

**Community-Based Aquaculture for Poverty Reduction:
Institutional and Technical Options for Sustainable Resource Use**

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List of Abbreviations

ADB	Asian Development Bank
CBFM	Community-Based Fisheries Management
CGIAR	Consultative Group on International Agricultural Research
DARD	Department of Agricultural and Rural Development
DONRE	Departments of Natural Resources and Environment
GDHM	General Department of Hydrology and Meteorology
GDLA	General Department of Land Administration
GMS	Greater Mekong Subregion
HH	Household
IHH	Interviewed Household
MARD	Ministry of Agriculture and Rural Development
DARD	Department of Agriculture and Rural Development
MRC	Mekong River Commission
MOC	Ministry of Construction
MoFin	Ministry of Finance
MoH	Ministry of Health
MOI	Ministry of Industry
MoNRE	Ministry of Natural Resources and Environment
MOSTE	Ministry of Science, Technology and Environment
MOT	Ministry of Tourism
MPI	Ministry of Planning and Investment
MRC	Mekong River Commission
NWRC	National Water Resource Council
PRA	Participatory Rural Appraisal
PRDS	Provincial Agriculture and Rural Development Service
RIA No 2	Research Institute for Aquaculture No. 2
VND	Vietnamese Dong
VNMC	Vietnam National Mekong Committee

1 Introduction

In 1995, the four lower Mekong user countries (Vietnam, Cambodia, Laos and Thailand) created the Mekong River Commission (MRC), whereby they agreed on a joint management of their shared water resources and development of the economic potential of the river. China and Myanmar only hold observer status and function as “Dialogue Partners” within the Commission (Mekong River Commission 2007). Another important international institution in regard to the water management in the region is the Greater Mekong Sub region (GMS), a program initiated by the Asian Development Bank (ADB) in 1991. Being the only institutions representing all six user countries, it can be described as the most important forum for challenging economic development assistance for regional projects (RATNER 2003). The GMS focuses on infrastructure and regional power projects, trading agreements as well as water resources management (GMS 2007). Within this regional framework, all user countries do have their own policies and laws for the management of water resources in their respective countries.

The Government of Vietnam is still engaged in a reorganisation of the institutional framework concerning water management. One important step in this direction was the adoption of the Law on Water Resources in 1998. Together with the *Law on Land* and the *Law on Environmental Protection* it provides the comprehensive basis for natural resource management in Vietnam. Based on this law, the National Water Resource Council (NWRC) was established and functions as an advisor to the ministries concerned with water resources (NWRC 2006).

However, the NWRC states, that Vietnam does not have an overall action plan concerning their water resources until now. Management of water is still based on action plans of sub-sectors (NWRC 2007). Several institutions are in charge for different responsibilities in water management. Thus, for example the Vietnam National Mekong Committee (VNMC) is responsible for assisting the Prime Minister in directing, and managing all corporation activities with the Mekong River Commission and to develop, use and protect the water resources. Furthermore, the Ministry of Agriculture and Rural Development (MARD), responsible for irrigation, flood prevention and rural water supply and the Ministry of Natural Resources and Environment (MoNRE), responsible for water resource management (including issuance of water extraction licenses and water discharge permissions, water supply to meet demands of the national economic sectors) are key players in Vietnams overall water management. Other ministries involved are Ministry of Planning and Investment (MPI), Ministry of Finance (MoFin), Ministry of Construction (MOC), Ministry of Industry (MOI), Ministry of Science, Technology and Environment (MOSTE), Ministry of Health (MOH) and the Ministry of Transportation (MOT) as well as the General Department of Land Administration (GDLA) and the General Department of Hydrology and Meteorology (GDHM). On a provincial level, water management is undertaken by the Departments of Natural Resources and Environment (DONREs) as well as through the Provincial Agriculture and Rural Development Service (PRDSs). On a district and

commune level it is the Extension offices and the People's Committees that are engaged in water management issues together with individuals using the water resource (The Socialist Republic of Vietnam 1999). Based on these complex governmental structures and functions on different levels, one can find shared responsibilities as well as overlaps in functions concerning Vietnam's water resource management.

Poverty is still very high in the rural floodplain areas of the Vietnamese Mekong Delta. People derive their livelihood from natural resource use, especially through fishing and farming. The Mekong Delta region accounts for almost half of Vietnam's rice and fish production and is also an important source for foreign exports (RATNER 2003). Thus, access to natural resources and their sustainable management play a significant role in poverty reduction in Vietnam. The underlying assumption of the *WorldFish Center/Research Institute for Aquaculture No.2 (RIA No 2)* cooperative approach is that seasonal water-bodies (flooded crop fields, ponds and reservoirs in irrigation schemes) can be communally managed by all stakeholders under equitable and sustainable sharing arrangements. Experiences from a ten-year *WorldFish* project (CBFM-2) in Bangladesh showed that livelihoods of fishers and poor communities can be improved (23000 direct beneficiaries in Bangladesh) through community-based fisheries management and that simultaneously environmental issues can be addressed and fisheries resources improved in terms of production, diversity and sustainability (WorldFish 2007).

Due to the successful implementation of the approach in Bangladesh and also in Vietnam in 2005, the *WorldFish Center* initiated a five year inter-disciplinary research project (2005-2010) in three water basins, namely the Indus-Ganges (Bangladesh), Niger River basin (Mali) as well as the Mekong Delta (Cambodia and Vietnam) called "CGIAR Challenge Program on Water and Food: Community Based Fish Culture in Irrigation Systems and Seasonal Floodplains". The project's main activity is to integrate the culture of fish and other living aquatic resources into existing water use systems and thus to enhance the productivity of seasonally occurring floodwaters. This is intended to contribute to reducing poverty, generating employment and increasing income of all classes of rural society in floodplain and irrigated areas. In Vietnam, research on institutional arrangements and technical options for community-based aquaculture in different hamlets of four ecological flood prone areas in the Lower Mekong area of Vietnam is conducted in collaboration with the *RIA No 2*. Expected outputs of this research are, among others, the development and testing of technical options for integrating fish and other living aquatic resources into irrigation systems and seasonal floodplains as well as the identification of locally appropriate institutional options for benefit sharing.

2 Materials and methods

2.1 Materials

In co-operation with local officials from Departments of Agriculture and Rural Development (DARDs) as well as with office representatives from Extension and Commune Offices four sites in total were selected. These sites are representative for managed floodplains in the Mekong Delta region of Vietnam and are within the Long Xuyen Quadrangle, the Plain of Reeds, and western Bassac River as well as between Mekong and Bassac River. The selection was made through careful designed surveys and formal discussions between related stakeholders. The first and main site selection criterion was that a suitable infrastructure for community-based approaches (dikes, suitable sized area of paddy fields, etc.) must be in place. However, also willingness for cooperation from local officials as well as farmers played a key role in the selection process.

Ecological region (Can Tho city)	District	Commune	Hamlet	No. of Farmers involved
Long Xuyen quadrangle	Co Do	Thoi Dong	<i>Thoi Trung</i>	9
		Thoi Lai	<i>Truong phu B</i>	28
	Vinh Thanh	Thanh Thang	<i>D1</i>	34
			<i>E2</i>	31

Table 1: RIA No 2 Research Sites

This paper presents data from four different hamlets in one key ecological floodplain area (Long Xuyen Quadrangle), where community-based aquaculture and institutional arrangement were implemented since 2006.

2.2 Methods

A “farmer group” was established in each of the sites in order to implement fish culture activities during the flood season. Financial support for nets and fingerlings as well as technical training was offered by *RIA No 2*. However, farmers were responsible for planning their activities, establishing a financial saving system, organising collective work activities and ensuring the guarding of the cultured fish.

The following species were grown: common carp, grass carp, red tilapia, bighead carp, silver carp, silver barb as well as featherback and snakehead. Together with technical staff from *RIA No 2*, the

project members came to an agreement about suitable fish species, structure and density as well as about fence and dike constructions. Thus, common carp, grass carp, red tilapia, bighead carp, silver carp, silver barb, were nursed at a density of 10 pcs./m², except for snakehead and featherback which were nursed in hapas suspended in either ponds or in the river at a density of 400 pcs./m². The nursing period lasted for two to four weeks. Thereafter the fish was released into the rice fields at a density of 4-5 pcs./m², when natural food was used, or only 2 pcs./m² when supplementary feed was provided. The total culture period lasted four to five months

In addition to secondary data analysis and literature review, Participatory Rural Appraisal (PRA) was applied in the hamlets. PRA is a method that facilitates community participation in examining issues of resource management, problem solving and decision making (IFAD, ANGOC and IIR 2001). In different group sessions, hamlets are invited to participate in different activities, such as the drawing of community maps, the creation of timelines recounting significant events in the community or preference ranking techniques which encourage the open discussion of questions that arise. This allows both the researcher and the participant to better understand actual resource use patterns and other related issues, to identify primary and secondary stakeholders and to examine difficulties associated with the natural resource. The PRA undertaken within this research included the following tools: resource mapping, social mapping, seasonal calendars, and time lines, transect walks, wealth ranking and semi-structured interviews. Information collected through a socio-economic baseline survey which was undertaken in both hamlets is presented in this paper, too. Thus, a combination of qualitative and quantitative methods was applied.

3 Results

3.1 Situational analysis

The following section will present findings from a situational analysis in two hamlets. The objective of this situational analysis was to identify new sites for the *WorldFish/RIA No 2* research project in order to disseminate implementation further and extend the research. As experienced in the first year of implementation, institutional arrangements play a crucial role in the success of community-based aquaculture and this chapter gives an overview about the institutional framework within the farmers catch and culture fish as well as a closer description about local arrangements in two hamlets.

The farmer group in *DI* hamlet had a one-year experience before *RIA No 2* engaged in the hamlet. The project group was established in 2005 with 34 members with the purpose of mutual support in fish culture during flood season in order to increase project member's income. Although the local economic officers supported the farmers in developing rules and regulation the farmers worked

together without any formally established institutional agreement. However, farmers reported



difficulties within the group, because of an ambiguity of different roles. Thus in 2006, *RIA No 2* staff facilitated a process of developing written rules regulation with the group. These were developed based on the farmers' previous co-operation experience, their mutual agreement, as well as their own decision. This change led to a higher satisfaction within the whole group.

Image 1: Project farmers after fish release

In comparison with the project in *DI*, the farmer that grouped together in Thoi Trung only worked individually beforehand. The idea was to make use of the potential natural food in the paddy field for the collective aquaculture. In wet seasons, the amount of time spent for agricultural or other activities is low and thus 9 farmers agreed on participation.

In both two project sites, different meetings were organised with project members and *RIA No 2* staff, who offered the facilitation for discussions about cultivation plans and members' duties. *RIA No 2* technicians offered their technical expertise and built capacity within the group. Plans were established about who is when responsible for guarding the water resource and maintaining the dike. Additionally, benefit sharing agreements were set-up, whereby profits can only be calculated after the harvest.

3.2 Local arrangements

The following section will present a closer look at the institutional arrangements the farmers created in four of the research hamlets, namely, *E2*, *Truong Phu B*, *DI* and *Co Do*. The main occupation in the first two hamlets (*E2* and *Truong Phu B*) is "agriculture/cultivation of own land", whereby 77% of all interviewed households (IHH) claim it as their primary occupation. As a main secondary occupation, 11% of all IHH named "Aquaculture production". This is due to the fact, that in 2006, farmers in both hamlets were encouraged by a communal initiative to engage in collective aquaculture production. The result survey of institutional arrangement in *DI* and Thoi Trung hamlets shows that the main occupation in both hamlets is "agriculture/cultivation of own land", whereby 100% of all interviewed households (IHH) in Thoi Trung claim it as their primary occupation.

In all hamlets a number of different organisations are in place. In *E2*, more than 40% of the respondents were member of the Church society (16 out of 36 respondents). *E2* is a catholic community that moved to the Delta in the 1970's and the Catholic Church remains an important institutional authority in the hamlet. Furthermore, people work collectively in field preparation, maintenance of dikes/ water storage/distribution systems, harvesting crops as well as in guarding aquatic resources.

Hamlet	Institutions (No of affected organisations in hamlet)
<i>D1</i>	Veteran's association Cooperative economy subgroup Woman association Farmer organisation Promulgate a parish Thanh Long Youth Union Aquaculture club
<i>E2</i>	Church or temple society Farmer organisation Fishing society Rice-fish organisation Youth group
<i>Truong Phu B</i>	Farmer organisation Fishing society Political organisation Rice fish organisation Hamlet welfare institution Women's group
<i>Thoi Trung</i>	Farmer organisation Aquaculture club Health care organisation Women association

Table 2: List of established institutions in four hamlets

3.3 Water management

All research hamlets use water from canals, which derive their water from the Bassac River. These canals contain water throughout the whole year, with water levels changing seasonally. Water is used for multiple purposes including irrigation, fishing, washing, doing the dishes, irrigation of gardens, transport (commercially as well as private), and sanitation, as well as providing a market place (floating markets) and waste disposal.

In E2, water in the channel is mainly used for irrigation and fishing. It also plays an important role in transportation. Some villagers (approx. 1/3) also use the canal as drinking water resource, whereby the rest of the hamlet gets drinking water from a drinking water company. The flood season starts at the



Image 2: Irrigated rice fields in E2 hamlet

beginning of September and water level in the canal starts rising with a peak level of 1.6m in October. The water is used for gravity irrigation during this time and pumped into the fields for irrigation during December and August. The canal was built by the government in 1954 and villagers are engaged in renovation measures, initiated and financially supported by the Vietnamese government.

The water resource for people living in *Truong Phu B* is a river called “O Mon”, which is fed by the Bassac River. It flows from north to south, where further down Truong Xuan commune accesses the river. The flood starts in September and reaches peak in October/November, where the water in the river is approximately 5m deep. In January/February the flood falls to its lowest level at 3m in the river. The river is used for gravity irrigation and pumped irrigation between March and June. As it holds water the whole year, it is a crucial to local livelihoods.



Image 3: Canal in Truong Phu B hamlet

The use of pesticides (63% of IHH use pesticides) and fertilizers (62% IHH used inorganic fertilizer during their last crop) is common in both hamlets. Villagers are aware of the fact, that this harms the fish population and the water quality, but there are no quality measures undertaken by the villagers themselves. They are also not aware of any water quality measure in their region undertaken by the government. In *Truong Phu B*, villagers report a decrease in wild fish catch, which is explained by an increase in population. However, from 2000 on, the government allowed the import of a snail called “Oc Buou Vang” (golden snail), which spread very fast and destroyed the rice yield. This made the farmers use chemicals to reduce the spread, which then also affected the fish. The fish population decreased dramatically until 2004. In 2004, a new chemical was introduced against the snails, which had less impact on fish populations. Thus, since then there is a slight increase in wild fish and villagers report, that it is sufficient for all households in the hamlet.

Water in both hamlets is used according to the daily needs and sluices are opened according to private decisions for irrigation. However, 12 IHH reported that they synchronise field preparation, 10

IHH synchronise having the same duration of crop varieties and 7 reported that they synchronise water release. In *E2*, more than 100 small private sluices connect the paddy fields with the canal and are used for individual private water release. These small sluices were built by the individual farmers themselves and farmers access the water whenever they are in need of water for irrigation. There are no collective decisions about when and how to irrigate. In *Truong Phu B*, farmers report that water pumping into the fields is done on the basis of individual decisions, without any common considerations. However, before the next rice crop can be sown, water needs to be pumped out of the fields and as this must be done at the same time in order to facilitate an effective disease prevention. Thus, the government announces a certain time frame within as water must be pumped out entirely. This is a local regulation from the DARD and farmers report that they are not included in this decision. They report that they need to follow the instructions, because in case of not compliance they fear a lack of financial or other government support in future.

In both hamlets, a problem associated with the water resources is that farmers which are not close to the water resource are excluded from fresh water for field irrigation. These “landlocked” farmers can enclose their fields with a small dike, if they do not want water to flow into their field from a neighbouring field. However, these farmers can only access water, when their neighbour with access to a sluice is willing to open it. As a result, water quality is lower as it first flows through neighbouring fields. This is considered to be fair as landlocked land is cheaper than the land close to the water resource.

In Vietnam, people do hold legal private property rights to their lands and transfer of land is regulated through the willing buyer and willing seller principle. Only water resources like canals, rivers and reservoirs are considered to be a public good and remains under the management of the government (The Socialist Republic of Vietnam 1993). However, the canals in the two hamlets face an open access situation during the whole year as everybody can use it for any purpose at any time. The access rights to the paddy fields change with the season. The fields are private land during the dry season, when borders between paddy fields can be easily observed and where small dikes mark border of private property. However, during the wet season, these obvious borders disappear due to the flood and thus flooded agricultural land becomes common property. The fields can then be accessed by anybody, including members of other communities, for fishing purposes. Landowners do not consider this as an open access situation or a change in property rights, because legally they still have the right to deny access to their land. However, as it is not common to deny anyone access to fields for fishing purposes, these areas can be classified as open access. Conflicts about water resources are not reported, even in times where there was a lack of fish for daily subsistence.

Rules concerning the water in the hamlets are based on national law and only refer to illegal fishing gears, which include electric fishing gears as well as small mesh nets (Vietnamese Fisheries Law, MOFI 2005). Seasonally, there are no restrictions; fishing is allowed during the whole year and is permitted anywhere. A police officer, employed by the commune is responsible for the monitoring of illegal fishing gear use. In the case of use of illegal fishing gears, they will be taken away and fines can be imposed by the police officer. They range from 200.000 VND to 500.000 VND¹. However, the amount of the fine also depends on the goodwill of the police officer. There are only a few people breaking the rules, the police officer in *Truong Phu B* reports. Illegal fishing activity is more common during the flood season, when illegal fishers are apprehended about once per week. The police officer considers himself to be very strict, “he must follow the law and the take away the fishing gear” (pers. comment police officer *Truong Phu B*). However, as they all know each other, villagers will not betray their neighbours when they see someone using illegal gears.

Rules and regulations established by the government as well as sanctions in the case of non compliance are spread by word of mouth, through the TV and on the radio. Villagers are not involved in decision making about rules and all laws concerning fisheries are made by the government. Villagers think this is good solution, because “only the government can make good laws” (pers. comment villager in *Truong Phu B*). The national rules are considered to lessen conflict between the farmers and they are considered as important, because it will ensure that there is enough fish for the next generation.

In Vietnam, maintenance of the canals is officially in the hands of the governments (The Socialist Republic of Vietnam 1999). However, villagers also report, that they are not aware about any monitoring concerning the status of the canal, dams or dikes or of water quality and fish abundance. It is the villagers that need to communicate renovation wishes to the government. After inspection and decision from the government, renovation may be organised by the government, whereby villagers contribute money and labour. In *Truong Phu B*, the government invested in making the canals deeper and renovate them approximately every ten years. Villagers report that it is an unsatisfactory process as the government decisions for renovation take a long time. For the small canals, the villagers of *Truong Phu B* are responsible for maintenance and they have to organise renovation themselves, including financial contribution from the people living around the small channels. However, the government encourages them to renovate these small channels, which takes place approximately every five years.

¹ 16.000 VND ≈ 1 US\$

3.4 Technical experiences

Together with technical staff from *RIA No 2*, the project members came to an agreement about suitable fish species, structure and density as well as about fence and dike constructions. The fish structure decided upon was based on the different needs of the several species concerning feeding and a balance according to available feeds was considered. The main fish introduced is the common carp, because it proved to have a high economic return. Over 60% of fish introduced in the project sites is thus common carp. The decision about which species to culture was taken as a mutual agreement between farmers and local people experiences strongly influenced the final structure of the fish cultured. The decision to release the fish into the field only after nursing it in suitable ponds was a financial consideration.

At the same time, water productivity was measured and the pH, temperature, transparency and the natural food (plankton), were compared between the different sites as well as natural fish abundance was monitored. During this period, all project farmers were trained in fish culture techniques by working with *RIA No 2* technicians.

Figure 1 shows the fish production in kg per hectare in Thoi Trung, and *D1* in the year 2006. The average fish production of the two trial hamlets is approximately 200 kg/ha. This yield is approximately the same as for wild fish in floodplain paddy fields. It is lower than the result of fish production in Plain of Reed, where about 400kg/ha were produced. However, another crucial factor for a high productivity must be seen in the successful organisation of collective activities and the fulfilment of the several duties. The participants are for example responsible to protect the cultured fish from natural risks as well as from poaching. Thus, the fish production in this region could be increased by applying other techniques and improving management structures.

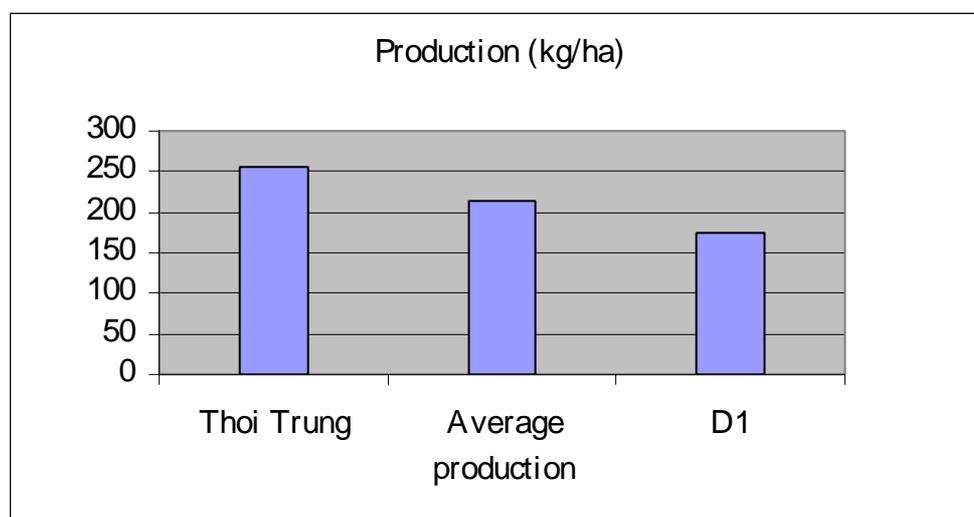


Figure 1: Fish Production in kg/ha in two hamlets

Figure 2 shows the survival rate of the main species cultured, namely the common carp, silver carp, bighead carp and the snakehead. The bighead carp, as well as the common carp showed significant higher survival rates in all sites than the other species, even almost 80% in Thoi Trung (Halwart and Gupta 2004). Another important finding was that the grass carp seemed to be not suitable for any of the sites. However, former research found that grass carp is one of the suitable fish species beside common carp and silver and bighead carp.

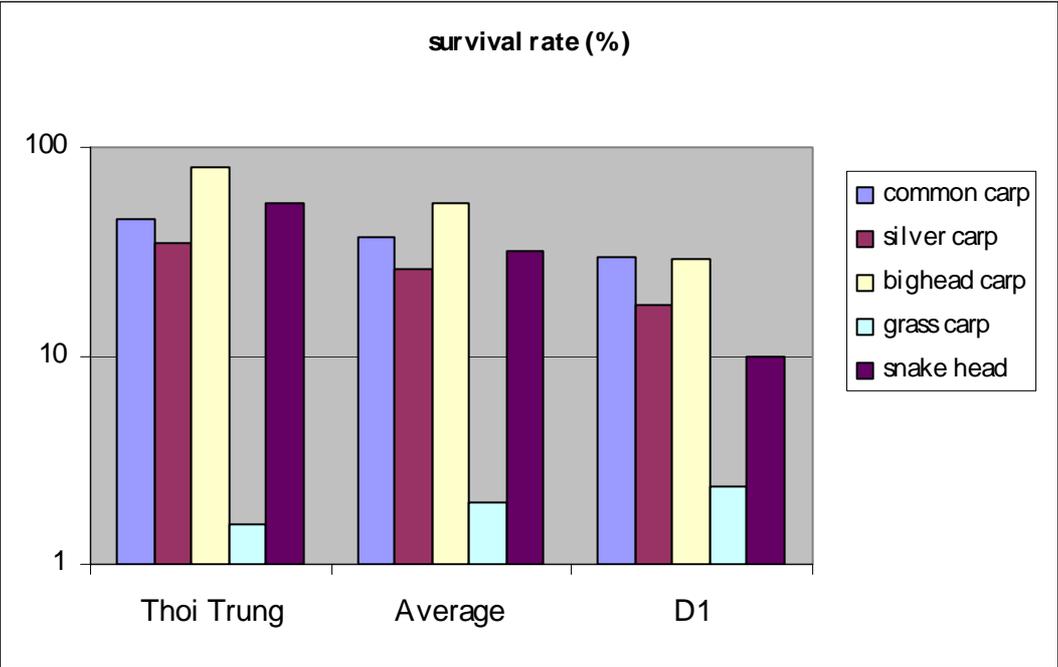


Figure 2: Survival rate of fish cultured in three hamlets

Figure 3 then ultimately shows the financial outcome of the collective fish culture, whereby figures confirm the initial assumption that farmers in the Thoi Trung project group received a higher income from their fish culture activities. They were able to earn about 800,000 VND/ha, while people in *D1* group earned about 500,000 VND/ha and average income for this activity in Long Xuyen quadrangle is about 650.000 VND/ha. Reasons for the low income of *D1* farmers can be found in the loss of cultured fish through a broken dyke as well as from poaching.

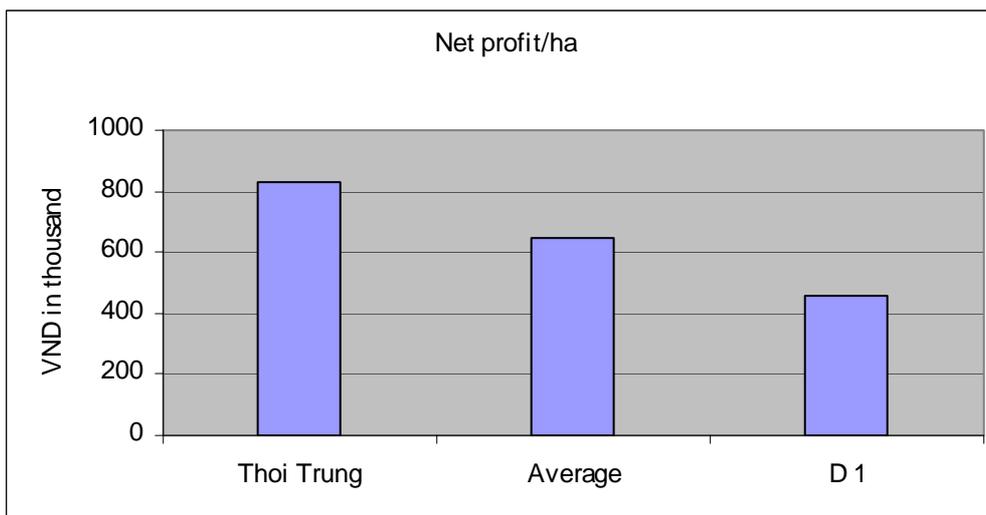


Figure 3: Net profit per hectare in VND in two hamlets

One main problem concerning the income, raised by the farmers, was that the harvest time for the cultured fish during and at the end of the flood season correlates with the catching of wild species and thus they face a highly competitive price level. Different options to avoid low prices were creating a marketing network within the project group in order to strengthen their bargaining position or to store the fish until dry season and wait for selling when prices levels rose. However, this would need large ponds, where fish could be stored and these are seldom available. Thus, the farmers plan to harvest at different times and start selling even earlier to avoid low prices. A plan with different stakeholders is being set up that is hoped to solve this problem.

4 Discussion

In *Thoi Trung*, 9 farmers grouped together to engage in fish production within their paddy fields in 2006. Individual pond culture is common in the hamlet already, but a collective approach was new. The project group, encouraged by the commune officer and project staff, started the project of collective aquaculture production, because of a lack of wild fish. The other landholders that hold land within the project sites left their property to the project farmers during the wet season. Instead of a third rice crop in wet season, farmers now culture fish from August until harvest in November and December.

In *DI*, 34 farmers grouped together and have now been working together for 3 years in order to raise fish. The idea was introduced to them by the district economic division and farmers decided to organise the project themselves, thereafter. In total, 34 farmers have land in the project area. People in *DI* also engaged in individual pond culture on their homestead before participating in the project. In November, water was pumped water out for the fish harvest, which was then sold to middlemen or farmers in the hamlet within 10 days.

In *E2*, 120 ha of paddy fields were enclosed by a dike in order to culture fish during the wet season. In this area a total of 55 farmers hold private land titles, but only 31 were interested in participating in the joint project. Fish was stocked from August until harvest in November and December.

In *Truong Phu B* before 2005, farmers engaged in three rice crops per year. In 2006, 28 farmers grouped together and have now been working together for one year to raise fish. Farmers started fish culture and stocked fish with the third rice crop in June. There are now actually two different project sites, divided by a canal, but farmers see them as one project with one group leader. In November, water was pumped water out for the fish harvest, which was then sold to middlemen or farmers in the hamlet within 10 days. For the next year, it is planned to stock fish without rice and engage in two rice crops only.

The idea behind the common projects is to increase the productivity from the communal water body, when compared to individual production systems or natural fisheries production thereby increasing household income. Working as a group enables farmers to enclose their fields using the dikes and share necessary guarding duties as well as costs. On an individually basis, fish culture is only possible next to the homestead in order to avoid losses from robbery.

In *DI* farmer group, although they got lower income than the others, the project management can be considered well functioning. The leader was responsible on taking notes on how many days every member worked for each activity. Then they calculated the total days needed as a whole and how many days needed per hectare. So every member knew how many working days they are supposed to work in the project area. Even an additional payment was offered for farmers that invested more time for the common project and they received with 20,000 VND per extra working day. Accordingly, anyone who worked less than the days agreed on has to pay. Guarding of the project area is considered as very important by the farmers and they hired other hamlet members (20,000 VND/day for guarding). Almost all farmers attend the monthly meeting frequently to discuss their plan without conflicts.

On the contrary, farmer group in *Co Thoi Trung* was not satisfied with their result as the expected to make more overall profit. Reasons for the low income can be seen in a lack of cooperation and missing regulation, as members did not always fulfil their responsibilities. This led to conflicts between project members. The conflicts that *Thoi Trung* farmer group faced were, for example, were problems with guarding responsibilities, when people left sooner from the sites than agreed on. Due to the financial disappointment farmers decided not to continue the project in this year. This lesson learned clearly showed how important it is to carefully underlying institutional arrangements and to support the creation of new sustainable structures as a collective basis. In addition, the local authorities, particularly commune authorities, need to be involved within the project.

In *E2* membership in the project groups is only possible for farmers that hold land in the respective areas. The farmers established links to a local bank that will provide loans to farmers who are not able to participate due to a lack of money for investment in fingerlings. In *Truong Phu B*, members must provide 200.000 VND/ha for investments in fingerlings and farmers support each other in case of a lack of financial capital. As a member in one of these groups, duties are, beside the financial contribution, labour participation in dike construction, guarding and participation in other collective activities, like stocking and harvest.

Neither group has written regulations or memberships, but minutes are taken during group meetings. Meetings are held approximately once a month and all decisions are taken through majority approval. *Truong Phu B* farmers explain that the attendance in the meetings is around 60-70% and that if there are less than 50% participating then the meeting will be postponed. Both groups also established a formal administration/management group, including a leader, a vice leader as well as an accountant. Both projects do have a strict book keeping system and an accountant in charge. All farmers are allowed to review the books at any time and the processes are kept transparent. *Truong Phu B* farmers also appointed a secretary and a monitoring person, who oversees if everybody fulfils his duties. The people engaging in these management activities do not receive any compensation for their time investments.

Although both projects were supported by commune authorities, farmers organised themselves to setting-up the project, establish a collective organisation with formal leaderships, organise the collective work and in find markets for fingerlings and fish. However, members in the groups and especially the leaders of both groups are not very satisfied with their first year experience in collective fish culture. Both group leaders explained that they would appreciate support from higher level institutions, especially at the commune level. So far, there is neither a connection to other community-based projects nor to the communal government. The farmers explain that they lack financial support, because some members have difficulties to pay their share of investments and had to borrow money from other project farmers in order to be able to participate in the project. Furthermore, farmers report that they lack technical support in the forms of trainings, information or learning networks. Farmers in *E2* also explained that they are interested in establishing common distribution channels with other aquaculture groups in order to have a stronger bargaining position, but do not feel able to establish such a network themselves.

All groups only report small conflicts between the members which can always be solved through explanations, discussions and encouragement. Problems that *Truong Phu B* faced, for example, were problems with guarding responsibilities, with people who were in charge of the fish guarding leaving sooner than agreed on. In the next meeting a discussion followed and people agreed, that it is necessary to guard the fish and that the investment they made is worth caring for the fish. However, the *E2* farmer leader reports a high level of frustration within the management committee, because of recent free-riding within the group. There is only a 70% attendance in the meetings and

participation in collective work activities is highly unsatisfactory (pers. comment Truong Van Nam, farmer group leader *E2*).

Another important problem is that access that was formerly open during the wet season now becomes restricted. Because of the cultured fish, the project areas are not available for hamlets that usually fished there for wild fish. *E2* farmers report that usually group members followed this rule. However, farmers that hold property rights on land within the project area, but are not participating in the project are particularly likely to continue to fish in the area and some have even increased their fishing efforts. On the one hand, this must be considered as a serious impact of the project, which affects non-members. On the other hand, if non-members take the cultured fish, frustration within the group increases and investments in the common project become less attractive and thus the commitment to the project might be weakened.

The experiences from the groups clearly show that hamlets were able to organise community-based aquaculture with respect to management, accountancy and guarding responsibilities. However, groups report a lack of support in technical and financial ways. Additionally, motivation within the groups seems to be still weak as results were not as satisfactory as expected and organisational hindrances make coordination of group activities difficult.

5 Conclusions

- Community-based aquaculture should be considered as a sustainable measure to reduce poverty in the rural areas of the Mekong Delta. The experience clearly shows those different groups of farmers were able to organise community-based aquaculture and that this approach can contribute to an increased income of participating farmers.²
- Farmers in research hamlets were able to organise themselves in order to culture fish commonly and also report an increase in income. In some cases farmers are now also cooperating in other fields, like irrigation and the use of insecticides and promises better overall water management in future.
- Bighead carp, common carp as well as silver carp proved to be suitable species with high survival rates and thus a high return on investment. In one of the project sites, project farmers were able to earn about 800,000 VND/ha and within the community-based approach, water productivity in the common waters was increased. Farmers also took into consideration marketing issues and plan to change the harvest time in order to attain higher prices for their cultured fish.

² cultured fish was either consumed or sold to local middlemen

- An important lesson learned from the low survival rate of fish and thus a low income was that institutional arrangements play a key role within the community-based approach. Although with the existing certain written rules and regulations, but no efficient way of monitoring and maintenance of the project site can cause a low fish yield. These findings helped outlining the need of focusing on institutional arrangements right from the project beginning in new hamlets.
- The collective actions in fish culture as well as participation in general water related policies are still low. So far, local users are lacking long-term support from higher level institutions in supporting their needs like water quality management or flood protection. Rules and regulations as well as monitoring/sanctions systems are rarely monitored and inefficient, because local users are not involved in either decision making or monitoring.
- The communities in Vietnam only established formal water management institutions recently and until now water is mainly used on individual basis without regard of the collective nature. However, collective action in the Mekong Delta is a promising approach for future development of the region.
- Institutional arrangements differ not only within social-economical dimensions among the hamlets, but as well as with seasonal changes. Findings from examining different technical and institutional options are that blue-print approaches to collective aquaculture can not be successful, because the differing local governance schemes that exist, even in similar natural settings. This all leads to the conclusions that strategies for pro-poor community-based aquaculture must be adapted to the specific local conditions in each community.
- Although many development projects in Vietnam focus on the enhancement of collective action and a better adoption to local conditions, there is still a lack of institutional support from other government levels as experienced by farmers in two research hamlets. Financial, technical and institutional support, according to the principle of subsidiary, still needs to develop in order to facilitate community-based aquaculture in the region

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