)* and *so trim (Cyclina sinensis)*, all collected for export. Smaller species and mainly for local consumption are *don* (glauconome chinensis), *vang me (nhot)* (Abrina), *mong tay* (Solen corneous), *vang trang (nhot)* Mactra quadrangularis), and *vem* (Sinovacula constrictor). At least 2 species declined dramatically: *vop* (Mactra quadrangilaris) and *den* (aloides laevis) (see also Nielsen *et al.*1998: 62-63).

[24] Meretrix lyrata or Abrina

[25] Total breeding area for fish and bivalves is 2570 ha, out which 870 ha is for fresh water species, 1360 ha is brackish water and 400 designated for *vang* culture (Bao Cao [Report] of Nghia Hung district, March 2001). A provincial land-use report from 2003 mentioned 1040 ha for aquaculture, 1752 ha for mangroves and sea pines and an area (*dat chuyen dung*) of 125 ha for transport and irrigation (canal system).

[26] On Cat Hai Island in the Bay of Ha Long, *vang* is called Ngo, or Chinese Dosinia, *Cyclina Sinensis.* Chinese Dosinia lives in areas with a lot of sand near the small rivers in the mangroves. Locally Chinese Dosinia is called Nga. Nga is one of the most valuable species and as a result collectors often rank it as very important. Nga can be collected throughout the year, but they are most fat in the eight lunar month (September). During the beginning of the year they are almost empty (Van Duijn 2002: 136 ff.).

[27] The official statistics make a distinction between people engaged in fresh water fish breeding (485 persons in 2000), in sea products (900), in all kind of services connected with the fisheries (900) and those indicated as employed (*khai thac*), 1050 persons. For 2001, these numbers rose from 500, 1340, 600 and 1100 respectively.

[28] Through a series of decrees (*quyet dinh*) based on a provincial original (no. 1917/2001 on 14 September 2001; 184/2001 on 2 October and no. 185 on 5 October 2001). Report of the commune, dd. 10 April 2002.

[29] Nielsen *et al.* (1998) reported for the Nghia Hung area a collection of 16.9 tonnes in 1994, with an average of 3 tons a month during their stay there (March- June). The total export of mud crabs from the district was 140 tons per year (based on official fishing statistics) or around 700,000 individual crabs. The total aquaculture yield per hectare has been counted at 2 tons (ADB 1999).

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