

**RESOURCE ACCESS AND
LIVELIHOOD RESILIENCE
IN TAM GIANG LAGOON, VIETNAM**

By

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A Thesis

Submitted to the Faculty of Graduate Studies of The University of Manitoba

in partial fulfilment of the requirements

for the degree of

Doctor of Philosophy

Clayton H. Riddell Faculty of Environment, Earth, and Resources

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Dedication

*To my mom and dad; your strength of spirit, unconditional love and support
have inspired me every step of my life.*

*Luận văn này là món quà dành cho Bố Mẹ, những người yêu thương,
động viên và giúp đỡ con trong mỗi bước đi của cuộc đời*

Abstract

The local livelihood systems of Tam Giang Lagoon, Central Vietnam have shifted since the policy changes of 1986. Aquaculture has replaced capture fishing as the most important livelihood activity in the lagoon. Aquaculture is governed by both customary and legal access rights. The move from a centrally-planned (collectivization) economy to a market-oriented economy in conjunction with the development of the aquaculture sector has had significant impacts. This change has reduced the available lagoon areas for mobile-gear fishers, polarized different user-groups, and raised the issue of resource access inequity.

The overarching objective of this thesis is to understand the complexity and influence of property rights on local livelihood systems; specifically: (1) to examine changes in resource access and various types of resource use in the lagoon; (2) to analyse the effects of aquaculture and changes in resource access on local livelihood systems; and (3) to assess the resilience of livelihood systems and identify the essential elements that contribute to resilience in livelihood systems.

Qualitative and quantitative research methods were used for data collection. Sixty-five semi-structured interviews were conducted and fourteen households were selected for an additional in-depth livelihood analysis. Focus group discussions were one of the most important methods used for data collection. Fifteen formal focus groups and several informal discussions were organized. Both types of focus groups were used in conjunction with a number of participatory methods, such as seasonal calendar, participatory mapping, and well-being ranking. The field work was conducted over twenty-nine months between December, 2005 and April, 2008.

The research examined the evolution of property rights and the complexity of resource access in Thuy Dien village. The research investigated seven types of resource use which are associated with “bundles of rights” and discussed the dynamics of property rights governed by both laws and customs. *De jure* and *de facto* rights were classified in different time periods by using Schlager and Ostrom’s framework.

By applying a sustainable livelihood framework, the research presented overview of livelihood systems and discussed the influence of property rights on household livelihoods. Households in the village were classified into four groups: (1) earth pond, (2) net-enclosure; (3) mobile fishing; and (4) non-fishing households. Attention was paid to the disparity between these household types in term of livelihood strategies and opportunities for livelihood development.

The research applied a resilience approach to the analysis of the local livelihood systems. Resilience is an inherent attribute of sustainable livelihood systems because it implies the flexibility and availability of options. If resilience is lost, livelihood systems may cross a threshold and shift to a different regime or alternative equilibrium. In Tam Giang Lagoon, a shift to a different regime seemed to have occurred over the last two decades.

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Acronyms

CBCRM:	Community-Based Coastal Resource Management Project
CECI:	Canadian Centre for International Studies and Cooperation
CPC:	Commune People's Committee
CRIC:	Components, Relationships, Innovation, and Continuity
DARD:	Department of Agriculture and Rural Development at Provincial level
DFID:	Department for International Development in United Kingdom
DMU:	Disaster Management Unit
DNRE:	Department of Natural Resources and Environment at Provincial level
DOF:	Department of Fisheries at Provincial level
DPC:	District People's Committee
ENSO:	El Nino- Southern Oscillation
FA:	Fisheries' Association
FAD:	Fish aggregating device
FAO:	Food and Agriculture Organization of the United Nations
GDP:	The Gross Domestic Product
GSO:	General Statistics Office
HUAF:	Hue University of Agriculture and Forestry, Vietnam
ICZM:	The Vietnam-Netherlands Integrated Coastal Zone Management
IDRC:	International Development Research Centre
IMOLA:	The Integrated Management of Lagoon Activities
MARD:	Ministry of Agriculture and Rural Development
MNRE:	Ministry of Natural Resources and Environment
MOF:	Ministry of Fisheries
NADAREP:	National Directorate of Fisheries Resources Exploitation and Protection
NAFEC:	National Fisheries Extension Centre
NAFIQUAD:	National Aquatic Resource Exploitation and Protection Directorate
PPC:	Provincial People's Committee
PDPC:	Provincial Disaster Prevention Committee
PFA:	The Provincial Fisheries' Association of Thua Thien Hue Province
PRA:	Participatory Rural Appraisal

RRA:	Rapid Rural Appraisal
UNDP:	United Nations Development Programme
UNEP:	United Nations Environmental Programme
VBARD:	Vietnam Bank of Agriculture and Rural Development
VBSP:	Vietnam Bank for Social Policies
VINAFIS:	The Vietnam Fisheries' Association
VND:	Vietnam Dong
WB:	The World Bank
WRI:	World Resource Institute
WSSV:	White spot syndrome virus

Glossary

- Champa*: Descendants of the Champa kingdom in southern Vietnam
- Commune (*xã*): An administrative unit that consists of a series of villages (5-10 villages generally)
- Đổi Mới*: A policy change from centrally-planned economy (collectivization) to a market economy in Vietnam in 1986
- Fish corrals (*nò sáo*): A V-shape made from bamboo and layers of nets. At the point of the V, a trap is made by bamboo and net of 2 mm in mesh size. Fish corrals are the most significant and most important type of fixed fishing gear in Tam Giang Lagoon; particularly in the Sam Chuon area.
- Kinh*: The major ethnic group in Vietnam (86% of the population)
- Lower earth pond (*ao đất hạ triều*): An aquaculture pond which was a fishing ground enclosed by a dike
- Monsoon: Central Vietnam is influenced by two monsoon seasons. The northeast monsoon occurs from October to February, carrying abundant precipitation to Central Vietnam; whereas, the southwest monsoon occurs from May to September, characterized by dry, hot winds.
- Net-enclosure (*ao vây*): A combination of fishing and aquaculture in a fishing ground surrounded by layers of polythene nets and bamboos
- Production collectives (*Hợp tác xã/ Tập đoàn sản xuất*): All assets and fishing equipments were owned by the collectives and involved several fishing units. The production collectives were the model of fishing management in the collectivization period (1954-1986).
- Số đỏ*: Land use title from the province that provides full *de jure* rights
- Sampan people (*dân vạn đò; dân thủy điện*): People who live on houseboats permanently

- Sampan:** A type of flat bottomed boats used in Vietnam, China and other Southeast Asia countries. A sampan in Tam Giang Lagoon is normally about 6-8 meter length and 1.6 meter width. There was an average of eight people living together in a bamboo boat with the area of 8-10 m².
- Typhoon:** A tropical cyclone characterized by a large low-pressure center and numerous thunderstorms that produce extremely powerful winds and torrential rain (equivalent to a hurricane)
- Upper earth pond (*ao đất cao triều*):** An aquaculture pond which was converted from an agriculture land
- Vạn*:** A group of relatives and people using similar types of fishing gear in designated areas that controlled its fishing grounds and managed the fishing activities within that area. A *Vạn* was considered as a self-management unit. Several *Vạn* formed an arch-village called as *Tổng*. The *Vạn* institution has been undermined.
- Vạn đại nghệ*:** Traditional fixed fishing gear groups
- Vạn tiểu nghệ*:** Traditional mobile fishing gear groups

CHAPTER 1. Introduction



Photo by Ta T.T. Huong (2006)

Figure 1.1: A morning market in Tam Giang Lagoon

1.1 Research context

This thesis focuses on three areas of importance in Tam Giang Lagoon, Central Vietnam: (1) livelihoods; (2) resource access; and (3) resilience. The term “livelihood” is considered to be more appropriate than “employment” and “job” for those living in rural areas or in poverty (Singh and Gilman 1999). People in such circumstances may achieve “employment” but may be unable to meet all their basic needs. “Livelihood” is a better descriptor because it encompasses all approaches people use to look for opportunities and the multiple activities used to earn their living. A good definition of livelihood is “...to comprise the capabilities, assets or resources, entitlements and activities required to make a living...” (Chambers and Conway 1992: 6). Livelihood capabilities refer to people’s ability to cope with perturbations and being able to find and make use of livelihood opportunities. Livelihood assets include natural capital (e.g., mangrove forest), physical capital (e.g., infrastructure), financial capital (e.g., saving, income), human capital (e.g. knowledge, health, skills), and social capital (e.g., social networks) (Carney 1998). The range of assets are not merely the means through which people make a living; they are also give meaning to the people’s world (Bebbington 1999). A livelihood is sustainable “when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities, assets, and entitlements, while not undermining the natural resource base” (Chambers and Conway 1992: 6). Sustainable livelihoods is an integrating concept, which can be understood not only as a goal and an approach (SD Gateway 2005), but also a process of coping and recovering in response to impacts.

Livelihood systems are affected by various social, ecological, economic and institutional components, which are mostly caused by perturbations. These perturbations can be thought of as stresses and shocks. Stresses are continuous or slowly increasing pressures (Turner *et al.* 2003); while shocks are major spikes in pressure which are usually discrete in space and time. Livelihood vulnerability is a negative state (Adger *et al.* 2001) which has two aspects: the external side of exposure to perturbations and the internal side of defencelessness or a lack of means to cope without experiencing damaging loss. The loss may take a number of different forms, such as social dependence or economic

impoverishment. The notion of coping and recovering from these perturbations is called “resilience”.

Resilience is identified as the capacity to absorb perturbations and reorganize, while undergoing changes so as to still retain essentially the same function, structure, identity, and feedbacks (Walker *et al.* 2004). The resilience perspective is a promising tool for analyzing adaptive change and learning capacity towards sustainability (Berkes *et al.* 2003). The resilience perspective is important for understanding sustainable livelihoods, especially in analyzing how livelihood systems respond to insecurities and options and how they reorganize in response to stresses and shocks. The resilience perspective was applied to the study of livelihood system dynamics in Tam Giang Lagoon, Vietnam.

Vietnam’s 330,000 square kilometres (sq km or km²) are comprised of lowland coastal plains and upland mountain areas. Approximately 83 per cent of the total population, which is roughly estimated at 84 million in July, 2005, are living within 100 km of Vietnam’s 3,500 km long coastline (WRI 2003). According to the Vietnam National General Statistics Office, development of the fisheries sector has increased rapidly over the last two decades and is the third-most important export sector after the garment and the crude oil industry and ahead of agricultural products such as rice and rubber (GSO 2006). In 2006, the fisheries industry accounted for approximately four percent of Vietnam’s GDP and approximately 10% of its export revenues. The fishery sector provides almost half (40%) of the animal protein in the Vietnamese diet and provides jobs for approximately four million people (Pomeroy *et al.* 2009).

Vietnam’s social and political history has affected its current social-ecological systems. Following several years of crisis in the collective economy, Vietnam experienced a transition to a market economy. This shift occurred in the mid-1980s via national policy reforms. Changes in resource management policies and increasing global market demand have gradually led to resource privatization. At the same time, Vietnam faces significant environmental challenges as a consequence of over-exploitation, mis-management of resources and increasing globalization (Adger *et al.* 2002). The social-ecological

changes, especially privatization of coastal resources, make the livelihood systems in coastal Vietnam, e.g. Tam Giang Lagoon, increasingly complex and vulnerable.

The resilience perspective is conceptually and practically useful to understand the dynamics of Vietnam's coastal livelihood systems. Assessing the level of resilience is important for understanding the current state of livelihood systems. Based on the assessment, enhancing resilience would be critical for overcoming all kinds of perturbations and changes and for potentially leading to future sustainability and livelihood security. Privatization is a global trend in resource tenure. It stems from globalization and the growing economic integration of nations and societies (WRI, UNDP, UNEP, and WB 2005). However, privatization may undermine resilience in livelihood systems, such as those found in Vietnam's coastal zone. My thesis attempts to address questions related to livelihoods, resource access, and resilience.

1.2 Research objectives

The overarching objective of this thesis is to understand the complexity and influence of property rights on local livelihood systems. The following objectives were used to focus my thesis:

1. To examine changes in resource access and various types of resource use in the lagoon;
2. To analyse the effects of aquaculture and changes in resource access on local livelihood systems; and
3. To assess the resilience of livelihood systems and identify the essential elements which contribute to resilience in livelihood systems.

To explore each of these objectives, my research was carried out in Tam Giang Lagoon, Central Vietnam over a period of 29 months. Chapters four, five, and six address these three objectives.

1.3 Research methods

The field research was composed of three components. The first component involved investigation of the complexity of livelihood systems. Both qualitative and quantitative research methods were used to collect data. Sixty-five semi-structured interviews were conducted. A sub-set of fourteen households were selected for additional in-depth livelihood analysis.

The second component focused on institutional structure and property rights. Several focus group discussions with different stakeholder groups were held. Additional information was also collected via a number of key informant interviews.

Lastly, the third component, resilience analysis, involved a number of focus group discussions. A livelihood questionnaire which included resilience-based questions was used.

Additional research tools were also used and included participant observation, institutional diagrams, participatory mapping, storytelling, and historical analysis. Chapter two provides a detailed research methodology.

1.4 Significance of the research

Traditionally, sustainable livelihoods have been considered as *outcomes* in development projects and as an *approach* in livelihood analysis. The research seeks to examine the effects of changes in property rights on resilience in livelihood systems. The research addresses sustainable livelihoods as a dynamic process and understands livelihood systems not only in the various livelihood strategies, but also in the reinvestment strategies used to improve local livelihood systems. The research also provides a revised framework for understanding sustainable livelihoods by incorporating feedback and investment into the analysis.

The research approaches livelihood systems within the framework of complex adaptive systems theory and, in particular, the resilience perspective. Resilience enables a greater understanding of sustainability, especially as a process that requires an adaptive capacity to deal with changes (Berkes *et al.* 2003). Resilience thinking provides a lens for understanding changes and the way livelihood systems respond and for building capacity to learn and to adapt (Berkes *et al.* 2003, Adger 2000). Moreover, the research assesses the current state of local livelihood systems as well as opportunities for building resilience into existing livelihood systems.

Privatization is a global trend of resource tenure (WRI, UNDP, UNEP, and WB 2005). However, is it an appropriate and secure tenure, especially when considering livelihood security for the rural poor? The research addresses this issue in the context of privatization of access rights in Tam Giang Lagoon, Vietnam. It examines how the privatization process has influenced livelihood systems and undermined livelihood resilience.

The research also has practical implications. Participatory research transforms the community from being research “objects” to “active participants” by incorporating the community into the research team and by addressing their objectives wherever possible. As well, the research could potentially empower community members by offering additional opportunities for members to express their ideas, share experiences, and to learn from each other.

Several other research projects have been conducted in Tam Giang Lagoon, Central Vietnam. However, these projects did not consider property rights and livelihood resilience. By addressing this gap, the research provides a broader picture and better understanding of the dynamics of livelihoods with respect to resource access and resilience.

1.5 Scope and limitation of the research

1.5.1 Scope of the research

The research was completed in Tam Giang Lagoon, which is located in the coastal zone of Thua Thien-Hue Province, Vietnam. The provincial coastal zone is comprised of a 128 kilometre coast line, an integrated lagoon system, and a number of estuaries connecting rivers and the lagoon to the Eastern Sea. The Tam Giang - Cau Hai lagoon system is part of five districts in Thua Thien-Hue Province, including Phong Dien, Quang Dien, Huong Tra, Phu Vang and Phu Loc. The research was conducted in Thuy Dien village, in the Phu Vang district. While this research may not be representative of other villages in the whole lagoon system, it may be useful for scaling up other research, especially research related to livelihoods and resource access.

An interdisciplinary research approach was applied to studying livelihood system dynamics in the context of coastal resource management in Vietnam. The three main theoretical frameworks guiding the research were: (1) common property; (2) complex systems; and (3) development studies. In the research location, lagoon resources are recognized as common property resources.

The concept of livelihood systems, especially its notion of well-being and capability resonates strongly within development paradigms. The livelihood dynamics were addressed as a complex social-ecological system. An understanding of the area's coastal ecology and ethnography enhanced the researcher's knowledge of the area's social-institutional characteristics, which is critical for the implementation of the research.

1.5.2 Research limitations

The research project had two main limitations; namely site selection trade-offs and the integration of multiple research disciplines.

The use of interdisciplinary approaches offered opportunities to view issues from several perspectives simultaneously, but this approach also proved to be intellectually challenging. It was difficult to master the relevant knowledge from each discipline while seeking to simultaneously gain an understanding of multiple fields (Naiman 1999). While difficult, it was felt that this approach would provide a more vigorous data set and provide a stronger knowledge base for the researcher.

There was also a trade-off in the selection of the final research area. Previously, a number of research projects had been carried out in Tam Giang Lagoon, resulting in a rich source of secondary data related to the aquaculture sector. The researcher wished to avoid “research fatigue” in communities previously involved in research, while ensuring that the research project would provide new insights for Tam Giang Lagoon’s aquaculture sector. Thuy Dien village was chosen as the research site. The village had previously been the site for the International Development Research Centre’s (IDRC) research projects. As part of the trade-off for site selection, the researcher remained vigilant regarding “research fatigue”. Site choice was influenced by access to data from projects completed in the village, as well as the opportunity to build on existing data by assessing the effectiveness of the Fisheries’ Association in resource management planning. While some secondary data from previous projects were available, the existing data did not address livelihood resilience and resource access. Thus, this research project added a new dimension, rather than overlapping with previous and on-going IDRC projects.

1.6 Thesis organization

This thesis is organized in seven chapters, followed by a list of references and appendices. The thesis is not organized as a set of independent papers. However, each chapter includes a literature review and is organized to facilitate future publications.

Chapter 1 provides the overall research context and objectives. It presents the significance and scope of the research and introduces the overall thesis plan.

Chapter 2 provides details of the research methods that were employed and introduces the theoretical frameworks that guided the research. It discusses the three approaches used to conduct the research: interdisciplinary, participatory, and case study. The chapter also details specific research methods, including the qualitative and quantitative research techniques used during the 29 months of field research. The research structure is defined by three main phases: (1) Site selection; (2) Data collection; and (3) Verifications and Synthesis.

Chapter 3 introduces and describes the case study area, Thuy Dien village in Tam Giang Lagoon, Vietnam. The chapter presents the ecological, social, cultural, and economic profile of Tam Giang Lagoon, with specific focus on Thuy Dien village and Sam Chuon area. The chapter summarizes the types of common fishing gear and different aquaculture models used in Tam Giang Lagoon.

Chapter 4 examines the process of property rights transformation and the complexity of resource access in Thuy Dien village. The chapter focuses on institutions for lagoon management and their inter-linkages. It also investigates different types of lagoon use and access. The chapter also discusses the dynamics of property rights governed by both laws and customs. Moreover, *de jure* and *de facto* rights are classified in different time periods by using Schlager and Ostrom's framework (1992).

Chapter 5 analyzes the complexity of lagoon livelihood systems. This chapter paints an overall picture of livelihood systems and applies a sustainable livelihood framework to discuss the impact of changes in resource access on household livelihoods. Households in the village are classified into four groups based on their livelihood activities and their access on lagoon resources: earth pond, net-enclosure, mobile fishing, or non-fishing households. Seasonality is considered with particular attention on its effects on fishing and aquaculture activities. This chapter also discusses how institutions govern local livelihood systems in addition to credit channels and fish markets. Livelihood strategies are explored. As well, income portfolios and expenditure allocations are analyzed to illustrate the disparity between aquaculture and non-aquaculture households. Particular

attention is paid to the challenges associated with livelihood development in the different user groups.

Chapter 6 applies resilience thinking to further analyze the local livelihood systems. This chapter identifies key elements that collectively constitute the identity of livelihood systems, as well as the thresholds of these elements. The chapter also discusses how these elements would contribute to livelihood transformation, as well as in resilience building.

Finally, *Chapter 7* sets out the research findings with a synthesis of key elements of the earlier chapters and provides the overall conclusions.

CHAPTER 2. Methodology



Photo by Ho Lan – a fisher in Thuy Dien (2006)

Figure 2.1: Living with villagers in Thuy Dien village

Photo by Nguyen N. Phuoc (2006)



Figure 2.2: Focus group discussion (Seasonal calendar)

2.1 Approaches and analytical framework

2.1.1 Conceptual framework

To address the purpose of the research, a number of different conceptual frameworks were adopted for data collection, analysis, and interpretation. These frameworks are described below.

Sustainable livelihoods approach: The sustainable livelihood framework is a conceptual approach used to understand the linkages between livelihood assets and livelihood activities and to identify livelihood strategies and the ways in which local people respond to shocks and stresses. The framework is a people-centred approach which focuses on people's strengths, rather than their needs (Toufique 2001). The framework brings all relevant aspects of sustainable livelihoods into development theory and provides a way to understand the complexity and diversity of livelihood systems.

Bundle of rights: The “bundle of rights” framework (Ostrom and Schlager 1996) provides five types of property rights, i.e., access, withdrawal, management, exclusion and alienation. This framework is useful to determine the position, i.e., owner, proprietor, claimant, authorized user and authorized entrant, of community members within the lagoon resource systems. The framework distinguishes between *de facto* or *de jure* rights held by individuals and communities. The research applies this framework in order to understand the nature of property rights and how these rights have evolved throughout Vietnam's different economic periods.

Institutions: This framework draws on the literature of common property theory, with its emphasis on the self-organization of local institutions and cross-scale linkages. How government and local institutions govern resource access and promote livelihood development is a critical component of this framework. Chapter four highlights the interplay between local and regional intuitions that assign control of lagoon resources; whereas Chapter five focuses on the effect of institutions in livelihood development.

Resilience and transformation: Resilience is an emerging concept in complex system theory. Resilience represents the capacity of a system to absorb disturbance and to move around the equilibrium in a particular domain. Transformation is the shift of a system from one domain into an alternate domain and occurs when resilience is undermined. In this thesis, system identity is used to examine the possibilities of livelihood transformation in the context of policy changes and aquaculture development. The implication of system identity with four essential elements and the determination of thresholds for each of these elements provide a framework for developing an analytical assessment of resilience in livelihood systems.

2.1.2 Research approach

An interdisciplinary approach was used in the research project to understand the dynamics of livelihood systems and property rights in the context of Tam Giang Lagoon, Vietnam. The research drew on techniques from the social sciences and from development studies to understand the issues from the perspective of the local people. This approach respected and valued the perspectives of community members and allowed interviewees to speak and share their views in an open environment for discussion. In fact, the interdisciplinary perspectives provided opportunities to go beyond institutional and professional barriers (Blaikie 1995). The research also utilized *a holistic approach* to provide a strong conceptual base with which to analyze the dynamics of the coastal livelihood systems. The research focused on system components and the interrelation among these components to broaden the understanding of the dynamics and non-linear feedbacks between ecosystems and societies.

Community participation is another approach utilized in the research project. This approach is important in defining the use of participatory research methods. The participatory approach in combination with participatory rural appraisal and rapid rural appraisal are examined further in the next section.

The research made use of both the *qualitative and quantitative research approaches*. The combination of qualitative research with a quantitative component strengthens

livelihood research, especially in an investigation into livelihood diversity (Ellis and Freeman 2004). Qualitative research aims to shed light on the experiences of the participants and the metaphors and meanings of livelihoods. In contrast, quantitative research uses numerical measurement for statistical analysis (Berg 2007). A combination of qualitative and quantitative approaches in data collection is “gaining credence in the literature on development methods” (Ellis and Freeman 2004: 8).

The research is also based *on a case study approach* (Gray 2004, Hoole 2008). This approach can be characterised as a single case with multiple units of analysis (Gray 2004) including the dynamics of livelihood systems, the institutional linkages, and the complexity of resource access and property rights. In this project, over two years were spent working with the community of Thuy Dien village. The case study approach provided opportunities for the in-depth analysis of 14 households. During the 29 months of fieldwork, the researcher interacted with local people to understand how they deal with shocks and stresses and to view some of the resilience-building strategies of local people.

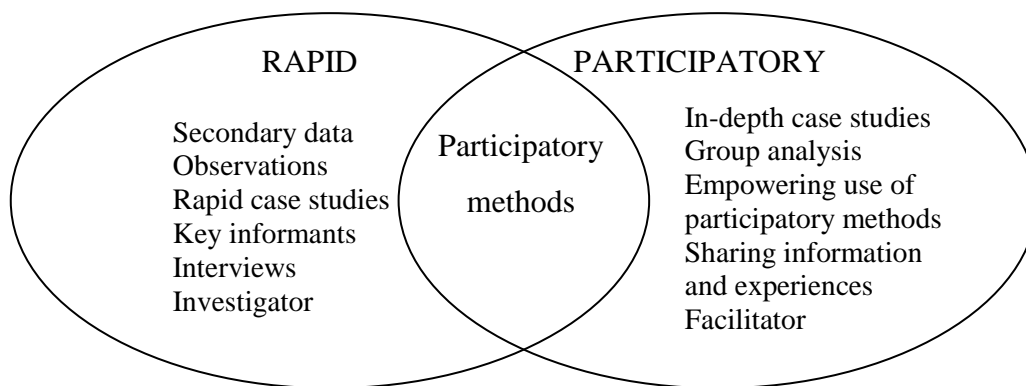
2.1.3 Participatory approach

The participatory research approach was the primary approach used to work with members of Thuy Dien village. The participatory approach is representative of a family of methodological approaches increasingly accepted and utilized in the field of community-based resource management as a mechanism to involve local people in research projects (IDRC 2004). Participatory research, with its focus on equity and diversity, is an appropriate approach for property rights and sustainable livelihoods analysis. The general guidelines for participatory research are community consultation, full disclosure, informed consents, ongoing consultation, and community participation (Chambers 1997).

Participatory research differs in each research context. However, there are four main aspects: (1) *political context* (existing management model, level of democracy, government policy, and centralize or decentralized policy making); (2) *economic context* (market economy or centralized economy, property rights, and market situation); (3)

environmental context (the conditions of resources, the degree of dependency of the resources, and availability of and access to resources); and (4) *social and cultural contexts* (leadership, gender, age, institutional systems, ethnicity, religious belief, migration, and relationships among others) (Brezski and Newkirk 1997). Since 1996, a participatory approach has been applied in research conducted in Tam Giang Lagoon. It is considered as “a new approach to an old problem” (Tuyen 2002). The previous experiences in Tam Giang Lagoon, Vietnam have been very useful for informing the development and implementation of this research project.

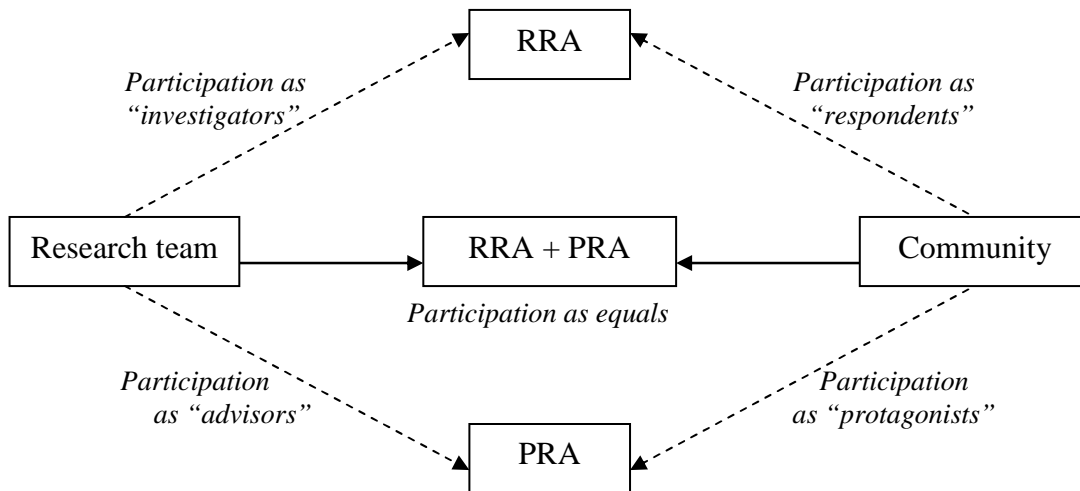
There are a number of different participatory approaches. This research combines participatory rural appraisal (PRA) and rapid rural appraisal (RRA) in participatory learning and action, which is an integration of a wide range of approaches and methodologies (Pido *et al.* 1996). PRA and RRA have been distinguished as approaches rather than methods (Chambers 1997). RRA methods are based on the interaction between researchers and community members to encourage learning about the community and information gathering about the community. The RRA methods tend to stress the use of secondary data, observations, and interviews (DFID 1999). On the other hand, PRA methods are more participatory and empowering. The PRA methods focus on enabling people to share, enhance and analyze their knowledge and reduce the negative influence of facilitators (Chambers 1997). This research attempted to incorporate aspects of both methods in an advantageous way, as illustrated in Figure 2.3.



Source: adapted from DFID (1999)

Figure 2.3: Rapid and participatory rural appraisal methods

PRA and RRA each have their own advantages and disadvantages. The combination of these two methods is ideal for the research as illustrated in Figure 2.4 (FAO 1996); however, the level of community participation is dependent on both the researcher and the community’s willingness to participate. It also depends on the specific techniques used. For example, some research techniques are more extractive in nature (e.g., open-ended interviews), while other methods encourage learning and sharing amongst participants (e.g., focus group discussions). It should be noted that the combination of PRA and RRA is different from participatory action research, which is a community-driven research. In this project, PRA and RRA guided the research process to incorporate community involvement in the planning and fieldwork activities.



Source: adapted from FAO (1996)

Figure 2.4: The combination of PRA and RRA

A combination of approaches and frameworks were used to gather and analyze data and to generate conclusions. This combination employs the use of historical data analysis and primary field data collection through direct contact with respondents. Interactions with provincial, district, and commune officials, as well as with university research team members also yielded significant data. Relevant policies were also examined.

2.2 Research methods

Table 2.1: Research methods and data sources for each research objective

Objectives	Information needed	Research methods
Background information	Lagoon ecosystems	Secondary data
	Socio-economic systems	Secondary data, participant observation
	Community history	Oral history, semi-structured interview, secondary data
	Overview of fishery industry (fishing and aquaculture)	Secondary data, semi-structured interview, participant observation
Institutions and property rights	Traditional institutions (Rule-in-use)	Semi-structured interview, participant observation, secondary data, story telling
	Government institutions	Venn diagram, semi-structured interview
	The role of social organizations	semi-structured interview
	Lagoon use types	semi-structured interview, focus group discussion
	User groups	semi-structured interview, focus group discussion
	Property rights	semi-structured interview, focus group discussion, secondary data
Livelihoods	Community livelihoods	Secondary data, semi-structured interview, timeline, Venn diagram resource mapping, focus group, well-being ranking
	Livelihoods of user groups	Semi-structured interview, livelihood survey, focus group, seasonal calendar
	Household and individual livelihoods	Livelihood survey, semi-structured interview
	Kinship and social relations	Participant observation
	Access to credit sectors	Semi-structured interview, secondary data
	Seasonal livelihood patterns	Seasonal calendar, semi-structured interview
	Livelihood strategies	Livelihood survey, semi-structured interview
	Circulation of livelihood income	Semi-structured interview, livelihood survey
	Challenges of livelihoods	Semi-structured interview, participant observation, focus group discussion
Resilience	Impact of shocks and stresses	semi-structured interview, focus group discussion, story telling
	Coping strategies	semi-structured interview, focus group discussion, story telling
	Indicator of resilience in local livelihoods	Focus group discussion, semi-structured interview, story telling

2.2.1 Qualitative methods

Based on a series of recent participatory research methods (Chamber 1997; IIRR 1998; Ellis 1999; DFID 1999) and previous research methods conducted in Vietnam (Pomeroy 1994, Tuyen 2002; Brezski and Newkirk 2002; Phap 2002; Tinh 2002), the following qualitative research techniques were modified and adapted for data collection.

- ***Semi-structured interview:*** This technique is central to all participatory methods (Pretty and Vodouhe 1997), especially in RRA (FAO 1996). Semi-structured interviews are flexible, informal and conversational in nature. They formed the primary means of data collection and allowed for greater detail by using guides, checklist, open-ended questions, and probing which ran parallel to the interview process (Pretty and Vodouhe 1997, IIRR 1998). Open-ended questions allowed the researcher to further investigate interesting points raised in the interview and encouraged local people to express their viewpoints. In this research, semi-structured interviews were used to collect data from community members, members of social organizations, and government officials based on sets of pre-determined questions (Appendix 1, 2 and 3)
- ***Focus group discussion:*** This technique was used for describing the broad context of rural livelihoods and identifying key informants for further examination at the household level (Ellis 2000). Focus group discussion provided the researcher with the flexibility to observe community members' interactions and provided access to various sub-groups within the community which the researcher would normally have difficulty accessing. The use of focus groups permitted the researcher to collect substantive content within a limited time frame (Berg 2007). For this research project, the researcher carried out focus group discussions with villagers. Some focus groups were a mixture of local fishers from different user groups, while other focus groups were designed to only have attendees from a single user group. Focus group participants discussed their livelihoods, challenges, and property rights. In total, 15 formal focus groups were conducted at different stages of the research. In addition, a number of informal and mini group discussions (composed of four or five people) were organized informally and provided valuable insights into what the fishers were thinking.

- ***Seasonal calendar:*** Lagoon livelihoods are strongly connected to the seasons; local villagers adjust their livelihood strategies and activities to different seasons. Seasonal calendars were well suited to understand the fishing cycles, weather patterns, and division of labour (Chamber 1997; Phap 2002). Seasonal calendars were developed based on community input at group discussions and meetings. The calendars provide an understanding of seasonal variations and community perceptions around resource access, the division of labour, and climatic influences (Table 5.9). Each resource user group developed their own seasonal calendar (Table 5.6, 5.7 and 5.8).
- ***Daily schedules:*** This activity detailed the daily work patterns and activities of different user groups and across genders in order to gain insight into how individuals prioritized their time. Daily time lines were made and divided by hours with their corresponding activities placed along the timeline. Development of the daily schedules was conducted in conjunction with the Integrated Management of Lagoon Activities (IMOLA) project in Phu Xuan Commune. Daily schedules allowed researchers to examine a person's daily activities or to compare the daily activities of two or more people.
- ***Participant observation:*** This tool was used to describe what occurred, whom/what was involved, when and where things happened, and how and why they occurred. It enabled the researcher to have insight into the household and community life (Jorgensen 1989). Participant observation became the primary technique to understanding how the community functioned. The researcher stayed in the community and actively participated in activities such as group meetings, family gatherings, ceremonies, and shopping to gain an appreciation of the social relationships in the community and to obtain information on kinship, social networks and institutions. In order to observe and understand fishing activities, the researcher participated in fishing activities and stayed with fishers in their patrol houses (located in the lagoon). Participant observation was also used to supplement and verify information generated from the seasonal calendar data, interviews, focus groups, and community meetings.

- ***Institutional diagram or Venn diagrams:*** This exercise involved the use of coloured cards to represent real linkages and distances between people, groups, and institutions (Pretty and Vodouhe 1997). Venn diagrams were integrated in a focus group with individuals of different ages, genders, and user groups participated. Venn diagrams were prepared with the involvement of the community and provided valuable insight into the status of cross-scale institutional linkages. This exercise was effective because it revealed how institutional arrangements influence relationship. It also facilitated a dialogue about institutions which were important to the community and key institutional interactions (DFID 1999).
- ***Participatory mapping:*** This exercise was an effective data collection and interpretation method. It engaged community members in illustrating the current resource use both within and outside the community (Pretty and Vodouhe 1997). The mapping exercise generated two important outputs: maps, and secondly, the map creation process which afforded the researcher an opportunity to understand the various community dynamics as a diverse group of local government officials and different user groups interacted. The participatory mapping exercise in Phu Xuan Commune, Vietnam was conducted with the IMOLA project research team. This exercise was repeated again at the village level with the support of a colleague from Hue University of Agriculture and Forestry, Hue, Vietnam.
- ***Transect walk:*** Transect walk was planned by drawing a transect line through the village. The walk was then conducted with a group of community members in order to observe people in the community, community infrastructure and resources. The walk began at the edge of Thuy Dien village and proceeded on the transect through to Dien Dai village and then to Dinh Cu village in Phu My Commune. The process took three hours. The researcher noted all vital information and tried to understand the interplay of the physical infrastructure, natural resources, and other aspects related to the community's social issues. After the transect walk, the researcher discussed the data with the walking group and drafted a diagram. The findings from this exercise are shown in Figure 3.13 (Chapter 3).

- **Well-being ranking:** this exercise involved sorting households into groups according to local perceptions and well-being criteria. Often, key indicators of well-being and ill-being (Chambers 1997) such as status, resource access, livelihood activities, number of income generators, loan, etc. were expressed. Ranking was an effective method for getting an indication about the socioeconomic well-being of the households in the research site.
- **Historical analysis (story telling):** This study employed historical analysis as mechanism to access the life stories of community members. Participants shared their life experiences and perceptions of how things have been changed in Thuy Dien. The stories were useful because they allowed the researcher to “scale up” and develop a larger picture of the community’s history and cultural values, as well as the development of aquaculture from an individual’s life story. Three timelines were formulated to understand and name the three key changes the community experienced: prior to reunification, collectivization, and market-oriented economy (post-collectivization).

2.2.2 Quantitative methods

Combining qualitative research methods with a quantitative component strengthened the livelihood aspect of the research, especially in an investigation into livelihood diversity (Ellis and Freeman 2004). The quantitative livelihood questionnaire design went through numerous drafts to ensure it captured the livelihood systems of individuals and



Photo by Ta T.T. Huong (2006)

Figure 2.5: Allocation of household expenses

households. The questionnaire was tested with five respondents and adjusted based on respondents’ input. On average, each questionnaire took 60 minutes to complete, given that in many cases, the participants were illiterate. The shortest time taken to complete a

questionnaire was 20 minutes, with 90 minutes the longest time taken. Candies were used for illiterate participants to visualize the allocation of their household income and expenditures (Figure 2.5).

A total of 65 questionnaires, representing almost half of the total households in the village (143), were completed (Table 2.2). Questionnaires were completed by all user groups including female and male heads of households. Because household members may engage in many different livelihood activities, the number of responses was added up to ensure that the various activities were accounted for. In the 65 interviews, there were 39 responses to net-enclosure aquaculture questions, 56 responses to mobile fishing questions, and 58 responses to questions about non-fishing related activities (Table 2.3).

Table 2.2: Percentages of households interviewed in each user group

User groups	Total households	Households Interviewed	%
Earth pond households	24	18	75%
Net-enclosure households	85	26	31%
Mobile fishing households	23	16	70%
Non-fishing households	11	5	45%
Total households	143	65	45%

Table 2.3: Numbers of responses to questions related to specific livelihood activities

User groups	Households interviewed	Responses to questions on			
		Earth pond aquaculture	Net-enclosure activities	Mobile fishing	Non-fishing activities
Earth pond	18	18	13	17	14
Net-enclosure	26		26	23	24
Mobile fishing	16			16	15
Non-fishing	5				5
Total households	65	18	39	56	58

Note: Although all earth pond and net-enclosure households practise mobile gear fishing, some did not answer questions related to mobile fishing activities. These households indicated that while they are involved in mobile fishing activities, the activity did not account for a significant part of their livelihoods – therefore, they chose not to answer the question.



Photo by Ho Hoang - a fisher in Thuy Dien (2006)

Figure 2.6: Transect walks in Thuy Dien village



Photo by Nguyen N. Phuoc (2006)

Figure 2.7: Interviewing a fisherman in his patrol house with IDRC researchers

2.3 Research structure

The research was conducted over 29 months in Tam Giang Lagoon, Thua Thien Hue Province, Vietnam. The work can be divided into three main phases: (1) Site selection; (2) Field research; and (3) Verification and synthesis. Table 2.4 illustrates the research process time-line. The following sections describe each phase of the fieldwork.

Table 2.4: A timeline for fieldwork in Tam Giang Lagoon, Vietnam

Fieldwork Activities	05	2006												2007												2008			
	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
Site selection																													
Field research																													
Verification and synthesis																													

2.3.1 Site selection

The site selection goal was to select a fishing village which would provide answers to the research objectives. Potential sites were identified based on the recommendation of colleagues from the IDRC community-based resource management project (CBCRM), a literature review, and professional connections with government officials in Thua Thien Hue Province, Vietnam. Additional criteria were developed based on the research objectives: reliance on lagoon resources; community cohesion; diversity of livelihood activities; ease of obtaining livelihood information; property rights dynamic; the presence of traditional institutions; the activeness of Fisheries' Association; applicability of resilience theory; and links to other research activities in different projects.

The site selection for this research project was also heavily influenced by the locations of the CBCRM because the CBCRM could potentially provide secondary data for this research project. Since 2002, IDRC has provided support for the CBCRM located in Tam Giang Lagoon. Initially, the CBCRM was conducted in Quang Thai and Quang Loi Communes. In 2004, IDRC expanded their project to include four additional locations in

the Sam Chuon area of Tam Giang Lagoon (Thuan An, Phu An, Phu My and Phu Xuan Communes). (Figure 2.8)



Source: Truong V. Tuyen (2006)

Figure 2.8: Research sites of the IDRC CBCRM Project

Table 2.5: Short-list of potential sites in Sam Chuon area

Villages	Communes	No. of hhs ^(*)	Cultural aspects	Main livelihood activities	FA
Thuy Dien	Phu Xuan	143	Sampan	fishing; aquaculture	Y
Le Binh	Phu Xuan	146	Sampan	fishing; aquaculture	N
Dien Dai	Phu Xuan	177	land-based	agriculture; aquaculture	N
Dinh Cu	Phu My	115	Sampan	fishing; aquaculture	Y
Dinh Cu	Phu An	254	Sampan	fishing; aquaculture	Y
Trieu Thuy	Phu An	151	land-based	agriculture; aquaculture	N
Tan Duong	Thuan An	192	Sampan	fishing; aquaculture	Y

^(*) hhs: households

Given that the research project might access secondary data from the IDRC sites, the decision was made to narrow the project site selection to IDRC project locations. The Sam Chuon area was suggested because of the density of fishing gear and emergent issues related to aquaculture development. As well, it was anticipated that this research would contribute to IDRC's on-going project in the Sam Chuon area. Based on input from the various sources, a short-list of fishing villages in four communes in Sam Chuon area was developed (Table 2.5).

The researcher started working with potential fishing villages in four communes to finalize the location to carry out the project. The researcher's professional connections with provincial and district government levels was important for creating a good working environment with local government officials. In fact, the willingness of the local government officials and villagers to work with the researcher was a key determinant for the final site selection. Potential sites were visited from December, 2005 to March, 2006. Based on the criteria established for site selection and the research objectives, Thuy Dien village in Phu Xuan Commune, Vietnam was selected as the case study for this research.

2.3.2 Household selection

Twenty households in Thuy Dien village were selected for in-depth livelihood analysis. Household selection was based on personal observation, their participation in group discussions, and at the suggestion of the village head. To ensure a diversity of households, the researcher developed the following criteria for household selection: resettlement circumstances (sampan households that have settled on land and current sampan households), heads of the household (female and male), age and education levels of the head of each household, access to fishing grounds, and the diversity of livelihood activities. However, not all households were interested in participating in the research. In fact, some households would rather participate in a development project than in a research project. After several months, it became clear that 14 households were interested in participating in the research process.

The researcher worked closely with the 14 households over two years. Of the 14 households, four were earth pond households, four were net-enclosure households, four were mobile fishing households, and two were non-fishing households. In terms of heads of households, two were led by women, in which one was a mobile fishing household and the other was a non-fishing household. The head of the household was the main contact for each household; however, in some households, the role of the main contact was completed by two or three household members based on their suitability to answer questions and the differences between their viewpoints. The researcher adopted an informal research process which provided opportunities for the researcher to stay and work with the households and to ask questions of different household members in an informal setting.

2.3.3 Field research

After the site selection process was completed, the main fieldwork was carried out in Thuy Dien village over 24 months. The fieldwork phase can be divided into two major phases: (i) Preparatory activities and background information gathering; and (ii) data collection (Table 2.1). Although the fieldwork was structured into two phases, the two phases overlapped each other. The research process was modified continuously to ensure that the stated research objectives were going to be met.

Preparatory activities and background information gathering

During the initial stages of the field study, the researcher interacted with the community and local institutions, observed community dynamics, and built a relationship with various groups in order to gain the acceptance and trust of community. Developing a close rapport and relationships with community members was critical to the success of this research. Interacting with the community was also an opportunity to introduce the research topics and to meet key community members.

The researcher stayed in Hue City, which is about 30 km from the village. For the first three months, the researcher went to the village almost daily to meet villagers. This

period familiarized the community with the researcher and helped the researcher identify a potential household that the researcher could stay with overnight.

When the research began, it was the peak season for fishing and aquaculture activities. Although the local fishers were busy, the researcher scheduled her visits to meet them when they came home for a break and before they left for their night fishing. Talking freely with fishers allowed them to speak openly about what they were doing, their concerns, and to identify specific issues for consideration in the research. Because many fishers identified shrimp diseases as a concern, the researcher asked an IDRC team member to go to the village and provide aquaculture disease prevention and treatment suggestions.

In March 2006, the researcher organized an introductory meeting at Phu Vang District with 12 individuals. Attendees included staff from District Divisions of Agriculture and Rural Development and Division of Natural Resources and Environment, two staff from the Fisheries Extension Centre, the vice-chairman and two staff from Phu Xuan Commune, and one researcher from the IDRC CBCRM project. This meeting gave participants an opportunity to make comments and suggestions regarding the research and its implementation strategy. After the meeting, the researcher spent most of the time reviewing documents related to the fishery industry, development planning, and government policies related to aquaculture development and land use at the Provincial Department of Agriculture and Rural Development (DARD), Department of Fisheries (DOF), and Department of Natural Resources and Environment (DNRE).

The researcher also worked at two relevant district divisions. Professional connections with provincial government officials were useful in strengthening the researcher's relationship with District and Commune government officials. The researcher reviewed local government documents and accessed the detailed planning documents of the district and commune levels. As well, the researcher attended weekly meetings with representatives from different departments on the current status of aquaculture diseases in the commune.

Concurrently, the researcher was involved in on-going research activities with the IMOLA project in Phu Xuan Commune. After a week of intensive work with the research team in all eight villages in the commune, the researcher collected data for the research project and developed a better understanding of livelihood system dynamics and emerging problems related to the use and management of fishery resources in Phu Xuan Commune.

At the end of this stage, the researcher reviewed the initial research plan along with comments and suggestions from colleagues from Hue University of Agriculture and Forestry, government officials at the district and commune levels, and the community. For example, the plan to organize a general livelihood meeting in the village was cancelled because the research started in the middle of the aquaculture season.

Data collection

The data collection process was divided into three major activities: (1) livelihood analysis; (2) property rights and institutional analysis; and (3) resilience analysis. Table 2.1 describes the main research tools used in each activity. These research tools were undertaken simultaneously to ensure the flow of research activities.

Focus group discussion was one of the most important methods used to collect data in Thuy Dien village, especially for livelihood analysis. The use of focus groups helped to facilitate discussion, as well as integrate several other research activities, including the seasonal calendar, daily schedule, institutional diagram, and well-being ranking. There were 15 formal focus groups and several informal discussions. The main difference between formal and informal focus groups was the presence of village head or local government staff, as well as the numbers of participants. While local government staff were helpful in facilitating discussions, their presence constrained the villagers' discussions. Information collected in informal discussions was verified by formal discussions.

Of the 15 formal focus groups, seven were organized around the participation of households from four specific user groups: (1) earth pond; (2) net-enclosure; (3) mobile

fishing; and (4) non-fishing. There were two focus groups organized with participants from the first three household groups. The first focus group addressed three themes: livelihoods, property rights and institutions. The second focus group addressed resilience-related issues such as identifying shocks and stresses and coping and adapting strategies. Only one focus group was organized for villagers in the non-fishing household category. This focus group discussed all aspects mentioned in the two focus groups held for the other groups. Two other focus groups were organized for villagers who were members of the Fisheries' Association and Women's Union.

Semi-structured interviews were conducted in late 2006 and early 2007. The questionnaire was pre-tested and revised before the final draft was accepted. Open-ended questions were used for interviewing to encourage the villagers to express their own opinions. Open-ended interviews and storytelling were crucial when asking questions related to shocks and stresses facing the villagers. As per the University of Manitoba's ethics guidelines, informed consent was completed prior to all interviews, surveys, and group discussions. The confidentiality of the individual participants was protected by the use of pseudonym. NViVo, SPSS, and Excel were used for data analysis and the creation of frequency tables. Results were discussed with key informants and the research team and also provided an opportunity to reflect on the data collection process and findings.

2.3.4 Synthesis and Verification

A series of meetings and workshops were organized in the village and with the government officials to share the findings and to promote further discussions on livelihoods and resource access. The meetings and workshops provided households and government officials with an opportunity to confirm information and to provide additional information. It was helpful for the researcher to receive feedback and comments on the research processes. Reports were written in Vietnamese to distribute to community members, local associations, and government offices.

Presentations were made to researchers in IDRC's CBCRM project. A final report was written in English to submit to IDRC for distribution to the CBCRM project and other

on-going projects in Thua Thien Hue Province, Vietnam. The researcher also attended at some local and national conferences over the project's lifetime where the research findings were presented and discussed.

2.4 Data analysis

A significant data set was produced over the two years of fieldwork. Data sets included interview notes, focus group discussion notes, semi-structured interview notes, and proceedings of meetings with local governments and social organizations. Both original and electronic copies were kept in Vietnamese. Some of the qualitative data were translated into English for quotation in this thesis.

Qualitative data were first written in descriptive forms in Microsoft Word and then entered in NVivo 2.0 for data analysis. Each interview was coded by the interviewee's pseudonym, resource user groups, and interview types (focus group or individual interview). Other qualitative data, including summaries and synthesis, were also analyzed using the NVivo computer program.

Quantitative survey data was coded, entered, and analyzed using SPSS, and/or Excel, whichever was most applicable. Data analysis in SPSS included simple descriptive statistics, frequency, cross-tabulation, and basic statistical analysis. SPSS tables were exported to Excel for graphical representations such as histograms and pie charts.

When possible, digital photos were taken of participatory research tools. Some photos were developed and given as gifts to participating households. Government resource planning maps were duplicated to build an information database.

2.5 Confidence and reliability

The researcher's close contact and connection with the local community was important because it allowed both the researcher and the community to learn and explore different issues together. The researcher was considered part of the family in one of the households

she stayed with. The husband joked with his neighbours and friends that the researcher was one of his wife's nieces who would stay in his house to learn about the community and aquaculture. Some pictures were taken for the children and their families and given as gifts to local households.

To approach the community, the researcher took advantages of her Vietnamese background, ability to speak the language, and knowledge of common customs. Some practical discussions and helpful suggestions on a range of local livelihood and aquaculture issues by the researcher and her colleague help build villager's trust and a willingness to work with the researcher. The researcher also provided some assistance with transportation, communicating with government officials, or tutoring some pupils in mathematics.

Trust was a critical aspect of the research process. Therefore, it was essential to work with villagers and local organizations to ensure their comfort with this research process. The researcher made friends with the younger generations in the village and members of the local Youth Association and Women's Union and participated in some of their social activities. As well, the researcher began the project with the least controversial topics: livelihood systems. More controversial questions related to resource access and property rights were conducted after several months when the villagers were more comfortable with the researcher. Additionally, these topics were asked mostly in informal focus group discussions or on an individual basis.

As per the University of Manitoba's ethics guidelines, informed consent was completed prior to all interviews and group discussions. The confidentiality of the individual participants was protected by the use of pseudonyms. Pseudonyms were used for technical reports, as well as in this thesis and for quotations in the thesis.

The cross-check process of data collection was important to ensure the accuracy and reliability of information (Grant 2006). While there was a lot of discussion and further input at the verification workshops and meetings, there was no disagreement with the research findings. Reports distributed to community members were written concisely in an easy to understand manner. The researcher randomly interviewed villagers after the report was released to determine the accuracy and clarity of the reports.

CHAPTER 3.

The study area and the fishing village



Source: <http://www.thuathienhue.gov.vn/index.asp>

Figure 3.1 The location of Tam Giang Lagoon in Vietnam

3.1 Tam Giang Lagoon

*“Thương em anh cũng muốn vô
Sợ trường Nhà Hồ, sợ phá Tam Giang”*

Tam Giang is mentioned as an obsession in the lyric from the above folk-song: a large, deep and risky lagoon. Indeed, Tam Giang is the largest lagoon in Southeast Asia. The lagoon represents almost half of Vietnam’s total area of 480 km². Its length is almost 70 km and it has a width varying from 0.6 to 1.4 km. The lagoon system forms a unique brackish ecosystem with a diversity of aquatic species and provides livelihoods for more than 300,000 inhabitants.

3.1.1 Geographic characteristics

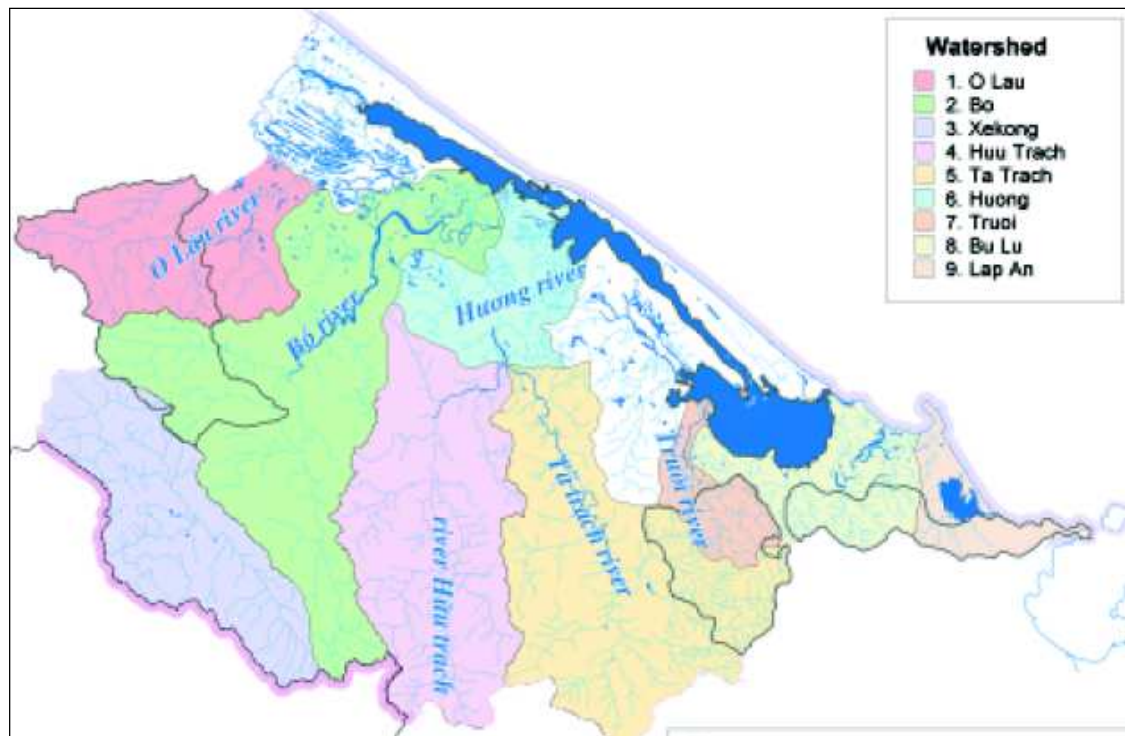
Tam Giang Lagoon stretches along the Thua Thien Hue Province’s coast (16⁰-16⁰80’N latitude and 107⁰80’-108⁰20’E longitude). Thua Thien Hue has an area of 5,054 square kilometres and is located in central Vietnam. It is bordered on the east by the Eastern Sea and on the west by Lao (Figure 3.1). The province has a diversity of natural resources within its 128 km coastal length and 220 km² of lagoon.

The Tam Giang Lagoon system receives water from four rivers: Huong, Bo, O Lau, Truoi, and Cau Hai (Figure 3.2), of which Huong river’s catchment area provides about 80% of the total water volume (Thung 2007). The three main rivers in the northern area of the lagoon (Huong, Bo and O Lau rivers) shaped the lagoon’s name. In Sino-Vietnamese ⁽¹⁾, “*Tam Giang*” means three rivers (“*Tam*” means three and “*Giang*” means rivers).

The average depth of the lagoon is two to four meters. The Thuan An estuary is the deepest area at more than seven meters. The lagoon is separated from the sea by a sandy ridge formed by coastal deposition. The lagoon has two openings: Thuan An and Tu Hien. Thuan An is the main mouth to the sea. It is located at the middle of the lagoon,

¹ Sino-Vietnamese (*Hán Việt*) are the elements in the Vietnamese language derived from Chinese. They account for about 60% of the Vietnamese vocabulary.

while Tu Hien is smaller and located at the south-eastern end. The lagoon is a semi-closed lagoon, which means that its mixture of fresh and salt water causes changes in its salinity both seasonally and with spatially regularity. The salinity range is from 0.2 to 34‰ (Thung 2007). The salinity and ecological characteristics are favourable for the development of aquaculture in most parts of lagoons (Phap *et al.* 2002).



Source: <http://www.mekong-protected-areas.org/vietnam/field.htm>

Figure 3.2: Catchment area, Thua Thien-Hue Province

The lagoon system covers 43% of Thua Thien Hue Province area. The Tam Giang Lagoon system is comprised of a series of lagoons, including the Tam Giang area, Sam Chuon area, Ha Trung-Thuy Tu area, and Cau Hai area (Figure 2.8)

(i) Tam Giang area: Its 52 km² encompasses 12 communes of three districts: Quang Dien, Phong Dien and Huong Tra. Its length from the estuary of O Lau River to Huong River is 26 km, where it connects directly to the Thuan An estuary.

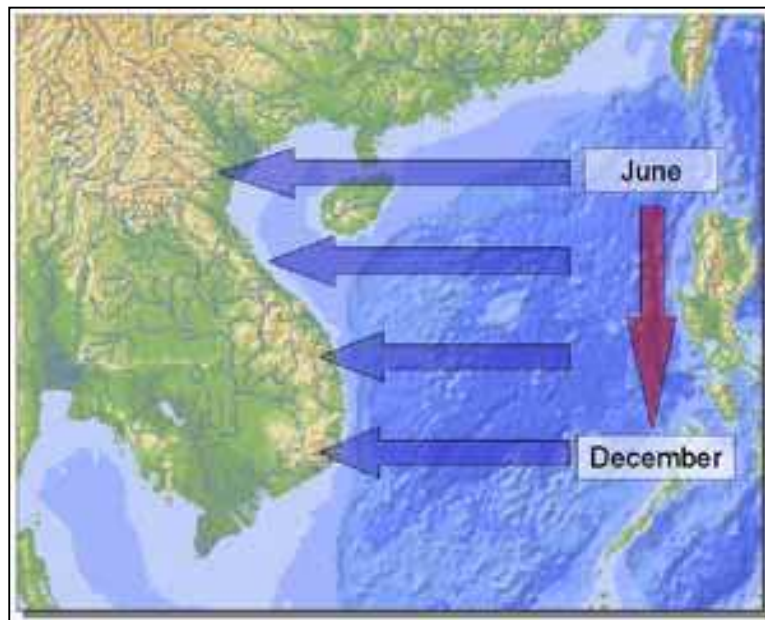
(ii) Sam Chuon area: With an area of 16.20 km², the lagoon belongs to eight communes in Phu Vang districts and is located to the south of the mouth of Huong River.

(iii) Ha Trung - Thuy Tu area: covers an area of 36 km² and has a length of 24 km. Four communes in Phu Vang and Phu Loc districts are located in the area.

(iv) Cau Hai area: It covers 16 km² of the southern lagoon system.

3.1.2 Meteorological characteristics

Vietnam's central region is characterised by distinct tropical wet and dry seasons, variable winter and summer temperatures, and eastern tropical monsoons. The average temperature in Thua Thien-Hue Province varies from 20.1⁰C in January to 29.2⁰C in June. Winters are cold and humid and the temperature can drop below 10⁰C due to the north-easterly wind. In contrast, the westerly wind of summer is hot and dry. Peak temperature can reach above 40⁰C (Trai *et al.* 1999). In contrast to the extreme variation in air temperature, the water temperature variation does not exceed 2.5⁰C, providing a stable condition for aquatic organisms in the lagoon.



Source: DMU - UNDP Vietnam (2002)

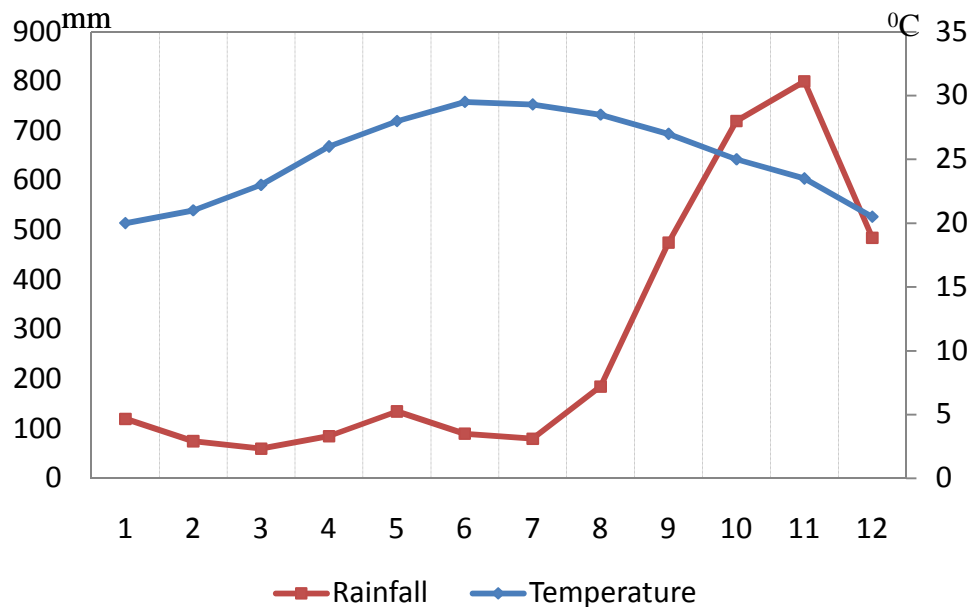
Figure 3.3: Movement of Vietnam's rainy season

In the last ten years (1996-2006), the annual rainfall in Thua Thien Hue Province has been approximately 3,250 mm, which is much higher than Vietnam's average

precipitation (1,900 mm/year). In November, 1999, Thua Thien Hue Province experienced record precipitation amounts of approximately 5,500 mm, which is double the average precipitation amount of 2,452 mm for November (An and Hoang 2007).

The rainy season generally occurs earlier in the North and moves gradually to the South (Figure 3.3). In Thua Thien Hue Province, it often begins in early September and ends in December or early January of the following year. According to data from the Disaster Management Unit (DMU) - UNDP Vietnam, the heaviest rainfall occurs in October and November (1,800-2,200 mm) (An and Hoang 2007), which is usually accompanied by storms, floods, typhoons, and other natural events.

The region’s average relative humidity is between 85 and 88%. During the rainy season, the relative humidity is usually greater than 90%. The minimum relative humidity during the hot season can be below 30%. Figure 3.4 shows the average monthly temperature and rainfall for the 10 year period of 1996-2006.



Source: Department of Hydrometeorology in Thua Thien Hue Province (2007)

Figure 3.4: Average monthly rainfall and temperature in 1996-2006

Natural disasters happened frequently in central Vietnam and have negatively impacted livelihood systems. Observations over the past few decades indicate that the frequency and severity of floods in Tam Giang Lagoon has increased significantly (Phong *et al.*

2008). Historical records for the period of 1800- 1950, record only 38 floods and typhoons. However, in just 25 years (1975-2000), 41 disasters, including the severe flood of 1983, the destructive storm of 1985, and the historic flood of 1999 were recorded (Do 2002). The tendency for flood seasons to also start earlier and end later than before has also been observed (Phong and Shaw 2007). Also, according to the Provincial Disaster Prevention Committee, the number of floods increased significantly during El Niño-Southern Oscillation (ENSO) conditions (PDPC 2000).

For example, in 1999, eight central provinces experienced severe flooding. The event was considered the worst flood in a century for Vietnam. It caused 622 deaths (including 373 in Tam Giang Lagoon), and 700,000 houses were destroyed, with the total losses valued at USD\$270 million in eight provinces. Losses in Thua Thien Hue were estimated at USD\$163 million. Most recently, in November 2004, precipitation following Typhoon Muifa resulted in flooding and caused 56 deaths in the central provinces. Thua Thien Hue, specifically Tam Giang Lagoon, was severely affected. Eleven deaths occurred and 110,000 houses were damaged with losses estimated at USD\$7 million (Dartmouth Flood Observatory 2009).

3.1.3 Bio-geographic characteristics

According to the Ramsar Convention classification of 1996, Tam Giang Lagoon is classified as a J type marine/coastal wetland: “*coastal brackish/saline lagoon - brackish to saline lagoons with at least one relatively narrow connection to the sea*”. Thanh *et al.* (1998) categorizes eight types of wetland habitats in Tam Giang Lagoon: swamp with rice farm, swamp with mangrove, tidal flat, aquatic grass bed, muddy bottom, sandy mud bottom, and aquaculture ponds. Recent research by Thung (2007) indicates that the area of aquaculture development has increased more than seven times, while rice farms and mangrove areas experienced a reduction of approximately 60%. Thung also categorizes Tam Giang Lagoon’s sub-systems into six types: (1) the river estuarine sub-ecosystem with low salinity; (2) the aquatic grass sub-ecosystem which occupies almost half of the lagoon and is important for the lagoon’s food chain; (3) the soft-bottom sub-ecosystem found mainly in the Thuan An and Tu Hien sea mouths at a depth of 2-9 meters; (4) the

narrow tidal sub-ecosystem found along the sand dunes between the lagoon and the sea; (5) the agriculture sub-system adjusted to areas by the river mouths; and (6) the mangrove sub-system, which is a relatively small area (Thung 2007).

Thanh *et al.* (1998) indicates that the lagoon is an important migratory habitat for waterfowl with 34 of 73 waterfowl species recorded in Vietnam (Nam *et al.* 2003; Thanh *et al.* 1998; Tuan *et al.* 2009). Its waters are also home to many aquatic species.

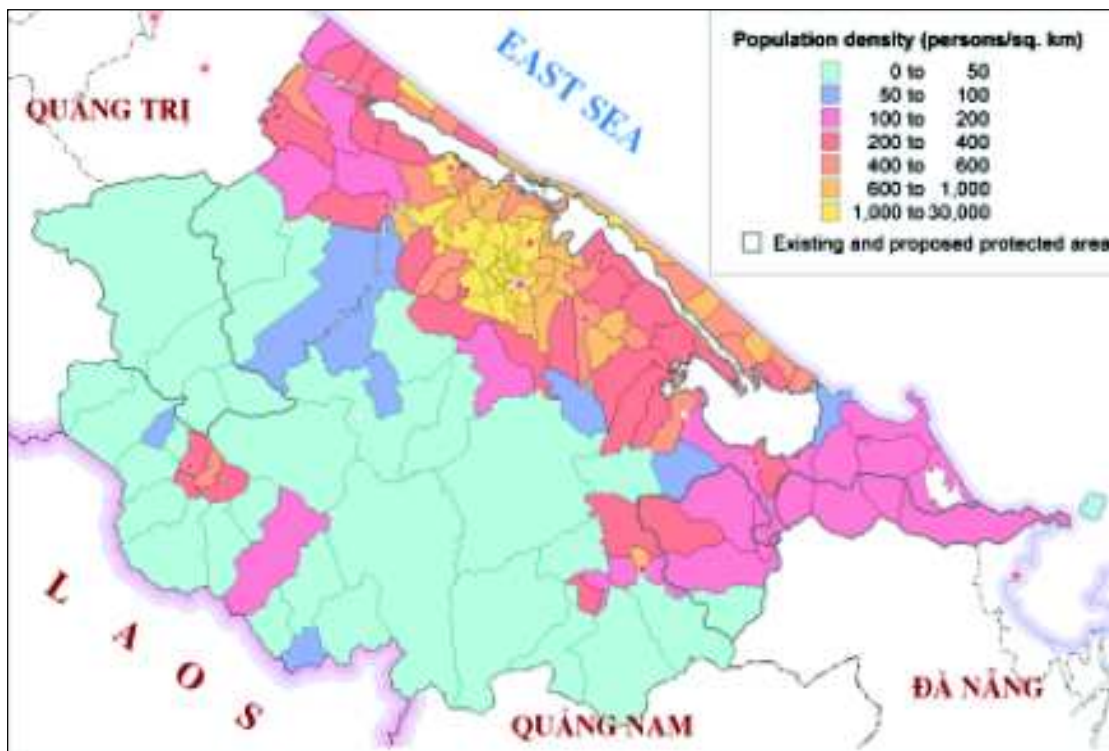
Tam Giang Lagoon has a wealth of aquatic life with 921 species, 444 genus and 237 families recorded in the Tam Giang Lagoon. There are 287 phytoplankton species, 72 zooplankton species, 193 benthic species, and 18 aquatic grass species, including seven sea grass species (Thung 2007). Of the 233 fish species identified, 48% are of the Perciformes order and 6.4% are in the Cypriniformes order (Thanh *et al.* 1997). Aquatic species in the lagoon are classified into three ecological groups: freshwater, blackish water and marine water because of seasonal and spatial changes in salinity in Tam Giang Lagoon. Some of the main aquatic species for aquaculture in Tam Giang Lagoon are represented in Table 3.1.

Table 3.1: The main aquatic species found in Tam Giang Lagoon

Local name	Latin name	English name
cá kình	<i>Siganus oramin</i>	Whitespotted spinefoot
cá dĩa	<i>Siganus guttatus</i>	Orangespotted spinefoot
cá móm	<i>Gerres filamentosus</i>	Whipfin silverbidy
cá bóng cát	<i>Glossogobius giuris</i>	Tank goby
cá cẵng	<i>Therapon theraps</i>	Largescaled herapon
tôm sú	<i>Penaeus monodon</i>	Tiger shrimp
tôm rằn	<i>Penaeus semisulcatus</i>	Green tiger shrimp
tôm đất	<i>Metapenaeus ensis</i>	Greasy-back shrimp
cua biển	<i>Scylla serrata</i>	Mud crab
ghẹ	<i>Portunus pelagicus</i>	Blue swimming crab
ghẹ 3 chấm/vọ	<i>Portunus sanguinolentus</i>	3-Spot swimming crab

3.1.4 Socio-economic characteristics

Thua Thien-Hue Province, Vietnam is home to just over one million people, with a density of 220 people per square kilometre (Figure 3.5). The Tam Giang Lagoon system provides partial or total livelihoods to the 300,000 inhabitants of 236 villages in the 33 communes in the five districts: Quang Dien, Phong Dien, Huong Tra, Phu Vang and Phu Loc (Thung 2007) (Figure 3.1).



Source: <http://www.mekong-protected-areas.org/vietnam/field.htm>

Figure 3.5: Population density, Thua Thien-Hue Province

The lagoon and the coastal fisheries activities it supports are an important part of the coastal area's subsistence and commercial economies. Agriculture, specifically rice paddies, is one of the three dominant land uses in the coastal zone. Fisheries and aquaculture are the other two main livelihood activities in this area. Aquaculture, especially shrimp farming, has become Thua Thien Hue province's key industry. In addition to these three primary economic activities, secondary activities include transportation, tourism, services, handicrafts, and agricultural processing.

Thua Thien Hue's economic sectors have changed significantly in the last 15 years. Thua Thien Hue's GDP experienced an average growth rate of 8.4% per year in the 1990s, which was much higher than the previous period (3.4% per year in 1976-1989). For 2000-2005, Thua Thien Hue's GDP was 9.5% per year; significantly higher than Vietnam's GDP of approximately 7-8% per year. Industry and manufacturing accounted for 19.7% of the provincial GDP in the 1990s and increased to 34.1% in 2004. In 15 years, the service and tourism sectors also increased from 36.1% to 43.7% of Thua Thien Hue's GDP. While sectors such as manufacturing and tourism were experiencing positive growth, the agriculture and fisheries sectors which had accounted for almost half of Thua Thien Hue's GDP in the 1990s, had declined to just 22.2% in 2004 (Provincial government statistics 2006).

3.2 Fishing gear used in Tam Giang Lagoon

There is a diversity of fishing gear used in the Tam Giang Lagoon. Most of the traditional fishing gear is made from locally available materials and with local knowledge. For instance, fish corrals, the most popular fixed gear, is made from bamboo and fishing net. In fish corrals, two corral wings are designed to lead fish and shrimp into the trap (Figure 3.6). This method is based on fisher's experiences of the moving direction and "trapping" principle. The fish aggregating device (FAD) is another example of the fisher's ingenuity at combining traditional knowledge with available materials. The FAD creates a man-made habitat to attract fish and other species (Figure 3.7). In fact, much of the fishing gear is built using traditional knowledge and innovation.

Local fishers also take advantage of technological developments to improve their fishing gear. While improvements to the fishing gear results in higher productivity and income levels, there is also the potential for more harmful impacts on the natural resources (Mien 2006). For example, electric fishing (Figure 3.8) is considered to be the most destructive activity, especially when combined with other fishing gear (e.g., electric lagoon seine). These fishing activities are prohibited in the lagoon; however, anecdotal evidence suggests that they are still used. Other fishing gear which is operated from motorized boats (such as: motorized push-net) also negatively impact the lagoon bed.

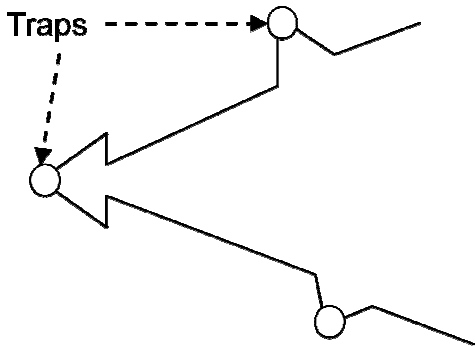


Photo by Ta T.T. Huong (2006)

Figure 3.6: A model of fish corral with multiple traps



Photo by Ta T.T. Huong (2006)

Figure 3.7 Fish aggregating device (FAD)



Photo by Ta T.T. Huong (2006)



Photo by Pham T.H. Nhung (2007)

Figure 3.8: Electric fishing – an illegal fishing method

Table 3.2: List of fishing gear in use at Tam Giang Lagoon

Fishing gear	Local name	Description
Fish corral	<i>Nò sáo</i>	The fish corral has two main parts: the corral wings and the trap. The most common fishing gear is with a “V” shape or combination of more wings to make a “W” shape. At the point of the “V”, a trap is made using bamboo and netting of two mm in mesh size.
Fish aggregating device (FAD)	<i>Chuôm</i>	Bamboo and branches are placed inside a net-enclosure to make a small, artificial habitat for fish and aquatic species to gather in, take shelter in and hunt for food. After 4-6 months, the owner encircles FAD with a net, capturing everything in the habitat. The cycle is repeated.
Gillnet	<i>Lưới</i>	The base of gillnet is weighted with lead while the top of the net is floated. It is temporarily set in the lagoon with one end attached to a float and the other to a boat.
Lagoon seine (Dragnet)	<i>Xiéc</i>	Seine is a pull-net with 6-10mm mesh size. Nowadays, it is operated in combination with electric fishing. It is one of the most destructive types of fishing gear and is prohibited in the lagoon.
Push-net	<i>Xèo</i>	Push-net is composed of a fine mesh size and a triangular frame with one side along the bottom to catch small crustaceans and fish. Push-net is used in shallow water areas.
Light fishing	<i>Soi</i>	Fishers use light to attract fish and other aquatic species at night.
Electric fishing	<i>Rà điện</i>	Fishers use transformers to increase the voltage of a battery up to 300-600 voltage to stun fish. The stunned fish float to the surface where larger fish are scooped up in a small basket and small fish which are dead drop to the bottom.
Motorized push-net	<i>Te máy</i>	A larger push-net is operated from a motorized boat to scoop up all species in its path. This method is more destructive than push-net.
Bottom net	<i>Đáy</i>	The bottom net has two main parts: two poles and net. Two poles are supported by a rope system and a net shaped like a sleeve with a tapered end. This gear takes the advantages of strong flowing currents.
Fixed lift net	<i>Rớ giàn</i>	A square-shaped net with fine mesh size is tied to four bamboo poles that hang the net. There is a trap at the centre of net, which fishers open to let all the fish fall into their boats. It is used in weak currents.
Boat lift net	<i>Rớ bà</i>	A smaller fixed lift net is operated from the stern of a boat.
Hammock stake trap/ Mullet trap	<i>Dạy / lưới nháy</i>	It is composed of two parts: a catching net and a trapping net, supported by a system of bamboo. One net is underwater leading fish into the centre of the circle and the other net is stretched across the surface of the water to capture mullet
Chinese cage-line trap	<i>Lừ</i>	Used after 2000. It is a system of 10-20 traps fixed to the lagoon bottom with two bags at the two ends for collecting fish and shrimp. Each trap has a hole located on opposite sides.
Mollusc rake	<i>Cào hén</i>	A handcraft of poor households. Bigger species are collected by hand; smaller ones are collected with mud in a basket, which is then filtered to separate the mud from the mollusc.
Eel rake	<i>Cào lươn</i>	An iron hook is mounted to a long pole and pressed into the mud bottom.
Aquatic grass collection	<i>Vớt rong</i>	Aquatic grass is collected to sell to farmers for animal feed.

Source: adapted from Brezski and Newkirk (2002); Mien (2006)

Table 3.3: Average catch per fishing gear unit year per day

	Catch per unit method (kg/fishing gear/day)	Percentages (%)
Fish corral	2.8	35
Gillnet	1.7	22
Light fishing	1.5	19
Lagoon seine	1.1	14
Push-net	0.8	10
Total	7.9	100

Source: Estimated by researcher based on the livelihood questionnaire, observations and calculations

Most of the fishing nets have significantly reduced mesh size. For example, the bottom net size has gone from 20mm to 3-7mm and nylon fishing net has replaced the traditional fishing net (Mien 2006). The unplanned and rapid improvement of the fishing gear has created a paradox: fishers are using more destructive methods in order to increase their catch, but these methods have significantly reduced the aquatic resources in the lagoon and will impact their future catch amounts.

Besides using traditional fishing gear, some fishers have adapted gear from other areas. For example, since the 2000s, the Chinese cage-line trap has been used in the lagoon. A list and descriptions of fishing gear are provided in Table 3.2.

The fish corral, gillnet, light fishing, lagoon seine and push-net are the most common types of fishing gear in Thuy Dien village, as well as in the Sam Chuon area. Electric fishing methods are also used in the lagoon in combination with lagoon seine. The fish corral is the most important fixed gear used by the fishers of Thuy Dien and accounts for approximately 35% of the total fish catch for households (Table 3.3). It is also considered the most effective gear by fishers because it results in the highest catch per unit with the least amount of effort. More than 90% of Thuy Dien households use gillnets. Gillnets account for approximately 25% of the total fish catch. Some fishing gear (e.g., light fishing, push-net) are only used seasonally or in sunny conditions (Table 5.8).

3.3 Aquaculture development in Tam Giang Lagoon

3.3.1 The context of aquaculture development in Vietnam

Since the early 1960s, small-scale aquaculture has been practiced domestically in Vietnam. There was a diversity of aquaculture systems. In the North of Vietnam, rice-cum-fish, livestock-cum-fish, freshwater fish pond, and marine cage culture were dominant, whereas intensive farming of giant tiger shrimp (*P.monodon*) and marine cage culture of finfish and lobster were preferred in Central Vietnam. Aquaculture was more diversified in Southern Vietnam, with several species and aquaculture models in use. Pond or cage farming for catfish, snakehead fish, and tiger shrimp was common in Southern Vietnam. There are several shrimp farm models: intensive, semi-intensive, improved-extensive, or integrated aquaculture such as rice-cum-fish/shrimp and mangrove-cum-fish/shrimp (FAO 2006). Aquaculture plays an important role in the development of the fishery industry, which currently ranks as Vietnam's third-most prominent economic industry, after the oil and garment industries (GSO 2006).

In the aquaculture industry, giant tiger shrimp was the first species commercially farmed for export and was seen as a comparative advantage that would enable Vietnam to achieve its socioeconomic targets (Anh 2006). The total area used for shrimp farming in Vietnam has steadily increased: 2,500 km² in 2000 to 4,780 km² in 2001, reaching 5,300 km² in 2003. Vietnam's export shrimp market was identified as a potential for both economic growth and poverty reduction (MOF 2001). Rapid export growth promoted the aquaculture boom of the last two decades. Various species suitable for export include: lobster (*Panulirus spp.*), groupers (*Epinephelus spp.*), and seaweed (*Gracilaria verrucosa*) in marine areas; giant tiger shrimp (*Penaeus monodon*), mud crab (*Scylla spp.*) and bivalves (*Meretrix lyrata* and *Anadara granosa*) in brackish areas; and catfish (*Pangasius hypophthalmus* and *Pangasius bocourti*), the silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idellus*), and common carp (*Cyprinus carpio*) in freshwater areas (FAO 2006).

Fisheries and aquaculture exports have increased significantly; from USD\$1.2 million in 1980 to USD\$551.2 million in 1994, to USD\$2.5 billion in 2005, and to USD\$3 billion in 2006 (MOF and WB 2005; Pomeroy *et al.* 2009). As well, the area for aquaculture has nearly doubled; from 4,910 km² in 1990 to 9,844 km² in 2006 (Pomeroy *et al.* 2009). The aquaculture industry has become one of Vietnam's most important economic sectors.

Currently, tiger shrimp and catfish are the major exports. According to Vietnam's Ministry of Fisheries and the World Bank, shrimp products make up more than 50% of the total volume of Vietnam's exported products. These products are exported to 80 countries, including the United States of America, Japan, China, South Korea, Taiwan and European Union. In fact, the United States of America and Japan are Vietnam's two larger customers, importing over half of Vietnam's fish products (MOF and WB 2005).

3.3.2 The development of aquaculture in Tam Giang Lagoon

Since the late 1970s, aquaculture has been practiced in the Tam Giang Lagoon. Seaweed culture was successful with the expansion of the Algae Seaweed Company, whose primary activities were processing and exporting (Mien 2006). In 1986, the Seaproduct Research Station started a tiger shrimp aquaculture project using wild post-larvae caught in the lagoon. Vatex, a Hue-Australia joint enterprise, and Phu Xuan of the Seaproduct Export Company also expanded their tiger shrimp aquaculture activities (Phap *et al.* 2002). The success of tiger shrimp aquaculture created propulsive forces for the development of tiger shrimp aquaculture in the lagoon.

Aquaculture expansion is diverse in many respects, with earth ponds, net-enclosures and pen culture. It can also be intensive, semi-intensive, improved extensive, or poly-culture. The species available for aquaculture are also diverse (e.g., shrimp, fish, crab, seaweed) (Tuyen 2002). Intensive farming of tiger shrimp with stocking density of 30-35 units/m² is not common in Thua Thien Hue Province because of the high investment needed to undertake the intensive systems (water intake control, pond preparation, water coloring, feed and so on), which has become the industry standard. This system is prevalent only in upper earth ponds in aquaculture enterprises such as Phu Dien and Vinh Ha

shrimp sites of Thien Phu An Company, or Phu Dien-ASC Shrimp Farming Centre with a very high stocking density (up to 120 units/m²) (Mien 2006).

Semi-intensive farming is dominant in Thua Thien Hue Province in both upper and lower earth ponds at 25-30 units/m². These earth ponds make use of industrial feed (Mien 2006). Some lower earth ponds apply improved-extensive farming with tiger shrimp stocking at 12-25 units/m² with certain species, such as mud crabs, (*Scylla serrata*), whitespotted spinefoot (*Siganus oramin*), orangespotted spinefoot (*Siganus guttatus*) being supplemented. This system makes intensive use of industrial feed combined with fresh feed. Net-enclosures are surrounded by layers of polythene nets with a mesh size of 4-6 mm and bamboo. This model began in the Sam Chuon area in the mid-1990s and has expanded to other areas in Phu Vang and Phu Loc District, Southern Tam Giang Lagoon. A net-enclosure is a combination of aquaculture and capture fishing (Figure 3.9). Inside the net-enclosure, a number of fixed gear, mostly fish corrals and FAD, are set up. A small plot is surrounded with double net-layers for poly-culture. Species in the plot are diverse and can include whitespotted spinefoot, orangespotted spinefoot, tiger shrimp, greasy-back shrimp, blue swimming crab, and so on.

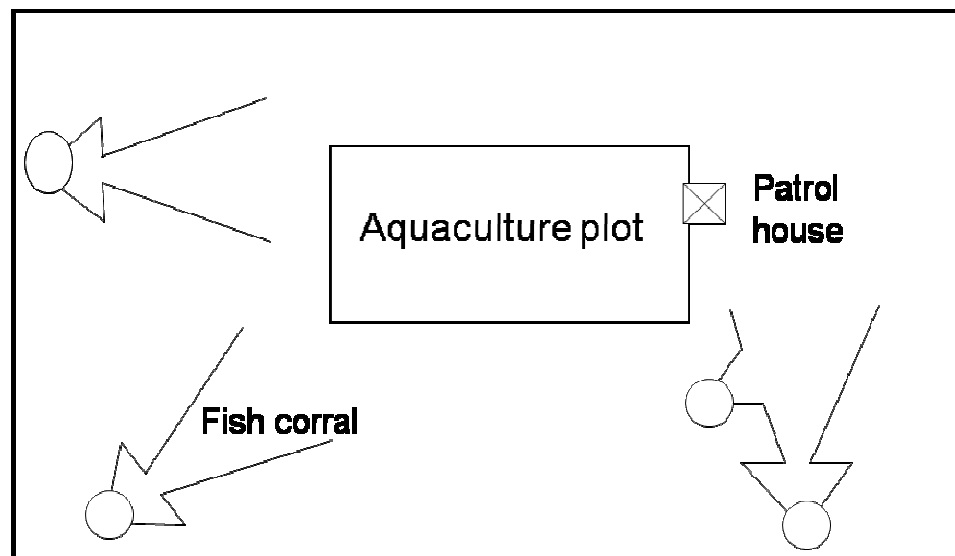


Figure 3.9: A net-enclosure model combining an aquaculture plot and fish corrals

The pen aquaculture model began in the northern area of the Tam Giang Lagoon in the late 1990s and has expanded quickly since 2000. The pen is made from bamboo and polyethylene fishing nets in the area of 50-200m² (Figure 3.10). Freshwater grass carp is the most popular species for fish pen culture. Fish pen culture usually starts in December after the flood season. In the first two months, grass carp fingerlings are fed with bran and small shrimp. Seaweed is collected for fish feeding for the next nine months. Previously, the feed was collected in July prior to the flooding season. Currently, fishers have strengthened their cages to keep the carp for a longer time in order to sell them at the Lunar New Year holiday for a higher price (Suong 2006).

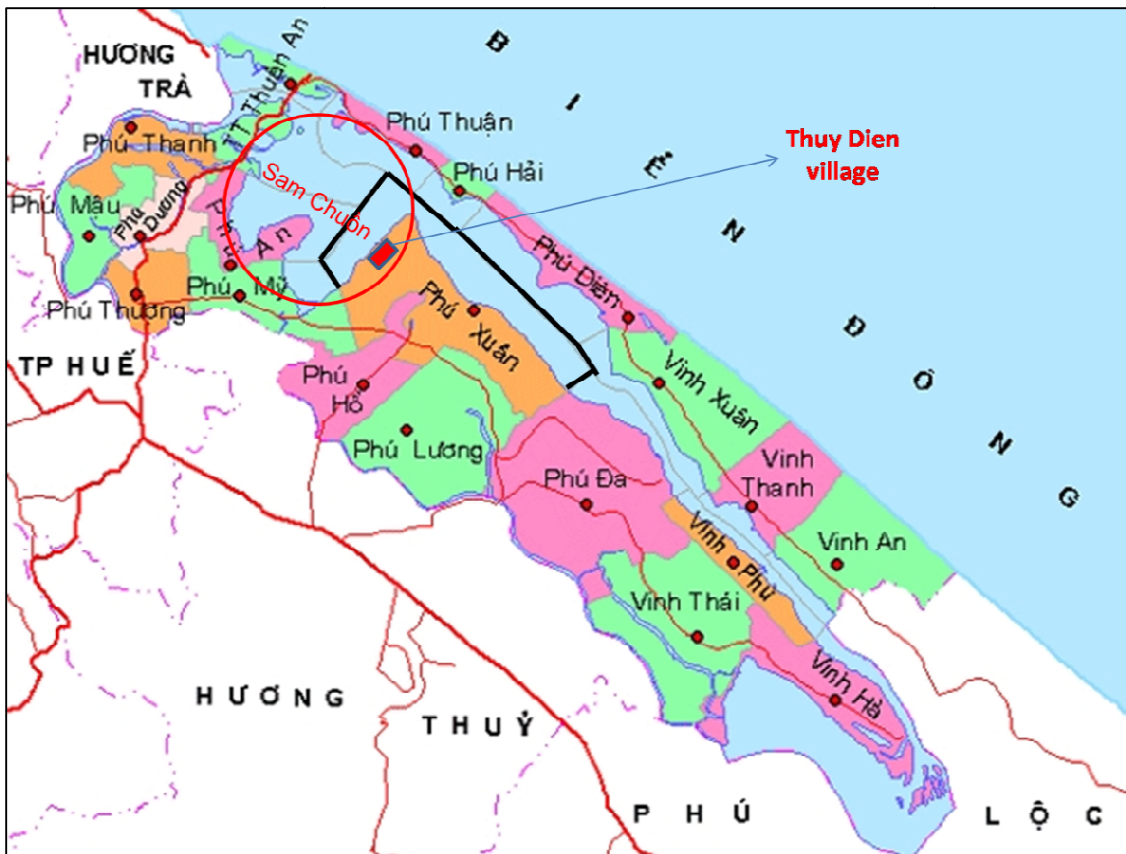


Photo by Ta T.T. Huong (2006)

Figure 3.10: Fish pen culture

3.4 The research site

The research was conducted in the Thuy Dien village at the Tam Giang Lagoon. The village is located at the southern part of the Sam Chuon area of the lagoon. Administration of the area is by the Phu Xuan Commune (Figure 3.11). The following sections identify the specific context for the research site.



Source: <http://www.thuathienhue.gov.vn/index.asp>

Figure 3.11: The research site location

3.4.1 The Sam Chuon area of the lagoon

The Sam Chuon Bay is located in the middle of Tam Giang Lagoon and has an area of 18.55km². The Sam Chuon area provides livelihoods for more than 9,000 households (Tuyen 2006). The average depth of the bay is 1.6 meters. There is a sub-tidal channel (the main water flow) two meters in depth, which gets deeper toward Thuan An (4-5meters). The Huong River flows directly into the Sam Chuon bay and is the major river flowing into the Tam Giang Lagoon. The salinity of Sam Chuon fluctuates depending on the river's water flow, the sea tides and the flooding regime. Environmental monitoring in 2006/07 showed that the salinity was as low as 0.5‰ in the rainy season and reached 25‰ in the dry season (Hop *et al.* 2008). The soft substrate and shallow water provides favourable conditions for net-enclosure aquaculture. The location of Sam Chuon also

provides unique habitat for a diversity of aquatic species. The ratio of “valuable species” collected in Sam Chuon is higher than in other areas (Thung 2007). Also, there are several nursery sites in the lagoon, one of which is located in the area controlled by Phu An Commune.

Table 3.4: Current lagoon use and government planning to 2010 in the Sam Chuon area

Fishery production	Current use (2006)		Planning to 2010	
	km ²	%	km ²	%
Water way systems	1.94	10.4	2.76	14.9
Mobile fishing grounds	0.42	2.3	4.39	23.7
Restoration for ecological aquaculture and embankment protection			1.46	7.8
Aquaculture areas (net-enclosures and lower earth ponds)	16.19	87.3	9.94	53.6
Total areas of Sam Chuon	18.55	100.0	18.55	100

Source: Provincial government statistics (2007)

According to Thua Thien Hue government statistics, in 2004, there were approximately 45,000 people residing in 20 villages in the four communes (Thuan An, Phu An, Phu My and Phu Xuan) surrounding the Sam Chuon area (Tuyen 2006). The social-ecological context in Sam Chuon is very complex. The capture fishing and aquaculture activities are located densely and are diverse (Figure 4.3). Approximately 87% of the Sam Chuon area is used for aquaculture related activities (Table 3.4). The traditional fishing areas have been reduced to 13% since the aquaculture boom; a significant decline. In 2007, provincial government plan (No. 1068/QĐ-UBND) for Sam Chuon area details a strategy to decrease the area for aquaculture from the current 16.19 km² to 9.94 km² in 2010 and 2.18 km² by 2020. The plan also indicates that about 3.90 km² of Sam Chuon should be set aside for nursery areas; however, implementation seems to be difficult.

3.4.2 Phu Xuan Commune

Phu Xuan is one of the poorest communes in Thua Thien Hue Province (Thua Thien Hue Province 2006) which is associated with the Phu Vang District. Phu Xuan Commune is

bordered by Phu My, Phu Ho, Phu Luong and Phu Da communes. The Phu Xuan Commune is 11.62 km² and includes parts of both the Sam Chuon and Ha Trung-Thuy Tu lagoon areas. Some information related to land and lagoon use in Phu Xuan Commune is represented in the following Table 3.5.

Table 3.5: Land and lagoon use in Phu Xuan Commune

Phu Xuan Commune	Characteristics
Shoreline	12.19 km
Total area	30.21 km ²
Land area	18.64 km ²
Residential areas	1.22 km ²
Agriculture farm	5.78 km ²
Forestry	2.26 km ²
Lagoon areas	11.57 km ²
Brackish water aquaculture	5.75 km ²
Upper earth ponds	3.60 km ²
Lower earth ponds	0.88 km ²
Net-enclosures	1.27 km ²
Fresh water aquaculture	0.06 km ²

Source: Phu Xuan Commune report (2007)

Currently, aquaculture areas (lower earth pond and net-enclosure) cover almost one fifth of the Phu Xuan Commune's lagoon areas. Phu Xuan has the largest areas of upper earth pond aquaculture in comparison with other communes around Sam Chuon. A tiger shrimp mono-culture is dominant in this commune, with earth ponds accounting for approximately 97% of the aquaculture activity. Table 3.6 compares the aquaculture activities of Phu Xuan with three other communes in Sam Chuon.

With 5.75 km² of aquaculture, especially 3.60 km² of upper earth pond, Phu Xuan Commune used to have the largest tiger shrimp production in the District, as well as in the Province. However, Phu Xuan's aquaculturists have suffered significant losses due to aquaculture diseases. The commune is carrying VND 27 billion (~ CAD\$2 million) in

debt with both formal and semi-formal credit sectors in 2007 (Phu Xuan Commune Report 2007).

According to government records in 2006, 24% of the total population (approximately 8500 people) lived under Vietnam’s national poverty rate. In Phu Xuan Commune, agriculture, stock raising, aquaculture, and capture fishing are the main livelihood activities. There are eight villages in the commune, of which Thuy Dien and Le Binh were the two sampan fishing villages. Since 1985, these two sampan villages have settled on land. Six other villages including Ba Lang, Quang Xuyen, Dien Dai, Xuan O, An Ha, and Loc Son villages are agriculture-based villages, of which the first four villages are also involved in aquaculture and fixed gear fishing activities.

Table 3.6: Brackish aquaculture areas in four communes

	Thuan An	Phu An	Phu My	Phu Xuan
Upper earth ponds (ha)	38	0	23	360
Lower earth ponds (ha)	156	89	16	88
Net-enclosures (ha)	130	137	90	127
Total of brackish aquaculture area (ha)	334	226	129	575
Total lagoon area (ha)	1059	614	178	1157

Source: Thua Thien Hue District government statistics (2007)

3.4.3 Thuy Dien Village

Thuy Dien was once a sampan community. Since 1985, the community has been settled on land and is located at the south end of Sam Chuon area, next to the farming lands of the villages of Xuan O and Dien Dai. These agricultural areas have been converted mostly to aquaculture earth ponds for tiger shrimp farming. Fishing grounds at the edge of the lagoon have been enclosed for lower earth pond aquaculture. Thuy Dien village is completely bound by aquaculture ponds, with only a main road connecting it to Dien Dai village. Local infrastructure and living standards have been much improved since the development of aquaculture in the area, with a clean water supply and access to

electricity as some of the benefits. Figure 3.13 shows the transect diagram crossing the village from southeast to northwest direction.

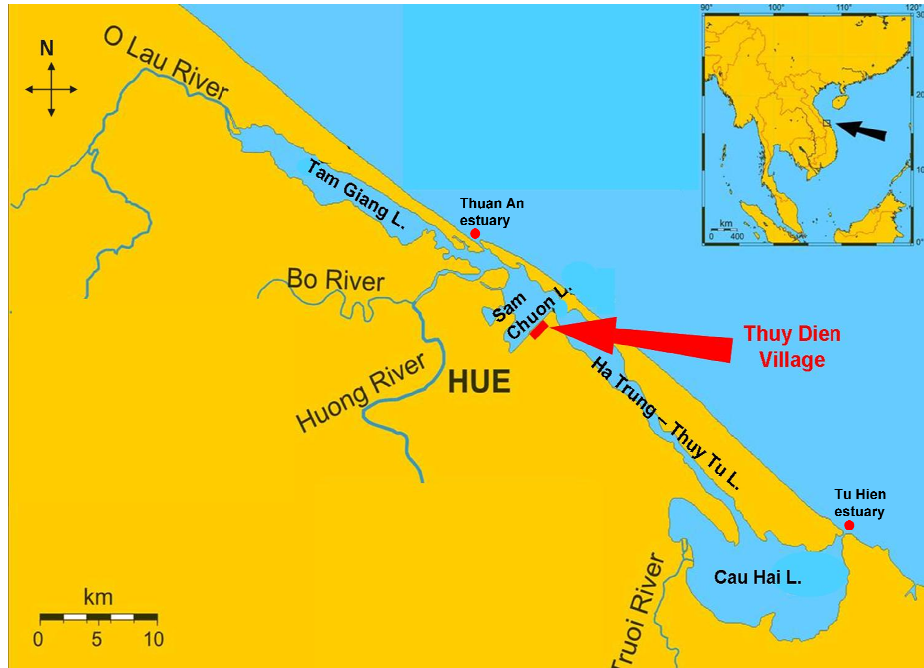


Figure 3.12: Thuy Dien village in Tam Giang Lagoon

Currently, the village has 143 households with 798 inhabitants. More than 90% of the households are involved in fishing and aquaculture activities. Of the 10% not involved in fishing and aquaculture, they used to be fishing households, but completely stopped fishing and are now involved in non-fishing activities (e.g., animal raising, trading, and wage labour). Other basic features of the village are illustrated in Table 5.1 (Chapter Five).

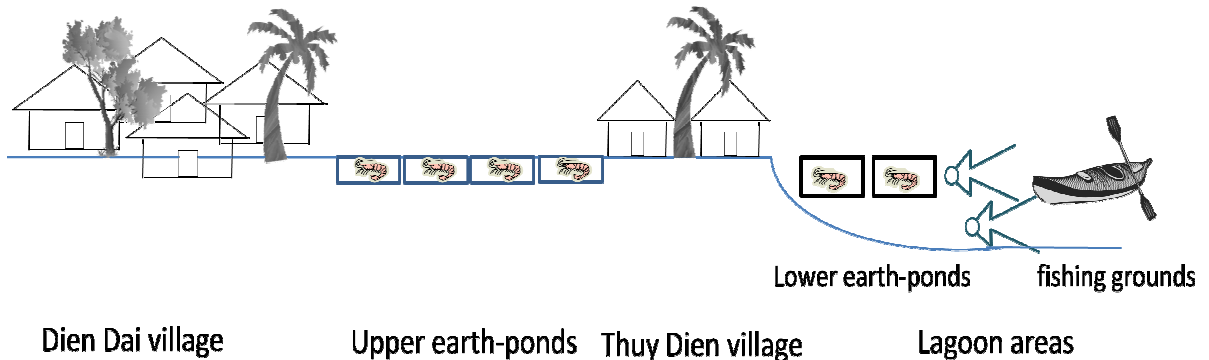


Figure 3.13 : Transect diagram (southeast to northwest) through the village

3.5 Sampan dwellers and the resettlement process

3.5.1 Ethnicity and history of the sampan dwellers

A sampan is a type of flat bottomed boat common to Vietnam, China and other Southeast Asian countries (Phap 2000; DaCosta and Turner 2007). Sampan communities spend the majority of their lives on their boats. The boats are very small (Figure 3.14). A sampan in Tam Giang Lagoon is normally about 6-8 meter length and 1.6 meters in width. On average, eight people live together in a sampan, sharing an area of 8 to 10 m² (Mien 2006). In Vietnam, there are a number of sampan communities located in the Ha Long Bay in the north, Huong River and Tam Giang Lagoon in central Vietnam, and the Mekong River in the south.

There are many theories regarding the history of the sampan people in Tam Giang Lagoon. Some anthropologists think sampan may be Champa descendents who fled to the water when their kingdom was lost to the Vietnamese in the 17th century. The Vietnamese government believes that they are of Kinh descent (the majority ethnic lowland Vietnamese), who attempted to settle in the area from the 11th to the 19th century during the Ly, Le and Nguyen dynasties (Hong and Thong 2000). At that time, many agricultural villages had already been established, leaving only the poorest land available for cultivation. Newcomers to the area had less opportunity to access land which was good for agriculture and were marginalized by the large society. Eventually, these marginalized groups moved onto bamboo boats or sampans, which became their homes and source of livelihood. The government also argues that there was another wave of sampan people who fled to the water to escape the ravages of the Vietnam War (Hong and Thong 2000).



Photo by Ta T.T. Huong (2006)

Figure 3.14: Photos of a sampan community

Sampan communities were a marginalized group. A clear division still exists between land-based communities and sampan communities. The sampan people tend to have lower incomes, are landless, and lack access to government services, such as health and education (Hong and Thong 2000). “Landlessness” in this case means that a person was not permanently buried in a tomb after passing away which is considered essential in Vietnamese culture to ensure a successful after-life. Sampan communities were scorned by land-based society members who considered them not only as landless, but also poor and uneducated. In turn, sampan communities were apprehensive about contacting land-based communities and considered themselves isolated from the land dwellers. Such perceptions meant that the sampan dwellers were largely disconnected from the land-based society with their relationship limited mostly to trade (Hong 2002).

Traditionally, sampan dwellers in Tam Giang belonged to fishing communities of about thirty boats referred to as “*Vạn*” (Ruddle 1998; Hong and Thong 2000; Phap 2000). Land-based villagers called sampan dwellers “*dân vạn đò*” or “*dân thủy diện*”, which are derogatory terms. The village I worked with, “*Thủy Diện*”, has its origin deep in the past and clearly shows the origin of local villagers. The “*Vạn*” was formed as groups of relatives and people using similar types of fishing gear in specific areas (Ruddle 1998). Many “*Vạn*” formed an arch-village called a “*tổng*” and might be managed by a land-based village (e.g., Ha Trung village) (Mien 2006).

Sampan communities, as well as some land-based fishing communities in Tam Giang Lagoon were classified into two groups based on the type of fishing gear they owned. Fixed fishing gear groups with larger capitals and investments formed “*Vạn đại nghệ*”, while mobile fishing gear groups were grouped with poorer sampan dwellers and formed “*Vạn tiểu nghệ*”. Traditionally, “*Vạn*” was considered as “*a self-management unit*” (Phap 2002) that controlled its fishing ground and managed the area’s fishing activities. This form of management of “*Vạn*” could be understood as community-based management.

3.5.2 The resettlement of sampan communities

The resettlement policies aimed at moving the sampan to land began after the historical typhoon in 1985, which killed 604 people and injured 234 people with another 98 missing (CECI 2003a). Initially, the National Assembly of Vietnam provided direction to the Provincial People's Committee to design a policy framework promoting the resettlement of the sampan people (CECI 2003b). Following the provincial policies, district governments developed their own strategies and resettlement plans. Provincial and local government provided physical and financial support for the resettlement process. Land, construction materials, and cash were provided for building houses. At the district level, the Division of Agriculture and Rural Department was the main stakeholder responsible for the resettlement. Commune government officials, specifically the Vice Chairman and staff in the Department of Agriculture and Land Management, facilitated the district strategies to identify the resettlement location and encouraged sampan people to resettle. Currently, there are still more than 4,000 sampan people living on Tam Giang Lagoon (Table 3.7).

Table 3.7: Current sampan households in Thua Thien Hue Province

Districts	No. of communes with sampan people	Sampan households	No. of sampan people
Quang Dien	5	120	487
Phong Dien	4	65	332
Huong Tra	1	26	107
Phu Vang	10	221	1078
Phu Loc	7	468	2101
Total	27	900	4105

Source: Thua Thien Hue provincial government statistics (2007)

Although settled households have no access to agriculture land and there is limited land available for settlement, the resettlement in Tam Giang Lagoon is seen as providing access to better education and non-fishing activities. The resettlement is also helpful in strengthening local social networks of villagers as they establish a new village (DaCosta

and Turner 2007), reduce the gap with the land-based community, and re-integrate into a land-based society. According to Ha, an interviewee, the resettlement not only tightens the kinship relations, but also creates new relationships with neighbours and other villagers and creates opportunities to participate in different social organizations. Moreover, the resettlement in combination with the expansion of aquaculture enables local villagers to diversify their livelihood possibilities.

While the resettlement process has resulted in many benefits, such as new livelihood opportunities, the resettlement process has also created many challenges. For example, because they lived in boats, sampan people did not have strong non-fishing related skills which would aid them in activities such as animal raising, food processing, etc. Because of the lack of skill sets, some households chose to return to living on boats. Some sampan household found it inconvenient live on land and to return to water for their fishing activities; choosing to return permanently to living on the water. Also, the land area allocated to each household was insufficient for extended families; therefore, some sampan offspring could not afford to purchase land for a new house and were forced to return to sampan. Another difficulty in the settlement process was linked to the government's financial support for the settlement. Government funding came after the construction had been completed (DaCosta and Turner 2007); some households suffered from outstanding loans, which made it more difficult to get credit. Also, the 1999 flood was very traumatic with water levels rising above the roofs of many houses. After the flood, villagers were forced to take out loans to repair and strengthen their houses; however, the investment was beyond their capacity to pay. Households who returned to sampan, but who wanted to return to dwelling on the land faced even more difficulties; government funding was discontinued, there was an even greater land scarcity in the resettlement areas and even higher construction costs.

CHAPTER 4.

Resource access and property rights



Source: http://www.geotecnologie.unisi.it/Formazione/International_Courses/GCLM/index.php

Figure 4.1: GIS Map of Sam Chuon area in 2006



Figure 4.2: Current use of Tam Giang Lagoon

Photo by Truong Q. Hoang (2005)

The nature and distribution of property rights are critical for determining how resources are used and conserved. In this project, property rights refer to the central and local institutions governing resource access and individual rights to those resources (Bromley 1997; McElfish 1994). Property rights determine who has access and how they use the lagoon resources (Wiebe and Meinzen-Dick 1998). Chapter four's main objective is *to examine the changes in resource access and various types of resource use in the lagoon*. The chapter begins by reviewing the theoretical literature governing the research and how it applies in the context of Tam Giang Lagoon. Attention is paid to the two main causes of change in property rights and resources access: Vietnam's complex political history and the development of aquaculture. Institutions, formal and informal, are then discussed with attention paid to the influence of fisheries management on the lagoon. The chapter continues with an analysis of different types of lagoon use and property rights according to Vietnamese laws and local customs. The chapter concludes with a discussion of the evolution of lagoon ownership systems and constraints in formal institutions in lagoon management.

4.1 Coastal commons

4.1.1 Characteristics of coastal commons

Commons have two important characteristics: (1) *excludability* or the control of access of potential users, which is costly and may be impossible; and (2) *subtractability* or the ability of each user to subtract from the welfare of other users (Feeny *et al.* 1990). Based on these two characteristics, common-property resources are defined as *a class of resources for which exclusion is difficult and joint use involves subtractability* (Ostrom *et al.* 1999). In the context of Tam Giang Lagoon management, excludability and subtractability remain controversial issues. Customarily, it was said that “farm land is private and water areas are open” - “*điền tư ngư chung*”. In Vietnam, lagoon resources are formally government property. However, aquaculture has resulted in an informal privatization process, which excludes the mobile group from the large fishing grounds.

The boundaries between the four communes, Thuan An, Phu An, Phu My and Phu Xuan, are not as defined as indicated on the map (Figure 4.1). There are buffer zones between the villages in Sam Chuon. In the Phu An Commune, a number of net-enclosures have been removed and fishing grounds have been reserved for nursery areas. However, these fishing grounds are still available for mobile gear fishers from the Phu An commune. Fishers in Thuy Dien – Phu Xuan also use mobile gear in the buffer zone areas between these villages and sometimes intrude into the nursery areas in Phu An.

My family is registered as people of the Thuy Dien village, Phu Xuan Commune, but we pay taxes to the Phu My Commune. Our fishing ground more or less belongs to both communes, but Phu My Commune claims that the fishing ground administration belongs to them. (Hang, a net-enclosure owner, December 2006)

Fishery resources are mobile, seasonal and migratory. These features make lagoon resources more challenging in terms of excludability and management than other commons (Wilson 2002). Dealing with the two problems of excludability and subtractability makes the coastal commons management complex. The roles of management are critically important in this context.

4.1.2 Property rights and bundles of rights

Property rights refer to the authority to undertake particular actions related to a specific domain (Hardin 1968; Schlager and Ostrom 1992 p. 250). Property rights are classified as two levels: an operational level and a collective-choice level (Schlager and Ostrom 1992 p. 251). With all resource types, the most relevant operational-level rights are *access* and *withdrawal*. Collective-choice rights including *management*, *exclusion* and *alienation* are especially important in participating in the definition of future operational-level rights. Ostrom and Schlager (1996) have discussed five types of rights as follows:

1. *Access*: The right to enter a defined physical area and enjoy non-subtractive benefit.
2. *Withdrawal*: The right to obtain the resource units or “products” of the resource.
3. *Management*: The right to regulate internal use patterns and transform the resource by making improvements.

4. *Exclusion*: The right to determine who will have a right to access the resource and how that right may be transferred.

5. *Alienation*: The right to sell or lease either or both of the above rights.

According to Ostrom and Schlager (1996), these rights are independent of one another. For example, villagers once had access rights without withdrawal rights in the navigation lanes. Currently, they have access rights, but no management rights in Tam Giang Lagoon’s main waterway systems. In other words, individuals or collectives frequently do not hold a full set of rights. Also, this varies from user group to user group in the lagoon. To hold some of these rights implies the possession of others. The exercise of one’s withdrawal rights is not meaningful without the rights of access; alienation rights depend upon having the ability to transfer rights (Schlager and Ostrom 1992). Consequently, researchers discuss the importance of a ‘bundle of rights’ rather than any single right (Table 4.1).

Table 4.1: Bundle of rights

	Owner	Proprietor	Claimant	Authorized user	Authorized entrant
Access	X	X	X	X	X
Withdrawal	X	X	X	X	
Management	X	X	X		
Exclusion	X	X			
Alienation	X				

Source: Adapted from Schlager and Ostrom (1992 p. 252); Ostrom and Schlager (1996)

A broader view point has property rights defined as “a bundle of rights and responsibilities of individuals or groups to the use of a resource base” (Berkes 1995). In this definition, property rights are not only the rights people receive to use the resources, but it also refers to the proper exploitation and efforts to maintain and enrich the resources. A particular combination of property rights held by users of a resource system is considered a property-rights regime (Schlager and Ostrom 1992). In the literature, a property-right regime is classified into four categories: (1) *Open access*; (2) *Communal*

property; (3) *Private property*, and (4) *Governmental property* (Feeny *et al.* 1990). This classification is important when looking to understand the foundation and institutions of the regimes and to analyze their two important characteristics: excludability and subtractability. Open access is considered as the absence of well-defined property rights. Under government property, rights to the resources are vested exclusively in the government for controlling access and regulating use. Individual rights to exclude others and to regulate the use of resources are referred to as private property rights. In communal property, a community of interdependent users excludes outsiders and regulates the internal use (Ostrom *et al.* 2002). In practice, many commons, especially coastal resources, are held in overlapping and conflicting combinations of these regimes (Feeny *et al.* 1990).

The research analyzes the five property rights to understand the different types of lagoon use in different periods. It distinguishes between whether the rights held by individuals and communities are *de facto* (rights originate among resource users without the government recognition) or *de jure* (rights are legally recognized and enforced by the government) (Schlager and Ostrom 1992). *De jure* and *de facto* rights may co-exist, overlap, complement, or conflict with one another. *De facto* collective-choice arrangements can produce operational rules closely matched to the social-ecological systems in the lagoon (Schlager and Ostrom 1992). Some *de facto* rights have been recognized by government and become *de jure* rights. *De jure* rights in the lagoon issued by different government levels co-exist and sometimes conflict with each other.

4.1.3 Coastal commons and complex adaptive systems

Complex adaptive systems theory provides a strong conceptual foundation to analyze the complexities in both social-ecological systems and to understand processes of change and adaptations. Complex adaptive systems are defined as “systems with inherent uncertainty in their dynamics that tend to have multiple stable states and that exhibit self-organization” (Resilience Alliance 2009). A complex system often has a number of attributes that are not observed in simple systems, including nonlinearity, scale, self-organization, uncertainty and emergence (Levin 1999; Gunderson and Holling 2002;

Berkes *et al.* 2003). *Emergence* is the development of properties in a self-organizing system, as the outgrowth of interactions between components (Levin 1999).

Some of the attributes of a complex adaptive system are inherent in coastal commons (Wilson 2002). Lagoon ecosystems remain subject to natural variation and are characterized by cycles of growth and depletion which make them both unpredictable and uncertain. Uncertainty is inherently linked to nonlinearity (Berkes *et al.* 2003). Recognition of the patterns of *uncertainty* and *non-linearity* is important not only for control, but also for gaining a better understanding of the lagoon systems. The lagoon ecosystem has a tendency to reorganize at critical points of instability through feedback mechanisms, thereby, making *self-organization* its defining property (Berkes *et al.* 2003 p. 6). The Sam Chuon area may be considered as an ecosystem itself; but it is a part of the larger Tam Giang Lagoon, which can also be considered as an ecosystem. The larger ecosystem encompasses the smaller area.

Coastal commons are complex adaptive systems with the integration of social and ecological systems with two-way feedbacks (Berkes 2003). Resilience is one of the emergent properties of such systems, which refers to the capacity of a system to buffer perturbation, to reorganize, and to learn and adapt (Walker *et al.* 2004; Resilience Alliance 2009). The management of coastal commons is an interdisciplinary subject (Berkes 2003), which requires attention to biodiversity and ecosystem health, as well as a broader understanding of human behaviour and how people use and misuse coastal commons (Ostrom *et al.* 1999). Berkes (2006) has suggested that commons management should be understood as the management of complex systems.

4.1.4 Cross-scale linkages in commons management

Scale is critical in resource management because it defines the scope of an issue and affects people's perception of natural and social systems (Hull *et al.* 2002). Commons management occurs at multiple scales, which refers to spatial (physical extent), temporal (rates, durations, frequencies), and organizational (the scope of management and institutions) (Cash and Moser 2000). Several kinds of scale mismatch problems are

pervasive (Cash *et al.* 2006). One of the biggest challenges in addressing lagoon management problems is perhaps the mismatch between the organizational scale and spatial scale of the problem. Indeed, resource boundaries rarely match institutional boundaries (Folke *et al.* 1998). Commons management problems are not maintained at any specific scale. Rather, they tend to occur at multiple scales. Berkes (2006) states that there should not be political levels that perfectly match the ecosystem levels. Interaction occurs within and across scales, leading to substantial complexity in dynamics (Cash *et al.* 2006).

Institutions are the essential aspect of social-ecological systems (Bromley 1997). The focus on institutions emerges from the commons literature documenting a rich diversity of ways in which rules can be made to avoid the commons dilemma (Berkes 2002). Ostrom (1990) proposed a set of eight design principles for commons institutions in which the eighth principle is for nested systems. The principle appears to characterize the scale issue in commons institutions.

Cross-scale institutional linkages mean something more than management at several scales, isolated from one another (Berkes 2002). This angle is relevant to the study of changes in resource access in the lagoon. Patterns of land use and the sustainability of the lagoon's ecosystems are greatly affected by the interplay of national and provincial regulatory systems and local practices guiding the actions of local users (Young 2002).

4.2 Changes in property rights and resource access

4.2.1 Historical changes in property rights and resource access

In Vietnam, property rights and resource access have changed in various time periods. The major cause of change has been Vietnam's complex political history. The most fundamental changes in term of property rights and resource access in Tam Giang Lagoon can be summarized as three main periods: (1) village-based resource management (prior to 1975), (2) the collectivization and centrally planned economy

(1975-1986), and (3) the market economy (post 1986). These major changes are summarized in the Table 4.2.

Table 4.2: Recent changes in property rights and resource access

Changes in Property Rights in Vietnam	
Prior to 1975	- Prior to re-unification - Lagoon areas: national property were managed by village authorities Some fishing grounds became <i>de facto</i> private
1975-1986	Collectivization– centrally planned economy National ownership of all natural resources Fishers were integrated in fishing units “ <i>Production collectives</i> ”
Post 1986	Policy reform – Market-oriented economy Land use rights Lagoon areas: national property under the management of local government (province, district, and commune)

Prior to 1975, natural resources, including lagoon areas, belonged to the feudal government followed by the French government and were controlled by village authorities, who set taxes on various fishing activities within their political boundaries. Although it was said that “*farm land is private and water areas are open*” – “*điền tư ngư chung*”, the lagoon was not open-access. The village authority auctioned off fishing ground rights for fixed gear fishing. The auction winners acquired long-term rights of use and in return, were required to pay tax to the village authorities. Although they only had rights to access and withdrawal, they were able to sell or transfer the location of fixed gear fishing grounds to their descendants (Phap 2000; Phap *et al.* 2002). Therefore, the fishing ground became the *de facto* private property of fish corral households. Mobile gear fishers could only access open lagoon areas (Ruddle 1998; Phap 2000), which can be seen as a form of common property. Although open lagoon areas were open to all villagers, village authorities regulated the use of mobile fishing gear. After 1945, there was a difference in the two systems of economic production in the North and the South of Vietnam. While the village-based resource management systems remained unchanged in the South, including in the Tam Giang Lagoon, fisheries production was collectivized in the North (Tien 1995; Ruddle 1998).

After 1975, all natural resources were government property following the collectivization already established in the North. Land was assigned to the agricultural co-operatives. Therefore, a farmer who wanted access to land had to join the co-operative. The collective systems were also applied to fishing households in the lagoon. The fishing ground allotted to households in the past was allowed to continue (Tuyen 2002), but fishers had to integrate into agriculture-fishing units as “*production collectives*”, an equivalent organization to agriculture cooperatives (Ruddle 1998; Phap 2000). Although all fishers in the lagoon were supposed to be members of different official production collectives, some mobile gear fishers were not sure whether they were members or not (Tuyen 2002).

Officially, fishing grounds were issued to fixed gear production collectives. These collectives provided subsidies for fishing gear and boats and were intended to control the fisheries production. However, there was a lack of economic incentive for fisheries development in these collectives. Fishers retained their production and sold it on the open market. As a consequence, the commercial fisheries developed very fast because of the cheap input and the high demand in the open market. Eventually, the production collectives proved to be inefficient (Ruddle 1998). Moreover, during the collectivization, traditional resource management institutions were ignored (Ruddle 1998). Although some unwritten rules have remained, the traditional institutions are no longer effective. Nowadays, “*Vạn*” institutions are mentioned in traditional ceremonies (Mien 2006). Generally, collectivization undermined the traditional resource management system in Tam Giang Lagoon.

In 1986, the Vietnamese government introduced “*Đổi Mới*”², a policy reform which resulted in a transition to a market economy. Subsequently, land tenure has significantly changed and each household has become the basic production unit (Kerkvliet and Selden 1998). The main changes in land tenure are shown in Table 4.3. In the Sam Chuon area, local households claimed their fishing grounds from the collectives and occupied other fishing ground areas to make new fish corrals. Consequently, a large fishing ground was

² *Đổi Mới* : A policy change from centrally-planned economy (collectivization) to a market economy in Vietnam in 1986

de facto privatized in the process of economic transition. Privatization and loss of commons are further addressed in the next section.

Table 4.3: Major land tenure reforms starting after the 1980s

Year	Major reforms
1981	Directive 100 did not alter the collective production relations, but allowed producers to keep 100% of any surplus they produced over the contracted output.
1986	Policy reform and market economy.
1987	Land Law <i>No.LCT/HĐNN8</i> , issued on December 29 th , 1987 from the National Assembly: the law recognized land use rights of individual households and assigned use rights on 15-year renewable leases. However, land use rights were not transferable and land could not be used as collateral for loans.
1993	Land Law issued July 14 th , 1993 from the National Assembly: the law allowed land use rights holders to transfer and mortgage their land use rights for a specific period.
1998	Law amending and supplementing a number of articles of the Land Law <i>No.10/1998/QH10</i> , issued on December 2 nd , 1998 from the National Assembly: the law provided long-term and stable use of 20 years for growing annual plants or aquaculture and 50 years for planting perennial trees, and allowed for the exchange, transfer, lease, bequeathment and/or mortgage of the land use right under certain conditions.
2001	Law amending and supplementing a number of articles of the Land Law <i>No. 25/2001/QH10</i> , issued on June 29 th , 2001 from the National Assembly: The District People’s Committees shall grant land use right permissions to households and individuals.
2003	Land Law <i>No. 13/2003/QH11</i> , issued on November 26 th , 2003 from the National Assembly: land use rights are considered as a commodity that will be openly traded on the market.

Source: The Vietnamese National Legal database (2009) and Vietnamese Government Web Portal (2009)

4.2.2 Aquaculture development and privatization

Within the context of a market economy, shrimp farming was a high development priority of both the central and local governments. The unprecedented success of shrimp farming in the late 1980s and early 1990s was the main impetus behind the restructuring of Vietnam’s farming systems and specially the massive shift to shrimp aquaculture (Nhuong *et al.* 2003).

Since 1987, aquaculture focused on seaweed culture has been a priority in Tam Giang Lagoon. However, prior to 1995, only government enterprises were assigned space in the lagoon to operate aquaculture. In 1994, the Prime Minister issued National Decision 773-TTg, an action which launched a program focussing on the utilization of waste land and barren land, river-banks, seashore areas, and water surface areas, stipulating that open coastal areas can be used for shrimp and crab farming. Following the national policy, shrimp culture in the lagoon quickly increased almost 50 fold in five years from 1990 to 1995 (Mien *et al.* 2000).

In the Sam Chuon area, local households claimed their fishing grounds from the collectives and occupied other fishing grounds to make new fish corrals. Consequently, a large fishing ground was privatized in the process of economic transition. In 1995, several fish corral owners applied for a license to convert their fish corral fishing grounds into aquaculture (Phap *et al.* 2002). According to local regulations, only fish corrals located at the edge of the lagoon can be converted into earth pond and the maximum conversion size was up to one hectare. According to Department of Fisheries Statistics, the total area of aquaculture in the whole lagoon reached 10 km² in 1999, 17 km² by mid-2000, 18.5 km² by the end of 2000, 27 km² by the end of 2001 and 40 km² in 2005 (Nam 2005; Xuan and Hoa 2005).

Following general trends, fixed gear fishers started to set up small net pens in their fish corrals to store small shrimp and fish to get a marketable size (Mien 2006). Gradually, the fishers spontaneously began using bamboo and multiple fishing nets to enclose their fish corrals into net-enclosures. Within the net-enclosures, a smaller area was surrounded by fine mesh size net layers for aquaculture. Fish corrals and gillnets were used in the area outside of the aquaculture plot for capture fishing. This combination of fishing and aquaculture was initiated by fixed gear fishers within their net-enclosures located in the Phu Tan commune, in the Sam Chuon area (Phap *et al.* 2002). More and more fishers in Sam Chuon have set up net-enclosures around their fishing grounds without official approval by government authorities. Fishing grounds for mobile gear fishers have been significantly reduced. In other words, mobile gear fishing groups have been excluded from the already occupied fishing grounds.

Resolution No.03/2000/NQ-CP dated February 02, 2000 on the farm economy and Resolution No.09/2000/NQ-CP dated June 15, 2000 on guidelines and policies concerning the restructuring of the agri-production economy were responsible for a major shift in the agriculture sector - the swift conversion of saline fields, ineffective rice fields and uncultivated areas to ponds for aquaculture (Anh 2006). The two major policies have also been welcomed at the provincial level by the complimentary introduction of a number of decisions to promote the farm economy, especially shrimp aquaculture.

Box 4.1: Government regulations regarding aquaculture development in Vietnam

Resolution No.03/2000/NQ-CP: “The farm economy is way of organizing the production of commodity goods in agriculture and the rural areas by relying chiefly on the household families aimed at expanding the scope and raising the efficiency of production in cultivation, livestock breeding, aquaculture, forest planting, and associating production with processing and the consumption of farm, forestry and aquaculture products”. “Family households that engage directly in agricultural and forestry production or aquaculture, that live in the locality and have the wish and capability of using land to expand production, shall be considered by the commune’s People’s Committee for renting land to develop their farms in addition to the land allotted to them within the quota of the locality.”

Resolution No.09/2000/NQ-CP: “Shrimp is a key product from our country’s aquaculture business. To develop the rearing of brackish water shrimp and fresh water shrimp, to combine industrial intensive rearing with semi-intensive rearing and ecological rearing, to increase the areas for intensive and semi-intensive rearing of different shrimp varieties to over 100,000 hectares, to increase the production output of different kinds of shrimp reared with technological methods to over 300,000 tons/year. Fish and other aquatic products: to strongly develop the rearing of various kinds of freshwater, blackish and sea fish as well as other specialty fish.”

Source: The National Legal database, Vietnam (2009)

In summary, in addition to the complex political history, aquaculture’s impact has been the second major reason for changes in resource access and property rights in Tam Giang Lagoon. Aquaculture development has privatized fishing grounds in the lagoon and

reduced available water areas for mobile gear fishers. The effects of aquaculture development and privatization on different user groups are further addressed in the next chapter.

4.3 Institutions for coastal management

In commons management, institutional interplay is a common occurrence. Institutions interact with one another as the result of both functional interdependencies arising from inherent connections and strategic links arising from political design and management. The interaction contains both horizontal (at the same level of social organization) and vertical (across levels of social organization) dimensions (Young 2002). In Vietnam, there is a clear distinction between the two relations in the current legal authority structure. The vertical (*dọc*) dimension is the relationship between government organizations within the hierarchy (e.g., between a ministry and the corresponding departments at the provincial level). The horizontal (*ngang*) dimension is the relationship between government organizations at the same level (e.g., between two departments at provincial level).

The vertical dimension deals with the relationship of the Central Government with the People's Councils (*HDND*) and with the People's Committee (*UBND*). According to the 1994 Law (Clause 8), People's Councils are under the supervision and guidance of the National Assembly Standing Committee and the Central Government. The People's Committees at all levels are the local representatives of the central government. The 1992 Constitution and its revised clauses (2001) grant the Prime Minister the power to endorse the appointment of the heads of the provincial People's Committees and if necessary, to remove them. At the district and commune levels, the People's Council elects its corresponding People's Committee with the approval of the chairperson of the higher level.

At each administrative level, there are line representatives under the management of ministries organized into departments at the provincial level (*sở*), divisions at district

level (*phòng*) and sections at commune level (*ban*) (Fforde 2003). Clause 53 of the 1994 law states that these line agencies “help their corresponding People’s Committees realize government management tasks in the locality and ensure a unified management of the sector from the centre to the locality.”

Table 4.4: Major institutions governing lagoon resource management

National level	<p><i>Ministry of Agriculture and Rural Development (MARD)</i></p> <ul style="list-style-type: none"> · Aquaculture Directorate · National Aquatic Resource Exploitation and Protection Directorate (NADAREP) · National Animal Health Directorate · National Agriculture Forestry and Fisheries Quality Assurance Directorate (NAFIQUAD) · National Agriculture and Fisheries Extension Centre <p><i>Ministry of Natural Resources and Environment (MNRE)</i></p> <ul style="list-style-type: none"> · Vietnam Environment Administration · Vietnam Land Management Administration · National Land Use Right Registration Office
Provincial level	<p><i>The Provincial People’s Committee (PPC)</i></p> <p><i>Department of Agriculture and Rural Development (DARD)</i></p> <ul style="list-style-type: none"> · Branch of Aquaculture Directorate · Branch of Aquatic Resource Exploitation and Protection Directorate · Branch of Animal Health Directorate · Centre of Agriculture Forestry and Fisheries Extension · Centre of Fingerling for brackish and marine aquaculture <p><i>Department of Natural Resources and Environment (DNRE)</i></p> <ul style="list-style-type: none"> · Branch of Environmental Administration · Branch of Land Management Administration · Provincial Land Use Right Registration Office
District level	<p>The District People’s Committee (DPC)</p> <p>The District Division of Agriculture and Rural Department</p> <p>The District Division of Natural Resources and Environment</p> <ul style="list-style-type: none"> · District Land Use Right Registration Office
Commune level	<p>The Commune People’s Committee (CPC)</p> <ul style="list-style-type: none"> · The Department of Agriculture and Land Management <p>Social-political organizations of fishers</p> <p>Village authority</p>

The Ministry of Agriculture and Rural Development and the Ministry of Natural Resources and Environment are currently the two main institutions responsible for lagoon

resource management in Tam Giang Lagoon. Accordingly, in the local government levels, there are corresponding provincial departments and district divisions. The major institutions governing lagoon resource management is represented in Table 4.4.

4.3.1 National and Provincial levels

The Ministry of Fisheries and Provincial Departments of Fisheries were the most important government institutions governing aquaculture development in the lagoon and generally in the whole country. In July 31, 2007, the Ministry of Fisheries (MOF) was merged with the Ministry of Agriculture and Rural Development (MARD). In early 2008, following the streamlining of central ministries, government organizations in two ministries and the corresponding provincial departments were also restructured to reflect their central government counterparts.

Thua Thien-Hue Department of Agriculture and Rural Development (DARD) is the functional department belonging the Provincial People's Committee and MARD. At the provincial level, DARD cooperates with local authorities to reach consensus in land use management. The organization is also responsible for provincial fisheries activities including aquaculture, exploitation and the protection of aquatic resources. DARD regulates the cropping calendar as well as the tiger shrimp stocking calendar. One of DARD's Vice Director is in charge of aquaculture development.

The Department of Natural Resources and Environment is responsible for resource use and management in Thua Thien-Hue Province, including lagoon resources. Although the Land Use Right Registration Office is under the management of DNRE, the "Sổ đỏ" land use title is issued by the Provincial People's Committee.

4.3.2 District and Commune levels

There is no separate division for fisheries in Phu Vang District, which differs from the provincial structure which does contain a separate division of fisheries. The Division of Agriculture and Rural Department is associated with the District People's Committee

(DPC) and is responsible for agriculture and fisheries management in the entire Phu Vang District. The Division has staff who are responsible for both agriculture and fisheries management in the communes they are assigned to. For example, one staff member is responsible for four communes including Phu Xuan, Phu An, Phu My, and Thuan An in the Sam Chuon area.

The Phu Vang Division of Natural Resources and Environment is responsible for resource use and management in the district. For land and lagoon use permission, local people have to submit an application form to the District Land Use Right Registration Office. After an assessment, the office submits the application for the DPC's approval.

At the commune level, the Vice-Chairman of the Phu Xuan Commune People's Committee (CPC) and one staff member from the Department of Agriculture and Land Management are responsible for fisheries management in the commune. In peak seasons, they have meetings every week with the representatives from the District Division of Natural Resources and Environment, Provincial Directorate Branches, and Centre of Agriculture Forestry and Fisheries Extension. The meetings focus on aquaculture development, especially current aquatic diseases occurring in the commune.

4.3.3 Village authority

Differing from other agricultural villages in Phu Xuan Commune, villagers in Thuy Dien were once sampan communities referred to as "*Vạn*" (Ruddle 1998; Hong and Thong 2000; Phap 2002). Traditionally, "*Vạn*" were considered "a self-management unit" (Phap 2002) that controlled its fishing ground and managed the fishing activities within a designed area (see section 3.5.1). Sampan communities were classified into two groups based on the type of fishing gear they owned: the fixed fishing gear group with its access to capital and large investment in gear and the mobile fishing gear group which were the poorer fishers (Phap 2002). In the sampan society, fixed gear fishing groups were dominant due to their considerable socioeconomic power, which was reflected in some "rule in use" (Ostrom 1992) in resource access. For example, mobile gear fishers were not allowed to fish at the mouth of fish corrals. During the collectivization, "*Vạn*" were

integrated into agriculture-fishing units (Ruddle 1998; Phap 2000) and the role of Van in resource management declined (Ruddle 1998). “*Vạn*” institutions were undermined and nowadays are only mentioned in traditional ceremonies (Mien 2006). Some traditional rules are no longer effective in the current society. Rules such as the rule of minimum distance between fish corrals (1 km) and between fish corrals, and other fixed gear (1.5 km) are no longer effective (Ruddle 1998).

Villages are not recognized at a government level in Vietnam; however, the village chief is appointed by the People’s Committee and becomes a member of the People’s Committee. Thuy Dien village has its own rules for governing the social relations as well as for governing the use of land and lagoon resources. These rules have been documented in the convention of cultural lifestyle in Thuy Dien village - “*Quy ước xây dựng nếp sống văn hóa thôn Thủy Điện*” and signed in 2002 by Phu Xuan CPC, representatives of different social organizations and the village chief, who is a member of the CPC. Besides the documented rules, other unwritten rules in “*Vạn*” have remained, especially rules governing the use of lagoon resources for fixed fishing gear and mobile fishing gear. Villagers seem to obey the unwritten rule more than the conventional rules. For example, in the Article 8, villagers are not allowed to use the primary waterways for aquaculture; however, many primary waterways have been encroached on and decreased in size by both net-enclosure users.

4.3.4 Social-political organizations

Since the resettlement of the sampan people, the now land-based villagers have had more opportunities to join social-political organizations such as the Women’s Union, Farmers’ Union, Youth Association, and Fisheries’ Association. These organizations play an important role in livelihood development and resource management at the local level. In Thuy Dien, these organizations also supported the process of settlement of sampan dwellers (DaCosta and Turner 2007).

My family participates in many different organizations. I am currently a member of the Women’s Union while my husband is in the Farmers’ Union. The participation in these organizations opens opportunities for us

to get access to loans from the Vietnam Bank for Social Policies (VBSP), as well as training on aquaculture techniques. I go to meetings every two or three months with other members in the organization to discuss family life, education for children, problem solving, and so on. After three years of being a part of the Association, I feel I have stronger ties with other members, as well as some connection with local government organizations. It seems to be easier for us to obtain official documents if it is needed (Lan - a female fisher, June 2006).

The social-political organizations are nationwide and are recognized at four political levels (national, provincial, district, and commune level) with sub-organization at the village level (Brzeski and Newkirk 2000). The Fisheries' Association represents the fishing society at the different levels from the village to the national level. The Fisheries' Association is a sub-association of the Provincial Fisheries' Association of Thua Thien Hue Province (PFA) and of the Vietnam Fisheries' Association (VINAFIS). The national association was established in 1992 by the former Ministry of Fisheries. According to Decision No. 4260/2006/QD-UBND of The People's Committee of Thua Thien Hue Province on management of lagoon fisheries, Fisheries' Associations are the formal, recognized local community-based organizations for building co-management mechanisms at the village and inter-village or commune levels.

The Fisheries' Association in Phu Xuan Commune was launched with support from the IDRC project in the application of participatory planning in late 2005 (Phuoc 2006). The initial members of the Phu Xuan Fisheries' Association were Thuy Dien villagers who participated in the participatory planning pilot. The Fisheries' Association played an important role in maintaining and enlarging the waterway systems in the commune. Moreover, the establishment of a Fisheries' Association at Thuy Dien Village in Phu Xuan Commune was an effort to empower resource users, as well as to build a bridge between local fishers and government authority. In the first two years since its establishment, the Fisheries' Association has played an important role in maintaining the main waterway systems and reducing the use of destructive fishing gear.

Since the establishment of the Fisheries' Association, the security in this area has been much better. We help each other in taking care of our net-enclosures when someone is busy. Together with local government officers, we patrol to ensure the maintenance of waterways. We organize

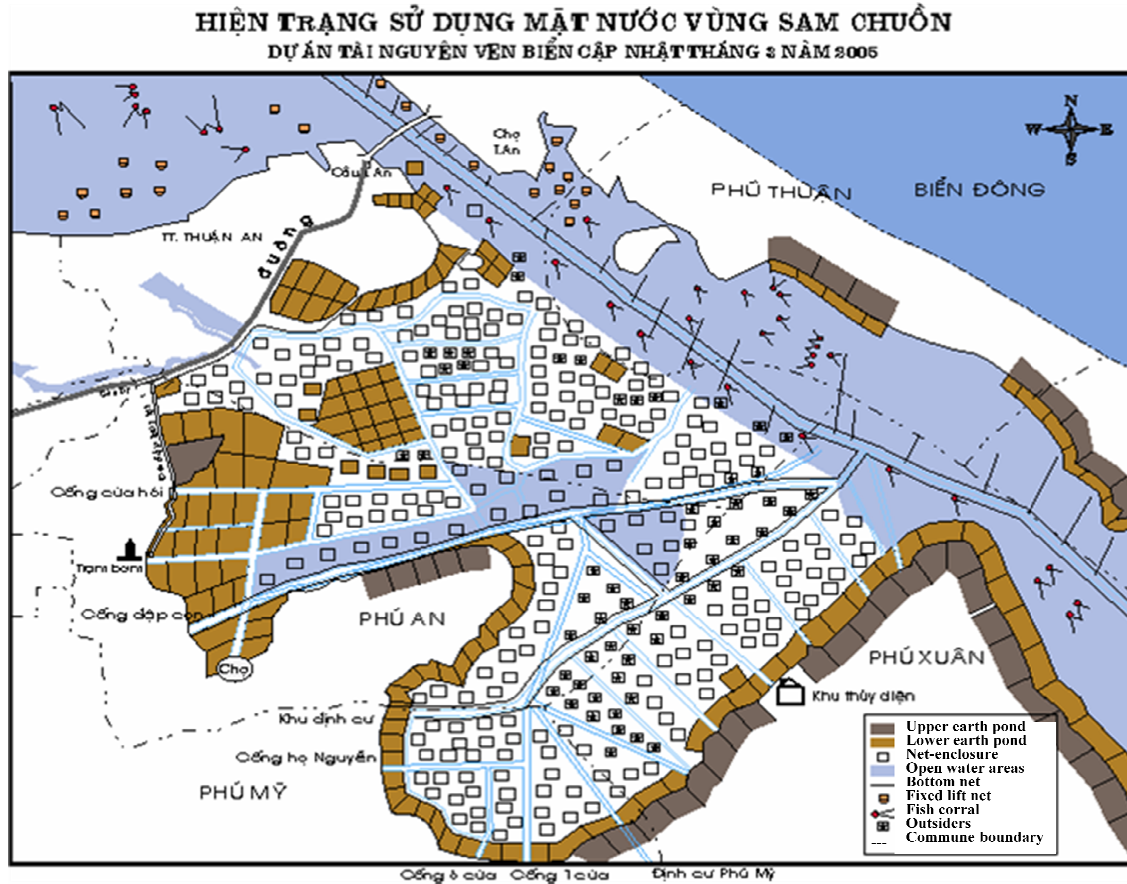
meetings with other fishers to share information on integrated aquaculture and fish disease prevention, and encourage villagers to join the organization (Ly - one of the first members of the local Fisheries' Association in Thuy Dien village, May 2006).

Besides the social-political associations, Hue University and international projects played an important role in the lagoon's resource management activities. The two major projects related to resource management in Tam Giang Lagoon is: (1) The project of Governance and Management of Common Pool Resources in Vietnam funded by IDRC <http://www.cprhue.org/index.php>; and (2) The Integrated Management of Lagoon Activities (IMOLA) Project funded by Food and Agriculture Organization of the United Nations (FAO) and the Italian and Vietnamese governments <http://www.imolahue.org/>. These projects focused on resource management and sustainable livelihoods of the local fishers in the lagoon. Hue University of Science and Hue University of Agriculture and Forestry are the local institutions and implementation partners for the two projects. These projects provided training for local fishers and government officers on sustainable resource use and management, facilitated integrated management plans and strengthened local social-political organizations such as the Fisheries' Association. The contribution of these projects to resource management and livelihood development is appreciated by the local people and government organizations.

4.4 Types of lagoon use and property rights according to laws and customs

There are different types of lagoon use in Sam Chuon. Thuy Dien village is newly settled with sampan households and the residential areas playing an important role in livelihood development. The land allocated for resettlement was not sufficient for all sampan households. The size of their land allocation is enough to sustain the present generation, but is not sufficient for additional future generations to live on. Some offspring from land settled households have returned to living on sampan and fishing for their livelihoods (DaCosta and Turner 2007). In addition, settlement on land is not convenient for fishing activities. For fish corral and net-enclosure owners, being close to their fishing ground is

necessary in order to exclude the access of other fishers. There are no areas which are close to the lagoon's edge for mobile gear fishers; therefore, they must venture further to access the available fishing areas. Consequently, most of them return to living on boats or at patrol houses in the summer.



Source: Truong V. Tuyen (2005)

Figure 4.3: Resource use in Sam Chuon area,³ Tam Giang Lagoon in 2005

There are seven main types of fishing and aquaculture based resource use in the Sam Chuon area: (i) upper earth pond; (ii) lower earth pond; (iii) fish corral; (iv) net-enclosure; (v) small waterway; (vi) main waterway; and (vii) open water areas (Figure 4.3). In different types of lagoon use, the operational rights and collective property rights varies with *de facto* or *de jure* rights. Most of *de facto* rights in the lagoon are rights that are not mentioned in law or government permissions. Although they may or may not be

³ The map focuses on Sam Chuon area only. Other areas, which do not belong to Sam Chuon, may or may not be occupied by net-enclosures and fixed fishing gear. In other words, the map does not show other parts of the lagoon that are open water areas available for mobile gear fishing.

against the law or the government permissions, they are accepted by the local community members, particularly in the village. *De jure* rights are rights mentioned in the law or in the permissions. There are some different types of user permits from different government levels: Land use title from the PPC, district permits from the DPC, and commune permits from CPC. The detailed features of each type are represented in Table 4.5.

Table 4.5: Type of user permissions

<i>Types of permissions</i>	<i>Characteristic features</i>
<i>“Sổ đỏ” Land use title</i>	Fully recognizes the full private rights of residential land, agriculture farm and some aquaculture earth ponds (mainly the upper earth ponds) for 20 years. The permission is renewable after 20 years
<i>District permit</i>	Recognizes the user rights of some of the lower earth pond owners. Five year permission and renewal
<i>Commune permit/ registration</i>	Recognizes the user rights of fish corrals and some of the lower earth ponds. One year permission and renewal

4.4.1 Upper earth ponds

Since the late 1990s, low grade rice fields have been converted into aquaculture ponds, referred to as upper earth ponds (Figure 4.4). The 1993 Land Law provided households with five rights in their residential lands and agriculture farms: the rights of access, mortgage, lease, inheritance, and sale. According to the Land Law, the “*Sổ đỏ*” land title is issued to owners of residential and production areas for 20 years. The land title is also applicable to the upper earth ponds, which were once agriculture land. It recognizes the full private rights of owners for 20 years including alienation rights. In Thuy Dien village, upper earth ponds are not very common. A few household received these ponds from buying or exchanging land with aquaculturists in neighbouring villages.

Most of the upper earth pond users in the Sam Chuon area acquired the land title. However, the land title application procedure takes a long time to process and also

requires a significant amount of investment. Because of the time and financial constraints, some obtained the district permit which only provides user rights for five years, rather than the 20 years. The permits are renewed when they expire. Owners of earth ponds who obtain the five year permit must pay a rental fee. However, the fee is not a large amount of money in comparison to the production taxes, which all earth pond owners have to pay.



Photo by Ta T.T. Huong (2006)

Figure 4.4: Upper aquaculture earth ponds

Although they have full *de jure* private property rights with the aquaculture ponds, the fishers have to follow the larva-stocking calendar from the government for tiger shrimp aquaculture. The calendar is arranged annually and varies from commune to commune depending on changes in the Lunar Calendar and weather forecasts.

4.4.2 Lower earth ponds

In addition to the conversion of agriculture farms to aquaculture ponds, a large area of the lagoon has been enclosed for aquaculture. Dykes have been set up to separate the ponds from water flowing into the lagoon (Figure 4.5). Because of the high start up costs, only wealthy households could afford the initial investment for building a dyke. Poorer households were eliminated from this type of aquaculture by their lack of access to investment capital.



Photo by Ta T.T. Huong (2006)



Photo by Truong V. Tuyen (2005)

Figure 4.5: Lower aquaculture earth ponds

Owners of lower aquaculture earth ponds have full operational rights and collective property rights, but some of them are *de facto* rights. Some lower earth ponds which were established in the early 1990s under government endorsement have applied for the “*Số đõ*” land title. Most owners of lower earth ponds received their five-year permits from the district, while some newly established lower earth ponds obtained their one-year permit from the commune. The district and commune permits recognize the withdrawal rights of lower earth ponds owners. Collective-choice rights are not included in the permits; however, they are accepted customarily. Lower earth ponds have become *de facto* private property with customary collective-choice rights. The one-year permit from the government was used as collateral; however, since the five-year permit is issued by the district, government banks prefer the longer permission.

We enclosed our fishing ground for net-enclosure. After three years, we decided to convert two hectares for earth pond aquaculture. It was convenient for us as our fishing ground was located at the edge of the lagoon. We got the district permit for our earth ponds, but not for the rest of the fishing ground in the net-enclosure. Nobody can exclude us out of the fishing ground; however, the permit was helpful when we asked for a loan from the Provincial Bank of Agriculture and Rural Development (Hiep, an earth pond owner, April 2007)

Similarly to upper earth ponds owners, the owners of lower earth ponds have rights to decide which kinds of aquatic species to culture; however, if they do tiger shrimp farming, they have to follow the government’s larva-stocking calendar.

4.4.3 Fish corrals

Fish corrals are the most common and most important fixed fishing gear in Tam Giang Lagoon, particularly in the Sam Chuon area. Fish corrals have a V-shape made from bamboo and net. There could be a number of traps in a fish corral (Figure 3.6). This type of fishing gear was introduced in the lagoon in the feudal era. Customarily, fishing grounds around the fish corral belongs to the owner of fish corral. No fishing activities are allowed at the mouth of fish corrals. Villagers acquired long-term user rights of the fish corrals from the village authorities through auction (Phap 2000, Tuyen 2002a:41). These fish corrals have been transferred intergenerationally. However, these rights were taxed, but did not include the right of sale (Ruddle 1998). Therefore, fish corrals became private property with some of the *de facto* collective rights.

Following the collectivization, after 1975, as with other parts of the lagoon, the fishing ground in fish corrals was under government ownership and managed by production collectives (Luttrell 2001; Tuyen 2002a). There were a number of production collectives in Phu Xuan Commune. Lagoon fishers become members of production collectives (Ruddle 1998, Phap 2000). Lagoon resources became a combination of government property, common property, and private property. The production collectives were not only government enterprises, but also groups of fishers with similar types of fishing gear. As members of the collective, fixed gear fishers did not own the fishing grounds, but still had the right to access their previous fishing grounds. The production collectives regulated the use of fishing grounds, such as the number of traps in fish corrals and the number of fish corrals in a fishing ground, and excluded outsiders of the units. However, in reality, individuals determined how, when and where they fished. The collectivization, in fact, resulted in inefficient, large fishing groups (Ruddle 1998).

After the policy reform in 1986, households became the basic unit of production. They claimed their fishing grounds from the collectives and simultaneously occupied other fishing ground areas to make new fish corrals. Most fish corral owners have been registered for taxes but may not obtain any user permits (official documents) from local government.

4.4.4 Aquaculture net-enclosures

Since the aquaculture boom of the 1990s, owners of fish corrals used bamboo and nets to enclose some parts of their fish corrals for net-enclosure aquaculture. This aquaculture model is a combination of aquaculture and natural fishing in fishing grounds (Figure 4.6). A small plot was surrounded with double net layers for aquaculture (Brzeski and Newkirk, 2000:32, Mien 2006).



Photo by Ta T.T. Huong (2006)

Figure 4.6: Aquaculture net-enclosures with patrol houses

Net-enclosure and fish corral owners have to pay taxes to the commune government in order to get permits. Taxes are based on the size of the area they register for fish corrals and net-enclosures. The fishing grounds they register and pay tax on are indicated in the permit; however, in reality, the fishing ground in net-enclosures is larger than what is registered. Some net-enclosure users obtained the one-year permits from the commune government while others did not. As indicated by most net-enclosure users in interviews, as well as in group discussions, district governments no longer issue the five-year permit to net-enclosure fishers.

My net-enclosure was one part of my mother's net-enclosure. After we had a child and bought my small piece of land, my mother decided to cut a third of her net-enclosure for us. We just made a layer of net and bamboo to split our net-enclosures. As usual, we pay taxes together. I do not need to have my own commune permit. It does not make any difference if we register separately. No one cares for that. We just keep it like what it was (Cu, a net-enclosure, March 2007).

Whether or not net-enclosure users applies for a commune permit, fish corrals and net-enclosures are considered as *de facto* private property with all customary collective-choice rights. These rights allow net-enclosure owners to decide whether they set up their aquaculture plot or use other fixed fishing gear in their fishing grounds and to exclude other fishers from their fishing ground by adding layers of net surrounding their net-enclosures. These owners also have *de facto* rights to transfer their property rights between generations and to different resource users. However, it is noted that customary exclusion rights are not secured if net-enclosure owners do not guard their fishing grounds.

The size of fingerling and larvae for net-enclosure aquaculture are normally more diverse than those used in earth ponds. However, they normally use two layers of nets with small mesh size. In some instances, the high densities of net-enclosures have obstructed the water-flow in the area, negatively impacting water quality. In some other villages, a number of net-enclosures have been converted to earth ponds although they are not close to the edge of the lagoon. According to the government's directive, net-enclosures in the Sam Chuon area should be removed by 2010; however, it is not clear how this will be enforced in the Phu Xuan Commune. A number of net-enclosures in Phu An Commune in Sam Chuon have been successfully removed because the lagoon area in Phu An Commune is considered a nursery area for fingerlings and larvae.

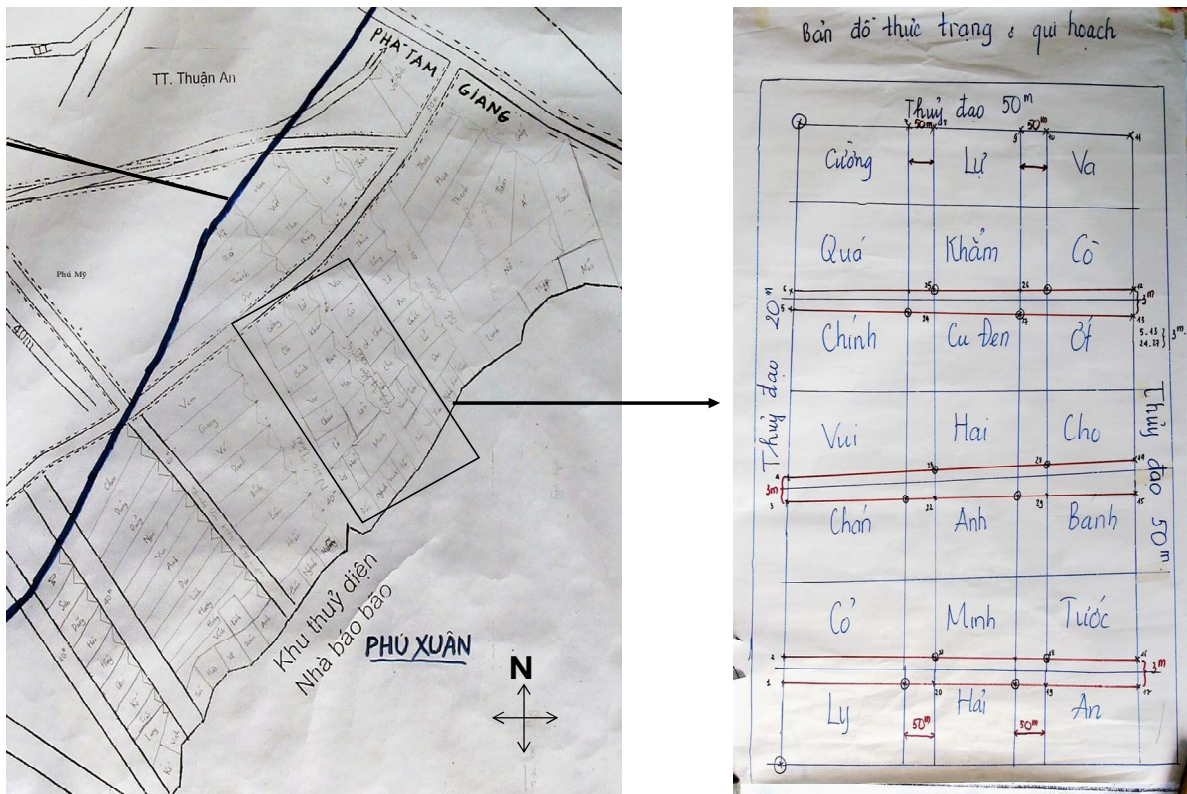
4.4.5 Secondary waterways

Since the explosion of aquaculture, the density of fish corrals and net-enclosures have blocked the water flowing into the Sam Chuon area. The waterway systems are designed to increase water flowing into the lagoon and particularly into the Sam Chuon bay. Secondary waterways have been opened through the process of participatory planning held in early 2006 with the support of the IDRC. Figure 4.8 represents the map of the pilot project before and after the participatory planning exercise.



Photo by Ta T.T. Huong (2006)

Figure 4.7: Secondary waterways between net-enclosures



Source: Nguyen N. Phuoc (2006)

Figure 4.8: Participatory planning to reorganize net-enclosures in Thuy Dien

In the pilot project, each net-enclosure owners contributed a 1.5m length along their fishing ground to set up the secondary waterways. The secondary waterway systems became common property and are managed by net-enclosure contributors with the support of the Fisheries' Association and local government. According to the agreement

among the above mentioned stakeholders, net-enclosure contributors are only allowed to practise mobile gear fishing in the secondary waterway systems. Mobile gear fishers are excluded from the secondary waterway systems.

The opening of the waterways was a long process. We got the agreement on opening the waterways after six months of negotiation. We rearranged our net-enclosure after aquaculture seasons. We were willing to contribute our fishing ground to open the waterways, but we wondered how difficult it would be to control the use of small waterways between net-enclosures. What will happen if they break our net-enclosures? We agreed to get them go through in day time but not to do fishing there (Vui – a net-enclosure owner who contributed his net-enclosure to the opening of waterway systems, March 2006).

4.4.6 Primary waterways

Primary waterways were traditionally used as navigation lanes for transportation. The previous navigation lanes and the current main waterway systems have elements of coastal commons. In the feudal government as well as in the colonial period, the navigation lanes were under the control of village authorities. Fishers could access the navigation lanes, but were not allowed to use them for fishing. During the aquaculture expansion, owners of fish corrals obtained parts of the navigation lanes for fish corrals and net-enclosures. The local government has put a lot of effort into removing these fish corrals but they are not under control yet.

In the process of participatory planning, the maintenance of waterways was addressed. After negotiations, the primary waterways are now 20-50 meter wide and marked by concrete posts. The main waterway systems are open to all local fishers with mobile fishing gear (such as gillnet, push-net). Fishers with fixed gear are not allowed to set up in the primary waterways. The commune government and Fisheries' Association try to exclude outsiders from the primary waterways systems.



Photo by Nguyen N. Phuoc (2007)



Photo by Ta T.T. Huong (2006)

Figure 4.9: Primary waterways with navigation post

4.4.7 Open water areas

Open water areas are located far from the lagoon's edge and from settled villages. There are almost no more available water areas in the Sam Chuon bay, with the exception of the open water areas in the Phu An Commune. District and commune governments put a lot of effort into regulating the use of open water areas for only mobile fishing gear. Outsiders (outside of the village and the commune) are not supposed to fish in the open water areas of the Phu An Commune; however, exclusion of outsiders is impractical. The government controls the extension of fixed gear (e.g., fish corrals) in the current open water areas; however, they are unable to control the use of destructive fishing gear (e.g., electric fishing, motorized push-net). To some extent, open water areas are held as open access.

4.5 Discussion and conclusions

4.5.1 The evolution of lagoon use systems

Research findings from the Sam Chuon area and specifically Thuy Dien village provide a complex picture of the interaction between the political and socioeconomic changes and the shift of property rights. The dominant effect of the political and economic revolution in access rights has been the privatization of lagoon resources. Lagoon commons were previously managed by village authority followed by different levels governments. Due

to a lack of effective management in the collectivization period and during the transition to a market economy, open fishing grounds have been converted to be net-enclosures for aquaculture. The process of privatization has also resulted in the official allocation of land and the promotion of open coastal areas for shrimp and crab farming. Currently, in the Sam Chuon area, over 80% of the lagoon area is private property.

In Thuy Dien village, the evolution of lagoon use systems resulted from the involvement of individuals and households in various types of aquaculture practice. Property rights systems were more complex with different types of government permissions at different levels of the institutional hierarchy, providing a separate bundle of *de jure* rights. *De jure* and *de facto* rights have changed continually over time. In the village, these rights co-exist and overlap in many different types of resource use. Table 4.6 summarizes the various types of lagoon uses over the three periods in the Sam Chuon area. Using Schlager and Ostrom's framework (1992), the table also reflects the ways in which villagers conceptualize access, withdrawal, management, exclusion, and alienation of different lagoon use types.

What emerged from the villager's and local official's accounts was that government regulations and tradition/custom provided a framework and guiding principal for lagoon use. However, local fishers perceived the need for constant negotiation to get official withdrawal rights in traditionally owned fishing grounds. Different bundles of property rights, whether they are *de facto* or *de jure*, affect the types of action individuals take and the outcomes they achieve. Alienation rights combined with exclusion may produce incentives for owners to undertake long term investments to capture long term benefits. However, ownership does not guarantee the sustainable use of lagoon resources.

Table 4.6: Type of lagoon use and individual rights by periods

a) Before 1975

<i>Lagoon use</i>	<i>Local name</i>	<i>Access^(*)</i>	<i>Management</i>	<i>Exclusion</i>	<i>Alienation</i>
Fish corrals and other fixed gear	<i>Nò sáo</i>	√	√	√	<i>De facto</i>
Navigation lanes	<i>Đường thủy đạo</i>	—	—	—	—
Open water areas	<i>Vùng khai thác tự nhiên</i>	<i>De facto</i>	—	—	—

b) 1975-1986

<i>Lagoon use</i>	<i>Local name</i>	<i>Access</i>	<i>Management</i>	<i>Exclusion</i>	<i>Alienation</i>
Fish corrals and other fixed gear	<i>Nò sáo</i>	√	<i>De facto</i>	—	—
Navigation lanes	<i>Đường thủy đạo</i>	—	—	—	—
Open water areas	<i>Vùng khai thác tự nhiên</i>	<i>De facto</i>	—	—	—

c) After 1986

<i>Lagoon use</i>	<i>Local name</i>	<i>Access</i>	<i>Management</i>	<i>Exclusion</i>	<i>Alienation</i>
Upper earth ponds with land title	<i>Ao đất cao triều</i>	√	√	√	√
Upper earth ponds with district permit	<i>Ao đất cao triều</i>	√	<i>De facto</i>	<i>De facto</i>	<i>De facto</i>
Lower earth ponds with land title	<i>Ao đất hạ triều</i>	√	√	√	√
Lower earth ponds with district or commune permits	<i>Ao đất hạ triều</i>	√	<i>De facto</i>	<i>De facto</i>	<i>De facto</i>
Registered fish corrals	<i>Nò sáo</i>	√	<i>De facto</i>	<i>De facto</i>	<i>De facto</i>
Unregistered fish corrals	<i>Nò sáo</i>	<i>De facto</i>	<i>De facto</i>	<i>De facto</i>	<i>De facto</i>
Net-enclosures with district or commune permits	<i>Ao vây có giấy phép</i>	√	<i>De facto</i>	<i>De facto</i>	<i>De facto</i>
Net-enclosures without permits	<i>Ao vây không giấy phép</i>	<i>De facto</i>	<i>De facto</i>	<i>De facto</i>	<i>De facto</i>
Secondary waterways	<i>Thủy đạo nhỏ</i>	<i>De facto</i>	<i>De facto</i>	<i>De facto</i>	—
Primary waterways	<i>Thủy đạo chính</i>	<i>De facto</i>	—	—	—
Open water areas	<i>Vùng khai thác tự nhiên</i>	<i>De facto</i>	—	—	—

Notes: Classification of rights is taken from Schlager and Ostrom 1992. Holders of the full set of property rights are considered to be the owners of private property. The symbol (√) refers to *de jure* rights of individual lagoon users with the permit from the government. *De facto* rights are rights which have been acquired by individual users and recognized by other resource users. These rights are accepted in custom.

(*) Right of access to a resource also includes the right to withdraw the resource.

The framework recognizes that the bundles of rights held by villagers both in law and in custom does provide a flexible and comprehensive understanding of the nature and distribution of property rights in Tam Giang Lagoon. It defines who can do what and how they can use lagoon resources (Wiebe and Meinzen-Dick 1998). The framework is also useful to define different types of property-rights regimes in the village. However, the bundles of rights necessitate the divisions of lagoon use into categories, including some artificial categories. The framework does not fully account for the actual complexity of lagoon use in the study area (Berkes *et al.* 1999). It is, in fact, the limitation of the static bundles of rights in analyzing the dynamic lagoon use systems.

Common property theory draws attention to the diversity of property rights-regimes, but the complexity of property-rights regimes in the study village challenges common property theory as well. The problem stems from the fact that customary rights in the lagoon are constantly changing. Individual rights become more dominant, whereas village rights are undermined. It is difficult to fit the actual system into the framework of property-rights regimes. In Tam Giang Lagoon, different property rights regimes coexist, overlap, and combine in different types of lagoon use.

The classification of property-rights regimes focuses mostly on the two characteristics of commons: excludability and subtractability (Ostrom *et al.* 1999). These two characteristics are associated with the exclusion rights and management rights in the bundles of rights. Therefore, these two characteristics (Schlager and Ostrom 1992) are used to define the property-rights regimes in the study village. Alienation rights are not used in this classification; however, an alienation right is a strong component of private property.

Accordingly, the types of property regimes found in the Sam Chuon area include five kinds of private property, two kinds of government property, and three kinds of common property (Table 4.7). Moreover, three other types of lagoon use (open water areas in Phu An, primary waterways, and fish corrals in 1975-1986) seem to be a combination of the two property-rights regimes (Feeny *et al.* 1990). As described by villagers and government officials, the primary waterway systems and open water areas are interpreted as a combination of government property and common property regimes. In this combination, exclusion rights are granted to the Fisheries' Association and management rights are held jointly by government and the Association. Although none of resource use is interpreted as open-access, the failure of other property-rights regimes may result in the creation of *de facto* open access (Feeny *et al.* 1990). For example, the navigation lanes and open water areas might be exploited as open access in the transition from collectivization to “*Đổi mới*” policy.

Table 4.7: Diversity of property rights regimes

<i>Property-rights regimes</i>	<i>Subtractability (management rights)</i>	<i>Excludability (exclusion rights)</i>	<i>Examples in Sam Chuon</i>
Private property	<i>De jure</i> individual rights	<i>De jure</i> individual rights	Earth ponds with land title Fish corrals (prior 1975)
	<i>De facto</i> individual rights	<i>De facto</i> individual rights	Earth ponds with permits Net-enclosures Fish corrals (post 1986)
Government property	Government authority	Government authority	Navigation lanes (1975-1986) Open water areas (post 1975)
Common property	Village authority	Village authority	Navigation lanes (prior 1975) Open water areas (prior 1975)
	Net-enclosure group	Net-enclosure group	Secondary waterways
Combination of property-right regimes	Government and Local Fisheries' Association	Local Fisheries' Association	Open water areas (nursery area in Phu An) Primary waterways
	<i>De facto</i> individual rights	Government (production co-operatives)	Fish corrals (1975-1986)

Institutions are critical in governing resource access and property rights in Tam Giang Lagoon. The research found that the combination of political and economic revolutions significantly influenced commons institutions, which governs the dynamics of property rights in Thuy Dien village. By addressing the dynamics of commons institutions at the village level, differentiation in economic status and in access to social-political networks has been interpreted as the important factor shaping resource access and livelihood capability. On the one hand, institutional changes have strengthened the fixed gear group's ability to engage in aquaculture. Also, the fixed gear group has traditionally laid claim to more power in the village. On the other hand, the mobile gear group, which has suffered from exclusion to previous fishing grounds, has become increasingly marginalized and vulnerable. This has damaged the equitable distribution of access rights that may be necessary for sustainability and efficiency in resource use and management in the village, as well as in the whole lagoon system.

4.5.2 Problems with institutions in lagoon management

Vietnamese legislation does not provide a specific concept of a lagoon. Each legal document defines the term “lagoon” differently. The Government’s Decree No. 109/2003/ND-CP of September 23rd, 2003 on Conservation and Sustainable Development of Submerged Areas references physical attributes when defining a lagoon: a lagoon as an “*inland wetland*” - an “area submerged in fresh or brackish water” including “rivers, streams, canals, ditches, special-use water surface, lakes and ponds”. Another definition of “lagoon” is found in Article 3 of the Law on Water Resources (No.8/1998/QH10 of May 20th, 1998) where a “lagoon” is defined as a “*water source*” and “*surface water*”, which is “a form of accumulation of natural or artificial water which may be exploited or used” including “rivers, lakes, and ponds”. Furthermore, the term “lagoon” appears within the “*land with inland water surface*” in the Land Law No.13/2003/QH11 and “*internal water*” in Fisheries Law No. 17/2003/QH 11 to regulate the fishing activities. The Fisheries Law also includes aquaculture ponds in the “*non-agriculture land with water surface*”. A common definition of “lagoon” is necessary in order to design appropriate management policies, especially in the case of Tam Giang Lagoon where the

rights and obligations of resource use are affected and differ between local fishers and outsiders (Albisinni 2006).

Formal government institutions have not been successful in terms of functioning effectively as commons institutions in Tam Giang Lagoon, especially in Thuy Dien village. The main problems faced by commons institutions included the situation of dual subordination, a mismatch in government institutions, decentralization, a lack of capacity building, corruption, and privatization.

The situation of dual subordination: The People's Committees are under the supervision of the Central Government and the People's Committee, a higher level of government, as well as its corresponding People's Council. Provincial and local line agencies are also under the supervision of the lines of ministries and their corresponding Peoples' Committee and People's Council (Fforde *et al.* 2003). Figure 4.11 shows the leadership relationship in government organizations (People's Committee and People's Council) and the lines of ministries on local agencies. Double supervision is the reason for tension between different government interests at different levels. At the provincial and lower levels, professional agencies prefer the direct guidance of the People's Committee as opposed to the supervision of their line ministries.

Mismatch in government institutions: Several different Laws and Government's Decrees established overlapping tasks, duties and responsibilities for different Ministries, different departments of Ministries, and the People's Committees at the provincial, district or commune level. The institutional overlapping not only creates confusion in defining functions, power and responsibilities. It also does not clarify and delimit agency and ministry jurisdictions for management of the coastal area. Such institutional systems break the fundamental vertical link within each institution and confuse the horizontal links between institutions, while contributing to the increasing incompetence of different agencies and inconsistency in resource management policies (Albisinni 2006).

Decentralization: The current administrative system is decentralized in only a limited sense. For example, the process focuses on the delegation of tasks from the central to provincial and district levels. In the area of planning and management, PPCs formulate

both long term and annual socioeconomic development plans and participate in the construction of national plans. The grassroots-level has not yet fully participated in the process. Also, there is no clear mechanism for local government to be creative in their decision making and planning (Fforde *et al.* 2003).

Losses of traditional institutions: “*Vạn*” were traditionally considered a self-management unit (Phap 2002) that managed all fishing activities within a specific area. However, in the collectivization, the roles of this traditional commons institution declined (Ruddle 1998). Gradually, the “*Vạn*” institutions have been undermined. Nowadays, that institution is only mentioned in traditional ceremonies (Mien 2002).

Capacity building: At the commune level, the skills required to govern a formal institution are far more than the capacity of its members, especially in planning and management. Most of the professional staff in the Phu Vang District Divisions have university degrees; however, staff in the Phu Xuan Commune have lower education levels or only secondary schooling.

The corruption of the local government: The Corruption Perceptions Index (CPI) measures the perceived level of public-sector corruption around the world. In 2007, the CPI of Vietnam remained at 2.6/10 points. In 2006, Vietnam’s position fell from 111th of 163 countries to 123rd of 180. A survey on public-sector corruption completed by the Transparency International ranked Vietnam as the 121st most corrupt country out of 180 countries in 2008. In the Phu Xuan Commune, corruption is also a serious problem. Unfortunately, it was not uncommon for corrupt official to mismanage and misappropriate assets meant for the resettlement of the sampan communities.

Privatization: Shrimp aquaculture development has been facilitated by policy changes intended to shift the sector towards a market-based economy and increasing integration with the global economy. This is illustrated by National Decree 773-TTg, issued by the Prime Minister on December 21, 1994, which stipulates that open coastal areas, including Tam Giang Lagoon, can be used for shrimp and crab farming. However, shrimp aquaculture has not benefited the entire community. Many people who have access to

aquaculture became rich quickly. On the other hand, the poor have been excluded from their fishing grounds and have become more disadvantaged and even poorer.



Photo by Truong Q. Hoang (2005)

Figure 4.10: Overview of livelihood activities in Sam Chuon area

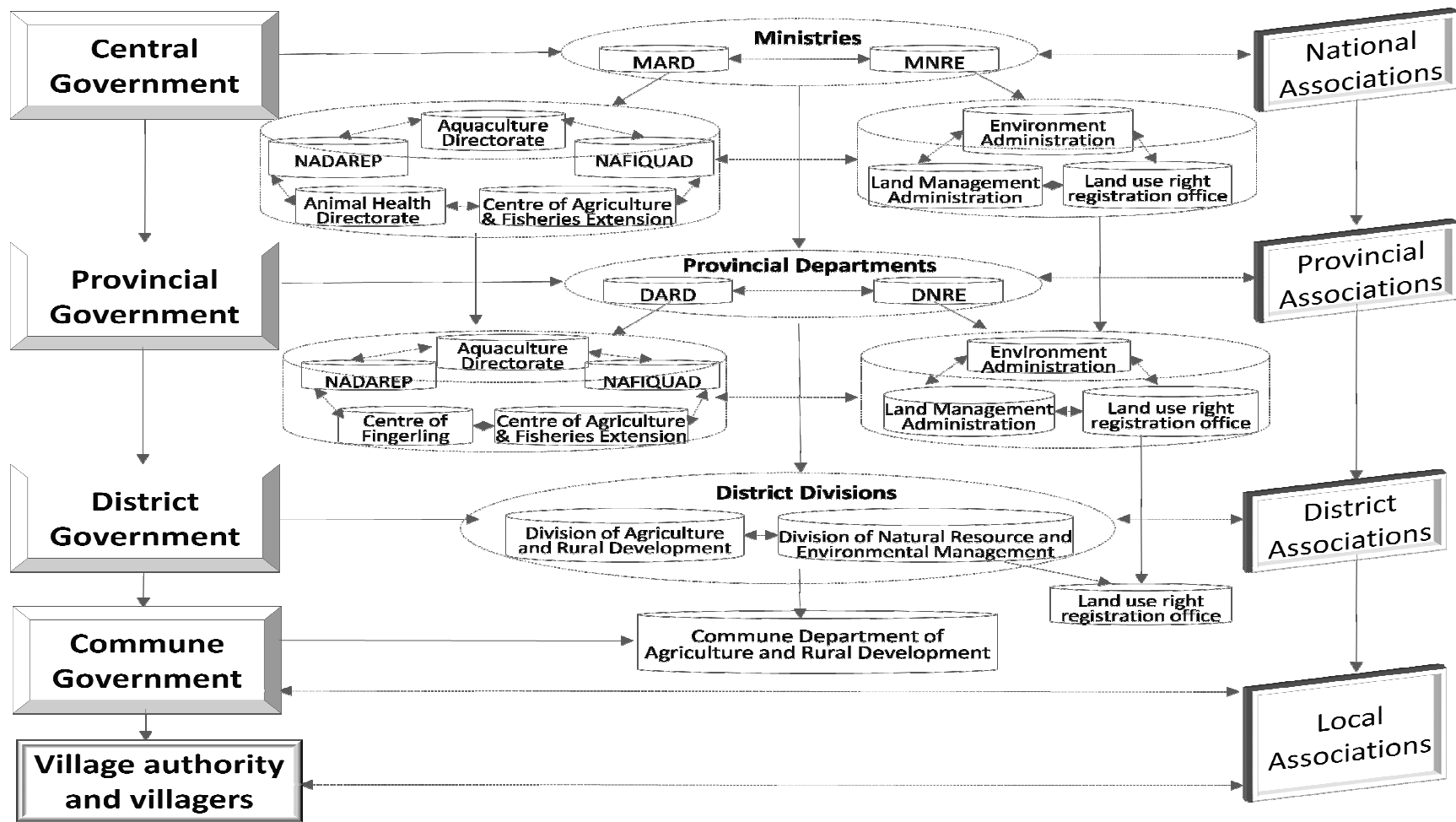


Figure 4.11: Institutional linkages governing lagoon resource management

Notes: —> Leadership relationship (vertical relationship) <-----> Working relationship (horizontal relationship)
 <-----> Consultative relationship (relationship between government organizations and associations)

CHAPTER 5.

The complexity of lagoon livelihoods



Photo by Ta T.T. Huong (2006)

Figure 5.1: The gillnet fishing process

The main objective of this chapter was to analyze the effect of aquaculture development and privatization on local livelihood systems. The chapter sets out to explore the complexity of local livelihood systems, especially of the 14 households in Thuy Dien village. It begins by presenting a framework for livelihood analysis which incorporates feedback and investment. Drawing upon the analysis framework, the chapter focuses on village and household characteristics and diversity of livelihood activities, especially fishing activities, in Thuy Dien village. The chapter classifies four resource user groups based on their access to fishing grounds: (i) earth pond group; (ii) net-enclosure group; (iii) mobile fishing group; and (iv) non-fishing group. Attention is paid to seasonality and its effects on livelihood activities in each group. Institutions are then discussed along with market opportunities and social relations. The combination of assets affects the livelihood strategies that a household may pursue, including mobility, diversification, intensification, commercialization, and migration. To understand how aquaculture development and privatization affects household livelihood strategies, two main examples from Vo's household (a net-enclosure household) and Manh's household (a mobile fishing household) are further analyzed in terms of their livelihood strategies and the circulation of livelihood income. Challenges of livelihood systems are examined in different user groups. Finally, the chapter discusses how livelihood systems fit in to the complex adaptive system theory.

5.1 Livelihood analysis framework

Over the last 30 years, the concept of livelihoods has developed gradually, offering new insights into the dynamics of development. Sen (1981) developed endowment-entitlement mapping for the analysis of famine and poverty. The entitlement approach was viewed as “the set of different alternative commodity bundles that a person can require” and was a central theory in development studies in the early 1980s (Sen 1981; Ghosal 2000; Start and Johnson 2004). Chambers (1987) developed the concept of “livelihood securities”, which was built on food security and sustainability. Tangible assets (stores and

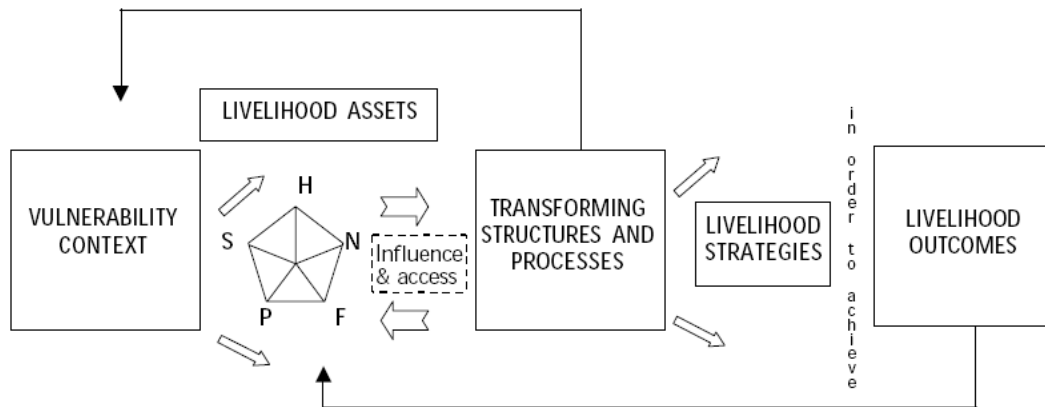
resources), intangible assets (claim and access) and livelihood capabilities are converted into flows in a livelihood through livelihood activities, and hence to well-being (Chambers 1987; Chambers and Conway 1992). A livelihood is defined as a “comprise of the capabilities, assets and activities required for a means of living” (Chambers and Conway 1992: 6). The term, *sustainable livelihoods*, was first used in the early 1990s and defined sustainable livelihoods as “A livelihood is sustainable if it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation” (Chambers and Conway 1992: 26).

In approaching the portfolio, Swift (1993, 2006) distinguished between three classes of “assets” - investment, stores and claims. Material assets were initially split into investment and stores, and then a non-material category of assets was added. This asset-based livelihood approach considers how assets are transformed into livelihood strategies and livelihood outcomes (Start and Johnson 2004).

In the late 1990s, new categories of livelihood capital emerged, including human, natural, social, physical and financial capital and livelihood frameworks were redesigned accordingly (Bebbington 1999). However, assets were still central to the different approaches. Scoones (1998) saw assets transformed by institutions into outcomes, Carney (1998) represented capital assets as being transformed by structures, processes and livelihood strategies into livelihood outcomes, and Bebbington (1999) observed “ the abilities of people” to transform livelihood assets into income, dignity, power, and sustainability (Start and Johnson 2004).

Adapted from Scoones (1998) and Carney (1998), Ellis (2000) provided a framework for micro policy analysis of rural livelihoods with an emphasis on social relations (gender, class, kin, belief systems) and institutions. Since the early 2000s, the sustainable livelihood approach has also been adopted by a number of government, non-government, and multilateral organizations such as the DFID, UNDP, OXFAM and CARE as a basis for rural development research and practice. The sustainable livelihoods framework developed by these organizations has many key features in common (Cahn 2002).

A sustainable livelihood (SL) framework is people-centred, holistic, non-sectoral, and grounded in the multiple factors that surround daily life (Scoones 1998; Ellis 2000). The most well known SL framework has been documented by The Department for International Development (DFID) (Figure 5.2) (Carney 1998, 1999; DFID 1999). The framework brings all relevant aspects of people’s lives and livelihoods into development, focuses on people’s strength rather than their needs (Toufique 2001), and provides a way to understand the complexity and diversity of livelihood systems.



Source: Carney (1999), DFID (1999)

Figure 5.2: The DFID Sustainable livelihood framework

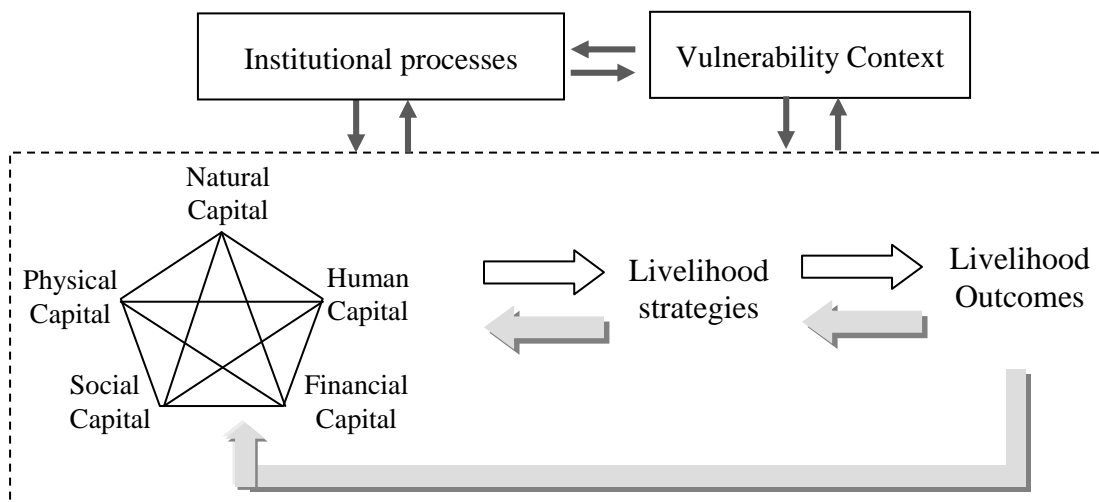


Figure 5.3: Analytical sustainable livelihood framework incorporating flows and feedbacks into the analysis, a modification of the DFID framework

Notes: drivers Feedbacks Livelihood flow

However, some concerns have emerged over what factors should be included in the conceptual framework as well as the relationships between those factors. There are two contradictory critiques of the DFID framework. Some think that the framework is oversimplified (Cahn 2002), while others consider it too complex and overambitious (Carney 1999). The approach is designed to work across sectors. However, in reality, cross sector development is difficult (Carney 1999; Singh and Gilman 1999).

Ellis (2000) identifies “rules, customs and land tenure” as institutional aspects that could modify access to resources (Ellis 2000: 30). A sustainable livelihood framework has the potential to incorporate institutional aspects. Furthermore, a livelihood is a complex system (see chapter six), hence the framework should have inter-linkages between elements in a non-linear way, especially incorporated with feedback and learning. In the case of Thuy Dien village in Tam Giang Lagoon, local institutional aspects and social networks play a very important role in the development of livelihood systems. Property rights and resource access have significantly changed. Bonding networks are the "social glue" (Warren *et al.* 2001; Policy Research Initiative 2003) in local society, especially between family members, relatives, and neighbours.

To understand livelihood systems in Thuy Dien village, Tam Giang Lagoon, the researcher developed an analytical sustainable livelihood framework incorporating flows and feedback as discussed above to modify the DFID livelihood framework (Figure 5.3). The adapted framework focused on institutional processes including formal and informal institutions, and social networks and organizations. Institutional structures influence and are influenced by, the vulnerability context. Institutional processes and vulnerability impact livelihood systems, including assets, strategies and outcomes through trends, shocks and stresses. These impacts are not always negative (DFID 1999) and may create opportunities for livelihood development.

The framework draws attention to the flows and feedback between livelihood assets, strategies and outcomes. People with more assets tend to have greater options and flexibility for switching between multiple strategies to secure their livelihoods. Outcomes can enhance, sustain or threaten livelihood assets and choices of livelihood strategies

through feedback and investments such as savings, paying loans or buying new equipment. The analytical livelihood framework, therefore, shows the inter-linkages of five interacting elements: vulnerability context, institutional processes, livelihood assets, livelihood strategies, and livelihood outcomes.

5.2 Livelihood systems in Thuy Dien village

5.2.1 Basic features of Thuy Dien village

Thuy Dien is a fishing community located in the Sam Chuon area, Tam Giang Lagoon, Thua Thien Hue Province. The village has 143 households with 798 inhabitants. Once a sampan community, they have, since 195, gradually settled on land. Therefore, the village has no access to agricultural land and has limited access to residential land. Fishing and aquaculture remain their main livelihood activities. Table 5.1 represents the basic features of the village and some key characteristics of the villagers.

There is an average of seven people per households, with an average of three main income generators per household. It is common for three generations to live together, a practise which is common elsewhere in Vietnam. Some families have returned to sampan because of the lack of available residential land. Culturally, it is important for Vietnamese people to have at least one son who is expected to take care of his parents in the future.

The government has organized many campaigns to eradicate illiteracy; however, illiteracy is quite common in the middle and older generations of Thuy Dien village. On average, two children per household attend primary school. There is a common understanding of the importance of attending school; however, most children's education stops at grade three. Few village children attend secondary school.

I have five children. Four of them left school when they were in grade four and grade five. My youngest child is currently attending grade four in primary school. Luckily, the school in Dien Dai is in walking distance. She will certainly go to grade five next year but she may not

go to secondary school. If she is going for secondary school, we have to buy a bicycle and have to pay tuition fee and other fees in school. What are the differences if she goes there? I think it is good if she is apprenticed to a hairdresser (Mo – a female fisher, January 2007).

Table 5.1: Basic features of the village

Characteristics	Thuy Dien village
Water supply	Water supply systems are available during specific hours; Rain water use is most common; Wells are not common because of high salinity in underground water.
Electricity	Electrical system; batteries for the patrol houses.
Fuel	Gas, petroleum, coal, charcoal.
Communication	Phones, cell-phones, radio, television, public broadcasting system (public loudspeaker).
Health center	One clinical center in the commune with two doctors and three nurses.
School	One kindergarten in the Phu Xuan Commune Two primary schools in the Phu Xuan Commune One secondary school in the Phu Xuan Commune (None of the schools are located in the village).
Agriculture land	No access to agriculture land.
Residential area	Limited access to residential land.
Housing	Brick house with concrete roof (concrete house). Brick house with corrugated roof (semi-concrete). Thatched houses (cottage). Boats.
Transportation	A main road along the village connects Thuy Dien with Dien Dai village. Scooter, bicycles.
Market	Two markets in Dien Dai and Quang Xuyen villages. Early morning local market at the village.
Institutions	Government organizations Social-political associations Universities, NGOs, international projects.
Credit	Banks (VBARD, VBSP); Local money lenders in the village.
Debt	Almost three-quarters of households are in debt.

Thanks to the development of aquaculture and government support, the overall livelihood system in Thuy Dien has improved significantly. Electricity, transportation and telecommunication devices are accessible now. A water supply system is available during specific hours. Rainwater remains the primary water source for more than 80% households in the rainy season. The village has minimal access to well water because of the high salinity and alum contamination in the underground water.

5.2.2 Household profiles

Table 5.2 details the characteristics of 14 households in Thuy Dien village with various circumstances related to resettlement, the number of children (working and attending school), household head education levels, the number of widows, fishing ground access, and livelihood activities. Of the 14 households, there are four earth pond households, four net-enclosure households, four mobile fishing households and two non-fishing households. The table is designed to focus the following discussion on livelihood activities and illustrate the diversity of the household situations among these 14 households. The heads of the household are usually the main income generators. Their ages range from 27 to 62 years old. Their education levels range from illiterate to grade 7. Each household is organized differently. Some are nuclear households and some are extended-family households.

The following stories illustrate the range of households found in the village. Tuyet is a widow who practices mobile gear fishing and raises chicken and ducks to support her children's schooling. Cu moved out from his mother's house after fathering a child in 2004. He received his fishing ground from his mother and purchased a small piece of land where he built a temporary house at the back of his mother's house. Lua and his wife and children live in his patrol house in his fishing ground. Every day, Lua's eldest daughter takes his youngest daughter to school by bamboo boat. Many households are extended family units with three generations living together such as Manh's, Dau's or Loi's households. Loi's household, for example, consists of his parents, his wife, his sons and daughters, and his daughter-in-law.

Table 5.2: Household details for the subset of 14 households

Hh ⁽⁴⁾ head	Settlement	Characteristics	Livelihood activities	Fishing ground	Fishing gear
Tran Dau	1985	44 years old, grade five education, eight people (one in school and four income generators)	Aquaculture, fishing, wage labour, and animal raising	Earth pond, open fishing areas, and waterways	Gillnet, seine and push-net
Tran Hiep	1985	40 years old, grade two education, six people (two in school and three income generators)	Aquaculture, fishing and lending money	Earth pond and net-enclosure	Fish corral, FAD, gillnet, light fishing
Ho Huong	1987	52 years old, grade three education, six people (one in school and three income generators)	Aquaculture, fishing, and clothes making	Earth pond and net-enclosure	Fish corral, FAD, gillnet, light fishing
Ha Loi	1985	41 years old, illiterate, 10 people (two in school and four income generators)	Aquaculture, fishing, wage labour, buying fish, and lending money	Earth pond and net-enclosure	Fish corral, gillnet, light fishing, seine
Nguyen Vinh	2000	32 years old, grade seven education, five people (one in school and two income generators)	Aquaculture, fishing, wage labour, and hair dressing	Net-enclosure	Fish corral, gillnet, light fishing, push-net
Nguyen Lua	sampan	35 years old, grade one education, five people (one in school and two income generators)	Aquaculture and fishing	Net-enclosure	Fish corral, gillnet, light fishing
Ho Cu	1998	27 years old, grade three education, five people with two income generators	Aquaculture, fishing, wage labour, and animal raising	Net-enclosure	Fish corral, gillnet, light fishing
Ho Vo	2000	47 years old, grade four education, six people (one in school and four income generators)	Aquaculture, fishing, wage labour, small trading, and animal raising	Net-enclosure	Fish corral, FAD, gillnet, light fishing
Tran Manh	2003	41 years old, illiterate, nine people (two in school and four income generators)	Fishing, wage labour and animal raising	Open fishing areas	Gillnet, seine, push-net
Phan Thi Tuyet	1999	36 years old, illiterate, female-headed hh, three people (two in school; one income generator)	Fishing, wage labour and animal raising	Open fishing areas	Gillnet
Ha Xuan Hong	1995	31 years old, grade five education, four people (one in school and two income generators)	Fishing and wage labour	Open fishing areas	Gillnet, push-net
Ho Ke	1985	43 years old, illiterate, five people (one in school and three income generators)	Fishing and wage labour	Open fishing areas	Gillnet, push-net, seine
Ho Boc	1986	62 years old, female-headed hh, illiterate, two people with one income generator	Trading, animal raising, and money remittance	No	
Nguyen Danh	1985	34 years old, grade one education, five people (two in school and two income generators)	Service (café), wage labour, and animal raising	No	

⁴ hh: household

For most households, fishing is their main livelihood activity. Some are mobile gear households, such as Manh's and Tuyet's, while others are involved in earth pond aquaculture, such as Hiep's and Huong's. Huong's household shares the fishing ground with his sister's household. They fish together in their net-enclosures, but each has their own aquaculture earth ponds. Those households who do not engage in fishing either lack a main income generator (such as Boc's household) or are forced to pursue other activities.

5.2.3 Diversity of livelihood activities

Households in Thuy Dien village are involved in a range of multiple livelihood activities (Table 5.3). Some activities are fisheries related, including boat repairing, net mending, fish buying, and wage labour in earth ponds. Non-fishing activities include small trading, livestock raising, and other services (clothes making, hair dressing, and etc.) to enhance household livelihoods.

Although there are multiple livelihood activities that a household can engage in, not all households have access to these opportunities. For some activities, skills are needed; for others, capital is needed (Marschke 2005). For example, small trading requires a significant capital investment, as well as for hire-purchasing (deferred payment) of local fishers. In fact, the diversity of livelihood activities depends on the livelihood assets available to the households.

Households fill their daily lives with a variety of activities. Some activities, such as net mending, are pursued because they are necessary for the household's principle livelihood activity, while other activities, such as livestock-raising, are pursued because the household is engaging in secondary livelihood pursuits. Women tend to engage in selling fish and small trading as part of their economic activities; however these activities require sufficient investment and/or lending capital in order to start. Other services (stitching, hairdressing, karaoke, café, billiards...) are more common now as better-off households and younger generations begin to demand these services. Small government pensions are also available for the village chief and for elders who were in the military.

Table 5.3: Household livelihood activities

Livelihood Activities	No of households	% in the village ⁵
Fishing	132	92.3
Aquaculture	109	76.2
Fish buying	6	4.2
Net mending	1	0.7
Bamboo boat repairing	4	2.8
Selling goods (small trading)	11	7.7
Livestock raising	87	60.8
Wage labour	60	42.0
Services (clothes making, hairdressing, café, and others)	13	9.1
Pension	4	2.8
Government employee	1	0.7

Source: livelihood survey (2007)

All of the 14 households (Table 5.2) pursue a variety of livelihood activities. Eight households raise chickens and ducks, mostly for their own consumption, and three of these households are involved in small trading. In Boc's household, trading is her main livelihood activity; with money remittance from Ho Chi Minh City and raising animals providing an additional income source. Loi's household was one of the first households involved in trading as well as money lending in the village. Three households provide services in the village including a café, hair dressing, and clothes making.

Wage labour is quite common in the village and involves more than 40% of the households. In many households, especially in mobile fishing households, two or more people are hired in aquaculture earth ponds in Thuy Dien or in other villages. However, working in aquaculture is seasonal work. Because there is mostly work at harvest time in aquaculture ponds, some wage labourers migrate to other cities to find work in the off-season. The result of this seasonal migration is that some wage labourers have opted to

⁵ Note: the percentages add up to more than 100% because most of households engage in more than one livelihood activity.

stay and have settled in cities. These settled wage earners are the main sources of money remittances supporting their families back in the village (e.g., Boc's household).

5.2.4 Fishing activities and lagoon user groups

Fishing and aquaculture are the main livelihood activities in Thuy Dien village (Table 5.4). More than 90% of households are engaged in fishing activities and 76% of the households are involved in aquaculture (net-enclosure and earth pond). All aquaculture households practice mobile fishing as well.

Table 5.4: Household fishing activities

Fishing Activities	No of households	% in the village
Fishing	132	92.3
Aquaculture	109	76.2
(i) Earth ponds	24	16.8
(ii) Net-enclosures	104	72.7
(iii) Both	19	13.3

Source: livelihood survey (2007)

The diverse gear types found in the village illustrate the wealth of fishing knowledge in the area (Table 5.5). However, not all households have access to these opportunities. In fact, access to lagoon resources is an important factor with which to characterize different groups of resource users in the village. Traditionally, there were two different fishing groups in Thuy Dien village, as well as in Tam Giang Lagoon: fixed gear and mobile gear. Since the development of the aquaculture industry in the 1990s, livelihood systems in the village have become more diverse and complex. Fixed gear households converted their fishing grounds to be earth ponds and net-enclosures for aquaculture. Mobile gear fishers who were part of the marginalized group in the village still fish in the open fishing areas and have diversified their livelihoods through wage labour or migration. Some have opted to stop fishing. Some have bought fishing grounds from indebted aquaculture households in order to become involved in aquaculture.

Table 5.5: Percentage of household using fishing gear

Fishing activities	Local name	% households in TD
Fish corral	<i>Nò sáo</i>	75
Fish aggregating device (FAD)	<i>Chuôm</i>	58
Gillnet	<i>Lưói</i>	92
Seine	<i>Xiéc</i>	67
Pushnet	<i>Xèo</i>	55
Light fishing	<i>Soi</i>	27
Electric fishing	<i>Rà điện</i>	2

Source: Livelihood survey (2007)

To understand the current complex livelihood systems, the village was classified into four groups: (1) Earth pond aquaculture households; (2) Net-enclosure households; (3) Mobile fishing households; and (4) Non-fishing households. The classification is based on lagoon resources access and fishery related livelihood activities.

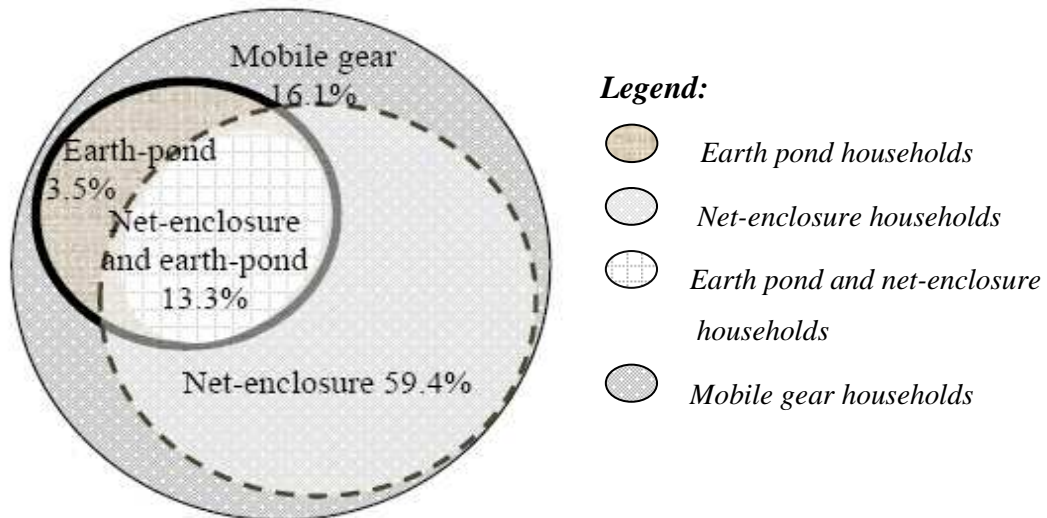


Figure 5.4: Lagoon user groups among fishing households

Note: Fishing households are equal to 92.3% of the total households in Thuy Dien village

Figure 5.4 represents the proportion of lagoon user groups among fishing households, as well as the overlap of the different groups. For example, all earth pond and net-enclosure households are involved in mobile gear fishing (e.g., gillnet, seine, push-net). 13.3% of the village households are involved in both earth pond and net-enclosure fishing, which are shown in the overlap of the first two groups. Households involved in both earth pond and net-enclosure activities are generally better-off than the other groups in the village. The third group includes approximately 16% of households who do not have access to net-enclosure or earth pond aquaculture. They practice mobile fishing in the waterway systems and open fishing areas.

All fishing households have their own bamboo boats. The village has a total of 18 motorized boats. Net-enclosure fishers fish mainly inside their fishing grounds and in the waterway systems. Mobile gear fishers do not have as many fishing ground options because there is a limited open fishing area. Primary waterways are the common fishing areas for mobile gear fishers in Thuy Dien village. Products from aquaculture and fisheries are for sale or local consumption, rather than for processing.

Fishing and aquaculture provides the largest income for almost all fishing households in the village. However, income from fishing activities has been declining in the last three years (*livelihood survey 2007*). Local fishers also complained that fishing equipment and gear has become more and more expensive; they are doing more maintenance on their equipment and working to improve the lifespan of their fishing gear. The following subsection examines the three fishing groups and their fishing activities.

EARTH POND HOUSEHOLDS

In Thuy Dien village, approximately 17% of households were engaged in earth pond aquaculture, of which 80% are also involved in net-enclosure aquaculture. Although aquaculture provides the main income for the households, capture fishing remains an important livelihood activity in their daily lives. Earth pond aquaculture is a highly demanding livelihood activity. It requires a large amount of capital for the initial investment and for maintenance. Households in this group are generally middle income

to wealthy by local standards; therefore, they can access credit from government banks, as well as from middlemen, who want to buy their products. It is expected that they could earn enough money not only to repay loans, but also earn enough for equipment and other items for the next aquaculture season and also have some savings.

Tiger shrimp (*Penaeus monodon*) is the main cultured species in earth ponds which are 5,000 - 10,000 m² in dimension. The level of intensification has increased over the years. Most earth ponds are semi-intensive mono-cultures of tiger shrimp with 25-30 units/m². The productivity ranges from 0.5 to 1.3 tons/ha (*livelihood survey 2007*). Some of lower earth ponds apply improved-extensive farming to tiger shrimp, crab, and fish with the shrimp intensity of 7-12 units/m². Table 5.6 illustrates the seasonal calendar for tiger shrimp aquaculture in earth ponds according to the Lunar Calendar. Generally, it takes about 1-2 months for pond preparation. Post-larvae stocking is dependent on the government aquaculture calendar, which varies from commune to commune; however, the difference is no more than two weeks. Shrimp products are harvested after about three and a half months of culturing.

Table 5.6: Seasonal calendar for earth pond aquaculture

	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
<i>Weather</i>												
<i>Flood</i>												
<i>Aquaculture season</i>			Crop 1				Crop 2					
<i>Pond preparation</i>												
<i>Culturing</i>												
<i>Harvesting</i>												
<i>Shrimp diseases</i>												

Note: The seasonal calendar is based on the lunar calendar as used in Vietnam

The number of crops depends on various conditions such as the local weather, water salinity, etc. On average, there are two shrimp crops per year. The first one is in March to mid-June and the second one is from mid-June to September. According to the government, crop failure rates are related to the number of crops per year. Therefore, it has been recommended not to culture the second crop. Since 2005, the Phu Xuan Commune's CPC has banned second crop cultures.

Shrimp diseases outbreaks (e.g., white spot, blind eye, yellow head ...) usually occur in April-May and July-August of every year (Table 5.6). Over 90% of farmers have experienced them, of which more than 70% of cases were caused by white spot syndrome virus (WSSV) (*livelihood survey 2007*). It is recommended that a pond which has suffered from WSSV should not be cultured in the next three years. However, local villagers tend to ignore this advice and start a new crop immediately after the treatment, resulting in a return of the shrimp disease. Most post-larvae are from private hatcheries in Thua Thien Hue Province (Thuan An town, Lang Co...) or from the nearby Danang City or Quang Tri Province. Recently, post-larvae tests for WSSV have been mandatory before stocking (Article 6.2 Decision 3014/2005/UD-UBND). However, owners of earth ponds have questioned the quality and reliability of the test which is conducted by the Provincial Branch of Animal Health Directorate – DARD.

Production from earth pond aquaculture was used solely to generate income via trade, rather than for personal consumption. Pricing pressure occurs for both crops because of the high volume of products from the first crop and the coming flood season in the second crop. Most households sell their products to middlemen from large towns or cities (Thuan An Town, Hue City) or other provinces (Da Nang), who control the price and drive it up or down. Some fishers manage to sell their products to companies such as Song Huong Joint-stock Company, and Thua Thien Hue Seafood Company. If a household does not owe money to anyone, they are free to sell their products. However, if a household owes money to a particular middleman, they must sell their product to this middleman. These middlemen normally sell their products to bigger middlemen and/or companies for processing before exporting these products to other big cities or other countries.

Aquaculture losses are the main reason for households in this group struggling with immense debt loads. However, they still borrow more credit for investment in aquaculture. Households who had borrowed from a government bank and had then run into difficulties would be unable to get further loans (DaCosta and Turner 2007) and turn to middlemen for loans. The cost of dealing with the middlemen for loans is higher interest rates.

I started doing tiger shrimp aquaculture in 2002. In the first three years, I gained a large benefit and cleared my debt. However, I got losses in the year afters and had to make another loan from my cousin with high interest. Although I have very few opportunities, I have to continue doing aquaculture in order to pay off my debt (Dau, an earth pond owner, March 2006).

NET-ENCLOSURE HOUSEHOLDS

Net-enclosure is the combination of aquaculture and capture fishing with fish corrals used as the main fishing gear. Fish corrals are usually used all year around. Summer is the most productive period (from March to August in the lunar calendar), especially in the areas with deeper waters and strong water-flow. There are two typical locations for net-enclosures referred to as inner and outer locations (NACA 2006). The location does not affect the overall degree of success; however, the inner net-enclosures are more prone to pollution from inland activities (chemicals used in aquaculture, pesticide and fertilize from agriculture), while the outer net-enclosures are more vulnerable to natural disasters (e.g., floods, typhoons). The number of fish corrals has rapidly increased recently because of increasing a number of fishers and a reduction of catch per unit.

In aquaculture plots, poly-culture is the preferred aquaculture style for whitespotted spinefoot (*Siganus oramin*), whitespotted spinefoot (*Siganus guttatus*), tiger shrimp (*Penaeus monodon*), greasy-back shrimp (*Metapenaeus ensis*), blue swimming crab (*Portunus pelagicus*), and so on. Table 5.7 represents the seasonal calendar for aquaculture in net-enclosures. The stocking density is low at 5-7 shrimp with one additional fish per m² (Mien 2006). There is an intensive use of industrial feed which is combined with pellets and trash fish, raising sustainability issues (FAO 2005). Owners of

net-enclosures also have to follow the government shrimp stocking calendar in March. Except for tiger shrimp, the main sources of fingerlings for net-enclosure aquaculture are wild fingerlings caught inside net-enclosures or from the lagoon's natural nursery areas (Mien 2006). Fingerlings purchased from middlemen are not tested for any diseases.

Table 5.7: Seasonal calendar for net-enclosure activities

	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
<i>Weather</i>												
<i>Flood</i>												
<i>Fish corrals</i>												
<i>Net-enclosure aquaculture</i>	Aquaculture seasons											
<i>Mud crab</i>			harvest →									
<i>Tiger shrimp</i>			harvest →									
<i>Orangespotted spinefoot</i>			Harvest →									
<i>Whitespotted spinefoot</i>			harvest →									

Note: Seasonal calendar is based on the lunar calendar as used in Vietnam

The farming method is very flexible with partial harvest and additional stocking occurring. Any small sized species captured by fish corrals or gillnets can be used to restock the fishing plot. Net-enclosure aquaculture is less risky than earth pond aquaculture because of the lower investment needed and the increased diversity of aquaculture species which are suitable for use in net-enclosure aquaculture. Products from net-enclosures fetch a higher price because of the larger size of the species (e.g., 20 tiger shrimps/kg; six swimming crabs/kg). However, because of extensive farming and harvesting, products from net-enclosures are not for the export market.

Aquaculture in net-enclosures also requires a considerable financial investment on the part of the fisher. Credit for the construction of the aquaculture plot (net and bamboo), patrol house, fingerlings, and feed can easily put a fisher into debt. Generally, it takes about 10 to 15 years for a fish corral household to save enough money to establish their plot for aquaculture production.

MOBILE FISHING HOUSEHOLDS

Capture fishing is the traditional occupation of the village. It is defined a small scale and subsistence artisanal fishery (Berkes *et al.* 2001). Capture fishing is a seasonal livelihood activity. Most capture fishing occurs in the peak season from February to June, according to the Lunar Calendar (Table 5.8).

Table 5.8: Seasonal calendar for mobile fishing gear activities

	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
<i>Weather</i>												
<i>Flood</i>												
<i>Large size Gillnet</i>												
<i>Medium size gillnet</i>												
<i>Fine size gillnet</i>												
<i>Lagoon seine</i>												
<i>Push-net</i>												
<i>Light fishing</i>												

Note: Seasonal calendar is based on the lunar calendar as used in Vietnam

Gillnets are the most common fishing gear in the village. The type of gillnet determines the fish species caught. There are three types of gillnets: (1) Large mesh size gillnets

(6cm of mesh) which are for capturing mud crabs and mullet; (2) Medium mesh size gillnets (4cm of mesh) which are used to capture multiple species, such as rabbit fish and the three-spotted swimming crab; and (3) Fine mesh size gillnets (2cm of mesh) which are used to capture shrimp, goby and barb. The medium mesh size gillnet is the most popular in Thuy Dien village. The productivity of large mesh size gillnets has been significantly reduced recently because of the high frequency of using fine mesh size gillnets. According to the livelihood survey, the fish catch from medium and large mesh size has decreased by 40% and 70% respectively.

5.2.5 Seasonality













All rural households confront seasonality as an inherent feature of their livelihoods (Chambers 1992). The production cycle of small-scale fisheries is determined by the onset and duration of rains, temperature variation across the calendar year, tidal fluctuation, variation of stock size and availability, and so on.







Central Vietnam is characterized by distinct tropical dry and wet (or rainy) seasons, variable winter and summer temperatures, and eastern tropical monsoons. The dry season lasts from late February to July. It is the peak time for fishing activities, especially for aquaculture. All aquaculture products are harvested before the rainy season which begins in late July. The average temperature in Thua Thien-Hue Province varies from 20.1⁰C in January to 29.2⁰C in June. Winters are cold and humid and the temperature can drop below 10⁰C, due to the northeast wind. In contrast, the summer southwest wind is hot and dry. Peak temperatures can be higher than 40⁰C (Trai *et al.* 1999). The relative humidity for the region averages between 85 and 88%. During the rainy season, the relative humidity is commonly 90%. Minimum relative humidity during the hottest season can be below 30%.

Sam Chuon is located close to the Huong River estuary; therefore, salinity is reduced significantly in rainy season. However, in the dry season, salinity increases to 28-30‰. Changes in salinity and temperature influence fish migration patterns. Some species are only available in a specific season, for example the *Lutjanus johnii*, *Platycephalus*

indicus is only available in the dry season and *Cyprinus centralus*, *Glossogobius giuris* is only available in the rainy season. In Thuy Dien village, fishers learn to fish according to the daily tidal fluctuations and seasonal perturbations. The rains are particularly heavy in this part of Vietnam due to monsoons and typhoons. Fishing activities have a tendency to decrease in rainy seasons. Income from fishing activities is reduced to lower than CAD\$1/day/household. As a way to increase their incomes in the rainy season, fishers migrate to other larger cities for work to supplement their income. In contrast, fishing after the floods can provide an income as high as CAD\$100/day/household.

Table 5.9: General seasonal calendar in Thuy Dien village

	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
<i>Weather</i>												
Flood				M			M	H	H	H		
Typhoon								H	H			
Wind	NE			SW	SW	SW	SW			NE	NE	NE
Salinity	L	M	M	H	H	H	M	L	L	L	L	L
Income from fishing activities	M	M	M	H	M	H	M	M	L	L	L	M
Spending	M	H	H	H	L	L	L	L	M	M	M	L
Illness	M	M			M	M		M	H	H	M	

Legend:  sunny  more sunny  very sunny
 light rain  rain  heavy rain
L low M medium H high
SE: south west wind NE: North east wind

According to data from the Disaster Management Unit (DMU) - UNDP Vietnam, the heaviest rainfall occurs in October and November, which is usually accompanied by storms, floods, cyclones, typhoons and other natural events. Floods start in August and last till the end of October. It has been said that there are no more floods after October

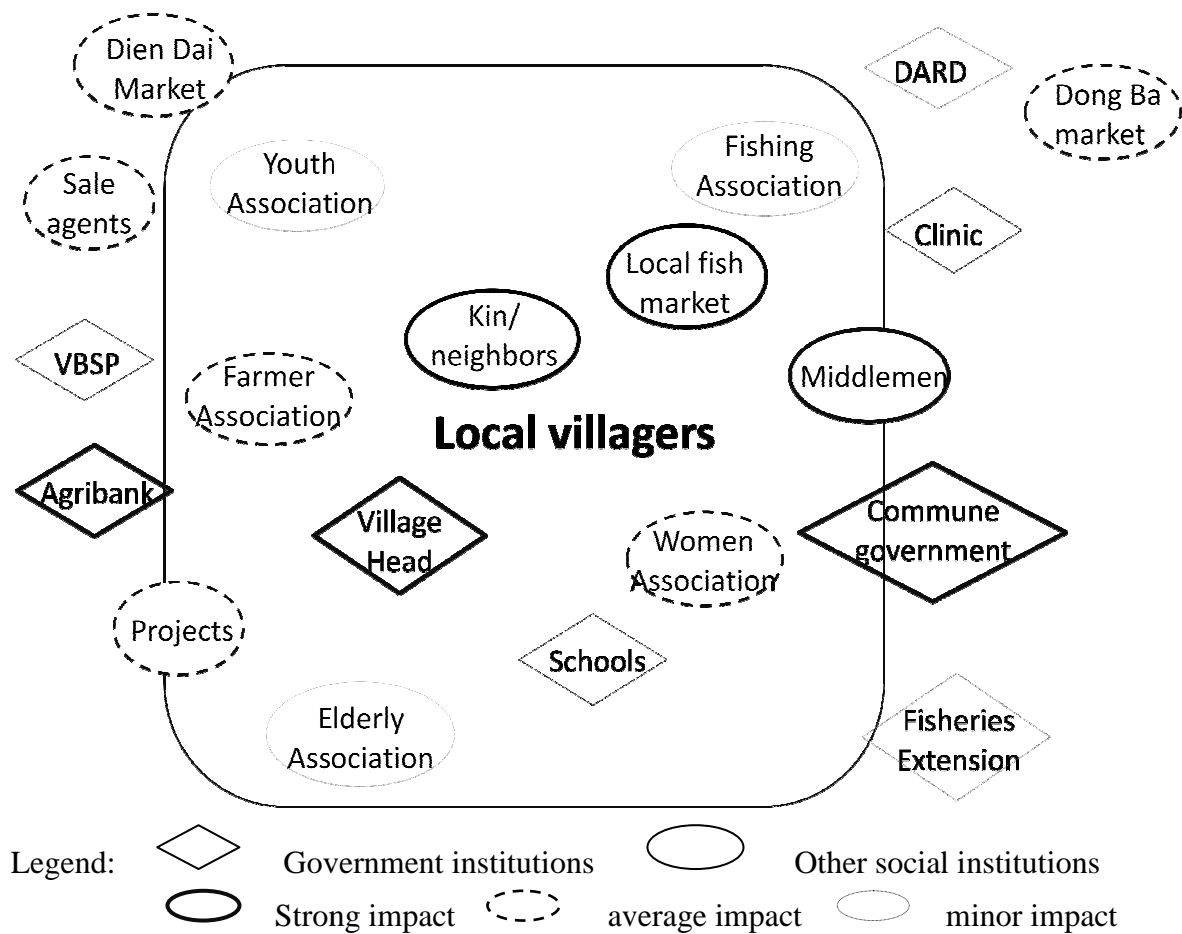
23rd. In the flood season, sampan households, who are still living on their bamboo boats, have to stay close to the edge of the lagoon or stay with land based relatives in houses. At the peak of the flooding, the water levels reach half of the temporary houses and local villagers have to stay with neighbours and relatives in brick houses.

Table 5.9 illustrates the seasonal calendar and how the seasonal patterns influence village incomes and expenditure levels. The highest expenditure occurs in the early sunny seasons because of financial investment needed for aquaculture preparation and for fishing equipment. The incomes of local people increase during the harvesting periods, but drop significantly in the rainy seasons. As well, the rainy seasons corresponds with an increase in illness (flu, cholera). Seasonal changes and wind direction change also increase illness during the peak fishing seasons. These socio-economic indicators (illness, earnings, and expenditure) illustrate the connections between seasonality and local daily lives (Marschke 2005).

Seasonality, in fact, results in peaks and off-peaks in labour utilization. It also creates food insecurity due to the mismatch between income streams and continuous consumption requirements, which are often referred to as “labour smoothing” and “consumption smoothing” problems, respectively (Ellis 1999, 2000). In response to seasonality, coastal communities engage in a variety of seasonal livelihood activities.

5.3 Institutions governing local livelihood systems

A series of formal and informal institutions exists in Thuy Dien village including: government organizations at various levels, government banks and the government poverty alleviation programs, the village head, social networks (kin and neighbours), middlemen, social political organizations (such as the Women’s Union, and the Fisheries’ Associations), NGOs, and international projects. Section 4.3 in the previous chapter analyzed these institutions in the context of changes in resource access and property rights in Thuy Dien village. Building on that discussion, this section examines the role of these institutions with regard to local livelihood systems in the village.



Source: Focus group discussion (2006)

Figure 5.5: Venn diagram of the impact of institutions on local livelihoods

Figure 5.5 is a Venn diagram representing the impact of institutions on local livelihoods. The institutional diagram was integrated in a focus group discussion in September 2006 with the participation of different age, gender and user groups. The exercises involved the use of coloured cards to represent real linkages and distances between people, groups and institutions (Pretty and Vodouhe 1997). The levels of impacts are illustrated by different circles and lozenges (or diamonds). Lozenges represent the impact of government institutions, while circles show the impact of other social institutions. The distance of the circles and lozenges from the center of the square indicates the importance of this institution to their daily lives. The square represents the village boundary. For example, Dien Dai market and Dong Ba market have an average impact on the local livelihood

systems, although they are not located in the village. Dien Dai market is located in the Phu Xuan Commune whereas Dong Ba market is in Hue city. The Women's Union and Farmers' Union play a more important role than other social organizations in the village because these organizations provide financial support for local villagers and support fishers to access to government bank loans. These institutions have been divided into three groups for further discussion: government institutions, local social networks, and credit channels. A detailed discussion is found in the following sub-sections.

5.3.1 Government institutions

The commune government is the grassroots level in Vietnam's government institutions and has a strong impact on the local livelihood systems. They have co-operated with development projects and sales agents to organize training activities on fishery-related issues, especially on shrimp disease prevention and aquaculture techniques. They have also created a bridge for local communities to access the formal credit sectors (government banks) and semi-formal credit sectors (such as credit cooperatives, NGOs, and development projects). In semi-structured interviews with fishers, more than 90% of households indicated that the commune government and the village head were the major information channel for information on government policies and development programs. The provincial and district governments have also provided some supports for livelihood development, such as larvae testing, stocking schedules, or financial assistance for settlement and flooding recovery. However, in some instances, there are pressures of provincial and district resource planning and management policies on local livelihoods.

One of the major concerns is the plan for net-enclosure removal. In some focus group discussions with net-enclosure aquaculture group, the issue of conflicts in resource use was broached. Both earth pond and net-enclosure fishing activities have negatively impacted each other. Water discharged from earth ponds has affected aquaculture activities in the net-enclosure, especially when these earth ponds have suffered WSSV. The density of net-enclosures has blocked water circulation in the area which increases the risk of aquatic diseases for earth pond aquaculture. Local fishers indicated that the

plan of net-enclosure removal is the preference of government institutions when dealing with net-enclosure aquaculture systems.

5.3.2 Credit channels and markets

According to the livelihood survey, almost 90% of households had borrowed money and approximately three-quarters of households in Thuy Dien are still in debt. Some households have borrowed money from multiple sources. The formal, semi-formal and informal financial sectors coexist in the village, but the interests rates of three sectors differ greatly.

The Bank of Agriculture and Rural Development (VBARD) and the Bank of Social Policies (VBSP ⁽⁶⁾) are by far the most popular sources of credit and cater to 70% of all households in the village. VBARD is considered as the leading institution in the formal financial sector in supporting fisheries and aquaculture in Vietnam (Lenn *et al.* 2004). Fixed assets such as houses or land property are accepted as collateral and the loan can be up to 70% of the property value. Aquaculture earth ponds can also serve as collateral for the loan up to 50% of the assessed value of the earth ponds. VBARD provides an average loan of VND 22 million ⁽⁷⁾ (~ CAD\$1,520) with a one percent monthly interest rate. VBSP only charges 0.65% interest per month and does not require collateral; however, the average loan amount is as high as seven million (~ CAD\$480) repayable in two to three years and only caters to poor households recommended by the Phu Xuan CPC or Women's Union and other social organizations. Loans from formal financial sectors are mostly for aquaculture and capture fishing investment. Available credit for aquaculture averages VND 30 million (~ CAD\$2070), followed by capture fishing, averaging VND 12 million (~ CAD\$830). Loan repayment has become increasingly difficult due to the failure of aquaculture crops. About one-third of all outstanding loans are overdue and are mainly from the aquaculture group. This situation happens not only in Thuy Dien village but also occurs in many other neighbouring areas (Tietze 2006).

⁽⁶⁾ VBSP is locally referred to as the Vietnam Bank for the Poor

⁽⁷⁾ Money conversion in June 2006: 1 Canadian dollars = 14,500 Vietnamese Dong

The formal financial sector is followed by the semi-formal sector, which caters to approximately 20% of all households. The semi-formal sector is comprised of the People's Credit Funds (PCFs), credit co-operatives, NGOs, development projects, and other social organizations, such as the Women's Union and Farmers' Union. Even though the Women's Union is not a lending agency, it plays an important role in sponsoring and identifying potential borrowers for VBSP and international NGOs and donors (e.g., IMOLA project) and assists the credits with loan recovery (Tietze 2006). The average loan amount disbursed by these associations is around VND 2 million (~CAD\$160). The repayment terms are two years and the monthly interest rate is 0.5%. These loans are sponsored by the Women's Union and are used mostly for stock raising and other trading activities to diversify local livelihood systems. The semi-formal sector focuses on borrowers whose poverty exempts them for accessing the formal lending institutions (Tra and Lensink 2008).

The informal sector is comprised of relatives, neighbours, friends, and middlemen. It caters to one-quarter of village households. Interest rates in the informal sector are normally higher than in the formal and semi-formal sectors, but vary case by case. Relatives and neighbours usually charge about 1.5% per month, whereas middlemen charge as much as 2-2.5% as their monthly interest rates. On occasion, interest-free loans are provided to relatives and neighbours for short durations and for special occasions such as weddings, funerals, and illnesses. With middlemen, providing credit is a way for them to stabilize their fish supply. The middleman and fishers establish a mutually beneficial relationship which is based on market interactions. Mobile gear fishers and net-enclosure owners may pay their interest daily or monthly. Minh, a mobile fisher, explained that it would be easier to pay a small amount every day rather than pay a larger amount at the end of the month. However, earth pond owners prefer to pay off their principals and interest after harvesting aquaculture products.

There is another unconventional credit saving stream in the village. It involves groups of 5 -10 households, mostly neighbours and relatives. Each household contributes a small amount every day to someone from the group who is responsible for managing and collecting the funds. Group members rotate through the system and are allowed to

withdraw funds after two weeks or a month. In bigger towns and cities, this system of credit has failed. However, in the village, it seems to be an appropriate mechanism. The system helps villagers build and save credit to spend in emergencies.

Access to markets and marketing opportunities are very important for local livelihood systems (Marschke 2005). The local market is important for villagers not only for trading, but also for social interaction. The market is only open in the early morning when fishers return from their fishing grounds. Women are responsible for selling the fish and buying food for daily consumption. Some women are also involved in money lending to relatives and/or neighbours. Ha, Loi's wife is an example. She lends money, buys fish from her neighbours, and then sells fish to another middleperson from Hue city. This is her way of diversifying her livelihood activities. She is also a host person for a credit saving stream of eight people who are her relatives and neighbours.

Most of the middlemen in the local market are women from Thuy Dien village and other neighbouring villages in the Phu Xuan Commune. In Thuy Dien village, fish processing is not common. Fishery products are sold to middlemen in the local market and then to other middlemen or processing enterprises from larger towns such as Hue City (Figure 5.6). There are a number of companies and individuals that provide services to support fisheries and aquaculture development in the village. Fingerling sales agents and food suppliers are examples of individuals who supply services to fishers. These enterprises and their branches organize meetings with local aquaculturists to provide information on aquaculture techniques and advertise their products under the supervision of the CPC.

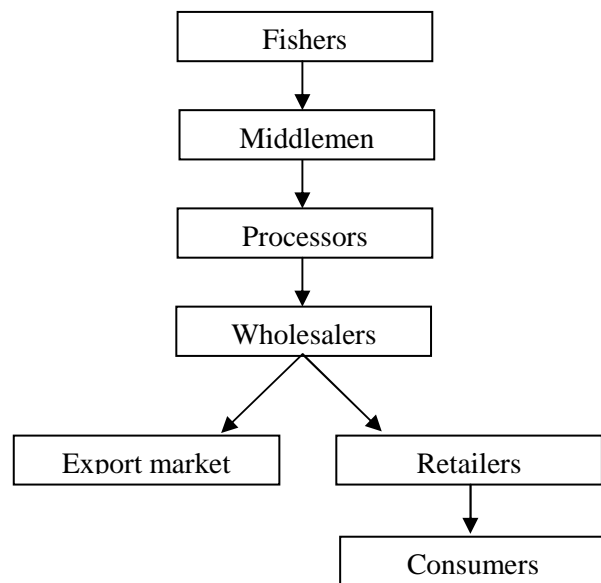


Figure 5.6: A fishery products marketing chain



Photo by Ta T.T. Huong (2006)

Figure 5.7: Middle woman lending money and buying aquatic products



Photo by Ta T.T. Huong (2006)

Figure 5.8: Quang Xuyen Market

5.3.3 Local social networks

Social networks are mechanisms to connect the individual to society, provide patterns of social interaction, social cues, and social identities (Inglehart and Baker 2000). Literature on social capital and social networks distinguish among bonding, bridging and linking forms of social capital (Putnam 1993, 2000; Pretty and Ward 2001; Newman and Dale 2005; Crowe 2007). Bonding capital is often based on a closed network of family, kin and ethnic groups, whereas bridging capital is formed across diverse social groups. Linking social capital refers to intercommunity connection (Crowe 2007) and/or community links with external agencies (Sanginga *et al.* 2007). A number of studies on social capital and networks in Vietnam have revealed that the family in Vietnam continues to be the central focal point of social life and suggested that bonding social capital may be more important in this context than bridging or linking (Dalton *et al.* 2002; Norlund 2003; Turner and An 2005). This section discusses the village's bonding network.

Vietnamese society is inherently “family-based” and even “*familistic*” (Haines 2006 p. 30). The importance of family is part of the country's history; similar to many Confucian societies in East Asia. The economic restructuring endorsed by government in 1986 has even enhanced the centrality of the household as policy has shifted towards giving households a major role in economic development (Haines 2006). Bonding social networks include kin and neighbours at the local level and refer to strong social bonds and effective relations within the village built through mutual trust. The bonding network is the “social glue” often used as a means to “get by”, especially by members of poorer communities (Warren *et al.* 2001; Policy Research Initiative 2003). In Thuy Dien village, a household has a survival value and is a focal point of social life, and familial ties and traditional authority patterns are emphasized within local social networks (Dalton *et al.* 2002). Fishing and aquaculture activities require household members to work together to maximize benefits (Marschke 2005). In Vo's household, his son mainly stays in the patrol house in the dry seasons to guard the net-enclosures and collect aquatic species. Vo, his wife and his son take turns fishing at night time. Vo's daughters help his wife with selling fish, preparing the fishing gear, mending nets, and raising chickens and

ducks. They are also responsible for cooking and housework. His eldest daughter also goes gillnet fishing with her brother during the day.

I have seven sisters and brothers. Most of them are living in this village. I was the last one in my family to settle on land. My brothers and sisters helped me so much especially when I built my own house. I borrowed their money. Their children worked with us to build my house. Without their helps, everything would be more difficult. (Ke, a mobile fisherman, June 2006)

Extended family is very common in the village. In many households, there are three or four generations living together. The knit kinship-based relationship was the original basis for the “*Vạn*” - the fishing community of sampan dwellers. The relationship has evolved over a long time period. Huong and his sister are an example of a kinship-based relationship. Huong helped his sister when her family faced difficulties. He sold part of his fishing ground to his sister. Huong and his sister agreed to a deferred payment plan which was helpful because his sister’s household was facing economic problem. They are currently working together in net-enclosure aquaculture and fishing in a large net-enclosure. They also have their own aquaculture earth ponds.

Neighbour relationships are a new social network for sampan dwellers. It is important for sampan dwellers to establish themselves in their new community. Indeed, it was difficult to maintain relationships over time because of the nature of living on bamboo boat (DaCosta and Turner 2007). According to Hong, he has a stronger and closer tie with villagers who he considers his lifelong neighbours. In the 2007 livelihood survey, more than 70% of households indicated that relatives and neighbours are the main information channels for marketing information and fishing techniques.

Since I settled and built my own house, my life has changed significantly. I have more friends and neighbours. I only work at night, so I spend a lot of free time with my neighbours. They are right here, next to us; therefore, it is very convenient to visit. In harvesting season, my son and one of my neighbours went for wage labour in aquaculture earth ponds. They worked together like brothers.... I participate in the Farmer's Union and encourage my wife to get involved in the Women's Union. I feel I have stronger tie with my village. (Dau, an earth pond owner, December 2006)

5.4 Livelihood activities and strategies

Livelihood strategies depend on the household's assets. In the village, the fishing ground is one of the most important assets that classifies the different user groups and influences the current livelihood systems. Comparing the livelihoods of Vo's and Manh's households reveals how households negotiate their livelihood activities and how the combination of assets determines household livelihood strategies.

Vo returned from the military and inherited his fishing ground complete with fish corrals. Since the aquaculture boom, he has enclosed a large fishing ground surrounding his fish corrals for net-enclosures. In 2001, Vo started building his aquaculture plot for tiger shrimp farming and also built a patrol house to stay in for the dry season. The patrol household is temporary and is set up annually after the flooding season. Vo's family has settled in a brick house since 2000. Manh's household is a traditional mobile gear-fishing household. Gillnets are the main fishing gear used in Manh's household as well as other mobile gear-fishing households. They have been settled on land since 2003. Currently, they are living in a temporary house and use mobile fishing gear. The main difference between these two households is the access to the fishing grounds (net-enclosures – *de facto* private property). Access to fishing grounds leads to a distinction in livelihood systems. With access to 2.5 hectare fishing ground, Vo's household has more opportunities to diversify and secure their livelihood. Table 5.10 illustrates the main difference in livelihood activities and strategies in the two households.

Livelihood strategies are plans and activities for achieving an end that, in turn, require certain assets, entitlements and capabilities. They are the product of the interaction between choices and constraints. In the Thuy Dien village case study, six main livelihood strategies were identified: *mobility*, *diversification*, *specialization*, *commercialization*, *intensification*, and *out-migration*. In the village, almost none of households pursue a single livelihood strategy. They may be involved in multiple strategies which sometimes seem to conflict with each other, such as diversification and specialization. In fact, these strategies are only incompatible at the individual level; they can co-exist within a household livelihood strategy (Ellis 2000). A household can diversify their livelihood as

each individual specializes in a single occupation. For example, in Vinh’s household, his daughter is a hairdresser; one of his sons is working in aquaculture in the neighbouring village, while the rest of the household are involved in fishing and aquaculture in their net-enclosures.

Table 5.10: Comparison between net-enclosure and mobile gear households

	Net-enclosure household (Vo’s household)	Mobile gear households (Manh’s household)
Mobility	<ul style="list-style-type: none"> • Fishing and aquaculture in his net-enclosure 	<ul style="list-style-type: none"> • Mobile fishing activities
Diversification	<ul style="list-style-type: none"> • Multiple activities: fishing, aquaculture, wage labour, trading, and animal raising • Multiple fishing gear 	<ul style="list-style-type: none"> • Multiple activities: fishing, wage labour, and animal raising • Multiple fishing gear
Specialization	<ul style="list-style-type: none"> • NA 	<ul style="list-style-type: none"> • NA
Commercialization	<ul style="list-style-type: none"> • Tiger shrimp farming 	<ul style="list-style-type: none"> • NA
Intensification	<ul style="list-style-type: none"> • Intensive fishing 	<ul style="list-style-type: none"> • Intensive fishing
Out-migration	<ul style="list-style-type: none"> • Seasonal migration 	<ul style="list-style-type: none"> • Seasonal migration

Local households may pursue different livelihood strategies, depending on the seasons, their access to livelihood assets (especially fishing grounds and education), their skill base and risk preference (Leach *et al.* 1997, Pomeroy *et al.* 2006). Household livelihood strategies may also be shaped by traditional and government institutions (local customs, government regulations...), social relations (gender, kinship...), and economic opportunities (Ellis 2000). Some strategies are pursued more strongly than others. For instance, more than 90% of households diversified their livelihood activities (*livelihood survey 2007*). Fishing grounds, specifically fish corrals, constitute the most important natural capital in forming household strategies. Access to this type of fishing gear is also the key characteristic distinguishing fishing groups in the village. In addition to the availability of livelihood assets, previous experiences, the number of people of working age, illness, and other factors may also influence household choices (Marschke 2005).

5.4.1 Mobility

Mobility in this context refer to the moving and “following the fish tail” to earn their livelihoods (Tuyen 1997; Tuyen and Brezski 1998). It is an aspect of rural fishing communities (Marschke 2005), especially for sampan households in Tam Giang Lagoon. In informal discussions with local fishers, they pointed out both advantages and disadvantages to their resettlement on land. Local fishers indicated that having more opportunities to diversify their livelihood activities was an advantage. Living on bamboo boat was seen as most convenient for their fishing activities, but was also seen as limiting access to land-based systems such as education, fresh water supplies, and health care systems. Most of sampan dwellers have been settled on land since 1985. In 2006, 10 households in the village were still living on bamboo boats. Although most of households in the village have been settled, mobility was still a common livelihood strategy for fishers, especially mobile gear fishers.

My family has not settled on land yet. We stay in our patrol house in peak season. It is convenient that we live and work in the same place. However, every day my older daughter has to take all products to the local market, as well as take her sister to school. It takes about 30 minutes or more one way to paddle. My wife and I went to the market sometimes for shopping and chatting with my relatives and friends. In the rainy season, we stay on the boat and move closer to the edge of the lagoon. My children may stay in my parents' house in case of floods or typhoons (Lua – a sampan net-enclosure owner).

5.4.2 Diversification

Diversification is a process “by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living” (Ellis 2000:15). It reduces the risk of livelihood failure by relying on multiple income sources (Allison and Ellis 2001; Marschke 2005). Fishing itself is a diverse occupation with both multiple species and multiple gear types (Pomeroy *et al.* 2006). For example, in the village, Manh’s household uses multiple gear types for their mobile fishing including gillnets, seine, and push-nets. Taking advantage of net-enclosure fishing, Vo’s household diversifies their activities not only in the combination of

aquaculture and capture fishing in his fishing ground, but also in the diversity of fixed gear (e.g., fish corrals and FAD) and mobile gear (e.g., gillnet and light fishing).

This diversification can also be seen in the expansion of non-fishing activities in the village. Both Manh’s and Vo’s households are involved in wage labour and animal-raising. Diversification can either be a coping strategy or an adaptive strategy (Allison and Ellis 2001); wage labour in these two households is a blend of both strategies to cope with and adapt to the fluctuation of seasonal activities. In Vo’s household, wage labour provides supplementary income in rainy seasons; in Manh’s household, his son works in an aquaculture earth pond in the peak seasons and contributes approximately one-third of the household’s annual income (Table 5.14). By settling on land, non-fishing activities are more and more common in the village. About seven percent of the households are engaged in trading, including exchanging fish and small goods in the village. More than 60% of households raise chickens and ducks. In some households, these non-fishing activities become their main livelihood. Danh’s household, for example, depends on different services (cafe, karaoke, billiards...), animal raising and wage labour for their daily living.

Table 5.11: Diversification as a livelihood strategy

Sub-strategies	Activities
Diversity of fishing activities	<ul style="list-style-type: none"> • Use multiple gear for fishing • Combination of fishing and aquaculture
Diversity of fishing related activities	<ul style="list-style-type: none"> • Services for fishing and aquaculture (net-mending, fish buying) • Wage labour in aquaculture earth ponds
Non-fishing activities	<ul style="list-style-type: none"> • Trading and money lending • Livestock raising (chicken, ducks) • Services (hairdressing, cafe) • Wage labour • Seasonal migration

Not only do households diversify their livelihoods, but individuals are also multi-tasking. Most female fishers are not only responsible for housework, but are also involved in all capture fishing activities, animal-raising, and/or trading. Diversification as a strategy may be more pervasive than is recognized (Marschke 2005) as a way to respond to resource

declines, seasonal fluctuation, and marketing opportunities. Local households constantly rearrange and find opportunities to diversify their livelihood activities based on various assets. Better-off households seem to have more opportunities for diversification in both fishing activities and non-fishing activities. Trading and other services in the village require sufficient financial capital for initial investment or basic training (e.g., hair dressing, clothes making). For households with limited credit, wage labour and migration are alternative options.

Household livelihood diversity is not necessarily synonymous with sectoral diversity (fishing, aquaculture, services, etc.) (Bryceson 1996). Diversification existed in the village even in the context of collectivization or before the reunification of the country. Livelihood systems have been more diversified with multiple fishing related and non-fishing activities since the development of aquaculture. Table 5.11 represents some sub-strategies and illustrates the main activities associated with diversification.

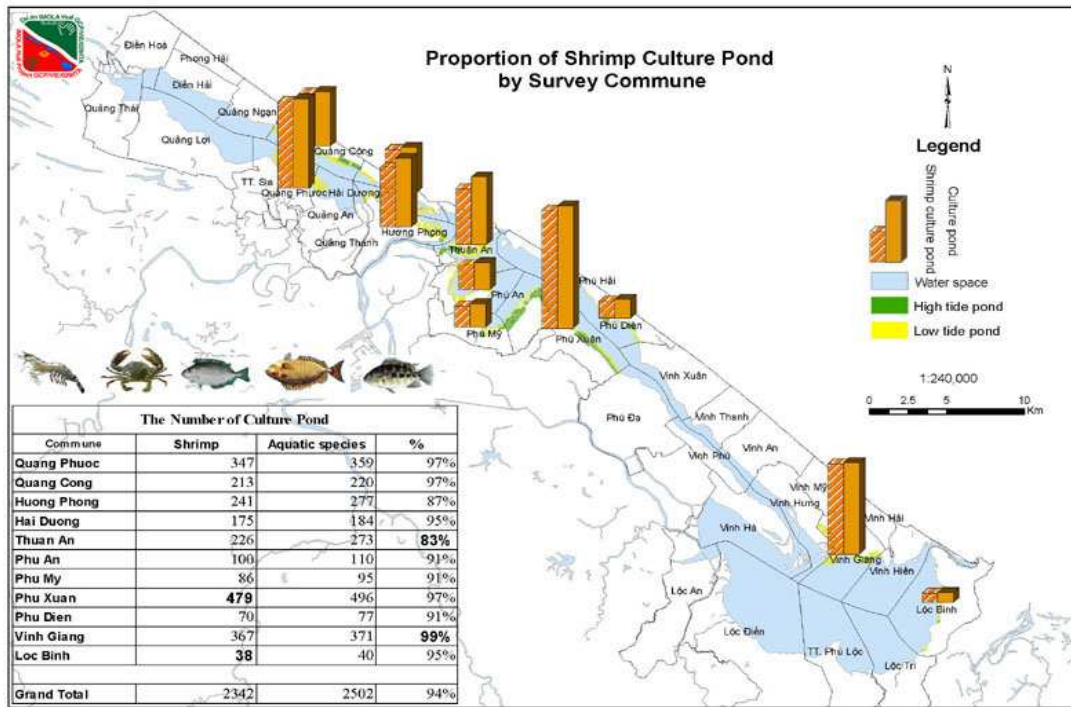
5.4.3 Specialization

Warren (2002) indicated that livelihood diversification may lead to some form of household specialization. In Thuy Dien village, involvement in aquaculture was one way to diversify livelihoods and respond to resource decline. However, earth pond aquaculture requires more labours and other assets. In this case, many households do not only specialize in a single activity, but also in producing a single cultured species, namely the black tiger shrimp (*P. Monodon*). Figure 5.9 illustrates the proportion of tiger shrimp ponds in the total aquaculture ponds in some communes surrounding Tam Giang Lagoon. The Phu Xuan Commune (where the village is located), has the second highest proportion of tiger shrimp ponds, with 97% of the total 496 aquaculture ponds devoted to tiger shrimp farming. On average, 94% of aquaculture ponds in Tam Giang Lagoon are specialized to tiger shrimp aquaculture (IMOLA 2006).

The high degree of specialization in aquaculture may result in negative long-term consequences in both environmental and social systems. Shrimp disease, antibiotics, chemical residues, and wastewater discharge from aquaculture ponds has significantly

affected the lagoon’s ecological systems. Although aquaculture households depend on different income sources from fishing and non-fishing activities, earth pond aquaculture provided the most important income and also requires a large investment. Losses in aquaculture were the main reason for the large amount of household debt in the village.

Specialization in aquaculture, in fact, is only a seasonal livelihood strategy in most earth pond households. In rainy seasons, most households are involved in other fishing and non-fishing activities. Some of them also go to other cities for wage labour; while some depend on their savings for their daily living needs. In fact, specialization and diversification coexist as important strategies for a large number of aquaculture households.



Source: IMOLA project 2006

Figure 5.9: The specialization of shrimp culture ponds in Tam Giang Lagoon

5.4.4 Commercialization

Commercialization is defined as “the product choice and input use decisions are based on the principles of profit maximization” (Pingali and Rosegrant 1995). Owing to market demand, a large number of households in Thuy Dien village, as well as in the rest of Tam

Giang Lagoon, are involved in aquaculture, especially tiger shrimp aquaculture. Government support, together with the appearance of middlemen and sale agents, has also further accelerated the commercialization of fisheries activities. In this context, commercialization refers to shrimp farming for commercial trade, which may be for local, regional, and/or export markets. Commercial production is likely to be greater for rural households with good market access (Minot *et al.* 2006).

In the village, a large fishing ground has been enclosed for earth pond and net-enclosure aquaculture for commercial production. The level of commercialization varies in different households and is dependent on their livelihood assets, especially their fishing ground access. Manh's household wants to get involved in aquaculture; however, they are unable to afford the high investment needed for fishing grounds and for other expenses. Minot *et al.* (2006) indicated that commercialization is higher among higher income rural households. Commercial aquaculture in the village, in fact, has raised a number of issues over the possibly adverse consequences of the commercialization process, including income distribution, market risks and resource sustainability (Pingali and Rosegrant 1995).

5.4.5 Intensification

In fishing communities, intensification, refers to increasing one's fishing effort. That is, households intensify strategies for generating income, using available labours and resources as fully as possible (De Haan and Zoomers 2003). In earth pond households, intensification is combined with tiger shrimp aquaculture. Owners of aquaculture earth ponds try to increase the density of tiger shrimp per square meter; however, the application of this strategy does not seem to be successful because it creates a lot of environmental problems, increases shrimp disease vulnerability, and creates an immense debt load for the household.

In net-enclosure and mobile gear fishing, intensification is observed in the increased amount of fishing gear, as well as in its intensive use. Cu's household has increased the fish corrals from four to six in his net-enclosure for three years. He has also added more

traps to each fish corral. Vo's household intensifies fishing activities in a different way. They make use of their fishing gear and their working hours as much as possible. In peak seasons, his son stays in his patrol house most of time. He goes fishing with his parents at night and goes fishing with his sister in the day. As well, they also increase the number of net-layers (two to three layers) surrounding their net-enclosures and aquaculture plots. Fishing nets with fine mesh size (e.g., gillnets) have become increasingly popular and have been used to catch all available species of any sizes. Table 5.12 provides some examples of intensive fishing and aquaculture activities in the lagoon. These activities are, in fact, one of the important causes of Tam Giang Lagoon's declining resources.

Table 5.12: Intensification as a livelihood strategy

Sub-strategies	Activities
Gear selection	<ul style="list-style-type: none"> • Use fine mesh size gillnets • Intensive use of fishing gear • Use two or more net layers surrounding net-enclosures
Meddling with fish seasonality	<ul style="list-style-type: none"> • Year-round fishing of all available aquatic species
No species or size restriction	<ul style="list-style-type: none"> • Catch all available species • Catch all available sizes
No time and space restriction	<ul style="list-style-type: none"> • Fishing anytime • Fishing outside the commune boundaries • Fishing anywhere outside of aquaculture areas
Aquaculture	<ul style="list-style-type: none"> • Intensive tiger shrimp farming

5.4.6 Out-migration

Out-migration is also an important diversification activity in Thuy Dien village. It represents the importance of the linkages of rural society with urban centers. Migration refers to the fact that one or more family members has left the village to work in Hue City or in other southern urban areas and is sending money back to the village (Central Census Steering Committee 2000; Dalton *et al.* 2002). It is possible to categorize migration into two different types: permanent migration and seasonal migration (McDowell and Haan 1997). In the village, money remittance from permanent migration is not popular, but it is

the most important income in single old-age households. Only approximately two percent of the population permanently migrates to urban areas. Temporary migration is very popular in rainy seasons and is a survival strategy for some households, but may be a supplemental activity in others. In some households, migration provides opportunities for younger members to save money and to improve their non-fishing skills. Migration within the province (Hue City or Thuan An town) and to Danang city is common in the village in rainy season. These cities are approximately 100 km or less from the village. Most long-term migration is outside the province, mostly to Ho Chi Minh City. While migration to other countries such as Canada or the United States is the plan for some households in Thuy Dien; however, in comparison with other villages, the number of households migrating from Thuy Dien to other countries is minimal.

Table 5.13: Out-migration as a livelihood strategy

Sub-strategies	Activities
Long-term migration	<ul style="list-style-type: none"> • Migrate all year around or permanently
Seasonal migration	<ul style="list-style-type: none"> • Migrate for a few months in rainy season • Migrate to work in aquaculture earth ponds in other neighbouring villages
Migrate within the province	<ul style="list-style-type: none"> • Migrate to Hue city or other towns in the province
Migrate outside the province	<ul style="list-style-type: none"> • Migrate to Danang city, Ho Chi Minh city or other major cities
Migrate outside the country	<ul style="list-style-type: none"> • Migrate to other countries after marriage

5.5 Circulation of livelihood income

To understand the feedback and investment of livelihood outcomes, income circulation was emphasized. Vo's and Manh's households were representative examples for two different resource user groups: net-enclosure and mobile fishing. Income portfolios and expenditures of Vo's and Manh's households were analyzed (Table 5.14 and Table 5.15) in order to understand the distinctive influences of aquaculture on each group. In Thuy Dien village, wives are responsible for selling fishing products, and also for the household's money in most cases. Information about income and expenditure was

obtained from interviewing the wives and observations of the household member's daily lives. Income and expenditure were also estimated, converted to a percentage, and verified by interviewing other local fishers in the same groups.

Table 5.14 represents the differences in income portfolios after five years. In 2001, Manh's household was still sampan-based; fishing was the only livelihood activity providing income for his household. Vo's household has been settled since 2000 and had more opportunities to diversify their activities as a means to supplement fishing incomes.

Table 5.14: Income portfolios of two households

	Vo's household (<i>net-enclosure</i>)			Manh's household (<i>mobile gear</i>)		
	2001	2006		2001	2006	
	%	%	VND	%	%	VND
Aquaculture		46	18,000,000			
Fishing	85	28	11,000,000	100.0	62	8,400,000
Wage labour	15	6	2,500,000		29	4,000,000
Trading		17	6,500,000			
Animal raising		3	1,200,000		8	1,100,000
	100	100	39,200,000	100	100	13,500,000

Note: CAD\$1 = VND 14,500 (June 2006)

After five years, livelihoods of both households have changed remarkably and diversified significantly. Vo's household involves net-enclosure aquaculture, which provided almost half of the household's income in 2006. Manh's household diversified their livelihoods; however, their total income was less than the income from aquaculture in Vo's household. Aquaculture, in fact, has made a significant difference in household incomes between the two households and generally between net-enclosure and mobile gear groups. Capture fishing remained an important livelihood activity in both households. In Manh's household, it was the primary income source, which was equal to two-thirds of the total household income. Income from capture fishing of Vo's household was higher than that of Manh's household because of the advantage fish corrals provide.

Non-fishing activities provided one-quarter to one-third of the incomes for both households. Manh's household has limited financial capital; consequently wage labour was the main alternative livelihood option. Animal raising was mostly for household consumption; a small amount was for the local market. In Vo's household, small trading was the most important non-fishing activity. Although most of the purchasing was deferred payment, their small shop provided considerable income for the household.

Table 5.15 analyzes the details of household expenditure to understand how local fishers spend their income. The differences in income would certainly influence each household's expenditures. Vo's household spent only one-third of their income for expenditures, while Manh's household spent two-thirds. Manh's wife explained that she tried to reduce their daily consumption and expenses as much as possible; however, it was still very difficult to save more. Differing from other land-based villages in Vietnam, villagers in Thuy Dien village do not have access to agriculture farms. Therefore, they are unable to produce food such as rice and vegetables for household consumptions. Most food for consumption was obtained by cash purchase from the local market. Fish and other aquatic products are the main protein sources for villagers. Although there are no tuition fees for primary schools; a considerable amount was spent for other school fees and compulsory insurance. Smoking is very common in the village. Although it was explained that they spent a small amount for smoking, it added up to a significant amount annually. In Vo's household, the amount spent for smoking was higher than the amount spent for sending his daughter to school.

Table 5.15: Income and allocation of expenditures of two households

	Income (VND)	Saving/ paying debt	Investment	Taxes and fees	Expenditure				
					Food	Smoking	Education/ insurance	Ceremony	Others
Vo's hh (net-enclosure)	39,200,000	24%	34%	5%	20%	5%	3%	3%	6%
Manh's hh (mobile gear)	13,500,000	12%	15%	3%	35%	8%	15%	8%	4%

Note: CAD\$1 = VND 14500 (June 2006)

The main difference in the expenditures of the two households was investment, paying taxes and fees, savings and paying debt. Vo's household had to pay taxes for their fishing ground to the commune government; consequently, they spent almost five times more than Manh's household in taxes and fees. Investment in net-enclosure aquaculture required a significant amount annually for making a patrol house and an aquaculture plot, and for buying more fishing gear and fingerlings. The amount for investment for net-enclosure in Vo's household was approximately equal to the total incomes of Manh's household. The biggest gap between the two households was in the saving and paying debt category. Manh's household was in debt; therefore, almost all of their savings was spent on debt repayment. Manh wanted to get involved in aquaculture net-enclosure; however, they had so little in the way of savings that they could not afford to.

5.6 Livelihoods challenges in different groups

In a livelihood survey in 2007, multiple factors were found to negatively influence livelihood systems in Thuy Dien village, e.g. seasonality, market fluctuation, and the increasing price of fishing gear and household expenditures. Open-ended questions regarding challenges for household livelihoods allowed multiple responses and explanations. An average of three to four problems were indicated in fishing households in the fishing groups, while non-fishing households mentioned only one or two problems. Table 5.16 represents the percentages of answers on household problems by user group. For example, lack of money is the most frequent answer. "Lack of money" is the response of 93% of mobile gear households and 90% of non-fishing households. Although most households would like more money, the difference for poor households is that access to cash might enable them to meet their basic needs (Chambers 2004; Marschke 2005). Some households are unable to access formal credit channels, while others are dealing with immense debt loads because of aquaculture losses.

Aquatic diseases are an emerging problem in aquaculture households. The problem was voiced by approximately 90% of households in the earth pond group. When an earth pond aquaculture household is impacted by shrimp diseases, especially WSSV, they may

lose their entire investment, while increasing the chances of having the same disease in the next aquaculture crop. An aquaculture earth pond may provide opportunities for higher profits, but the risk level is also higher for this activity.

Table 5.16: Household problems in different user groups

	Earth pond group	Net-enclosure group	Mobile gear group	Non-fishing group
Lack of money	72	82	93	90
Aquatic diseases	89	64		
Market fluctuation	56	36	27	40
Resource decline	60	77	87	30
Lack of fishing grounds	19	27	80	20
Destructive fishing	34	45	53	
Lagoon contamination	36	55	60	

Source: Livelihood survey 2007 and focus group discussions 2007

The availability of open fishing grounds for all fishers has been reduced remarkably since the aquaculture boom. Therefore, the lack of fishing ground is the major problem facing mobile fishing households who are not involved in aquaculture activities. Net-enclosure owners also claim that the lack of fishing grounds for their net-enclosures is negatively impacting them.

The problem of resource decline is mentioned by all four groups, especially by fishing households. 30 % of households in the non-fishing group indicate that the decline of the fishery resources is the main reason they are discontinuing their fishing activities. In focus group discussions, this was considered the second problem facing both net-enclosure and mobile fishing groups, followed by the lack of capital. Participants indicated that the two main reasons for the decline in fishery resources are the use of destructive fishing gear and the discharge of wastewater from in-land activities, including earth pond aquaculture. Electric fishing, a kind of destructive fishing, is not very common nowadays but is still a considerable problem in the village. Households engaged in destructive fishing are mostly poor households in Thuy Dien, as well as in other neighbouring villages. The use of destructive fishing, together with increased competition over declining resources is an ever-increasing pressure for the mobile gear fisher in the village.

While some problems were critical for some user groups, they were of lesser concern for other groups. However, most of these problems were inter-connected and linked to reduction in income and a lack of money (Figure 5.10). Although general livelihood systems in the village have significantly improved after aquaculture development, livelihood sustainability is still a challenge.

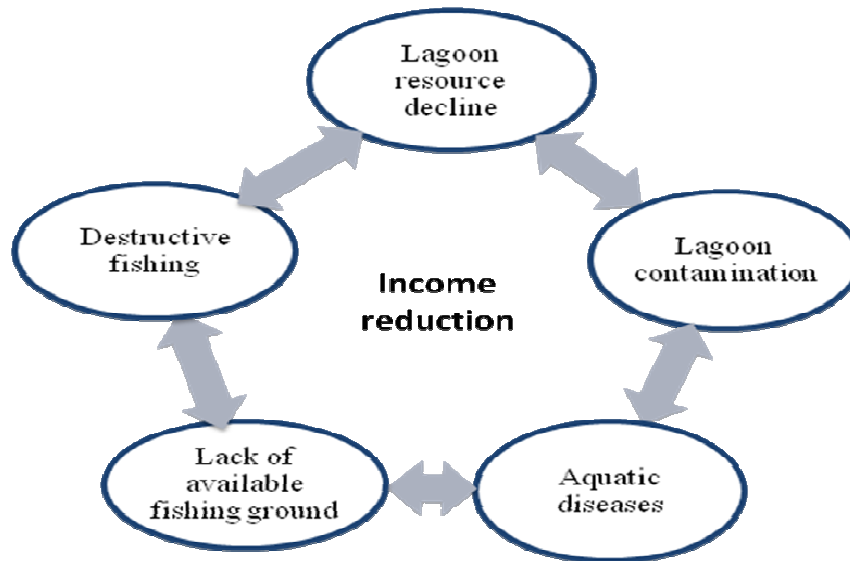


Figure 5.10: The circle of livelihood problems

5.7 Discussion and conclusions

5.7.1 The effects of property right changes and aquaculture development on livelihood systems

Chapter Five draws on an analytical livelihood framework to examine the livelihood systems in Thuy Dien village in response to aquaculture development and changes in resource access. Natural resources are the most important livelihood asset in rural Vietnam. Access to fishing grounds may provide opportunities for households to enhance their access to other livelihood assets (physical, financial, human, and social capitals) and to pursue various livelihood activities. For example, Hiep’s household has been saving, but still borrow credit from the Agribank for aquaculture related expenses. Other aquaculture households, such as Huong’s or Vinh’s, supported their daughters

participating in training for clothes making and hair dressing. Women in earth pond households had more time to participate in the Women's Union and other social activities. Consequently, they also have better opportunities to get a loan from semi-formal credit sectors.

In the case of Thuy Dien village, fishing grounds are not simply resources for local community to build their livelihoods, but provide them “*capabilities to be and act*” (Bebbington 1999: 2022). Access to resources is also the basis of social-political powers of different groups to act, to reproduce, and to challenge or change the rules that govern the use and management of resources (Bebbington 1999; Acemoglu and Robinson 2008). In Thuy Dien village, holding property rights reinforces their social-political power and enables this group to push for economic and political institutions favourable for its own interests; at the same time, holding social-political power is helpful for fixed gear fishers to strengthen their *de facto* property rights.

A new range of livelihood assets became available to villagers by the settlement in the village and expansion of aquaculture. Each household negotiates their activities, based upon seasonality, division of household labour and available resource assets (Marschke 2005). Diversification into fishing and non-fishing activities can be seen as a coping strategy or an adaptive strategy, or may be a blend of both (Marschke 2005). This livelihood strategy reduces the risk of livelihood failure by developing multiple income sources. Livelihood diversification has become a key livelihood strategy for most village households.

Some livelihood strategies were not known in the village, but some user groups have become more familiar with alternate livelihood strategies. For example, specialization and commercialization became very strong strategies in aquaculture households, especially in the peak seasons, while out-migration is pursued in most non-fishing and mobile fishing households in the off-peak seasons. At the same time, mobility, the essential livelihood strategy of sampan households, has been significantly reduced in the village. Local households may pursue one or more strategies. Some strategies may not be

incompatible, e.g., specialization and diversification, at an individual level; they can co-exist within a household livelihood strategy (Ellis 2000).

Table 5.17: Livelihood strategies before and after aquaculture development

Livelihood strategies	Before aquaculture development	After aquaculture development			
		Earth pond	Net-enclosure	Mobile fishing	Non-fishing
Diversification	+	+++	+++	+++	+++
Specialization	-	+++	++	-	-
Commercialization	-	++	++	+	+
Intensification	+	+++	++	+++	+
Out-migration	-	+	+	++	+++
Mobility	++	+	+	+++	-

Notes: Relative strength of variables (+++) (++) (+) (-)
 (+++) very strong strategy (+) neutral strategy
 (++) strong strategy (-) weak strategy

5.7.2 Livelihood systems in Thuy Dien village as complex adaptive systems

Complex systems thinking is used to bridge social and biophysical sciences to understand the linkages in social-ecological systems for sustainability (Berkes and Folke 1998; Berkes *et al.* 2003; Gunderson and Holling 2002; Scoones 1998). Livelihood systems in Thuy Dien village are dynamic and integrated systems of making a living, supporting well-being and giving meaning to the person's world (Bebbington 1999; Chambers 1997). The systems are influenced by trends, shocks and stresses, and seasonality, as well as by the dynamic processes such as formal and informal institutions, social relations, and cultures. In this context, livelihood systems should be understood as complex systems of social and ecological systems. Fisheries resources themselves are inherently unpredictable due to their internal complexity, external influences, as well as the difficulty in obtaining accurate information about them (Mahon *et al.* 2008; Hughest *et al.* 2005). Resource dependent livelihoods are more uncertain because of the complexity in social systems, and especially of the linkages between social and ecological systems.

Livelihoods fit the requirement of complex systems because they are organized hierarchically from individual, household, community to provincial, national, and finally

global levels. The household is a key level of development perspectives, as well as for livelihood analysis. Two other nearby levels, individuals and community, are also essential in examining livelihood systems. Indeed, the heterogeneous differences within a household or a community (i.e. age, gender, resource access) have been one of the most popular aspects for understanding the livelihood systems at the individual level. For example, in Hiep's household (an earth pond household), the husband is responsible for his pond, while his wife is in charge of net-mending, animal raising, money lending, and housework. Each individual's livelihood could be considered a complex system with the internal dynamics of livelihood capabilities, strategies, and trade-offs in livelihood outcomes. Communities may be more complex, dynamic and diverse than individual and household level systems, with various interests by gender, age, class, ethnicity, socio-economic groups and power relationships (Agrawal and Gibson 1999). Competing groups are often found within the community, especially related to resource use and access. For example, at the village level, the mobile gear group is struggling with the encroachment of net-enclosure and earth pond aquaculture; whereas at the commune level, conflicts are stronger between agriculture and aquaculture groups. Cross-scale analysis, which may include individual levels, household levels, community levels, provincial levels, national levels, and international levels, would provide a full picture for understanding the systems (Gunderson and Holling 2002). However, no single study can provide a complete cross-scale analysis of livelihoods. In this study, the household is the main level of analysis, and linkages with other levels are also considered.

As a complex adaptive system, a livelihood system is self-organized and adaptive. Self-organization simply implies rules that govern how livelihoods respond to past and present conditions, rather than the system's development (Levin 1999:12). As with the "Vạn"-based system, these rules exist for a long time and may also empower the community to cope effectively with disturbances. The concept of resilience in complex adaptive systems is a promising tool for understanding livelihood sustainability, which should be examined from multiple perspectives. This must involve the building of sustainable relationships among people and between people and their environment. Livelihoods are sustainable when they are resilient in the face of external shocks and stresses, maintain the long-term productivity of natural resources and do not compromise the livelihood

options of others (Chambers and Conway 1992; Hossain *et al.* 2006). However, livelihood sustainability may be difficult to achieve in the context of resource decline and lack of alternative livelihood options (Marschke 2005). The issues of livelihood resilience and sustainability will be the focus of Chapter Six.

CHAPTER 6.

Livelihood Transformations and Resilience⁸



Photo by Ta T.T. Huong (2006)

Figure 6.1: A kitchen of a sampan household in Thuy Dien village

⁽⁸⁾ The researcher's paper on Transformation on Coastal Livelihoods in Tam Giang Lagoon, Vietnam which is based on this chapter, was awarded the best student paper in the 2009 Ocean Management Research Network conference.

Livelihood systems in Thuy Dien village have changed remarkably since the policy reforms of 1986 and aquaculture development. In general, the living standard found in the village is much higher, especially in aquaculture households. However, the aquaculture boom has reduced the water area available for mobile gear fishing groups, polarized different user groups, and created conflicts. As argued in the previous chapter, livelihood systems in Thuy Dien village, Tam Giang Lagoon showed a number of characteristics of complex adaptive systems. Resilience is an emergent property of complex systems, including livelihood systems in the present case. It deals with the capacity to absorb disturbances, as well as the capacity for renewal, reorganization and development (Gunderson and Holling 2002; Berkes 2003; Folke 2006). When resilience is lost, the systems may cross their thresholds and transfer to an alternative domain.

This chapter applies resilience thinking to an analysis of the local livelihood systems in Thuy Dien village, Tam Giang Lagoon. The main objective of this chapter is to understand the resilience of livelihood systems and how that resilience is enhanced. The chapter sets out to answer the following questions:

- (i) Is there transformation in local livelihood systems after the policy reforms and aquaculture development?
- (ii) If yes, how has resilience been changed and how have livelihood systems transformed?
- (iii) Which factors contribute to building resilience in livelihood systems in the village?

The chapter begins with an exploration of the relevance of resilience thinking for understanding the system transformation with respect to thresholds and livelihood system identity. The chapter then provides an overview of shocks and stresses experienced by villagers. Some of these shocks and stresses are common to the whole village, whereas others are specific to some user groups. The overview also includes various ways in which local people respond to these disturbances. Livelihood strategies are then analyzed with specific attention to how resilience is built or reduced. Besides livelihood strategies, a number of different factors which may strengthen resilience are also identified.

6.1 Resilience in livelihood systems

6.1.1 Resilience and transformation in livelihood systems

The resilience perspective emerged from ecology in the early 1970s through the study of ecological systems and their stability and ability to absorb changes (Holling 1973). It became an essential theory which influenced various fields outside ecology, especially interdisciplinary studies (Folke 2006), biodiversity (Folke *et al.* 1996), property rights and commons property (Hanna *et al.* 1996; Berkes and Folke 1998), cross-scale linkages (Folke *et al.* 1998), and socioeconomic systems (Levin *et al.* 1998). The resilience perspective also shifts policy approaches from controlling change in systems to managing the capacity of social-ecological systems to cope with and adapt to changes and disturbances (Berkes 2003; Folke 2006; Smit and Wandel 2006).

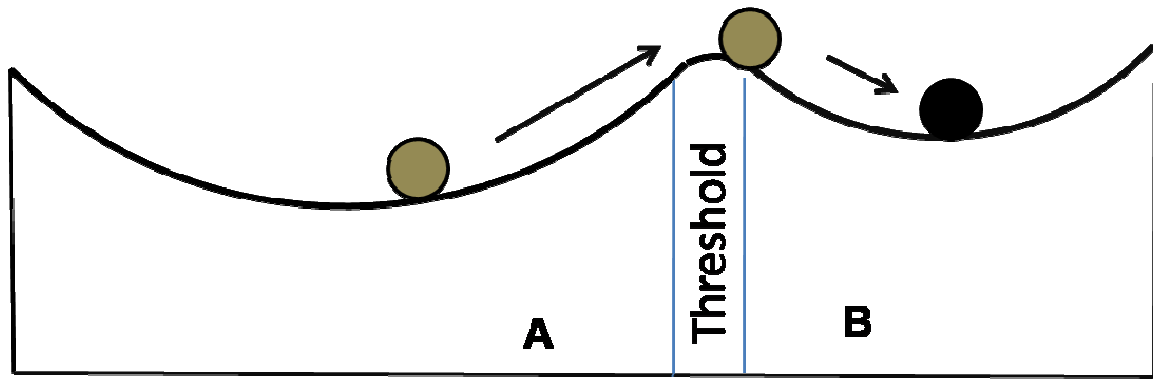
Resilience is defined as “*the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedback*” (Walker *et al.* 2004). Levels of resilience are defined by three criteria: (1) the amount of change the system can undergo and still retain the same controls on function and structure; (2) the degree to which the system is capable of self-organization; and (3) the ability to build and increase the capacity for learning and adaptation (Resilience Alliance 2009). A lot of work on resilience has focused on the capacity to absorb disturbances and still retain the same function. But resilience is also about the capacity for renewal, reorganization and development which has been less in focus but is essential for sustainability discourse (Gunderson and Holling 2002; Berkes 2003; Folke 2006). When a livelihood system loses resilience, it becomes vulnerable to change that previously could be absorbed (Kasperson and Kasperson 2001) and even small changes may be devastating (Folke *et al.* 2003).

Walker *et al.* (2004) introduced the “basin of attraction” to understand the dynamics of resilience. They defined a basin of attraction as a region in a state of space in which the system tends to remain (Walker *et al.* 2004). A livelihood system moves around an equilibrium of a particular basin of attraction when facing disturbances. The basin of

attraction is influenced by variables reflecting the system. A livelihood system may have occupied various basins of attraction and may experience a shift from one basin of attraction to an alternative basin of attraction. The capacity to create a new stability landscape when the existing systems are untenable is defined as transformability (Walker *et al.* 2004). The shift to the new stability landscape, in fact, is the transformation of the livelihood system.

Transformation has become a part of resilience theory and terminology. With attention on transformation, resilience may be an obstacle for a livelihood system to move into a desirable stability landscape. In this circumstance, resilience may not be a good thing (Walker *et al.* 2004). However, transformation in the direction of sustainable development is one of the great challenges for system management. In fact, transformation may be taken as the harm or damage to a system (Gallopín 2006). A less resilient system may shift from the current regime into a more undesirable and vulnerable one. In some cases, the transformation may be largely irreversible (Folke *et al.* 2004). Several studies have illustrated that ecological systems can be transformed into less productive or less desired regimes. The theoretical basis of negative transformations in ecological systems have been developed by Beisner *et al.* 2003; Scheffer and Carpenter 2003; Scheffer *et al.* 2001; Folke *et al.* 2004.

Resilience perspectives bring attention to shocks and stresses which are inherent in livelihood systems. Stresses and shocks impacting livelihoods are the result of interactions between external (e.g., international market) and internal drivers (e.g., seasonal cycle of resource user, changes in resource access) (De Haan 2000; Armitage and Johnson 2006; Marschke and Berkes 2006). Stress is a continuously or slowly increasing pressure (e.g., environmental degradation), commonly within the range of normal variability; whereas, shocks are major spikes in pressure beyond the normal range of variability, usually discrete in space and time (Turner *et al.* 2003; Marschke and Berkes 2006). A livelihood system is continuously buffeted by shocks and stresses, which makes the system move about within its basin of attraction. If the system moves within the regime, it is resilient. In other words, if the system crosses its threshold, it is transformed to an alternative regime (Figure 6.2).



Source: adapted from Gunderson (2000)

Figure 6.2: A shift of a livelihood system to an alternative regime

Shocks and stresses challenge not only the livelihood systems, but also the social-ecological systems in which the livelihoods are sub-systems. Changes in social-ecological systems may result in changes in the stability landscape of livelihood systems, such as changes in numbers of basins of attraction, changes in the depth of the basin, and changes in the position of threshold (Walker *et al.* 2004).

Resilience thinking emphasizes the importance of scale and cross-scale linkages (Berkes *et al.* 2003). In fact, livelihood systems cannot be understood by examining only one scale. Livelihood systems fit the requirement of complex adaptive systems in the hierarchical organization. The household is the key level for livelihood analysis; however, it is the actually only one level among several possible levels of analysis. Loss of resilience at a small scale of organization (e.g., individual level) changes the state of household livelihood systems but may not transform household livelihood systems. Walker *et al.* (2004) also suggested a system at one scale that loses resilience at smaller scale would be more resilient than one that loses resilience at larger scale. In fact, whether a livelihood system is resilient or transformed to a new regime depends on the scale of the definition of the systems. Characterizing the transformation as positive or negative (transformed to a desirable or undesirable regime, respectively) also depends on different judgment and various scales (Gallopín 2003).

6.1.2 Livelihood system identity and threshold

The resilience approach has been used extensively in many studies on social-ecological systems; however, resilience cannot be measured directly. In addition, it is difficult to apply the stable regime to the complex livelihood systems and to determine the threshold between two regimes (Carpenter 2003; Scheffer & Carpenter 2003; Carpenter *et al.* 2005). There have been some efforts focused on the prediction of threshold positions (Brand 2009). The first approach to predict the position of ecological thresholds is proposed by Wissel (1984) and refers to the time that an ecosystem needs to return to equilibrium after disturbance. Mathematical investigations prove that the characteristic return time will increase if system variables approach an ecological threshold. The second approach of Fath *et al.* (2003) and Mayer *et al.* (2006) refers to fishery information. Fisher information under the theme of estimation theory can be described in three ways: as a measure of the degree to which a variable (or state of a system) can be estimated; as a measure of the relative amount of information that exists between different states of a system; as a measure of the disorder or chaos of a system. The repeated calculation of the fishery information provides data to identify the period of regime shift and the pattern of variables at the system thresholds. The third approach examines the standard deviations of certain variables of a system to predict the position of ecological thresholds (Carpenter and Brock 2006). Carpenter and Brock (2006) suggested that increased variability should occur prior to threshold transitions in many ecosystem types. Interestingly, all three approaches for predicting the position of ecological thresholds seem to be highly connected, especially the last two approaches which may be used to identify the position of livelihood thresholds. It is important to determine key system variables and measure them to identify livelihood thresholds, or in other words, to assess resilience in livelihood systems. One way to determine key variables is to focus on system identity as offered by Cumming *et al.* (2005).

System identity depends on four essential attributes: (1) *components*, which include human and non-human actors; (2) *relationships*, which describe the way in which system components interact or fit together; (3) *innovation*, which are those subsets of the system that generate change and novelty; and (4) *continuity*, which describe the system's ability

to maintain its cohesive entity through space and time (Cumming *et al.* 2005). These four attributes (CRIC) are logically related, cohesive and mutually constraining (e.g., interactions among systems component constrain the types of components, or continuity constrains innovation), that are suitable for maintaining system identity (Cumming and Collier 2005). Different types of complex systems have their own identity criteria and require different kinds of relations which determine the dynamic unity of the system.

Cumming and his co-authors (2005) give an example of the eutrophication of a shallow lake from a clear water regime to a turbid water regime with the focus on water phosphorus. The standard deviations of total water phosphorus increase as the lake approaches its threshold. Water phosphorus is a system attribute but would not be considered as a part of system identity (Cumming *et al.* 2005). The concept of system identity helps clarify the distinction between the attributes that define the system itself and the drivers that impact on the system.

The most important idea of this CRIC approach is that many attributes of the systems may change in the face of shocks and stresses, but essential attributes of system identity must be maintained if the system is resilient (Cumming *et al.* 2005). To assess the maintenance of system identity, Cumming *et al.* 2005 suggested identifying a level of change as a fixed point against which to quantify changes in resilience. That level of change, in fact, is the boundary within a basin of attraction. In other words, it is the threshold of the system before transforming to an alternative domain. The following discussions examine shocks and stresses which impact the livelihood system. As well, the following sections discuss a number of key attributes of system identity associated with their thresholds as a surrogate measure of the current resilience and the possibility of system transformation.

6.2 Effects of drivers: shocks and stresses

In Thuy Dien village, both shocks and stresses have occurred. In open-ended interviews, local villagers in 65 households were encouraged to discuss disturbances they had

experienced and how they responded. Collected information was verified by observation and focus group discussions and summarized in Table 6.1.

Although shocks and stresses were categorized, the line between them may be blurred (Marschke 2005). A shock for one household may be a stress for the others. Illness, for example, may be an on-going stress for some households with multiple members pursuing different livelihood activities, but may be a shock to another household which only has a few working members, especially if it has affected the main income generator in a peak season. Similarly, tiger shrimp diseases are one of the on-going stresses facing most aquaculture households, but WSSV may be a shock as it causes high mortality (50-70% in two to three days and up to 100% after 4-5 days of infection) (Phuoc, pers. comm. 2007).

Some shocks and stresses were mentioned by all fishing households, whereas others were related to specific user groups in the village. Lack of access to fishing grounds and decline of fishery resources were a concern for most of the mobile fishing interviewees (80% and 87%, respectively) (see Table 5.17). Indeed, more than 80% of the available lagoon areas in the Sam Chuon region were occupied by aquaculture. Mobile gear fishers had to travel further to the lagoon to fish, but caught lower daily catches and smaller sized fish. For example, greasy-back shrimps (*Metapenaeus ensis*) were about 80 units/kg in 2003, but in 2006, they were about 100-120 units/kg products.

More than one third of interviewees in Thuy Dien village reported that destructive fishing was an on-going stress. An increased use of fine mesh size gillnets significantly reduced the productivity of large and medium mesh size gillnets. Destructive fishing, in fact, is an important factor in the decline of fishing resources in the area. According to Tung – a member of the Fisheries' Association, the number of households engaged in electric fishing has recently decreased significantly; however, it remained a considerable problem in the Sam Chuon area. Households engaged in destructive fishing were mostly poor households in Thuy Dien, as well as in other neighbouring villages. The use of destructive fishing together with more fishers competing over declining resources was an ever-increasing pressure for the mobile gear fishers in the village.

Table 6.1: List of shocks and stresses experienced by local villagers

Items		Explanation	Interviewees (%)	Responses to shocks and stresses
Stresses	Lack of access to fishing grounds	<ul style="list-style-type: none"> The expansion of net-enclosures and earth ponds has reduced the fishing grounds for mobile fishers 	35	<ul style="list-style-type: none"> Rearrange net-enclosures to provide larger areas for mobile fishing activities and to increase water flows in the area Travel long distance for fishing in response to lack of fishing ground and resource decline
	Decline of fishery resources	<ul style="list-style-type: none"> Decline of fish populations and habitat degradation because of over-fishing, destructive fishing and lagoon contamination (discharge of wastewater from inland activities) 	68	<ul style="list-style-type: none"> Diversifying livelihood activities (e.g., trading, animal raising, wage labour ...) to supplement income
	Destructive fishing	<ul style="list-style-type: none"> Illegal use of destructive fishing gear such as electric fishing, fine mesh size gillnets, etc. 	37	<ul style="list-style-type: none"> Government ban of destructive fishing gear Patrolling to minimize illegal fishing activities
	Market fluctuation	<ul style="list-style-type: none"> Price drops at the harvesting seasons; Increased price of feed and nets; 	40	<ul style="list-style-type: none"> Help from relatives
	Pressure of net-enclosure removal	<ul style="list-style-type: none"> Provincial and district government's strategies to remove net-enclosures 	36	<ul style="list-style-type: none"> Apply and renew commune permit
	Increase numbers of fishers	<ul style="list-style-type: none"> Population growth Large number of famer-fishers 	33	<ul style="list-style-type: none"> Travel long distance for fishing in response to lack of fishing ground and resource decline

	Items	Explanation	Interviewees (%)	Responses to shocks and stresses
Stresses (cont')	Large seasonal variation in fishing activities	<ul style="list-style-type: none"> • Dry seasons and rainy seasons • Fluctuation in temperature and salinity • Availability of different aquatic species 	68	<ul style="list-style-type: none"> • Seasonal migration to secure an alternative income source: Local villagers fish in peak season and travel to large cities for wage labour in rainy season • Intensive fishing after floods and heavy rains when productivity is said to be high
	Illness	<ul style="list-style-type: none"> • One or more households members is sick • Illness of income generators 	38	<ul style="list-style-type: none"> • NA
	Aquatic diseases	<ul style="list-style-type: none"> • Outbreaks of aquatic diseases lead to economic loss in aquaculture and fishing 	46	<ul style="list-style-type: none"> • Preventive measures to reduce the risk of aquaculture diseases (e.g., antibiotics, sedimentary ponds for water treatment) • Poly-aquaculture of different species (shrimp, fish, crab, seaweed...) in response to the loss of tiger shrimp monoculture
Shocks	Disease outbreak	<ul style="list-style-type: none"> • White spot syndrome virus (WSSV) cause high mortality) and result in 70% of losses in aquaculture in the village 		
	Natural disasters (typhoon, flood)	<ul style="list-style-type: none"> • Typhoons, floods, heavy rains, and other natural disasters cause damage to fishing gear, bamboo boats and aquaculture net-enclosures and earth ponds 	97	<ul style="list-style-type: none"> • Government supports and compensation: resettlement program and emergency relief after natural disasters (e.g., floods, storms...) • Local households reinforce their houses before the rainy seasons
	Loss of fishing gear	<ul style="list-style-type: none"> • Fish corrals are stolen • Products in fish corrals are stolen 	11	<ul style="list-style-type: none"> • Guarding to prevent theft of aquatic products
	Damage of fishing net-enclosure	<ul style="list-style-type: none"> • Nets surrounding net-enclosures are destroyed by mobile fishers or outsiders 	26	<ul style="list-style-type: none"> • Guarding net-enclosures and earth ponds to prevent damage

In the village, almost 70% of respondents reported that the seasonal cycle of the fishery resource availability was an annual stress and 40% reported that market fluctuation was also a concern. Seasonality is the nature of fishery activities; therefore, incomes related to fishing activities are unstable. Aquaculturists complained that the price of fingerlings and feed was artificially increased at the beginning of the aquaculture seasons, whereas the sale prices of aquatic products decreased at the harvesting stage. Hiep explained that they had to sell their products before the flood seasons. Taking advantage of that pressure, middlemen reduced the prices in the whole area.

Besides these on-going stresses, shocks may intensively affect livelihoods of a household or of the whole village. Shrimp disease outbreaks (e.g., white spot, blind eye, yellow head...) are problems for aquaculture households in almost every aquaculture season. Over 90% of farmers had experienced aquatic diseases, of which more than 70% were caused by white spot syndrome virus (WSSV) (livelihood survey, 2007). Other shocks that particularly affected net-enclosure owners were the loss of fishing gear and the damage of net-enclosures. These losses happened mostly in net-enclosures which were located next to primary waterways. Fishers operating mobile gear in water-way systems, unintentionally or intentionally, destroyed net layers of the net-enclosures.

Typhoons and floods occur every year. In fact, seven to eight floods a year were recorded (An and Hoang 2007). In 1999, tropical storm Eve brought torrential rain to Central Vietnam. The resulting flood was considered the worst flood of the century and encompassed eight provinces in Central Vietnam. It caused 622 deaths, including 373 deaths in Thua Thien Hue province, and losses valued roughly at US\$270 million. In November 2004, floods and landslides from heavy rain following Typhoon Muifa caused 56 deaths in the Central Provinces. In 2006, Typhoon Xangsane caused losses of approximately US\$630 million and another large scale torrential rain occurred in the mid-dry season and flooded 2,400 hectares of farmland. In 2007, typhoon Lekima also killed more than 20 people in the province (Dartmouth Flood Observatory 2009).

How do households, local community and government cope with and adapt to these shocks and stresses?

At the household level, there are various ways of dealing with shocks and stresses depending on access to livelihood assets. Diversification of livelihood activities is the most common answer given by interviewees in Thuy Dien village with approximately 90% of respondents mentioning it. Having multiple income sources reduced fishers' dependence on lagoon resources. Seasonal or permanent migration was another option for households who have fewer opportunities to diversify their livelihoods within the village. Almost 80% of interviewees mentioned that they depended on government emergency relief after typhoons, floods and other natural disasters. Some households' responses may negatively affect long-term livelihoods. For example, because of the decline of fishery resources, the frequency in the use of fine mesh size gillnets was increased. It was found that destructive fishing practices was directly proportional to the decline of lagoon resources.

Each household had their own way of coping with and adapting to shocks and stresses. However, the mechanism and strategies for dealing with shocks and stresses are broadly consistent. Learning from previous experiences, some strategies are classified as preparation for shocks and stresses. For example, some households reinforce their houses and harvest all aquatic products in net-enclosures and earth ponds before the rainy seasons. All aquaculture households guard their ponds and net-enclosures all day, especially at night. Virtually any communities and households will face a series of challenges (Gardner *et al.* 2002) and people cannot adapt to all shocks and stresses, given the constant change communities face. Some of the interviewees replied that a lot of shocks and stresses were unavoidable and they did not know how to respond. Nonetheless, people were continuously 'doing something' in response to these stresses and shocks (Marschke 2005).

Local social networks played an important role in supporting households which were dealing with shocks and stresses. Personal savings were not available in most households. Taking a loan from a formal sector was a long and challenging process and only available

to households with collateral. Most households relied on social networks and borrowed money from relatives, neighbours or middlemen to deal with shocks and stresses. Several associations (Fisheries' Association, Women's Union ...) also supported local people's access to loans from semi-formal credit sectors. The local Women's Union supported some alternative options for livelihood diversification. Collaborating with development projects and government levels, the local Fisheries' Association effectively maintained and enlarged water-way systems for mobile gear fishing in a pilot project, and patrolled illegal fishing in the area. In some instances, various government levels were quite helpful in supporting local households dealing with shocks and stresses; especially when responding to destruction related to floods, storms and typhoons.

Box 6.1: Responding to shocks and stresses: Preparation, Coping, and Adaptation

There are almost no available fishing grounds for us to work. We had to travel further for fishing. We spend more effort on fishing but the production drops down a lot. In peak season, we may still earn enough for our living; however, in off-peak seasons, we have to go to Hue City for wage labour.

(Lien, a mobile gear fishers, January 2008)

I prefer to fish in water-way systems; however, it is more and more crowded and the waterways have been smaller and smaller. I have to go further to fish. It takes an hour to go out of the culturing areas; but sometimes we could only get some for our own consumption. We have three kids and hundreds of things to pay. Fishing seems more and more difficult now.

(Manh, a mobile gear fisher, March 2007)

Recently, there have been an increasing number of natural disasters in both their frequency and intensity. When I was young, there was an average of one or two floods a year. Even for some years, there were no floods at all. However, in some recent years, there have been several storms and floods. We could do nothing when it was flooded, especially when the flood lasted four to five days. As that time, we had to wait for the support from local government.

(Hoang, a member of Elderly Association, June 2007)

We started doing aquaculture in 2001. In the first two years, we preferred intensive tiger shrimp farming. However, we suffered WVVS in the third year of aquaculture. We lost everything we invested. We got a loan from the Bank of Agriculture and Rural Development, but it is not enough to restart aquaculture again. We had to make a loan from my neighbours with high interest. We have to continue in order to pay off my debt.

(Thuy, an earth pond owner, September 2007)

My husband was the main income generator in my family. However, he was sick and I had to stay with him in the hospital. My children were very young and had to stay with my parent-in-laws. I was very depressed but I could not do anything to help my husband. And he passed away... Now I have to work hard for my children. They are still going to school but my eldest son goes fishing with me in peak-season. He is only 12 years old, but he is so small and looks like 8 years old... If I got sick now, he might have to leave school and go for wage labour in Hue. I know I have to be healthy.....

(Tuyet, a mobile gear fisher, April 2006)

Life is not always easy. It has been much better now since we do aquaculture. However, there are a lot of related concerns. At the beginning of the season, we have to borrow money for investment on pond preparation, fingerlings and feeds. And then we always have to check for diseases. If we are lucky, we could harvest at the end of season. However, the price is always up and down. We do not have time to wait for higher price because we may lose everything if early floods or high floods happen.

(Hiep, an earth pond owner, September 2006)

Aquatic diseases have become an emerging problem in the village. Aquaculturists discharged wastewater from infected aquaculture ponds directly to the lagoon. It has caused many environmental problems, especially the contamination of the lagoon resources. We organized some workshops and invited some experts to discuss with local aquaculturists what they should do if their ponds get diseases. We also provided some financial supports for building sedimentary ponds for water treatment before they discharge wastewater to the lagoon.

(Linh, a government official in Phu Xuan Commune, October 2006)

6.3 Transformation in local livelihood systems

6.3.1 Livelihood system identity

Transformation of livelihood systems in Thuy Dien village may result from the interaction of internal variables. To understand the internal dynamics of livelihood systems, the researcher used the system identity as a framework for resilience measurement and threshold estimation (Cumming and Collier 2005; Cumming *et al.* 2005). As described in the previous section (section 6.1.1), system identity depends on the maintenance of four attributes: components, relationships, innovation, and continuity. Local livelihood systems are an integration of social and biophysical components and are affected by external and internal drivers. It is impossible to study all aspects of the complex livelihood systems. As well, some variables may not represent the identity of local livelihood systems. According to the “rule of hand,” there should be three to five key variables for analysis (Yorque *et al.* 2002; Walker *et al.* 2006). This rule represents a specific approach for understanding and reducing the complexity in livelihood dynamics. Therefore, for each of these attributes, a set of specific variables, which reflects changes in local livelihood systems in response to shocks and stresses, were selected for assessment (Table 6.2). These variables represent the livelihood systems. For example, the dependency on lagoon resources is not only the key relationships, but also the most important attribute to define the local livelihood systems. If the livelihood systems no longer depend on lagoon resources, the livelihood systems are qualitatively different systems.

Although livelihood systems depend on fishery resources in Tam Giang Lagoon, there is probably no single fish species or any specific aquatic species which may define the local livelihood systems. On the other hand, fishery resources on the whole are the center of the resource-dependent livelihood systems. It is difficult to imagine how local livelihood systems could exist without fishery resources. Other resource attributes such as pH, salinity, sedimentation are important indicators of lagoon ecosystems and directly influence the availability of fishery resources; however, these attributes are not a part of system identity.

Table 6.2: Characteristics of system identity

Attributes	Key variables in local livelihood systems
Components	Households: The primary economic unit in Thuy Dien village Resource user groups: earth pond, net-enclosure, mobile fishing, and non fishing groups Livelihood assets: especially lagoon resources Cultural groups: sampan vs. land-based communities Skills and knowledge of local villagers to engage in fishing and other non-fishing activities
Relationships	Dependence of livelihood systems on lagoon resources Conflict between user groups on lagoon access Conflict among different surrounding livelihood activities Biophysical relations within the lagoon Access to land-based activities, market, and credit sectors
Innovation	Diversity of fishery related activities (aquaculture, multiple gear) Diversity of non-fishing activities (wage labour, out-migration, animal raising, trading ...) Ability to join social organizations
Continuity	Traditional institutions governing commons Local knowledge and social memory (fishing activities, predicting the possibilities of floods, typhoons and other disasters)

Note: The community livelihood system is described according to four types of elements (CRIC) that comprise its identity. *Components* are human and non-human actors of the system. *Relationships* are the ways in which system components interact or fit together. *Sources of innovation* are those subsets of the system that generate change and novelty. *Sources of continuity* are system's abilities to maintain its cohesive entity through space and time (Cumming *et al.* 2005).

System identity also focuses on the non-linear relationships between the previously referenced variables of system components (Cumming *et al.* 2005). Changes in these relationships directly lead to changes in the livelihood systems' attributes. One of the most important relations in the local livelihood systems are the social connection and

local interaction. The resettlement of the sampan people provided opportunities to strengthen their social network, especially with neighbours and friends. It also provided access to local markets and different credit sectors. However, in the village, the resettlement of sampan households has combined with aquaculture development and policy reforms. The privatization of lagoon resources for aquaculture has increased the conflict between different user groups. For example, mobile gear fishers and aquaculturists are involved in conflict over the fishing grounds. Mobile gear fishers have been excluded from the fishing grounds which have been converted to aquaculture ponds and net-enclosures. The extension of the aquaculture area has increasingly marginalized mobile fishers and impacted their livelihoods. As well, wastewater discharged from aquaculture ponds and agriculture farms contains different chemical residues which may be contaminating the lagoon resources. In fact, conflicts among different livelihood activities (fishing, aquaculture, agriculture) and resource users (fishers, aquaculturists, farmers) are becoming increasingly critical in the lagoon.

Biophysical relationships are important because the availability of fishery resources in the lagoon is seasonal. The location of Sam Chuon next to the Thuan An opening and Huong river estuary increases fluctuation in lagoon resources. One other important relationship is the dependence of local villagers on lagoon resources for their livelihoods. In fact, both fishing and aquaculture activities are dependent on the biophysical dynamics of the lagoon. However, the over exploitation of lagoon resources such as destructive fishing (electric fishing, intensive use of fine mesh size gillnets...), and the discharge of wastewater from aquaculture ponds into the lagoon without treatment, has influenced the multiple biophysical attributes leading to resource decline. According to Thanh *et al.* 1998, the number of fishers has almost doubled in the period of 1977-1997; however, the productivity yield for the same period in Tam Giang Lagoon has declined from 3,600 tons to 2,000 tons over ten years (Hoi *et al.* 1998). Electric fishing gear is common and when combined with other gear, tends to be more destructive. The lagoon is polluted by the residuals and chemical used in agriculture and aquaculture activities; shrimp diseases related to aquaculture activities; solid waste and waste water from settlement areas; pesticide and fertilizer residuals from agriculture lands around the lagoon; and other pollutants from many different activities in surrounding areas (Tuan *et al.* 2009). These

activities, in fact, threaten lagoon resources and go beyond the carrying capacity, recovery and self-purification of the lagoon systems. Consequently, this over-exploitation pushes the lagoon resources closer to the threshold of the regime.

One important source of continuity that deserves mention is social and ecological memory. Memory is maintained through oral history (e.g., proverbs) and the continuance of fishing activities. For example, observations of ants building their nest in higher places or gulls returning to the mainland are some indicators for a heavy flood. Traditional institutions act as “a subset of social memory” (Folke *et al.* 2003: 366) and are an essential source of continuity. The traditional institutions of “*Vạn*” and villages have long been responsible for resource use and management in Tam Giang Lagoon. There are several “*Vạn*” in a village including “*Vạn đại nghệ*” of the fixed gear fishers and “*Vạn tiểu nghệ*” of the mobile gear fishers. Each local institution had its own rules in resource access; however, there were some common rules among all “*Vạn*” in Tam Giang Lagoon. For example, village authorities auctioned off rights to fishing grounds and controlled the access and use of these fish corrals. Mobile fishers in all “*Vạn tiểu nghệ*” were not allowed to fish at the mouth of fish corrals. Government institutions may influence local institutions to some extent but they may not be the patterns of local livelihood system identity.

An important source of innovation in local livelihood systems is the engagement of villagers in different social organizations at the local level after settlement. To some extent, these institutions empower local fishers to participate in the decision-making processes and build a bridge between local fishers and government institutions (e.g., Fisheries’ Association). Some organizations (e.g., Women’s Union, Farmers’ Union) provide opportunities for villagers to access semi-formal credit sectors and to get involved in some non-fishing activities.

Another feature that contributes to both innovation and continuity is the diversity of fishery-related activities. Livelihood diversification is a coping strategy for responding to resource decline and increasing numbers of fishers. Aquaculture is not only an alternative livelihood activity but also a new adopted technology. Local fishers get

involved in aquaculture in different ways: earth ponds, net-enclosures, or pen aquaculture. A net-enclosure is the combination of aquaculture and traditional capture fishing in a specific fishing ground. In capture fishing, local fishers also take advantage of new technology to improve their fishing gear, such as electric lagoon seine, and motorized push-nets. The improved gear provides a higher level of production, but negatively impacts lagoon resources.

6.3.2 Thresholds

Cumming and his co-authors (2005) suggest focusing on the elements of system identity in order to overcome the difficulty of measuring resilience in particular cases. They suggested measuring different elements of the components, relationships, innovation, and continuity that distinguishes the system and determines thresholds for those elements based on the specific circumstance of each system. Rather than attempting to measure the width and depth of the regime and the resistance of the livelihood systems, one can examine whether these attributes go beyond their threshold values. This section discusses the small set of system variables identified above and considers quantitative values for the thresholds (Table 6.3).

In this research, most quantitative thresholds of the system were determined on the basis of majority (50%) because this is how most of the people in the village seem to regard changes. For example, villagers indicated that more than 50% households were involved in aquaculture, and that made the village an aquaculture village. In fact, a threshold of 50% is somewhat arbitrary because there may be intangible elements (such as values) that may also be important. Therefore, the determination of a transformation (Table 6.3) is not based on anyone single threshold, but a combination of several thresholds covering all four attributes of social-ecological system (Cumming *et al.* 2005).

Table 6.3: Selected variables of livelihood systems and examples of thresholds in comparison with the current situation in Thuy Dien village

Attributes	Example of Thresholds	Current situation
<u>Components</u>		
Resource user groups	≥ 50% households involved in aquaculture	76.2%
Resources	≥ 50% interviewees mentioning resource decline	68%
<u>Relationships</u>		
Access of mobile groups to Tam Giang Lagoon	≥ 50% mobile fishers mentioned issues related to lack of fishing grounds	80%
Size of aquaculture areas	≥ 50% Sam Chuon for aquaculture	87.3%
<u>Innovation</u>		
Use of destructive gear	≥ 50% interviewees mentioned	37 %
Aquaculture diseases	≥ 50% aquaculturists mentioned	75%
<u>Continuity</u>		
Traditional fishing activities	≤ 50% households involved in one or more traditional fishing activities	92%
	Income from traditional fishing activities ≤ 50% total income of aquaculture households	25-30%
Permanent migration	≥ 20% permanent migration	2%

One critical threshold of system components relates to the number of households in aquaculture groups. If the number of aquaculture households goes beyond half of the village, the village livelihood system relies more on aquaculture than on traditional fishing activities. In 2006, more than three quarters of households in Thuy Dien village were involved in aquaculture. Aquaculture groups are larger in number of fishers and stronger in terms of economic development. The size of the aquaculture area is particularly important. When the aquaculture areas are very large, fishing ground for mobile gear fishers are reduced. In this case, the threshold for aquaculture areas could be determined at 50% of the total Sam Chuon area. Government statistics in 2007 showed that more than 80% of the Sam Chuon area was converted to aquaculture. The expansion of aquaculture has indeed gone beyond the threshold of the number of aquaculturists, as

well as the size of aquaculture areas in the village. Consequently, the mobile fishing group is more marginalized and gets less attention in government development strategies. The access of mobile groups in Tam Giang Lagoon is also another variable of livelihood system identity. In the Sam Chuon area, mobile fishers claim less than 20% of lagoon areas, including waterways for fishing access. One of the purposes of open-ended questions related to livelihood challenges is the number of mobile fishers mentioning lack of fishing ground as an issue. The quantitative value of this threshold has been identified at 50% of mobile gear interviewees. However, analysis has shown that the lack of fishing grounds was a concern for approximately 80% of the mobile gear fishers.

In the previous section, lagoon resources have been considered one of the most important components of resource-dependent livelihood systems in Thuy Dien village. Therefore, one critical threshold is 50% of the interviewees. In fact, resource decline has become a major problem and a concern for 68% of the total interviewees. Significantly, almost 90% of mobile gear respondents mentioned this variable as one of the most challenging and another 30% of the non-fishing groups claimed that resource decline is one of the reasons why they stopped fishing.

Diversity of livelihood activities has been considered an important element in providing supplemental income for building a diverse portfolio of livelihood activities (Marschke and Berkes 2006). However, some alternative activities negatively impact local livelihood systems. For example, the use of destructive fishing gear is an emerging problem in the Sam Chuon area. It is difficult to determine the number of destructive gear currently in use (e.g., electric fishing, electric lagoon seine ...). However, the threshold of this pattern might be defined according by the number of interviewees who mentioned the problem.

In the face of changing government policies and the aquaculture boom, elements of continuity have been vital for the maintenance of the identity of local livelihood systems (Cumming *et al.* 2005). To understand the thresholds of variables in continuity, it is important to note that if the systems crosses its threshold, the livelihood systems loses its continuity. In other words, those variables will show the discontinuity of the local

livelihood systems. Income from traditional fishing activities partially illustrates the continuity of capture fishing in local livelihood systems. If income from capture fishing drops dramatically, it may cause the discontinuity of traditional fishing in aquaculture households. The quantitative value of this threshold has been set at 50% of the income generated from traditional fishing activities as part of the total income of aquaculture households. The current situation shows that in most aquaculture households, income from traditional fishing has dropped to about 25-30% of their total income.

Another quantitative value for measuring the continuity or discontinuity of livelihood system is permanent migration. Migration has been considered an innovation and is one manner of livelihood diversification. However, if too many villagers permanently out-migrate to other cities, it may result in a labour shortage for peak season fishing activities and a discontinuity in social and ecological memory related to traditional fishing. The threshold for livelihood system continuity is set at having less than 20% of the population permanently migrating to other areas. In Thuy Dien village, most of the permanent out-migrants are of an employable age; however, the number of out-migrant accounts for only two percent of the population. This variable, in fact, does not cross its threshold.

Table 6.3 presents examples of quantitative thresholds which have been estimated based on the specific context of this research. It is also somewhat subjective as it is based on the researcher's viewpoints. However, in most cases, there is a long distance between the thresholds and the current situation. If the real threshold is little higher or lower than the estimated threshold, it is not a significant effect. For example, a threshold was estimated at 50% for the Sam Chuon area for aquaculture activities. Even if the real threshold is slightly lower at 40% or higher at 60%, the current situation of 87.3% certainly goes beyond its threshold.

Another important feature of local livelihood systems mentioned previously is the institutions governing lagoon commons, including rules and customs regulating resource access and management and decision-making processes. Various factors could undermine, or have undermined these institutions, especially government policies changes. The threshold of the institutions is inapplicable for quantitative measurement,

but applicable for qualitative measurement (Robinson 2009). The threshold of institutional patterns in livelihood systems may reflect the effectiveness of traditional institutions in regulating the equitable access and the correct manner of resource exploitation. In Thuy Dien village, traditional institutions have been undermined and are mostly mentioned in traditional ceremonies (Mien 2006). Some other local institutions governing resource access and management have been built up to empower local fishers to participate in local decision making processes. Local institutions, in fact, have crossed the threshold and shifted to an alternative regime.

Box 6.2: Local views on important attributes of their current livelihood systems

We have some money saved. I want to buy more fishing grounds for net-enclosures, but my wife wants to buy a piece of land for building a house. We got married three years ago and my daughter is 2 years old now. We are living with my mother and two siblings now. I do want to have my own house, but our savings are enough for buying a piece of land, not for building a temporary house. It is more important for us to have a larger fishing ground for net-enclosures. We may think of a house after three or five years.

(Tuan, a net-enclosure owner, February 2007)

Fishery resources are very important for our livelihoods. Resource depletion is my biggest concern. My daily catch has reduced significantly since the last three years; however, fishing still provides the main income for my family.

(Loc, a mobile gear fisher, August 2007)

Both fishing and aquaculture are dependent on lagoon resources. Lagoon pollution has become a major problem in the area. Mobile fishers and net-enclosure owners complained that their production declined because of water discharged from earth ponds and aquaculture. Earth pond owners complained that the density of net-enclosures obstructed water flow so they could not get clean input water for their aquaculture ponds.

(Nghia, a member of Fisheries' Association, April 2006)

My village is not a fishing village anymore. Everyone wants to engage in aquaculture. Aquaculture has become more dominant in the village, as well as in the whole commune. Just look at their houses: you can tell whether they do aquaculture and what type of aquaculture they are involved. Many households are in debt but none wants to stop tiger shrimp farming.

(Linh, a member of Farmers' Union, May 2006)

Life has been much easier since our settlement. We do not have to think much about safety in flooding season. Although I have to stay in my patrol house most of time, it is more convenient for my children to go to school and my wife to keep some chicken and ducks at home. My parents are living with us but they can see our relatives more frequent, especially their grandchildren. Personally, I have more friends and have stronger tie with my neighbours. We take care of each other, so I do not have to worry about my parents and my children when my wife and I are busy fishing at night.

(Cung, a net-enclosure owner, August 2007)

Rules of the traditional “*Vạn*” are no longer applicable in the current village. I told them to stay a long distance away from fish corrals and to use larger mesh size gillnets, but most of them did not listen to me. Yes, they want to catch more, but the fish they catch gets smaller and smaller, and certainly a lower price. Setting up a fish corral is quite expensive; large investment is not going to provide a higher income if there is no more fish in the lagoon.

(Trung, a member of Elderly Association, May 2006)

6.3.3 Livelihood system transformation

As discussed in previous sections, a number of thresholds have been crossed. The most two important attributes of livelihood system identity - resource user groups and open fishing grounds - have changed. More than three quarters of the village have been involved in aquaculture. The size of mobile gear fishing grounds has fallen below a minimum threshold. A lack of fishing grounds combined with resource decline has forced a large number of households to find other ways to earn their livelihoods. The expansion of aquaculture has created a considerable income disparity between aquaculture households and non-aquaculture households. In many cases, mobile gear fishing household’s income from all activities is lower than net-enclosure household’s income from only aquaculture activities. Conflicts between different user groups about resource access are becoming an emergent problem. The issue of aquatic diseases has pushed a number of aquaculture households into immense debt. Because many attributes have crossed their thresholds, the livelihood system may shift into an alternative domain which

is associated with many social-ecological and economic related problems. The shift of livelihood systems between two domains is visualized in Figure 6.3.

The transformation of livelihood systems not only resulted from the dynamics of system identity, but also from the changes in the stability domain. Government policies changes and aquaculture development have created challenges for the conventional domain and have probably changed the “depth” of the basin of attraction and the position of threshold (Walker *et al.* 2004). These changes have made the conventional domain of livelihood systems (Regime A in Figure 6.3) less and less viable and the alternative domain (Regime B in Figure 6.3) more and more viable. In other words, these changes have undermined resilience of the livelihood systems in the conventional domain.

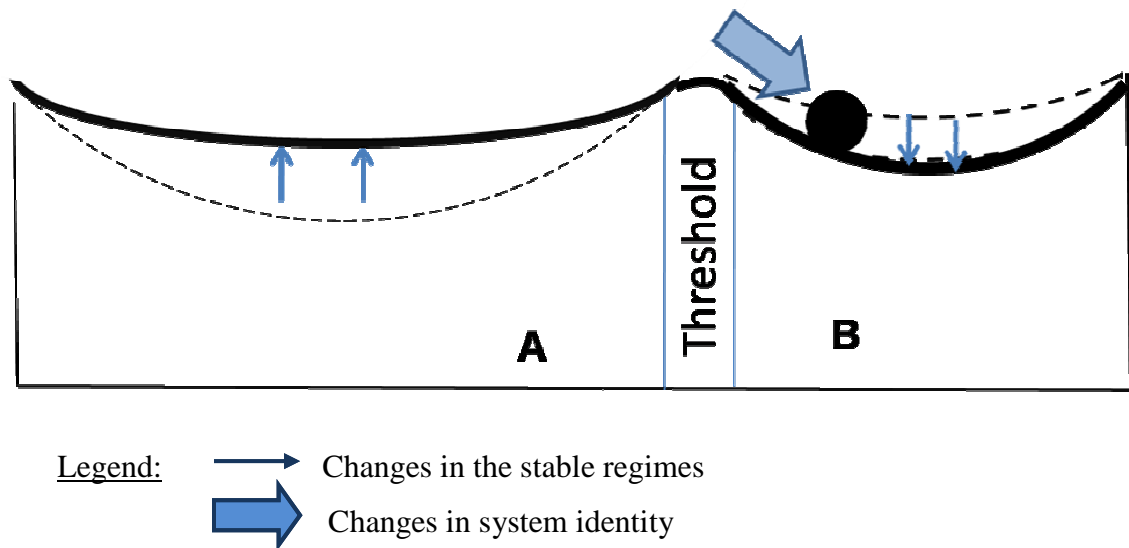


Figure 6.3: The transformation of livelihood systems in Thuy Dien village

Note: Figure 6.3 shows two possible domains for livelihood systems. A is the conventional basin of attraction; whereas, B is the challenging trap associated with debt, inequity and other shocks and stresses that livelihood systems have to cope with.

In the case of Thuy Dien village, the conventional domain is associated with the traditional fishing based socio-economic and ecological systems; whereas the alternative domain is based on aquaculture development. The question of which domain is more desirable should be asked. In fact, the expansion of the aquaculture areas has created new mechanisms for distributing resource access and has excluded non-aquaculture

households from traditional fishing grounds. The distance between fixed gear households and mobile gear households was replaced by the polarization between aquaculture households and mobile fishing households and the increasing tensions between these groups. Aquaculture diseases which resulted in immense debt for aquaculture households were also not expected. Crossing the threshold, household livelihoods fall into the circle of livelihood problems. In comparing the two domains, the alternative domain is clearly undesirable and more problematic.

6.4 Resilience of livelihood systems at the new regime

6.4.1 Livelihood strategies in resilience perspectives

Livelihood strategies are not static. They are the products of interaction between choices and constraints. Existing livelihood strategies may be modified and new strategies adapted to meet changed conditions (Pomeroy *et al.* 2006). In Thuy Dien village, livelihood strategies, which are mentioned in the previous chapter, have significantly changed due to attempts to deal with shocks and stresses. Short-term responses are coping strategies (Davies 1996), and long-term responses are adaptive strategies (Singh and Gilman 1999). Berkes and Jolly (2001) define coping strategies as “*the bundle of short-term responses to situations that threaten livelihood systems, and they often take the form of emergency responses in abnormal seasons or years*”. Adaptive strategies are described as “*the ways in which individuals, households, and communities change their productive activities and modify local rules and institutions to secure livelihoods*”. Strategies are not always deliberately planned; reactive and opportunistic strategies may be common (Moser 1998). Coping strategies may be developed into adaptive strategies over time (Berkes and Jolly 2001).

As mentioned in chapter five, the diversification of fishing and non-fishing activities has become a strong and popular strategy in all resource user groups. In a broad conceptualization, diversification is a strategy building a diverse portfolio of livelihood activities (Marschke and Berkes 2006), which is necessary to live with changes and

uncertainties (Allison and Ellis 2001; Marschke 2005; Seixa and Berkes 2005). Each household builds their own livelihood portfolios in different ways based on their access to different ranges of capital. Diversification may be a coping strategy in some cases (Davies 1996), or may be an adaptive strategy in others (Singh and Gilman 1999). It may also be a blend of both (Marschke 2005). For example, both Vo's and Manh's households got involved in non-fishing activities. In the first household, these activities provide supplemental income, but in the second one, diversification plays a very important role as a survival strategy. Manh's choice to diversify is a coping strategy to deal with the lack of fishing grounds and resource depletion and is a potential adaptive strategy if his son can obtain opportunities for long-term work in cities, like Boc's son. Livelihood diversification may be understood as a strategy for poverty reduction (Ellis 2000), or for risk mitigation (Turner *et al.* 2003). In Thuy Dien village, diversification is a strategy to enhance livelihood security for most households; in other words, it is a resilience building strategy.

In fact, there is no single correct level for livelihood analysis. At the village or community level, a single livelihood strategy could not apply, since different households will adapt different strategies according to their particular asset and access status (Ellis 2000). In Thuy Dien village, a single livelihood strategy is not common at the household level as well. Some households may not participate in non-fishing activities, but on-farm diversification (e.g. multiple fishing gears and aquaculture) is common. Diversification at the individual level in the village is quite common because of seasonal livelihood activities. The individual engaged in multiple activities is typically involved in low skilled, low pay part-time occupations. Therefore, individual livelihood diversification in this case tends to be unstable and less resilient. A household that have a diverse activity portfolio while individual household members are specializing in single occupations would get more security and higher incomes.

Besides livelihood diversification, a number of livelihood strategies such as intensification, specialization and migration, have emerged as alternative livelihood strategies. They have become popular means of coping with and adapting to changes in socioeconomic systems after the advance of aquaculture. These coping strategies may or

may not solve the problems. In fact, some of them fail to do an effective job and also create more struggles for local livelihood systems. For example, intensive fishing by using small mesh size gillnets has become a reason for the resource decline in the Sam Chuon area. The combination of intensification and specialization in tiger shrimp farming has resulted in ever-increasing problems of aquatic diseases and the decline of lagoon resources. Consequently, villagers suffer from aquaculture-related financial losses and immense debt loads. Such strategies make livelihood system unsustainable and leave local people even more vulnerable. For that reason, these coping strategies may reduce livelihood resilience.

A livelihood strategy may encompass a number of sub-livelihood strategies and activities. These sub-strategies and activities may or may not build resilience in specific circumstances. For example, intensive aquaculture may cause resource decline. However, intensive fishing after floods is important for most fishing households. Fishing after the floods allows households to compensate for their low incomes in the rainy season and for flood related damages.

6.4.2 Key factors for building resilience in the current local livelihood systems

There are a number of factors that strengthen livelihood resilience in Thuy Dien village: livelihood diversity, building rapid feedback capacity, conflict management mechanisms, building trusting relationships between users, ecological and social memory, creating political space for experimentation, and institutional linkages (Table 6.4). Livelihood diversity is a major factor that has been discussed in the previous section.

Table 6.4: Resilience building strategies observed in Thuy Dien village (2006-2007)

Factors building resilience	Examples of activities to build resilience
1. Livelihood diversity	Diversity of livelihood strategies Diversity of livelihood activities
2. Building rapid feedback capacity	Local people report suspected ponds with fish diseases to the local government for treatment
3. Conflict management mechanism	Efforts to resolve the conflict between aquaculture and mobile gear fishing by rearranging net-enclosures, and solving the problem of destructive fishing
4. Building a trust among users	Taking care of net-enclosures for each other; Sharing knowledge and experiences with relatives and neighbours The unconventional credit saving stream
5. Social-ecological memory	Predicting storms and floods based on traditional knowledge Experiences of “ <i>Vạn</i> ” institutions
6. Creating political space for experimentation	Development of co-management plan (IMOLA) Development of resource management strategies (IMOLA); A pilot for participatory planning (rearranging net-enclosures, widening water-way systems, patrolling for the use of illegal fishing gear ...)
7. Multi-level governance and institutional linkages	Social organization at the village, district, provincial and national levels (Fisheries’ Association, Farmers’ Union, Women’s Union ...) Horizontal linkages between different organizations (Fisheries’ Association, Women’s Union,...) with local government Vertical linkages between different government levels (Commune, District, Provincial, National levels)

In Thuy Dien village, changes and uncertainties are driven by both biophysical (e.g. decline of fishery resources, aquatic diseases, natural disasters ...) and socio-political (e.g. market fluctuation, policy reform, aquaculture development ...) circumstances. In learning from these changes and their consequences, local households may develop their capacity to cope with similar disturbances in the future. For instance, environmental degradation and aquatic diseases forced local aquaculturists to reconsider their

aquaculture activities, rearrange net-enclosures to increase water flow, and take aquatic disease prevention measures. Aquaculture households and their neighbours actively participate in feedback mechanisms by reporting aquaculture diseases to Fisheries' Association and local government officials. In many cases, neighbours adjacent to the ponds were the people who quickly informed the government. Their speed in informing the government of the issue was due to the potential consequence they could suffer if their neighbours discharged their water without disinfecting it. Building a rapid feedback capacity is critical for livelihood resilience in the back-loop of the cycle (Berkes *et al.* 2003).

In Tam Giang Lagoon, traditional institutions play a very important role in building capacity for conflict management at the local level. Many unwritten rules in “*Vạn*” – the traditional sampan community, have been undermined after the resettlement and in the collectivization. However, some remained and adjusted to fit with the current situation. For example, ownership of fishing grounds around fish corrals is customarily recognised and transferred without a requirement for any legal documents. Mobile gear fishers suffer from a lack of fishing grounds, but do not fish at the mouths of fish corrals. The damage to fishing net-enclosures is normally caused by outsiders and is a continuing problem.

The importance of traditional and local institutions in the village also emphasizes building trust among resource users and conflict management. Fishers in the same user groups used to belong to the same “*Vạn*” in the past. They have a common understanding of their difficulties and often gather to help each other. For example, net-enclosure owners share their small water-way systems and help guard each other's net-enclosures. Building trust is very important for users to self-organize, share knowledge and experience and recover from difficulties. According to livelihood survey in 2007, more than 70% of interviewees indicated that relatives, neighbours and friends are their main information channels for marketing and fishing techniques. Trust is also the foundation for the unconventional credit saving system mentioned in chapter five. Local institutions are critically important in self-organization, especially when supporting self-governance and promoting conflict management at the local level.

Most of the rules in “Vạn” are no longer applicable in the village. However, some influences remain in their behaviour and relationships. Mobile gear fishing groups suffer from the boom of aquaculture. However, because of their [peaceful] tradition, they responded more quietly. There have been a lot of complaints, but the conflict has not led to any violent issues in the village (a commune government official, September 2007)

Social-ecological memory is also important for resilience-building strategies in livelihood systems. Ecological memory is composed of species interactions with the environment, and the structures that make reorganization after disturbance possible and its components which may be found within disturbed patches (internal memory) as well in the surrounding landscape (external memory) (Bengtsson *et al.* 2003). Social memory is defined as the accumulation of experiences concerning management practices that ensure the capacity of social systems to produce appropriate responses to disturbances and to build institutions (McIntosh *et al.* 2000). Social-ecological memory is important for predicting potential floods or typhoons. For example, ants building their nest at higher places or gulls flying in from the sea to the inland are indicators that heavy floods may occur. Social-ecological memory has been observed in the way in which local people choose areas for fishing (e.g., fishing grounds with seaweed...) and which gear they use in specific times or specific seasons. The experiences of “Vạn” institutions in coping with shocks and stresses are important for social memory. Although “Vạn” institutions may not be effective, the common understanding of that institution remains in the village and influences their behaviour and relationships should be transformed into practical resource management. In fact, enhancing social-ecological memory in the village involves sharing experiences between different generations regarding both knowledge and experience (Berkes *et al.* 2003).

There have been several development projects in collaboration with provincial and local governments aiming to test the political appetite for local experiments. The government has promoted various frameworks for resource management such as integrated coastal management, co-management, and community-based resource management. For example, the Vietnam-Netherlands Integrated Coastal Zone Management Project developed an action plan for Thua Thien Hue province with a focus on integration between departments and linkages and trust building between stakeholders (ICZM 2004).

IMOLA and IDRC projects facilitated the establishment and strengthening of the Fisheries' Association at the village and commune levels. Their work has empowered social institutions to represent local fishers in resource management and planning, which is recognized by all government levels. Decision No. 4260/2006/QD-UBND of The People's Committee of Thua Thien Hue Province on lagoon fisheries management states that Fisheries' Associations are the formal community-based organizations for building co-management mechanisms at the village, inter-village or commune levels.

Box 6.3: Comments from different stakeholders on participatory planning and the establishment of Fisheries' Association in Thuy Dien village

The first time I heard about participatory planning was in a workshop organized by researchers from Hue University. I did not think that I might participate in such things; however, I trusted them as they taught us how to prevent and treat aquaculture diseases. I shared my thoughts with others and they listened. My net-enclosure is not located in the pilot [pilot area for participatory planning] but I am glad that my comments were considered. I hope they would expand what they have done to the whole lagoon area in the village.

(Thuan, a net-enclosure owner, March 2006)

We participated in the planning, as we wanted to ensure the legality of our aquaculture net-enclosures. Although no one could exclude us from the fishing grounds, government officials sometimes removed our net layers [multiple layers of net decrease the effective mesh size]. Now they agreed with our plan, so our net-enclosures in the planning area are secure. Moreover, we are members of the Fisheries' Association; the Association will help us to protect our fishing ground.

(Tinh, a member of Fisheries' Association, May 2006)

Participatory planning is a long process. It took 6 months of negotiation between different group users and local government. Fortunately, the process was facilitated by a research team. That team provided a neutral environment for different user groups and government officials to contribute their views on lagoon management and planning, and then they found consensus among all stakeholders. In fact, it was good to know different viewpoints of local villagers in resource management. I think they somewhat knew what they were doing, and what they should do for long-term use of lagoon resources.

(a commune government official, Phu Xuan Commune, March 2006)

I joined the Fisheries' Association because I contributed some parts of my fishing ground for the waterway systems.... I wanted to participate in the implementation of the plan. We went patrolling with government officials to ensure the maintenance of waterways and prevent the use of illegal fishing. After that, I found that it was more comfortable for me to discuss some management issues with local government officials, and it became easier for me to get paperwork done.

(Nghia, a member of Fisheries' Association, March 2006)

Cross-scale analysis is needed to produce the full picture, and linkages between levels are important (Gunderson and Holling 2002). Livelihood systems fit the requirements of complex systems in that they are organized hierarchically. In Thuy Dien village, household and community are the key level in livelihood analysis, providing the grounded view of development from household and community perspectives. However, no single scale or level is correct for livelihood analysis. Cross-scale analysis includes individual, household, community, different government, and international level analysis coupled with the temporal analysis (day, week, season, life-time) and institutional analysis (local rules, district and provincial regulations, national laws) (Cash *et al.* 2006).

Each level in the hierarchy is linked with the others through feedback relationships, but is somewhat independent (Levin 1999). High demand for export to global market has become an external driver for government policies to encourage commercial and intensive tiger shrimp farming in Tam Giang Lagoon. Such commercialization may enhance the income of some households, but reduce access of other households to fishing grounds, and result in the production of additional contaminants that affect regional ecosystems. It creates conflicts between different user groups, as well as short and long-term resource use. Therefore, resilience has to be viewed from multiple scales, multiple levels and their linkages (Marschke 2005).

In the case of Thuy Dien village, this category of resilience building focuses on multi-level governance and institutional linkages. Multi-level governance systems may provide the flexibility to learn from experience and to cope to with disturbance. These systems may strengthen local institutions and foster their interactions with higher level institutions (Berkes *et al.* 2005). In Tam Giang Lagoon, Fisheries' Associations are established at the village level. These local Fisheries' Associations are encouraged to develop their "self-

management rules” to protect fishery resources (Decision No. 4260/2006/QD-UBND of The People’s Committee of Thua Thien Hue Province) and participate in the development of integrated management plans at government levels. These local institutions are supported by Fisheries’ Associations at the provincial level and the national Vietnam Fisheries Society (vertical linkages). They are also horizontally connected with government and other social organizations.

The cross-scale linkages in this case study are also those between national-level policies and household livelihoods. Changes in government policies from collectivization to market economy, as well as the promotion of aquaculture development have formed the livelihood strategies at lower levels (individual, household, community ...). Cross-scale and cross-level analysis helps in understanding the dynamics of livelihood systems at multiple scales. Institutional interplay, in fact, is an important resilience-building strategy in this context.

6.4.3 Resilience building on the ground

The term resilience does not translate into Vietnamese and it is difficult to explain the meaning of this term to both local government officials and local villagers. However, many strategies, which were observed in the village, can be understood as resilience building. Some strategies might be learnt from previous disturbances; some others may result from finding opportunities for renewal. Some other strategies were also interpreted from local livelihood stories (Box 6.4). These strategies are somewhat helpful for households and village in the face of unpredictable shocks and stresses.

Questions about resilience building were also discussed in focus group sessions. However, questions about resilience could not be asked directly. Instead, questions about factors that contribute towards livelihood security and sustainability were asked and the responses were interpreted and analyzed for their insights into resilience building.

Many responses from the villagers were related to lagoon resources and fishing ground access. Villagers started out by emphasizing the value of lagoon resources for their livelihoods. Some villagers hinted that they were capable of managing and sustaining the

lagoon resources themselves. Access to lagoon resources was also mentioned as a feature of livelihood security. Other responses focused on access to different credit channels as important for supporting household livelihoods. In addition, money saving and investment were thought to be critical components of livelihood sustainability. Many villagers indicated that their savings would be used to buy new fishing gear or to invest in education or training. Knowing a practical skill (such as sewing or hairdressing) or getting involved in non-fishing activities (such as poultry-raising) was considered to be diverse income-generating opportunities and ways of dealing with the seasonal fluctuation of fishing related activities.

Box 6.4: *Stories related to resilience building in Thuy Dien village*

I have thought about my livelihoods. I have to work harder to pay off my debts. If all debts are paid, I could sell my products in other markets where the price is higher. Fishing remains my main livelihoods; however, we try to engage in other activities. For example, my wife is a member of the local Women's Union, so she got a loan for chicken and duck-raising. I go for wage labour in Thuan An town in the rainy season. We try different ways to support our family. My children are growing up. We want them to learn other hands-on skills, so they do not depend only on fishing.

(Loc, a mobile gear fisher, August 2007)

My sister told me to join Women's Union. Yes, it was a good suggestion. I got a loan for poultry-raising just three months after joining the union. Monthly interest rate is reasonable. The loan might not be a large amount of money for others, but for us it is important and provides an opportunity to improve our living. These chickens and ducks are not for consumption; I will sell them at the Lunar New Year [celebration time]. I think my business would be fine, and hopefully I would be able to pay back the loan next year.

(Tuyet, a mobile fishing household, November 2007)

I got my net-enclosure from my parents. It is located among a number of net-enclosures. It is a good location as it is difficult for outsiders to poach; however, I still have to stay overnight in my patrol house to fish and guard. In daytime, we may go home as other neighbours will keep an eye on my fishing ground. We sometimes help each other to fish, to come over for a drink, and to share some useful information on fingerlings, prices, and buyers. In rainy season, some of us go to cities together for wage labour. We understand each other and feel comfortable to work together.

(Tung, a net-enclosure owner, May 2007)

I did not understand why my wife gave money (a small amount of money) everyday to my neighbour. She said that it was the way for her to save money. I trusted my neighbour but I thought that we could save money ourselves. However, it was a great way to do. Five months ago, my daughter was very sick. We had to take her to a hospital in Hue, but we did not have enough money. Fortunately, my wife got the funds from my neighbour. It was not her turn to withdraw but they offered my wife to take them.

(Hong, a mobile fisher, March 2006)

Knowledge and wisdom are other important aspects for enhancing livelihoods. Villagers emphasized the importance of learning aquaculture techniques, especially those related to disease prevention and treatment. Sharing knowledge and information among villagers plays a meaningful role in sustaining livelihoods, as well as building social networks in the village. The role of elders and the Elderly Association were mentioned when talking about dealing with complicated situations or asking for advice in solving local conflicts.

Relationships play an important role in sustaining both livelihoods and local society. For instance, good relationships with government officials will be useful for local villagers when they need to solve paperwork related issues. Keeping positive relationships with middlemen could be helpful in dealing with money related problems. Relationships with relatives, friends, and neighbours were all mentioned by different villagers. These relationships were mostly hinted at in their stories and experiences about who helped them in dealing with previous shocks and stresses. Relationships within a household were also brought up by most villagers. They commented that the harmony inside the household influenced people's feelings and encourage them to overcome difficulties in their lives. They concluded that the more positive the relationships and the larger number of relationships a person has built up, the easier their livelihoods would become.

In summary, from the villagers' perspectives, there were various factors contributing to livelihood security and sustainability; these factors help build resilience in local livelihood systems. They include different livelihood capitals in the livelihood framework, such as lagoon resources as natural capital, fishing gear as physical capital, credit and savings as financial capital, knowledge and livelihood skills as human capital, and networks and relationships as social capital. The combination of these factors is important for resilience building.

6.5 Discussion and conclusions

The occurrence of alternative basins of attraction and thresholds has been developed for further understanding system transformation and specified the meaning of resilience more precisely (Brand 2009). This notion of resilience as “staying in the same basin of attraction” can be subdivided into four aspects: latitude, resistance, precariousness, and panarchy. These aspects are inter-related and define the resilience level of a system (Walker *et al.* 2004). However, it is difficult to measure these aspects for resilience assessment. The implication of system identity with four essential elements (components, relationships, sources of innovation, and sources of continuity) and the determination of thresholds for each of these elements provide a framework for developing an analytical assessment of resilience in livelihood systems. The four elements are strongly connected to each other and define the livelihood system. It is clear that some elements and their thresholds are measureable, or in some cases, are obvious. For example, one possible indicator might be the equivalent of an aquaculture area as a percentage of the Sam Chuon area. The researcher used 50% as a threshold marker for system transformation. However, the threshold can only be identified and is only measureable after the transformation has happened. The framework also does not describe how the transformation occurs and how resilience was reduced. On the other hand, the CRIC approach does provide an analytical description of what is happening within the system (Cumming *et al.* 2005). Identifying and measuring the four elements and their thresholds also contributes to an understanding of the ongoing evolution of the livelihood systems and measuring resilience changes in the system over time (Robinson 2009).

Understanding resilience in a basin of attraction is important in order to understand the dynamics of local livelihood systems, as well as to examine the livelihood systems as a whole. The system identity approach was adopted in this thesis to help clarify how resilience is reduced in livelihood systems. Many aspects of system identity provided the conceptual link between resilience and identity. The combination of these approaches is useful for identifying the dynamic mechanisms within the livelihood system, describing how the system functions, and measuring thresholds of system attributes. If the livelihood

system shifts to an undesirable regime, it is important to pay more attention to resilience in the post-threshold regime (Briske *et al.* 2006).

Assessing the likelihood of alternative futures in livelihood systems is one of the main considerations of the post-threshold regime. The current regime (Regime B in Figure 6.3) of livelihood systems is definitely not desirable. However, it may be difficult or impossible to push the system back toward the previous regime (Regime A in Figure 6.3). Robinson (2009) suggested that even if the system returns to Regime A, it may create an opportunity for an ongoing crisis. In other words, it is necessary to create an alternative basin of attraction which is more desirable and in which the livelihood system is more resilient. Another option would be to change the “depth” of the current basin to make it more desirable.

Although the current regime of the livelihood systems is not desirable, strengthening resilience is necessary to reduce the risks of transforming to an uneven desirable regime. Several factors that currently help build resilience in livelihood systems are areas of system identity. For example, conflict management mechanisms play an important role in governing the relationships among resource users. Social-ecological memory is a very important source of continuity; conversely, creating political space for experiment is a source of innovation. The maintenance and improvement of system identity, the components, relationships, sources of innovation, and sources of continuity, may be the criteria for resilience building in livelihood systems.

Building resilience in livelihood systems may also contribute to making the basin of attraction deeper (basin B in Figure 6.3) by giving people more control over decisions that affect them. For example, the promotion of participatory planning and the development of a co-management plan would empower villagers in self-governance of the local commons. Such management systems may lead to a more sustainable resource use and planning direction, which make the current basin of attraction (basin B) more desirable.

CHAPTER 7. Conclusions



(Photo: Truong V. Tuyen 2006)

Figure 7.1: A picture of aquaculture net-enclosures in the distance

This chapter reviews the initial purpose and objectives of the thesis. Following that, an overview of the principal findings is provided. The next section considers the policy implications of these findings and concludes with a discussion of the main theoretical and practical research contributions.

7.1 Revisiting the thesis objectives

The research strove to understand the complexity and influence of property rights on local livelihood systems. It focused on three major theoretical fields: property rights,

livelihoods, and resilience. The research's three main objectives corresponded with the three major research areas.

Firstly, the researcher examined the changes in resource access and various types of resource use in the lagoon. The analysis of property rights in Tam Giang Lagoon applied the bundle of rights framework of Schlager and Ostrom (1992). The framework was also useful to define different types of property-rights regimes in the village.

Secondly, the researcher analyzed how changes in resource access and aquaculture affected local livelihood systems. Because of the sensitivity of property rights issues, the researcher collected a wide range of livelihood data and gained the trust of the community before asking questions related to resource access. However, understanding the dynamics of resource use and access was very helpful for revising the livelihood questionnaire and survey. Specific questions for each user group were added to the questionnaire and more attention was paid to the impact of property rights on livelihood systems.

Lastly, the researcher concentrated on resilience building in livelihood systems. To understand how resilience is strengthened in livelihood systems, it was necessary to assess the stage of resilience. The essential elements that comprise the local lagoon livelihood system and that measure its resilience were identified. Changes in resource access and use had undermined resilience in local livelihood systems and pushed a number of variables beyond their thresholds. It was also observed that some resilience building strategies in the livelihood systems were developed at multiple scales (e.g., from daily to annual levels in temporal scale, from a household to a community in network scale, from a local to a national level in an administrative scale, and from traditional rule to government regulation in an institutional scale), as well as their cross-scale linkages.

Institutions were not mentioned in the research objectives, but linked the various concerns related to resource access, livelihood systems, and resilience building capacity. Institutional dynamics are the key social capital of livelihood systems, but may also cause shocks and stresses on livelihood systems. In the Thuy Dien village case study, changes

to institutions governing lagoon access from the local to national levels have made the local livelihoods more vulnerable and contributed significantly to the loss of resilience in livelihood systems. For these reasons, attention was given to institutions across the three main research areas. These three areas of inquiry correspond to the three specific objectives of the research. In fact, institutions contributed to the interconnections of the three research areas.

7.2 Principal findings

The following sections present the major thesis findings. The first three research findings are consistent with the first objective: *to examine the changes in resource access and various types of resource use in the lagoon*, as covered in Chapter 4. The next two findings are based on the study of the second objective: *to analyze the effects of aquaculture and changes in resource access on local livelihood systems*, as covered in Chapter 5. The last three findings stem from the third objective: *to assess the resilience of livelihood systems and identify the essential elements those contribute to resilience in livelihood systems*, as covered in Chapter 6.

Research finding 1: *Access to fishing grounds is the most important livelihood asset for local livelihood systems; resource access is the key indicator for well-being ranking in the village.*

Fishing grounds are not simply natural resources for livelihood development. Access to lagoon resources is associated with access to other livelihood assets and opportunities to pursue various livelihood activities. Access to fishing grounds has become the criteria for well-being ranking. Before the aquaculture development, there were only two main fishing groups: fixed gear and mobile gear fishers (Phap 2000; Phap *et al.* 2002). Fixed gear fishers were the better-off group with access to fixed fishing grounds (Binh 2002). Taking advantage of the development in aquaculture, fixed gear fishers acquired larger fishing grounds for a combination of fishing and aquaculture.

Households who are involved in aquaculture are mostly better-off households, although some suffer from debt resulting from aquaculture diseases. Information from both livelihood interviews and surveys show that aquaculture represents a large proportion of households. That income portion in an aquaculture household is generally higher than the total income of a non-aquaculture household. The average proportion of saving and investment in an aquaculture household is about six times higher than that of non-aquaculture households. Consequently, the two user groups in Thuy Dien village, aquaculture households and non-aquaculture households are the most polarized.

Changes in government policies and aquaculture development have provided more opportunities for better-off households to enhance their access to other livelihood assets and to pursue various livelihood activities. Aquaculture households have more opportunities to get loans from both formal and semi-formal credit sectors. They may also get involved in a number of livelihood activities which require an initially large investment, such as trading, fish buying or money lending. The aquaculture group is more dominant in Thuy Dien in terms of the number of fishers, as well as the attention of government development strategies. In other words, the aquaculture group has become more powerful politically and has better access to a bundle of livelihood assets than the non-aquaculture group.

Research finding 2: *Seven types of lagoon resource use are associated with different types of user permits, which provide specific bundles of rights.*

After the development of aquaculture, the use of lagoon resources was diversified through different types of user permits. In the case of Thuy Dien, seven types of lagoon resource use have been classified: (1) upper earth pond, which was converted from low productivity agriculture farms; (2) lower earth pond, which was fishing grounds but which has been separated from water flow by dyke systems; (3) fish corral, which was the traditional fixed fishing gear with a V-shape made from bamboo and a net; (4) net-enclosure, which were fish corrals and have been enclosed with double net layers for aquaculture; (5) small waterways, which are located between net-enclosures with a 1.5 meter length; (6) large waterways, which were navigation lanes; and (7) open fishing

grounds, which are available for mobile gear fishing activities. In different types of lagoon use, the operational rights and collective property rights vary with *de facto* and *de jure* rights.

There are three types of permits issued by different government levels. Each one provides specific types of *de jure* rights to resource users: (1) Land use title from the Provincial People's Committee; (2) District permit from the District People's Committee; and (3) Commune permit from the Commune People's Committee. The provincial permit provides the full *de jure* rights to resource users for 20 years, while other permits only provide *de jure* access and withdrawal rights for a shorter time period. Government at the higher level may or may not recognize the commune permits based on specific circumstances. Government banks no longer accept commune permits as collateral. However, all permits are accepted at the local level.

Resource users may get one of three types of resource permits although they have a similar type of resource use. For example, most upper earth pond users and some lower earth pond users acquired provincial land use titles which fully recognize their *de jure* private property rights. Other earth ponds users obtained five-year permits from the district government. Some newly established lower earth pond owners received commune permits on a one-year basis. A few net-enclosures received district permits, but most of them are only registered with the commune government. Because of the provincial policy of net-enclosure removal, the district government no longer issued permits to net-enclosures and fish corrals. The type of permits sometimes depends on the specific time of their application, as well as the individual's personal connection with the government levels.

While resource users may not obtain any type of permits some types of lagoon use, *de facto* rights are recognized at the community level. For example, some fish corrals that are not registered with either the commune or district government have a full bundle of *de facto* private rights. Some *de facto* rights are claimed by a user group, e.g. in small waterway systems which have been opened through the process of participatory planning in early 2006 with the support of IDRC projects. Only net-enclosure owners who

contributed their fishing grounds for the secondary waterways have *de facto* operational rights in the small waterway systems. Primary waterways were traditionally used for navigation lanes for transportation. Before the development of aquaculture, fishing activities were not allowed; currently, the primary waterway systems are open to all local fishers with fishing gear.

Generally, resource use and access in the lagoon are very complex. There are seven types of lagoon use and three types of government permits. Each type of permit provides a specific bundle of *de jure* rights for different types of resource use. In addition, resource users may have a bundle of *de facto* rights, which are not recognized by government institutions, but accepted by informal institutions. *De jure* and *de facto* rights may co-exist, overlap, complement, or conflict with one another based on the specific circumstances (Schlager and Ostrom 1992). *De facto* rights are strong enough so that governments are not easily able to take them away, e.g. aquaculture net-enclosures.

Research finding 3: *Traditional institutions have been undermined in the period of collectivization and then again in the market-oriented economy. Strengthening local commons institutions may lead to more sustainable resource use and management.*

Vietnam's lagoon commons have undergone several different management changes. Before 1975, they were under the village-based commons management system with “*Vạn*” institutions. In the period of 1975-1986 following the collectivization, all commons, including Tam Giang Lagoon, were government property. Since 1986, changes in management policies that support a market economy have promoted *de facto* privatization of lagoon resources.

Traditionally, “*Vạn*” was considered a self-management unit (Phap 2002) that controlled its fishing ground and managed the fishing activities within a specific area. During the collectivization, the “*Vạn*” institutions were disbanded (Ruddle 1998) and fishers in “*Vạn*” were integrated into agriculture-fishing units (Ruddle 1998; Phap 2000). Although some unwritten rules have remained, the traditional institutions are no longer effective. Nowadays, “*Vạn*” institutions are mostly mentioned in traditional ceremonies (Mien

2006). Generally, collectivization undermined the traditional resource management system in Tam Giang Lagoon.

The establishment of the Fisheries' Association has encouraged community participation in resource management and planning in Tam Giang Lagoon. According to Decision No. 4260/2006/QĐ-UBND of The People's Committee of Thua Thien Hue Province, Fisheries' Associations have been recognized as the formal community-based organization for building co-management mechanisms for lagoon fisheries at the village or commune level. In Thuy Dien village, the Fisheries' Association was recently launched with the support of the IDRC project (Phuoc 2006). In the first two years, the local organization played an important role in maintaining and enlarging the waterway systems and reducing the use of destructive fishing gear in the commune. Moreover, the establishment of the Fisheries' Association at Thuy Dien Village in Phu Xuan Commune was an effort to empower resource users, as well as to build a bridge between local fishers and government authorities. The introduction of the community-based organization, especially through the development of commons institutions, has made resource use and management in the village more sustainable (Marschke 2005).

There are many challenges when promoting sustainability in resource use and management. Sustainability is a process with no end-point; it remains a direction to strive towards (Lee 1993; Marschke 2005). Therefore, developing an ability to learn and adapt may be more important than solving particular problems. A challenge for local resource management is finding flexible approaches that support creative learning-by-doing and problem-solving opportunities (Marschke 2005). Another challenge is the necessity of capacity building and empowerment for local level institutions towards sustainable resource use and management.

Research finding 4: *Local livelihood systems are complex and multidimensional involving diversification as the key livelihood strategy.*

Livelihood is far more than income generation (Marschke 2005). Livelihoods “comprise the capabilities, assets or resource, entitlements and activities required to make a living”

(Chambers and Conway 1992:6). From local perspectives, a set of livelihood skills that include fishing skills, traditional knowledge, and building good relationships in local society contributes towards a successful livelihood. For resource-dependent communities, livelihoods include access to natural resources, e.g., lagoon resources in Thuy Dien village. Livelihoods include multiple ways to transform household's assets into plans, activities, strategies and livelihood outcomes (Start and Johnson 2004). That combination makes livelihood systems more complex and multidimensional and adds meaning to people's world (Bebbington 1999; Marschke 2005).

Fishing households in Thuy Dien village tend to diversify their activities by pursuing fishing and non-fishing activities and pursuing livelihood activities at multiple locations. This livelihood strategy reduces the risk of livelihood failure by depending on multiple income sources. Diversification may be a coping strategy in some cases (Davies 1996), or may be an adaptive strategy in others (Singh and Gilman 1999). It may also be a blend of both (Marschke 2005). In Thuy Dien village, diversification of fishing related activities is mostly preferred in the peak season and diversification of non-fishing activities is preferred in the off-peak season.

Research finding 5: *There are four main user groups; each user group pursues different livelihood strategies and has different livelihood development concerns.*

Since the development of an aquaculture industry in the 1990s, livelihood systems in the village have become more diverse and complex, as covered in Chapter 5. Fixed gear households have converted their fishing grounds to earth ponds and net-enclosures for aquaculture. Mobile gear fishers, who were previously considered marginalized, still operate in open fishing areas and supplement their livelihoods by wage labour or migration. Some have stopped fishing; some have purchased fishing grounds from indebted aquaculture households as a way to get involved in aquaculture. The researcher identified four main user groups in Thuy Dien village: (1) Earth pond aquaculture households; (2) Net-enclosure households; (3) Mobile fishing households; and (4) Non-fishing households. There are some overlaps between these groups because some earth pond households are also involved in net-enclosure aquaculture. All aquaculture

households practise mobile fishing; however, the mobile fishing group includes only those with no access to aquaculture. The mobile gear fishing and non fishing groups are more marginalized than the other two.

Each fishing group follows its own seasonal calendar; however, the aquaculture season is also the peak season for fishing activities. In this season, intensification is a strong strategy for all fishing groups. In earth pond households, specialization and intensification are favoured with tiger shrimp aquaculture. The intensification in mobile gear fishing households refers to the intensive fishing in primary waterways and open fishing areas. Some new livelihood strategies have become more familiar in some user groups. For example, specialization and commercialization are strongly engaged in by aquaculture households in the peak seasons, while out-migration is pursued in most mobile fishing and non-fishing households, especially in the off-peak seasons. The main differences in livelihood strategies of each group have been presented in Table 5.17 (Chapter 5).

The researcher developed a list of shocks and stresses that the villagers identified. The problem of declining resources was mentioned by all four groups, but was mostly an issue in fishing households. In fact, some problems which were deemed critical by one user group were not a concern of the other groups. For example, aquaculture diseases were an emerging problem in aquaculture households, especially earth pond aquaculture households. The lack of fishing grounds was the major problem of non-fishing households. Local households depend on their assets to develop multiple ways of dealing with shocks and stresses.

Research finding 6: *The application of system identity with four essential elements: components, relationships, sources of innovation, and sources of continuity (CRIC) provide an analytical framework for resilience assessment in livelihood systems.*

System identity depends on the four essential attributes which are strongly connected with each other and which define the livelihood system and describe the ability of the system's maintenance and cohesiveness entity through space and time (Cumming *et al.*

2005). Many aspects of system identity (components, relationships, sources of innovation, and sources of continuity) provide a conceptual link between resilience and those that focus on identity. System resilience is lost when the system enters a new domain. Similarly, identity can be quantitatively defined in relation to boundaries within a state space of the variables of interest. Therefore, system identity has been used to assess resilience in livelihood systems.

Identifying individual elements that comprise the livelihood system's identity is essentially an analytical process, while considering thresholds for some of the system elements is a holistic approach (Robinson 2009). In fact, the implication of system identity and the determination of thresholds of each of these elements provide a framework for developing an analytical and systematic assessment of resilience in livelihood systems. Identifying and measuring the four elements and their thresholds also contribute to understanding the ongoing evolution of the livelihood systems and measuring resilience changes in the system over time (Robinson 2009). This approach provides a new perspective in understanding and assessing livelihood resilience both more holistically and more analytically.

Research finding 7: *Livelihood systems have been transformed from one regime to another which is associated with privatization, debt and inequity.*

For measuring resilience in livelihood systems, a set of specific variables that define the identity of the local livelihood systems and reflect changes in response to shocks and stresses have been selected and summarized in Table 6.2 (Chapter 6). Most of the elements and thresholds of livelihood systems are measured either quantitatively or qualitatively. In Thuy Dien livelihood systems, some of the quantitative elements have been defined, e.g., the number of aquaculture households and the percentage of Sam Chuon area residents occupied by aquaculture. Some other quantitative elements are based on the results of livelihood interviews and surveys, e.g., the number of interviewees that mentioned aquaculture diseases or the use of destructive fishing gear. The thresholds of institutions are qualitatively assessed based on the effectiveness in regulating resource use and access. As many attributes have crossed their thresholds, the

community livelihood system has lost its identity and the resilience of the livelihood systems has been undermined. Community livelihood system may shift from one basin of attraction to another.

In the case of Thuy Dien village, the conventional domain was associated with the traditional fishing based socio-economic and ecological systems. The alternative domain was based on aquaculture development. In fact, the expansion of aquaculture areas has created new mechanisms for distributing resource access by excluding non-aquaculture households from traditional fishing grounds. It has polarized the community into two groups: the better-off group that is involved in aquaculture and the poor group that is not involved in aquaculture. On the other hand, aquaculture diseases have led to high debt loads in aquaculture households. Crossing the threshold, household and community livelihoods fall into the circle of livelihood problems (Figure 5.10 in Chapter 5). In comparing the two domains, the alternative domain is clearly undesirable for some user groups and more problematic due to debt and inequity.

Research finding 8: *While households and community have to face a series of challenges, they cannot deal with all stresses and shocks. However, they develop strategies at multiple scales that may enhance livelihood resilience.*

The resilience perspective drew attention to shocks and stresses which were inherent in the livelihood systems. A list of shocks and stresses experienced by villagers was identified. There were various ways of dealing with shocks and stresses at different levels. Each household had their own negotiating strategies depending on their available livelihood assets. Local people and the community could not deal with all the constantly occurring shocks and stresses. Nonetheless, people are continuously “doing something” in response to these stresses and shocks (Marschke 2005).

One option is livelihood diversification, which is the universal strategy for poverty reduction (Ellis 2000) and/or for risk mitigation (Turner *et al.* 2003). Diversification may be a coping strategy for some households, but may also be an adaptive strategy for others.

In Thuy Dien village, diversification is also found as a resilience building strategy to increase household flexibility in response to shocks and stresses.

The researcher identified some resilience building strategies in livelihood systems. These strategies may have been developed at multiple scales, as well as their cross-scale institutional linkages, e.g., building a portfolio of livelihood options (Allison and Ellis 2000) at the local level, building trust between fishers at the community level, and creating political space for experimentation at different government levels. Interestingly, these strategies all fit into the different attributes of livelihood system identity and also strengthen its components and relationships, as well as provide sources for innovation and continuity.

7.3 Contributions of the research

7.3.1 Theoretical contributions

The major theoretical contribution of the research was in the area of livelihood, resilience and commons literatures. Conventionally, sustainable livelihoods have been considered as *outcomes* in development projects and as *approaches* in livelihood analysis. The research examined local livelihood systems not only in terms of the various strategies, but also in the re-investment strategies to expand livelihood assets. It provided an approach to understand sustainable livelihoods and incorporated feedback and learning in the analysis.

The research examined livelihood systems within the framework of complex adaptive systems theory and, in particular, resilience perspectives. Resilience enabled a better understanding of livelihood sustainability, especially as a process that requires an adaptive capacity to deal with changes (Berkes *et al.* 2003). Resilience thinking provided a lens for understanding changes and the way livelihood systems responded to build capacity, to learn, and to adapt (Berkes *et al.* 2003; Adger 2000). However, it was difficult to measure and assess resilience in social-ecological systems. To address this

gap in the literature, the present research developed and applied ways to measure system identity to assess the level of resilience. Following Cumming *et al.* (2005), system identity is characterized by four essential elements: (1) components that are the human and non-human actors of the system, (2) relationships or the interaction of system components, (3) sources of innovation that generate change and novelty, and (4) sources of continuity that maintain a system's cohesion through space and time (Table 6.2). Additionally, the present research determined thresholds for each of these elements to provide a framework for developing an analytical assessment of resilience (Table 6.3). The system identity approach provided an analytical description of what was happening within the system (Cumming *et al.* 2005). Identifying and measuring the four elements and their thresholds contributed to an understanding of the ongoing evolution of the livelihood systems and measuring resilience changes in the system over time (Robinson 2009).

The research also contributed to commons theory. The research has applied the "bundle of rights" (Schlager and Ostrom 1992; Ostrom and Schlager 1996) to examine changes in resource use and access in three periods: village-based resource management (before 1975), collectivization (1975-1986) and *de jure* privatization of resources. *De jure* government property rights have gradually changed to *de facto* private property rights in all types of aquaculture. It illustrates the complexity of resource use and access with the combination of *de facto* and *de jure* rights. The research used this framework to understand the nature of property rights and how these rights have changed in different periods.

Another major contribution of the research was the interconnection between three theories: livelihoods, resilience and commons. The research examined both livelihoods and commons as complex adaptive systems, of which resilience is an emergent property (Berkes *et al.* 2003). The dynamics of commons systems influenced resilience in livelihood systems. Livelihood resilience is relevant to sustainable commons management.

7.3.2 Methodological contributions

The social-ecological systems framework (Berkes *et al.* 2003) used in this research provided some useful tools to investigate the various aspects of livelihood systems and commons management systems. These aspects included ecological features of the lagoon systems, components of social-ecological systems, bundles of *de facto* and *de jure* rights, commons institutions at local and government levels, and resilience of livelihood systems. The research utilized the interdisciplinary approach, case study approach, and community participation for the investigation of commons and livelihood resilience.

Since 1996, the participatory research approach has been applied to research in the Tam Giang Lagoon (Tuyen 2002). However, this research project was different from previous ones because the researcher was interested in using participatory methods to facilitate a robust analysis of livelihood issues in the village. Therefore, the researcher lived with the community and followed their daily activities. The researcher spent over 29 months completing research in the Tam Giang Lagoon (Table 2.4 in Chapter 2). That time period was long enough for the researcher to apply several qualitative and quantitative techniques, such as focus group discussions, participant observation, and household surveys. Experiences in effectively using these techniques would be useful for other on-going or potential research projects in Vietnam as well as in other countries.

7.3.3 Policy contributions

The primary policy contribution of this thesis concerns commons management and resilience building in livelihood systems, as follows:

1. The urgency of addressing the mismatch between commons institutions and problem solving practices at the local level and higher level. This policy implication followed the scale-matching principle that solutions to specific problems should be addressed at the scale that matches the problem (Costanza *et al.* 1998).
2. Promoting local participation in commons management and in other decision making processes at multiple levels. In the village, the establishment of a local Fisheries'

Association was partially effective in encouraging local participation in management and planning. However, members of the Association are mostly aquaculturists and not mobile fishers. Community participation should be broadened to other decision making processes at multiple levels to promote self-governance and co-management through partnerships (Calsson and Berkes 2005). In the context of Tam Giang Lagoon, the establishment of co-management systems may help reduce transaction costs (North 1997), conflict resolution (Pomeroy and Berkes 1997, Singleton 1998), and link different types and levels of social-political organizations both vertically and horizontally (Calsson and Berkes 2005).

3. Strengthening local institutions is necessary. Many social-political organizations have been established at the local levels. However, these organizations have limited official decision-making power. They are somewhat influenced by government organizations. Therefore, empowerment is vital for strengthening these local institutions.

4. It is necessary for decision makers to identify key thresholds for the essential elements for livelihood systems. An analytical framework for resilience assessment was developed in Chapter 6. It will be helpful for different stakeholders to identify key elements of the system identity, identify thresholds for these elements, and assess how the system is doing (Cumming *et al.* 2005).

5. Development policies should consider livelihood resilience and the sustainable use of lagoon resources. Commons management for sustainability occurs at both spatial and physical scales. At the spatial scale, attention should be given to environmental pollution. At the temporal scale, sustainability should be considered over at least a 10-year period, which would take into account factors such as the white spot disease. These factors, including increasing household debt and shrimp disease, increase vulnerabilities and erode resilience of the whole social-ecological system.

6. Livelihood resilience can be built at various levels, and the likelihood of alternative futures in livelihood systems can be assessed before decision making occurs. For resilience building, it may be necessary to change existing elements of system identity (components, relationships, sources of innovation, and source of continuity) and

introduce new elements (Cumming *et al.* 2005; Robinson 2009). These changes can be informed by local needs and priorities, taking into consideration all user groups.

7.4 Concluding remarks

What can one learn from investigating the complexity and the influence of property rights on local livelihood systems?

The research findings reveal the need to include local institutions and encourage community participation in commons management, the importance of matching the scale of management institutions and the spatial scale of the resource itself, the significance of livelihood issues in commons management, and the importance of resilience assessment in livelihood systems. Moreover, commons management requires an interdisciplinary approach, a participatory approach, and an analytical framework to deal with complex social-ecological systems. Such an approach could lead to better commons management that enhances resilience in livelihood systems and may lead to the sustainable use of lagoon resources.

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Appendices

Appendix 1: Household questionnaire

Appendix 2: Questionnaire for members of social organizations

Appendix 3: Questionnaire for government officials

Appendix 1: Household questionnaire

Appendix 1.1: English version

Date: _____

Time: _____

Name of respondent: _____ Gender: Female Male

HISTORY OF THE VILLAGE AND THE RESETTLEMENT PROCESS

1. How long have you and your family lived in the village?
2. Where did your family live before living in the village?
3. When did you and family settle in the village?
4. How big is your house? (m²)
5. How did you get your land for building this house?
6. Who supported your family to settle and how?
7. Why did you settle on land?
 - a. Advantages?
 - b. Disadvantages?
8. What made major changes in the village and how the village have been changed?
9. Describe the effects of the typhoons in 1985 and 1999?
10. Describe the village before 1975, in the collective management, and after the development of aquaculture?
11. How has life changed after the boom of aquaculture?
12. What do you see as the future of the village?

HOUSEHOLD INFORMATION

1. How many people and generations are living in your household?
2. Is the household headed male or female?
3. How many people are over 18 years old?

4. How many people in your household regularly generate income?
5. How many children are attending to school?
6. Where are they attending to school? Which grade? and what do you plan for them?
7. If one or more children are not attending school, what are the main reasons?
8. What kinds of house are you living?
 - a. Brick house with concrete roof (concrete house)
 - b. Brick house with corrugated roof (semi-concrete house)
 - c. Thatched house (cottage)
 - d. Sampan boat
9. When was your house built?
10. What sources of cooking fuel do you use (at home, on sampan boat, or on patrol house) and how do you obtain it?
11. When did you have electricity?
12. When did you have water supply?
13. Do you have a latrine? Yes No
14. Means of transportation (scooters, bicycles)? How many?
15. Means of communication? (Telephone, cell phone)
16. Means of recreational facilities? (television, radio, video player)
17. Means of advanced household facilities? (fridge, electric fan, gas cooker, rice cooker)
18. What kinds of boat do you have? How many boats do you have?
 - a. Sampan boat
 - b. Bamboo row boat
 - c. Boat with engine
19. What are the criteria for that household classification in your village? (better-off, average, poor)
20. How do you rank your own household? (better-off, average, poor)

LIVELIHOOD INFORMATION

General information

1. Which activities take place within your household?

a. Natural fishing:

<i>Fisk corrals</i>	<i>Push-net</i>	<i>Chinese cage line trap</i>
<i>FAD</i>	<i>Motorized push-net</i>	<i>Mollusc rake</i>
<i>Gillnet</i>	<i>Light fishing</i>	<i>Eel rake</i>
<i>Lagoon seine</i>	<i>Bottom net</i>	<i>Aquatic grass collection</i>
<i>Others (specify) _____</i>		

b. Aquaculture

<i>Types of aquaculture</i>	<i>Aquaculture species</i>
Net-enclosure	
Lower earth pond	
Upper earth pond	

c. Stock raising (specify) _____

d. Fish monger

e. Small trading

f. Money lending

g. Hired labour (for what, where) _____

h. Hands-on activities (specify) _____

i. Government employee (commune officials, village officials, teachers and others)

j. Pension (retirement pension, old-age pension, social pension for revolutionary family)

k. Money remittances (from other cities or from overseas)

l. Other services (karaoke, billiards)

m. Other activities (specify) _____

2. Which activities provide highest income? Which activities provide stable income?

Which activities are most important for your household and why?

<i>List of incomes</i>	<i>Ranking (1 is most important)</i>		<i>% of total income</i>	<i>Reasons of change</i>
	<i>Current</i>	<i>5 years ago</i>		

3. Besides making money, how else does your household support yourself?
4. Are there any ways you think your livelihoods could be improved?
5. How do you spend your income? (%)

	<i>Saving/ paying debt</i>	<i>Investment</i>	<i>Taxes & fees</i>	<i>Food</i>	<i>Smoking</i>	<i>Education/ insurance</i>	<i>Ceremony</i>	<i>Others</i>
%								

6. Information related to specific livelihood activities

Fishing activities

1. How long have you been a fisher?
2. Why did you begin fishing? How did you learn fishing?
3. How many people in your family involve in fishing activities?
4. How many months (days) do you usually go fishing?
5. Where do you usually fish?
 - a. Inside your net-enclosures
 - b. Secondary waterways
 - c. Primary waterways
 - d. Open fishing areas
6. Where did you usually fish about 5 years ago?
7. What types of fishing gear you are using?
8. Where do you buy your fishing gear?
9. How do you decide the type of fishing gear to use?
 - a. Family tradition
 - b. Seasonality
 - c. Learn from friends / neighbours
 - d. Ease of harvesting
 - e. Lower investment
 - f. Other (specify) _____
10. Which species do you usually catch? How do you decide where and why you fish these species?
 - a. Family tradition
 - b. Seasonality
 - c. Advice from friends / neighbours
 - d. Market demands / profitability
 - e. Personal experience and knowledge of the fish and water
 - f. Ease of harvesting
 - g. Other (specify) _____

11. How do you distribute fish catch? (use candies for their ease to distribute in each line)

<i>Distribution of catch</i>	<i>Sunny season (%)</i>	<i>Rainy season (%)</i>
Family consumption		
Share with relatives		
Share with friends/neighbours		
Sell to middleman		
Others (specify)		

12. Where do you sell your products?

13. Who do you sell your products?

14. How do you choose your fish buyer?

15. What are the main differences in fishing in comparison with 5 years ago? (in terms of sizes, weights and amounts of fish catch, types and numbers of fishing gear, fishing grounds, and numbers of fishers)

16. What are your main constraints in capture fishing? Why?

Earth pond aquaculture activities

1. How long have you involved in earth pond aquaculture?

2. How many people in your family involve in earth pond aquaculture?

3. Who are in charge of earth pond aquaculture in your household?

4. What types of your earth ponds (upper earth pond or lower earth pond)?

5. Size of your earth ponds?

6. Why did you begin aquaculture?

7. How did you begin aquaculture (enclosing your fishing grounds, buying from others)

8. How did you learn aquaculture?

9. What species are you raising? Why?

10. What is the intensity of culturing?

11. How many crops do you culture per year? How long is each crop?

12. Investment:

	Pond preparation	Fingerling / larvae	Feed	Medicine	Hiring people	Taxes and fee	Others
%							

13. Where do you buy your fingerling/larvae? Why?
14. Where do you buy your feeds/ medicine? Why?
15. Harvesting sizes:
 - a. Giant tiger shrimp
 - b. Crab
 - c. Fish
16. What are the main differences in earth pond aquaculture in comparison with 3 or 5 years ago? (investment, harvesting, diseases, species of aquaculture)
17. Have you experienced an aquatic disease? Which diseases? How did you solve it?
18. Who provided support when you face that problem? How did they help you?
19. Have you attended any training on aquaculture and disease prevention?
20. Which institutions are the main sources for your information on aquaculture (fingerlings, larvae, feeds, medicine, prices...)

<ol style="list-style-type: none"> a. Provincial government (departments?) b. District government c. Commune government d. Village head e. Social organizations (specify) f. NGOs g. Development projects 	<ol style="list-style-type: none"> h. Universities i. Feeding enterprises j. Fingerling enterprises k. Friends/neighbours l. Relatives m. Television, radio, public broadcasting system n. Others (specify)
--	--
21. What are your main constraints in earth pond aquaculture? Why?
22. How do you plan to improve your production?

Net-enclosure aquaculture activities

1. How long have you involved in net-enclosure aquaculture?
2. How many people in your family involve in net-enclosure aquaculture?
3. Who are in charge of net-enclosure aquaculture?
4. Size of your net-enclosures?

5. Size of your aquaculture plot?
6. Why did you begin aquaculture?
7. How did you begin aquaculture (enclosing your fishing grounds, buying from others)
8. How did you learn aquaculture?
9. What species are you raising? Why?
10. What is the intensity of culturing? (Shrimp, crab, swimming crab, fish)
11. Where do you buy your fingerling/larvae? Why?
12. Where do you buy feed? Why?
13. Investment:

	Aquaculture plot	Net-enclosure	Patrol house	Fingerling/larvae	Feed	Taxes and fee	Others
%							

14. Harvesting sizes:
 - a. Shrimp
 - b. Crab/swimming crab
 - c. Fish
15. What are the main differences in net-enclosure aquaculture in comparison with 3 or 5 years ago? (investment, harvesting, diseases, species of aquaculture)
16. What are the main constraints in net-enclosure aquaculture? Why?
17. How do you plan to improve your production?

Animal raising

1. What kinds of animal are you raising? And how many?
 - a. *Chicken*
 - b. *Duck*
 - c. *Goose*
 - d. *Pig*
 - e. *Others (specify) _____*
2. When did you start animal raising?
3. Why did you start animal raising?
4. Did you get technical supports when you began animal raising?
5. Did you get a loan when you began animal raising?

6. If yes, which institutions gave you support?
7. Do you have to pay interest? If yes, what is the interest rate?
8. Have you paid off your loan?
9. Who are in charge of animal raising in your household?
10. What are the main purposes of animal raising?
 - a. *Household consumption*
 - b. *Selling*
 - c. *Others (specify)_____*
11. If you are selling, to whom do you sell?
12. How important animal raising is to your household livelihoods?

ACCESS TO CREDIT AND ASSISTANCE

1. Information of existing loan

Loan sources	Date of taking the loan	Initial amount	Interest rate	Methods of payment	When do you need to pay off	How much do you still owe	Why you took the loan

2. Information of repaid loan

Sources:	Purposes:
<ol style="list-style-type: none"> 1. Relatives 2. Friends or neighbours 3. Money lenders 4. Government banks (specify) 5. Social organizations (specify) 6. Others 	<ol style="list-style-type: none"> a. Settlement (building a house) b. Fishing c. Earth pond aquaculture d. Net-enclosure aquaculture e. Animal raising f. Emergency (illness, accident, after flood/typhoon) g. Subsistence (food, clothing) h. Education i. Social activities (wedding, funeral) j. Repay of exiting loan k. Others (specify)
Detailed loan information (e.g.: 1a, 2d)	

3. If you intend to apply for credit, from which sources and for which purposes? Why?

4. Do you involve in any unorthodox credit saving streams?
5. If yes, Who are in your groups? How did you choose your group?
6. Do you have family or friends in this village that help your household? What type of assistance do they provide and how often do you get this support?

a. Cash	a. Daily
b. Food	b. Weekly
c. Labour	c. Monthly
d. Others (specify)	d. Occasionally
	e. Others (specify)
7. Do you have family or friends in other villages/towns/cities that help your household? What type of assistance do they provide and how often do you get this support?

a. Cash	a. Daily
b. Food	b. Weekly
c. Labour	c. Monthly
d. Others (specify)	d. Occasionally
	e. Others (specify)
8. Do you have family or friends living abroad that help your household? How often do you get this support?
9. Do you help your family and friends in the village? What type of assistance do you provide and how often do you give this support?

a. Cash	a. Daily
b. Food	b. Weekly
c. Labour	c. Monthly
d. Others (specify)	d. Occasionally
	e. Others (specify)

FISHER GROUPS AND LOCAL SOCIAL ORGANIZATIONS

1. Traditionally, which “*Van*” did your family belong to?
2. How do “*Van*” influence your current livelihood activities?
3. Which rules from “*Van*” are currently in use?
4. Do you still get help from, or help, people in the same “*Van*” with your household?

5. Are you or your family members of social organizations? If yes, which one?
6. How did you join the organizations?
7. How frequent do you meet other members of the social organizations?
8. What are the benefits to you as a member?

SHOCKS AND STRESSES AND PROBLEM-SOLVING

1. What are the main difficulties for your livelihoods?
2. How did you respond when those problems happened?
3. Which institutions helped you to solve your livelihood problems and how did they help? (1: very helpful; 2: somewhat helpful; 3: unhelpful or negatively influenced)

<i>Institutions</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>Which department? How did they help?</i>
Provincial government				
District government				
Commune government				
Village head				
Women's Union				
Elderly Association				
Fisheries' Association				
Youth Association				
Relatives				
Friends/neighbours				
Own household				
Others (specify)				

4. How do you prevent the consequence of those problems if they happen again?
5. If that problem happens again, what will you respond?
6. Are there any ways you think your livelihoods could be improved? How?
7. If you have a stable job and you have to work in peak seasons, would you accept that job?
8. What type of jobs do you prefer? Where do you want to work and why?

WELL-BEING and ILL-BEING

1. Have you or any family members had any illness over the past 12 months?

<i>Who was ill?</i>	<i>Types of illnesses?</i>	<i>How many days unable to work?</i>	<i>Where/who did you go for financial assistance?</i>

2. Who do you see if you get ill?

- a. Local clinic
- b. Hospital
- c. Home remedy
- d. Traditional doctor
- e. Doing nothing
- f. Others (specify)

3. If someone in your family is ill for a long time, how do you deal with it?

4. How do you get financial support if you or someone in your family has to stay in hospital?

5. What can make you sick and how do you avoid sickness?

HOUSEHOLD PLANNING

1. What is your personal aim in life?

2. If you had more money, what would be your priority for spending?

- a. Buy food
- b. Buy advanced household facilities
- c. Buy scooter
- d. Buy boat with engine
- e. Buy fishing grounds for net-enclosures
- f. Buying earth ponds
- g. Buy more land
- h. Build a new house
- i. Invest in fishing activities
- j. Invest in fishing gear
- k. Invest in aquaculture
- l. Education
- m. Repay loan
- n. Save money
- o. Others

3. What are the most three priorities? Why?

4. What would you like your children do in the future?

- a. Fisher
- b. Job in city
- c. Learning a skill
- d. Trading in the village
- e. Government employee
- f. Others (specify)

Appendix 1.2: Original version in Vietnamese

Ngày: _____

Giờ: _____

Họ tên: _____

Giới tính: Nữ Nam

LỊCH SỬ PHÁT TRIỂN CỦA THÔN VÀ QUÁ TRÌNH ĐỊNH CƯ

1. Anh chị và gia đình đã sống trong thôn bao lâu?
2. Trước đó anh chị và gia đình sống ở đâu?
3. Anh chị định cư trong thôn từ năm nào?
4. Diện tích nhà ở? (m²)
5. Anh chị đã nhận được mảnh đất hiện nay như thế nào?
6. Những ai đã giúp đỡ anh chị trong quá trình định cư và giúp như thế nào?
7. Tại sao anh chị định cư?
 - a. Thuận lợi?
 - b. Khó khăn?
8. Thôn đã thay đổi như thế nào trong thời gian gần đây?
9. Mô tả ảnh hưởng của cơn bão năm 1985 và 1999?
10. Mô tả thôn trước năm 1975, trong thời kỳ bao cấp và sau khi nuôi trồng thủy sản?
11. Cuộc sống của anh chị thay đổi như thế nào từ khi mở cửa?
12. Anh chị thấy tương lai của thôn mình thế nào?

THÔNG TIN HỘ GIA ĐÌNH

1. Gia đình có bao nhiêu nhân lực?
2. Ai là người chịu trách nhiệm chính?
3. Gia đình có bao nhiêu người trên 18 tuổi?
4. Bao nhiêu người trong gia đình có thu nhập thường xuyên?
5. Gia đình có bao nhiêu trẻ em đang tới trường?
6. Thông tin về trường lớp và kế hoạch cho các em tới trường
7. Trong gia đình có mấy em đã nghỉ học và tại sao?

8. Nhà ở
 - e. Nhà mái bằng
 - f. Nhà lợp giấy dầu
 - g. Nhà tạm
 - h. Ổ đò
9. Nhà của anh chị được xây từ năm nào
10. Anh chị dùng nhiên liệu gì để đun nấu (ở nhà, ở đò hoặc ở ngoài chòi)
11. Gia đình có điện từ năm nào
12. Gia đình có nước sinh hoạt từ năm nào
13. Gia đình có nhà vệ sinh? có không
14. Phương tiện đi lại (bao nhiêu xe máy, xe đạp)
15. Phương tiện liên lạc (điện thoại bàn, di động)
16. Giải trí (tivi, đài, đầu đĩa)
17. Các đồ dùng gia đình (tủ lạnh, quạt máy, bếp ga, nồi cơm điện)
18. Anh chị có loại ghe nào? Và có mấy chiếc
 - a. Đò
 - b. Ghe
 - c. Ghe máy
19. Các tiêu chuẩn phân loại hộ gia đình
20. Anh chị đánh giá gia đình mình thuộc loại nào (khá giả, trung bình, nghèo)

THÔNG TIN VỀ SINH KẾ

Thông tin chung

1. Các hoạt động sinh kế

a. Đánh bắt thủy sản

Nò sáo

Xèo

Lừ

Chuôm

Te máy

Cào hén

Lưới

Soi

Cào lươn

Xiếc

Đáy

Vớt rong

Các nghề khác (liệt kê) _____

b. Nuôi trồng thủy sản

<i>Nuôi trồng</i>	<i>Các loại thủy sản</i>
Ao vây	
Ao đất hạ triều	
Ao đất cao triều	

c. Chăn nuôi (liệt kê) _____

d. Thu mua cá

e. Buôn bán nhỏ

f. Cho vay lãi

g. Làm thuê (làm gì, ở đâu) _____

h. Các nghề thủ công (cụ thể) _____

i. Nhân viên nhà nước (làm ở xã, trường thôn, giáo viên)

j. Trợ cấp (lương hưu, hỗ trợ người già, hỗ trợ gia đình có công với cách mạng)

k. Trợ cấp từ nơi khác (từ các thành phố hoặc từ nước ngoài)

l. Các dịch vụ khác (karaoke, bi da)

m. Các sinh kế khác (liệt kê) _____

2. Nghề nào cho thu nhập cao nhất? Nghề nào ổn định nhất? Nghề nào quan trọng nhất đối với gia đình, tại sao?

<i>Các nguồn thu nhập</i>	<i>Xếp hạng (1 q.trọng nhất)</i>		<i>% tổng thu nhập</i>	<i>Lý do thay đổi</i>
	Hiện tại	5 năm trước		

3. Bên cạnh các nguồn thu nhập trên, anh chị còn làm gì để cải thiện đời sống?

4. Có cách nào để tăng thêm thu nhập khác không?

5. Chi tiêu? (%)

	<i>Tiết kiệm /trả nợ</i>	<i>Đầu tư tái sản xuất</i>	<i>Thuế và phí</i>	<i>Thực phẩm</i>	<i>Thuốc lá</i>	<i>Giáo dục /bảo hiểm</i>	<i>Các ngày lễ lạt</i>	<i>Khác</i>
%								

6. Thông tin chi tiết các hoạt động sinh kế

Khai thác thủy sản

1. Anh chị đánh bắt thủy sản từ khi nào?
2. Tại sao và anh chị học đánh bắt như thế nào?
3. Có bao nhiêu người trong gia đình cùng tham gia khai thác thủy sản?
4. Bao nhiêu tháng (ngày) anh chị thường xuyên khai thác?
5. Ngư trường?
 - a. Trong ao vây
 - b. Thủy đạo nhỏ
 - c. Thủy đạo lớn
 - d. Vùng khai thác tự do
6. Ngư trường 5 năm trước?
7. Các ngư cụ thường được sử dụng?
8. Anh chị mua các ngư cụ này ở đâu?
9. Anh chị quyết định sử dụng ngư cụ vì các yếu tố nào
 - a. Thói quen truyền thống
 - b. Mùa vụ
 - c. Học từ bạn/hàng xóm
 - d. Dễ dàng đánh bắt
 - e. Giá rẻ
 - f. Các yếu tố khác (cụ thể) _____
10. Anh chị hay đánh bắt loài nào? Tại sao?
 - a. Thói quen truyền thống
 - b. Mùa vụ
 - c. Học từ bạn/hàng xóm
 - d. Thị trường/giá cao
 - e. Kinh nghiệm đánh bắt của bản thân
 - f. Dễ dàng đánh bắt
 - g. Các yếu tố khác (cụ thể) _____
11. Phân chia sản phẩm

<i>Sử dụng</i>	<i>Mùa nắng (%)</i>	<i>Mùa mưa (%)</i>
Thức ăn cho gia đình		
Chia cho họ hàng		
Chia cho bạn bè/hàng xóm		
Bán cho người buôn cá		
Sử dụng khác		

12. Anh chị bán tôm cá ở đâu
13. Anh chị bán cho ai?
14. Anh chị chọn người mua như thế nào?
15. Nhưng thay đổi chính trong 5 năm vừa qua (kích cỡ, khối lượng, trọng lượng sản phẩm, loại và số lượng ngư cụ, ngư trường, số lượng người tham gia đánh bắt)

16. Khó khăn lớn nhất trong khai thác thủy sản

Nuôi trồng thủy sản trong ao đất

1. Anh chị tham gia nuôi ao đất từ khi nào?
2. Bao nhiêu người trong gia đình cùng tham gia?
3. Ai là người chịu trách nhiệm và quyết định chính trong các hoạt động nuôi trồng thủy sản ao đất
4. Loại ao đất (cao triều, hạ triều)
5. Diện tích ao, số lượng ao?
6. Tại sao anh chị quyết định nuôi trồng ao đất?
7. Anh chị đã bắt đầu như thế nào (tự xây dựng, mua của hàng xóm)
8. Anh chị tìm hiểu thông tin nuôi trồng ao đất như thế nào?
9. Anh chị nuôi trồng loài nào? Tại sao?
10. Mật độ nuôi?
11. Bao nhiêu vụ một năm, mỗi vụ dài bao lâu, mô tả
12. Đầu tư

	Cải tạo ao	Giống	Thức ăn	Thuốc	Thuê người làm	Thuế và các phí	Khác
%							

13. Anh chị mua giống tại đâu và tại sao?
14. Anh chị mua thức ăn và thuốc ở đâu và tại sao?
15. Kích cỡ thu hoạch
 - a. Tôm sú
 - b. Cua
 - c. Cá
16. Thay đổi chính trong 3-5 năm vừa qua? (đầu tư, thu hoạch, bệnh, loài nuôi)
17. Vấn đề bệnh thủy sản? Bệnh gì? Giải quyết thế nào?
18. Cơ quan nào hỗ trợ và hỗ trợ như thế nào khi ao nuôi bị bệnh?
19. Anh chị đã tham gia tập huấn về nuôi trồng và phương pháp phòng bệnh chưa?

20. Kênh thông tin chính về nuôi trồng thủy sản (về giống, thức ăn, thuốc, giá cả)?

- a. Tỉnh (phòng ban nào?)
- b. Huyện
- c. Xã
- d. Trưởng thôn
- e. Các hội (cụ thể)
- f. Tổ chức phi chính phủ
- g. Dự án phát triển
- h. Trường đại học
- i. Cty thức ăn
- j. Cty giống
- k. Bạn bè/hàng xóm
- l. Hộ hàng
- m. Tivi, đài, loa truyền thanh
- n. Kênh t.tin khác(cụ thể)

21. Khó khăn lớn nhất trong nuôi trồng thủy sản ao đất

22. Kế hoạch cải thiện sản xuất

Nuôi trồng thủy sản trong ao vây

1. Anh chị tham gia nuôi ao vây từ khi nào?
2. Bao nhiêu người trong gia đình cùng tham gia?
3. Ai là người chịu trách nhiệm và quyết định chính trong các hoạt động nuôi trồng thủy sản ao vây
4. Diện tích ao vây
5. Diện tích nuôi
6. Tại sao nuôi trồng thủy sản ao vây?
7. Anh chị đã bắt đầu như thế nào (tự xây dựng, mua của hàng xóm)
8. Anh chị tìm hiểu thông tin nuôi trồng ao đất như thế nào?
9. Anh chị nuôi trồng loài nào? Tại sao?
10. Mật độ nuôi? (tôm cua cá)
11. Anh chị mua giống tại đâu và tại sao?
12. Anh chị mua thức ăn ở đâu và tại sao?
13. Đầu tư

	Nuôi trồng	Ao vây	Chòi	Giống	Thức ăn	Thuê và phí	Khác
%							

14. Kích cỡ thu hoạch

- a. Tôm sú
- b. Cua
- c. Cá

15. Thay đổi chính trong 3-5 năm vừa qua? (đầu tư, thu hoạch, bệnh, loài nuôi)

16. Khó khăn lớn nhất trong nuôi trồng thủy sản ao vây

17. Kế hoạch cải thiện sản xuất

Chăn nuôi

1. Loài? Số lượng

a. Gà

b. Vịt

c. Ngan, ngỗng

d. Lợn

e. Các loài khác (cụ thể)

2. Anh chị bắt đầu chăn nuôi từ khi nào?

3. Tại sao?

4. Anh chị có nhận được sự hỗ trợ kỹ thuật nào không?

5. Anh chị có được vay vốn khi bắt đầu chăn nuôi không?

6. Nếu có, anh chị vay của tổ chức nào

7. Lãi suất?

8. Anh chị đã trả hết nợ chưa?

9. Trong gia đình ai chịu trách nhiệm chăn nuôi chính

10. Mục đích chính của chăn nuôi

a. Cho gia đình

b. Bán

c. Khác (cụ thể)_____

11. Nếu anh chị bán, anh chị bán cho ai?

12. Tầm quan trọng của chăn nuôi?

VAY VỐN VÀ CÁC PHƯƠNG THỨC HỖ TRỢ

1. Thông tin về các khoản vay hiện tại

Nguồn	Ngày vay	Vay bao nhiêu	Lãi suất	Phương thức trả nợ	Khi nào phải trả hết	Anh chị vẫn còn nợ bao nhiêu	Tại sao vay?

2. Thông tin về các khoản vay trước

Nguồn vay:	Mục đích vay?
<ol style="list-style-type: none"> 1. Hộ hàng 2. Bạn bè, hàng xóm 3. Người cho vay lãi trong thôn 4. Ngân hàng (cụ thể) 5. Các hội (cụ thể) 6. Nguồn khác 	<ol style="list-style-type: none"> a. Mua nhà định cư b. Đầu tư khai thác thủy sản c. Đầu tư ao đất d. Đầu tư ao vây e. Chăn nuôi f. Ốm đau, tai nạn, sau lũ lụt g. Chi tiêu hàng ngày (thức ăn, q.áo) h. Giáo dục i. Các hoạt động trong thôn (cưới xin, ma chay) j. Trả nợ k. Các hoạt động khác (cụ thể)
Thông tin chi tiết về các khoản vay (VD: 1a, 2d)	

3. Anh chị có kế hoạch vay vốn không? Nguồn nào? Mục đích gì? Tại sao?

4. Anh chị có chơi hội không?

5. Nếu có, ai trong nhóm của anh chị. Tại sao anh chị chọn nhóm này?

6. Hộ hàng và bạn bè trong thôn có giúp đỡ gia đình không? Giúp đỡ như thế nào? Có thường xuyên không?

- | | |
|---------------------|----------------|
| a. Vay tiền | a. Hàng ngày |
| b. Thực phẩm | b. Hàng tuần |
| c. Công lao động | c. Hàng tháng |
| d. Các giúp đỡ khác | d. Tỉnh thoảng |
| | e. Khác |

7. Hộ hàng và bạn bè ở các nơi khác có giúp đỡ gia đình không? Giúp đỡ như thế nào? Có thường xuyên không?

- | | |
|---------------------|-----------------|
| a. Vay tiền | a. Hàng ngày |
| b. Thực phẩm | b. Hàng tuần |
| c. Công lao động | c. Hàng tháng |
| d. Các giúp đỡ khác | d. Thỉnh thoảng |
| | e. Khác |

8. Họ hàng và bạn bè ở các nước ngoài có giúp đỡ gia đình không? Giúp đỡ như thế nào? Có thường xuyên không
9. Anh chị có thường xuyên giúp đỡ mọi người trong thôn không? Giúp đỡ như thế nào? Có thường xuyên không
- | | |
|---------------------|-----------------|
| a. Vay tiền | a. Hàng ngày |
| b. Thực phẩm | b. Hàng tuần |
| c. Công lao động | c. Hàng tháng |
| d. Các giúp đỡ khác | d. Thỉnh thoảng |
| | e. Khác |

CÁC NHÓM NGHỀ VÀ CÁC TỔ CHỨC XÃ HỘI

1. Trước đây gia đình anh chị thuộc vạ nào?
2. Tầm quan trọng của vạ đối với cuộc sống hiện nay?
3. Những quy định nào của vạ vẫn còn được thực hiện
4. Anh chị có giúp đỡ hay nhận được sự giúp đỡ nào từ những người trong cùng vạ trước đây không?
5. Anh chị và mọi người trong gia đình tham gia các nhóm hiệp hội nào?
6. Anh chị đã tham gia như thế nào
7. Anh chị có thường xuyên gặp các hội viên khác không?
8. Lợi ích khi tham gia

KHÓ KHĂN VÀ CÁC PHƯƠNG THỨC GIẢI QUYẾT

1. Khó khăn chính
2. Phương hướng giải quyết các khó khăn đó

3. Tổ chức nào giúp đỡ giải quyết các khó khăn đó và giúp như thế nào? (1: giúp đỡ hiện quả; 2: có giúp đỡ một phần; 3: không giúp hoặc ảnh hưởng tiêu cực)

<i>Tổ chức</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>Phòng ban nào? Giúp đỡ như thế nào?</i>
Tỉnh				
Huyện				
Xã				
Trưởng thôn				
Hội Phụ Nữ				
Hội Phụ Lão				
Hội Nghề Cá				
Hội Thanh Niên				
Họ hàng				
Bạn bè.hàng xóm				
Người trong nhà				
Khác				

4. Anh chị làm gì để hạn chế những ảnh hưởng tiêu cực
5. Nếu vấn đề đó xảy ra bây giờ, anh chị sẽ làm thế nào?
6. Có cách nào cải thiện đời sống hiện tại không và cải thiện như thế nào?
7. Nếu anh chị có công việc ổn định và phải làm việc cả trong mùa nắng, anh chị có làm không?
8. Anh chị thích làm nghề gì? ở đâu? Tại sao?

SỨC KHỎE VÀ BỆNH TẬT

1. Trong gia đình có ai ốm trong năm vừa qua không

<i>Người ốm</i>	<i>Bệnh gì?</i>	<i>Bao nhiêu ngày không đi làm?</i>	<i>Hỗ trợ tài chính?</i>

2. Nếu ốm, anh chị sẽ gặp ai

- | | |
|------------------|--------------------|
| a. Trạm xá | d. Thầy lang |
| b. Bệnh viện | e. Không làm gì cả |
| c. Uống thuốc lá | f. Khác |

3. Nếu ai đó trong gia đình ốm trong một thời gian dài, anh chị sẽ làm thế nào?
4. Anh chị có được hỗ trợ gì nếu ai đó trong gia đình phải nằm viện?
5. Nguyên nhân tại sao ốm, cách phòng bệnh

KẾ HOẠCH PHÁT TRIỂN

1. Mục tiêu chính trong cuộc sống
2. Nếu anh chị có tiền, anh chị sẽ sử dụng làm gì?
 - a. Mua thức ăn
 - b. Mua sắm đồ dùng gia đình
 - c. Mua xe máy
 - d. Mua ghe máy
 - e. Mua thêm mặt nước để vây ví
 - f. Mua ao đất
 - g. Mua đất
 - h. Xây nhà
 - i. Đầu tư các hoạt động khai thác thủy sản
 - j. Mua ngư cụ
 - k. Đầu tư nuôi trồng thủy sản
 - l. Giáo dục
 - m. Trả nợ
 - n. Tiết kiệm
 - o. Chi tiêu khác
3. Anh chị hãy chọn 3 ưu tiên quan trọng nhất trong bảng trên? Tại sao?
4. Anh chị muốn con cái mình sẽ làm gì trong tương lai
 - g. Đánh bắt thủy sản
 - h. Làm việc ở thành phố
 - i. Học một nghề gì đó
 - j. Buôn bán tại thôn
 - k. Làm viên chức nhà nước
 - l. Ngành nghề khác

Appendix 2: Questionnaire for members of social organizations

Appendix 2.1: English version

Date: _____ Place of interview: _____

Name of social organizations: _____

Name of respondent: _____ Gender: Female Male

Personal information

1. When did you join the organization?
2. Why did you join the organization?
3. What are the benefits to you as a member?
4. What is your position in the organization?
5. What are your responsibilities?
6. What do you expect from the organization?

Organization information

7. History of the organization? (e.g.: when it was established, circumstances?)
8. Structure of the organization?
9. How is the chairman of the organization appointed?
10. What are the criteria of a membership?
11. How frequent do you meet other members of the organizations?
12. How is the relation between your organization and local government?

Rules

13. What are the formal and informal rules of the organizations?
14. Who developed the rules? Were you part of the rule making process?
15. How the rules are enforced?

Fishery management and planning

16. How involved has the organization been towards fishery issues?
17. How has the organization improved the lives of their members?
18. How the organization is involved (or should be involved) in fisheries planning?
19. How do you see the future of the organization?

Appendix 2.2: Original version in Vietnamese

Ngày: _____ Địa điểm: _____

Tổ chức xã hội: _____

Họ tên: _____ Giới tính: Nữ Nam

Thông tin cá nhân

1. Anh/chị tham gia hiệp hội này từ năm nào?
2. Tại sao anh/chị quyết định tham gia hiệp hội này?
3. Lợi ích của việc trở thành thành viên?
4. Anh/chị đang giữ vị trí gì?
5. Trách nhiệm chính của anh/chị là gì?
6. Anh chị hi vọng gì từ hiệp hội

Thông tin về tổ chức xã hội

7. Lịch sử phát triển? (VD: thành lập từ khi nào, trong hoàn cảnh nào)
8. Tổ chức quản lý điều hành của hội?
9. Hội trường được bổ nhiệm như thế nào?
10. Điều kiện để trở thành thành viên?
11. Anh/chị có thường xuyên gặp gỡ những thành viên khác không?
12. Quan hệ của hội với chính quyền xã như thế nào?

Quy định

13. Những quy định của hội?
14. Ai là người đề ra những quy định này? Anh/chị có tham gia vào quá trình xây dựng những quy định này không?
15. Những quy định này được áp dụng như thế nào

Quản lý tài nguyên đảm phá

16. Vai trò của hội trong giải quyết các vấn đề khai thác thủy sản như thế nào?
17. Hội đã có những đóng góp gì trong việc cải thiện đời sống người dân?
18. Vai trò của hội trong việc xây dựng kế hoạch quản lý nghề cá?
19. Anh/chị thấy định hướng tương lai phát triển của hội như thế nào?

Appendix 3: Questionnaire for government officials

(This questionnaire was used to interview government officials at provincial, district and commune levels, including village head)

Appendix 3.1: English version

Date: _____ Place of interview: _____

Name of government organizations: _____

Name of respondent: _____ Gender: Female Male

Education level: _____

Back ground information

1. How long have you worked in this government organization?
2. What is your position in the government organization?
3. What are your main responsibilities?
4. The position you presently hold, how did you learn your job?
5. Have you attended any specific training for your current positions?
6. History of the organization?

Working with community

7. How often do you work with local community in Thuy Dien village?
8. How often do you work with local community in other villages?
9. What are the main purposes of your meeting with local communities?
10. What are main activities?
11. Based on your knowledge, what are the main challenges for their livelihoods?
12. What are the main challenges for resource management and planning?
13. What kinds of support your organization have provided and in which circumstance?

Fishery management and planning

14. What is the status of lagoon resources now?
15. Does the government organization have a management plan for lagoon resources?
16. Are local fishers involved in that planning? Do you think they should be involved?
17. How is management policy created by the organization? Who is involved?
18. Who enforces fisheries policies? How?

Appendix 3.2: Original version in Vietnamese

Ngày: _____ Địa điểm: _____

Cơ quan: _____

Họ tên: _____ Giới tính: Nữ Nam

Trình độ học vấn: _____

Thông tin chung

1. Anh/chị đã làm ở cơ quan này trong bao lâu?
2. Chức vụ?
3. Nhiệm vụ chính?
4. Khi bắt đầu làm ở vị trí này, anh/chị đã tìm hiểu về công việc này như thế nào?
5. Anh/chị đã dự những khóa đào tạo, tập huấn nào từ khi làm ở vị trí này?
6. Lịch sử phát triển của cơ quan?

Làm việc với cộng đồng

7. Anh/chị có thường xuyên làm việc và tiếp xúc với cư dân thôn Thủy Điện không?
8. Anh/chị có thường xuyên làm việc và tiếp xúc với các thôn khác không?
9. Mục đích chính của các cuộc thảo luận và tiếp xúc với cộng đồng là gì?
10. Anh/chị thường thảo luận vấn đề gì với người dân trong thôn?
11. Qua kinh nghiệm tiếp xúc với bà con trong thôn, anh/chị thấy khó khăn lớn nhất của bà con hiện nay là gì?
12. Khó khăn lớn nhất trong quản lý tài nguyên đầm phá là gì?
13. Những hỗ trợ chính đối với đời sống người dân? Những hỗ trợ trong hoàn cảnh đặc biệt nào?

Quản lý tài nguyên đầm phá

14. Tình trạng tài nguyên đầm phá hiện nay?
15. Cơ quan anh/chị có kế hoạch quản lý và phát triển đầm phá như thế nào?
16. Cộng đồng địa phương có đóng góp ý kiến cho kế hoạch đó không? Tầm quan trọng của cộng đồng trong xây dựng kế hoạch quản lý?
17. Quy trình xây dựng các chính sách quản lý? Những cơ quan nào tham gia vào quy trình này?
18. Cơ quan nào chịu trách nhiệm thực thi chính sách đó? Và cơ quan đó đã làm thế nào để thực hiện chính sách đó?



Photo by Nguyen N. Phuoc (2006)

Photo of an informal focus group discussion



Photo by Ta. T.T. Huong (2006)

Photo of a formal focus group discussion



Photo by Ho Lan – a fisher in Thuy Dien (2006)

Photo of the researcher at the research site



Photo by Neuvan N. Phuoc (2006)

Photo of the researcher and a villager in Thuy Dien taken at a patrol house



(a) *Therapon theraps*

(b) *Siganus guttatus*



(c) *Metapenaeus ensis*

Photos of some common aquatic species in Tam Giang Lagoon

(Photo by Ta T.T. Huong 2006)