

## FACTORS AFFECTING THE CONFLICT BETWEEN FISHING COMMUNITY AND AGRICULTURAL COMMUNITY: A CASE STUDY OF TAM GIANG LAGOON IN THE CENTRAL OF VIETNAM.

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### Abstract

The paper examines factors affecting the conflict between the fishing community and the agricultural community. This dissatisfaction is due to the discharge of wastewater from the upland community into the lagoon, which caused bad effects to the lagoon environment and resources as well as the production of net enclosure aquaculture. The paper argues that the conflict is derived from multiple interacting factors, which include changes in property rights, overlapping practice of the management right, and resource characteristics. The paper shows that different property rights have been established in natural fish exploitation and aquaculture activities, which resulted in the fact that the fishing community could not prevent the lagoon water from being affected by wastewater from the agricultural community. Moreover, the management right over the lagoon resource is performed by different stakeholders including resource users, village fisheries association, and different government agencies. It is difficult to define clearly their roles and responsibilities in the cooperation for the lagoon management. Therefore, no single actor feels fully accountable for the actions of the cooperation. The management of the lagoon is mostly about specific lagoon exploitation activities and within the lagoon boundary. Meanwhile, the lagoon is not a separated system, but adjacent to agriculture system and affected by the wastewater from the system. Understanding the nature of these factors is important in finding the solutions for addressing this conflict.

**Keywords:** Factors, property rights, resource conflict, Tam Giang lagoon

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### 1. Introduction

The Tam Giang lagoon system in Thua Thien Hue province, Vietnam is about 22,000 ha large. It has an important role in nursing fisheries resource, protecting biodiversity, contributing to the province's socio-economic development. Connecting to both sea and rivers, the lagoon system is diverse in aquatic resources (Tuyen *et al.*, 2010). Additionally, it provides fulltime employments for more than 100 thousand inhabitants and supplement incomes for about 200 thousand residents (Tuyen *et al.*, 2010). In terms of production, fishing and aquaculture in the lagoon and rivers contribute about 36% to the total fisheries production of nearly 44 thousand tons in 2011 (Department of Agricultural and Rural Development [DARD], 2012).

Exploiting activities of lagoon fisheries resource are crowded and chaotic with a large number of mobile and fixed fishing gears (Mien, 2006). Since the early 1990s, aquaculture has been developed promptly and rapidly (Armitage *et al.*, 2011; Phap *et al.*, 2002; Tuyen *et al.*, 2010). As a consequence of crowded and chaotic lagoon activities, conflicts have emerged (Armitage *et al.*, 2011; Nhung, 2008; Tuyen and Brzeski, 1998). The conflicts happen among fishers, between fishers and aquaculturers, between aquaculture and agriculture community (Armitage *et al.*, 2011; Nhung, 2008; Tuyen and Brzeski, 1998). Among these conflicts, the conflict between the fishing community and the agricultural community has been found to be of utmost concern. This conflict derives from the discharge of wastewater from the upland community into the lagoon, which caused the lagoon water pollution and bad effects to the livelihoods of the people who earn for their living by net enclosure aquaculture. In this situation, it is necessary to investigate factors affecting the conflict between the fishing community and the agricultural community in order to find out appropriate solutions to the conflict as well as the issue of lagoon environmental degradation. In Vietnam, there have been some studies that mention the conflicts existing in Tam Giang lagoon regarding using its resource (Armitage *et al.*,

2011; Nhung, 2008; Phap *et al.*, 2002; Tuyen and Brzeski, 1998). However, no comprehensive study has been conducted to understand the factors affecting conflicts among resource users. Therefore, this study is conducted to examine factors affecting the conflict between fishing community and agricultural community in Tam Giang lagoon in central Vietnam. Understanding the nature of these factors is meaningful in finding solutions for managing the conflict effectively and addressing the issue of lagoon environmental degradation.

## 2. Materials and methods

### 1. Resource conflicts

Conflicts over natural resources are “disagreements and disputes over access to, and control and use of”, the resources (FAO, 2000). Conflict emerges when ‘the interests of two or more parties clash and at least one of the parties seeks to assert its interests at the expense of another party’s interests’ (FAO 1998, p. 199). Conflicts, sometimes, lead to animosity and armed clash, or are just hidden dissatisfaction “because of fear, distrust, peer pressure, financial constraints...”(FAO, 2000).

Conflicts happen due to a wide range of reasons. According to Warner (2000), conflict results from a) demographic change; b) natural resources competition; c) development pressures; and d) structural injustices. These factors are the underlying causes of conflict over natural resources, both among community groups, and between community groups and other parts of society (Warner, 2000).

In line with Warner’s argument, Bennet *et al.* (2001) adds institutional failures to the causes of disputes. Institution concept used by Bennet includes informal institutions (i.e. a set of de facto rules or norms regulates individuals’ behaviour) and formal institutions (i.e. a set of de jure rules and regulations). If these institutions are unable to manage resources efficiently, the perception of inequality or injustice among social actors increases. The fact may lead to conflict (Bennett *et al.*, 2001). The researcher also argues that the causal relationship between conflict and institution, however, is not a linear one. It is a circulating cause-effect relationship. When the conflict happens, the management costs increase. The costs prevent the institutions from working properly that, in turn, can lead to further conflicts (Bennett *et al.*, 2001). This circulating causal relationship makes it more difficult for conflict management. Additionally, dissatisfaction among natural resource actors emerges from differences of interests and needs, “or when the priorities of some user groups are not considered in policies, programs and projects” (FAO, 2000, p. 1).

### 2. Resource property rights

Property rights are institutions and arrangements determining the use and control of resources. They are established from law, custom, and the operation of markets (Wiebe and Meinzen-Dick, 1998). Property rights are classified as two levels: an operational level (access and withdrawal) and a collective-choice level (management, exclusion and alienation right) (Schlager and Ostrom, 1992). A particular combination of property rights held by users of a resource system is considered a property-rights regime (Schlager and Ostrom, 1992). Theoretically, there are four basic property regimes: Open access; private property; communal property; and state property. In practice, these regimes may co-exist and overlap in many resources (Feeny *et al.*, 1990). Among the regimes, private property is supposed to be well-defined, which should be well managed and less likely susceptible to externalities (Hardin, 1968).

The study applied the property right analysis framework by Barry and Meinzen-Dick (2008). The framework is useful to portray the status of lagoon exploitation with different right holders and their rights over the resource. The paper looks into different property regimes and five property rights associated with different types of lagoon use. The differences in terms of the legitimacy of the rights held by individuals and communities will be presented.

### 3. Resource characteristics

Literature of common-pool resources largely shows that the root of resource-use problems is resource's subtractability and excludability (Acheson, 2006). A resource is subtractable, which means the use of the resource by one person cannot be available for others. Excludability refers to a difficulty for one to exclude or limit others from using the resource (Ostrom *et al.*, 1994). These two characteristics together can cause serious problems for resource use (Acheson, 2006).

It is widely accepted that defining a transparent boundary for almost natural resources such as forestry or fisheries is likely impossible due to the mobility of resources (Purwanto, 2003). The mobility of resources would determine how it costs for collecting information and data for management purposes. Further, it would determine the extent to which these information and data are reliable (Agrawal, 2001). Hence, the more mobilized are resources, the less likely appropriate are the managerial decisions. Thus, these characteristics are possibly claimed to hamper the efficacy of resource management (Agrawal, 2001).

### 3. Research methods

The study was conducted in Dinh Cu village in Phu My commune, Thua Thien Hue province, Vietnam. At present, there are 155 households settling in the village. Among those, 139 households, which are nearly 90% of total household in the village, are earning their main income from the lagoon. The lagoon activities operated by the local people include net enclosure aquaculture and natural fish catching by mobile gears. Mostly, this is a net enclosure aquaculture-based village.

The fieldwork was conducted in 2013. The research methods included semi-structure individual interview, group discussion and observation. Informants for interviews include one official from Division of Fisheries Exploitation Management and Resource Protection, 1 from Division of Aquaculture, 1 fisheries official from Phu My commune, 1 head of the village, and 1 head of village fisheries association (VFA). A total of five group discussions were organized: two with village heads and Fishery Association leaders, two with aquaculturers, and one with mobile gear fishers. Information collected from interviews and discussions was on: (1) Lagoon resource uses and property rights; (2) Types, intensity, and causes of the disputes in the community; (3) Difficulties in managing the lagoon. This study used observation technique in order to observe and understand geographical characteristics of the community and lagoon exploitation activities. The geographical characteristics of the community were presented through a transect map. The observation activity involved participation of head of the village and VFA.

Information from interviews, group discussions, and observations was noted and kept in hard copy. Information from these sources was synthesized and reviewed right after it was collected. This work was done continuously from the start to the end of the fieldwork time to assure collecting sufficient data. Information, then, was classified, compared, and combined in order to establish evidence for the research findings. Then, it was compared across different sources to find patterns, differences or contradicts to elaborate the issues, to answer the research questions, and to support the arguments.

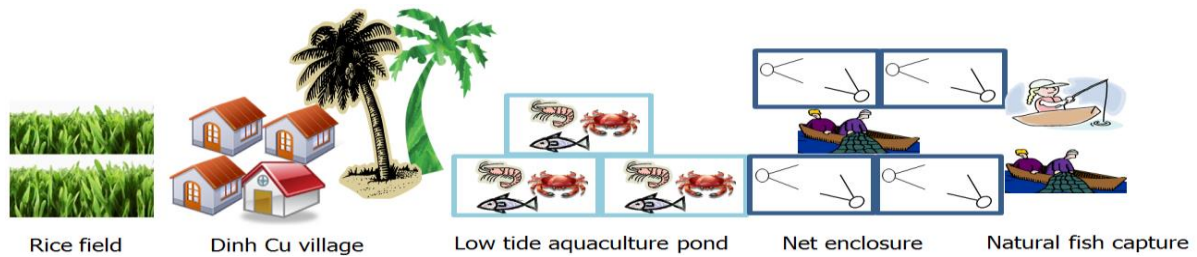
### 4. Findings

#### 1. The use of lagoon resource in the study site

Dinh Cu village borders the lagoon in one side and rice fields of upland agriculture community in the other side (Figure 1).

In the side of the lagoon, the submerged area in the lagoon water edge is used for earth pond aquaculture. The lagoon water is mainly for net enclosures. Some areas between the net enclosure groups are the water ways which are for water traffic and circulating the lagoon water. The water ways are also the fishing ground for fishers using the mobile gears to capture natural fish.

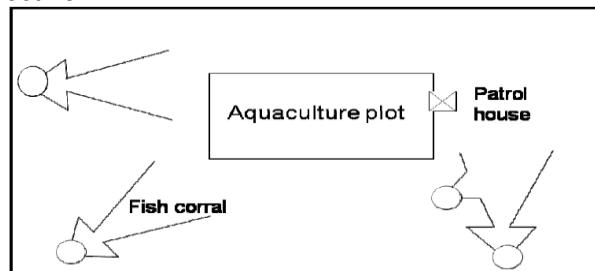
Figure 1: Transect map of Dinh Cu village



*Earth pond aquaculture:* Ponds are constructed in the submerged areas and water edge areas around the lagoon. To separate the ponds with the lagoon, wealthy households construct surrounding dykes; others just use nets and bamboo stakes to keep the fish stock inside the pond. This type of aquaculture is not common in Dinh Cu village. Currently, the area for earth pond aquaculture around the village lagoon is about 35ha (23ha high tide and 12ha low tide ponds). Most of them belong to other farming villages of the commune.

*Net-enclosure:* It is a form of aquaculture developed from fish coral activity, combining fish raising and fish capturing (Figure 2). Fishers use net (2a=5mm) to stick to bamboo stakes to surround an area of lagoon water which varies from 1000m<sup>2</sup> to 5ha. Inside a net-enclosure, fishers normally set up some fish corrals to collect fish. This is the main activity of the Dinh Cu villagers. The result from group discussions with head of the village and VFA, and with aquaculturers shows that the area for the net enclosure aquaculture in this village is about 160 ha, occupied 85% of the village lagoon water body. Net enclosure activity provides income for 130 households, nearly 85% of the village population. Contribution of this activity into total household income ranges from 70-100%.

Figure 2: A typical net enclosure



Source: (Huong 2010)

*Mobile fishing activities:* These are operated by mobile gear fishers who have no fixed location to catch fish. Customarily, fishers are not limited in number and type of gears, fishing time, or volume of their harvesting. They decide it by themselves based on availability of financial capital and labour. The most popular mobile fishing tools in the study site are gillnet, goby net, trammel net, Chinese fish trap.

In the other side, Dinh Cu village borders a large area of rice fields which belong to surrounding agricultural villages. This geographical characteristic is associated with the existence of the conflicts between this fishing community and the upland community. The issue of this dissatisfaction is related to the discharge of wastewater from the upland community into the lagoon, which caused bad effects to the lagoon environment and resource as well as the production of net enclosure aquaculture. Consequently, livelihoods of the locals are strongly affected.

Locals believe that the wastewater has chemical substances from pesticides and fertilizers of agriculture production; even it contains domestic waste from urban area. The discharged water comes into the lagoon and places an adverse impact on cultured aquatic species. Normally, discharge happens in March, April, July, and December. These months are also the crucial time for net enclosure aquaculture. Seedling of aquaculture often happens between December and March while harvesting is mainly in April and July. Not only aquaculture, the waste also affects the natural fisheries resource in particular and the lagoon environment in general. The wastewater carries mud and sand that shallow the lagoon bed and extend the lagoon water edge. This leads to the loss of a part

of net enclosure area for those having their net enclosure near shore. Additionally, the wastewater push masses of water hyacinth into the lagoon. As this type of plant cannot live in salty water, they are rotten and pollute the lagoon water. Even, the masses of water hyacinth break net enclosures when the flow of water is strong.

According to the result from the discussions with head of village and VFA, and aquaculturers in the village, the conflict with agriculture community regarding lagoon water pollution is the most serious and important ones to the locals. This type of conflict needs to have more attention of fisheries managers. To have a better understanding of the conflict to find appropriate solutions for it, it is necessary to learn about the factors affecting it. The study finds that changes in property rights, overlapping practice of the management right and resource characteristics are the factors affecting the conflict regarding lagoon environment pollution.

## **2. Changes and ambiguities of property rights over the Tam Giang lagoon**

In the Tam Giang lagoon, the property right over the lagoon access and control has dramatically changed throughout different historic periods.

In *the community-based resource management period (prior to 1975)*, the lagoon was controlled by the imperial government. At the village level, fisher associations - called Van or Van chai organized auctions and taxation to lease out fixed gear fishing locations in the lagoon for fixed gears. Many fishing grounds became quasi-private property as the same families won the annual bid for the same fixed gear areas (Boonstra and Nhung, 2011).

In *the collectivization period (1975-1986)*, the Communist government declared its right to manage natural resources and denied individual ownership of natural resources including water bodies. The traditional Van and its management practice were abolished. Fishers had to join fisheries cooperatives. However, the cooperatives failed in controlling fisheries production and stopped functioning. Since then, fishers claimed their permanent control over their traditional fishing grounds or appropriated new ones. A large part of the lagoon was occupied as de facto private property (Boonstra and Nhung, 2011). Unoccupied areas of the lagoon were open access to mobile gear fishing. In *the Renovation period (post 1986)*, the new Land Law and Fisheries Law have allowed long-term user rights of natural resources to individuals. In 1990s, when aquaculture was developed, local government encouraged and allowed low productive agricultural land and submerged and abandoned land around the lagoon to be converted into earth ponds. Not long later, fixed gear fishers also converted their fishing ground into net enclosures. In this period, the lagoon privatization for aquaculture happens strongly and seems to be out of control of the local government.

Indeed, the property rights over Tam Giang lagoon resource have much changed. They are currently quite complex, which is one of the reasons of ineffectively managing the resource as well as dealing with externalities. As the property regimes are established based on specific resource exploitation activities which are very diverse in Tam Giang lagoon, some of them co-exist and overlap with one another in different types of lagoon resource use. Popularly, open access regime exists in mobile fishing area, public property regime in waterway system, communal property regime in fix gear fishing area. Private property regime is dominant in the area for aquaculture. These regimes are mostly based on custom and tradition. Through time, under the effects of government's management effort, some property regimes have been provided with legitimacy which varies differently among them. Aquaculture earth ponds with land title have the full legitimacy, which means owners of the ponds have full de jure private property rights. The lower legitimacies include: permits by DPC, permits by CPC, unofficial acceptance by CPC, acceptance by local community.

Table 4 below presents complications of property rights in different zones in the village lagoon, which include (i) earth pond, (ii) net enclosure, (iii) and waterway system – mobile fishing zone.

Table 4: The property right regime in relation to different types of lagoon resource use in Dinh Cu village's lagoon

Area	Resource use/ Activity	Property regimes	Basis of rights	Recognition
<b>Earth pond area</b>	Low tide and high tide aquaculture by individuals	Private property	Planning and allocating land use right	Auction off (Permit) by commune or district government
	Low tide and high tide aquaculture by State companies	State property	Land conversion from low productive agriculture land	Land title by government
<b>Net enclosure area</b>	Net enclosure aquaculture	Communal property	Planning and allocating water area	Approval by related government authorities
		Private property	Customary	Permit by commune or district government
<b>Waterway system-Mobile fishing area</b>	Water traffic	State property	Planning	Approval by related government authorities
	Mobile gear fishing activities	Communal property	Planning and allocating water area	Approval by related government authorities
		Open access	Customary	Customary

**Earth pond area:** In this area, both individual property and state property exist. The establishment of private property regime is based on the official allocation of the user rights of land in the area according to the land law. The land law permits users to exercise the use rights and other rights comprising the right to transfer, exchange, lease, sub-lease, bequeath of the land use rights; and to mortgage and contribute capital using the land use rights. These rights are indicated through the Red Certificate which is evidence of the full legitimacy of private rights of earth ponds.

State property regime includes ponds auctioned-off ponds by the local government and those belong to state-owned companies. In Vietnam, the state property regime is established to the land and lagoon areas that have not been allocated to any user for a long period of time. Local government is able to lease these areas for its budget. These ponds have district or commune permits instead of the land certificate. The user rights of these ponds have a lower legitimacy in comparison with ones having the land title “Red Certificate”. The permits only recognize the operational-level rights, not the collective-choice rights which are; however, accepted customarily. In this manner, the ponds have become de factor private property (Huong, 2010). Also, there are some ponds owned by state-own companies who involved in aquaculture. The state-owned companies have full legitimacy of property rights to the allocated aquaculture areas.

**Net enclosure area:** Net enclosures are practiced under both private and collective property regimes. Private property regime of net enclosure originated from the traditional management system in the past. It has low legitimacy. Net enclosure owners have the communal permit which recognizes the owners’ operational level rights to their net enclosures. Collective-choice rights and the right of bequeathing the net enclosures are not officially granted. These rights are accepted by the local community and by the commune government unofficially.

In the early 2000s, collective property regime has been initiated in the Dinh Cu village lagoon. This regime has existed simultaneously with the de factor private property regime in the net enclosure area. Dinh Cu VFA has been officially recognized as a right holder of the collective property regime and granted the right of management of the village lagoon area. The regime has been provided with full legitimacy. The VFA has legal status to effectuate its functions which are to assist the commune government in rearranging the net enclosure area, proposing the detail planning of the village lagoon, organizing collective actions for protecting members’ rights and lagoon resource under its mandate.

**Waterway system - Mobile fishing area:** In 2005 and 2008, as net enclosures were so crowded that they impeded water traffic and water circulation, Phu My commune government had a guideline to open a waterway system to improve water traffic and lagoon environment. At present, this system is about 28 ha. This area is also the fishing ground of mobile gear fishers.

In this area, different property regimes are overlapping; those are state property, communal property, and open access. In terms of the use for water traffic, the area is defined as a state property. The regime is established and recognized by governmental authorities engaging in the lagoon management through the planning of opening of the waterway system. In terms of the use as the fishing ground for mobile gears, theoretically, this area is under the management of VFA. This organization is responsible to manage or to control who accesses the area, kind and number of gear allowed to fish in the village lagoon. Nevertheless, practically, VFA is too lax in performing this task; the area seems to be in open access regime. Operating mobile gears in this area, fishers have rights of access and harvest; they do not have rights of management, exclusion, and alienation to this area.

#### 4. Practice of management right over the lagoon resource and lagoon resource characteristics

The management practice over the lagoon is complicated and overlapped in Tam Giang lagoon. In Viet Nam, natural resources belong to its people. The government represents its people to hold all the rights to all resources. Citizens, organisations and companies can only be granted the use right and some basic related rights to certain resource. Government plays a key role in practicing the management right; they are responsible to common management of the whole lagoon system. Government defines how other stakeholders take part in the lagoon management.

The management of Tam Giang lagoon is practiced by different stakeholders including governmental agencies (Division of Fisheries Exploitation Management and Resource Protection -DFEMRP, Division of Aquaculture-DOA, Department of Natural Resources and Environment-DONRE, Department of Traffic and Transportation-DOTT, Provincial People Committee-PPC, District People Committee -DPC, and Commune People Committee - CPC), VFA, and resource users. Each stakeholder has different functions and responsibilities in managing the lagoon (Table 5). The People Committee at different levels is responsible for state management of the lagoon and its resources. The People Committees make plans for aquaculture and fisheries development, and provides support to VFA such as legalization and resource. Provincial Departments and agencies are responsible for management activities on their fields of competence. In the area of earth pond aquaculture, the management activities (i.e. building aquaculture plan, management of aquaculture environment and diseases...) are practiced by DOA, DONRE, DPC and CPC. In the area of net enclosure aquaculture, besides the above stakeholders, there are participations of DFEMRP and VFA. In the area of waterway system, DFEMRP, VFA and DOTT are also involved. In the community, VFA mainly does self-management of fishing territory, fishery resources, and aquatic environment. Resource users (fishing households) organize their own activities and take part in the management actions to protect their rights.

Table 5: Practice of management right in Dinh Cu village's lagoon

Area	Right holders		
	Government	VFA	Individual/ Household
<b>Whole lagoon system</b>	<ul style="list-style-type: none"> <li>. Build overall planning of lagoon use</li> <li>. Set up general regulations to manage lagoon</li> <li>. Organize network to monitor implementation of regulations</li> <li>. Establish and delegate rights of exploitation and management of lagoon to VFA</li> </ul>	<ul style="list-style-type: none"> <li>. Build detail planning of lagoon use within village boundary</li> <li>. Set up VFA bylaws and organize self-management activities within village lagoon</li> <li>. Participate in activities against destructive fishing methods</li> <li>. Organize collective actions to protect members' rights</li> <li>. Solve conflicts among fishers</li> </ul>	<ul style="list-style-type: none"> <li>. Participate in VFA as a member</li> <li>. Take part in VFA activities against destructive fishing and to protect members' rights</li> </ul>
<b>Earth pond</b>	<ul style="list-style-type: none"> <li>. Set up overall planning and zoning for earth pond aquaculture</li> </ul>	-	<ul style="list-style-type: none"> <li>. Organize aquaculture activities at household level</li> </ul>

	(PPC, DPC, CPC, DOA) . Delegate user rights of land for aquaculture to individual households (PPC, DPC, CPC) . Issue regulations for managing environment and monitor the implementation (DOA, DONRE)		. Take action to manage aquaculture environment, to cover disease outbreak at household level
<b>Net enclosure</b>	. Set up overall planning and zoning for net enclosure aquaculture (PPC, DPC, CPC, DFEMRP, DOA) . Delegate user rights of water surface for net enclosure aquaculture to VFA (PPC, DPC) . Issue regulations for managing environment and monitor the implementation (DFEMRP, DOA, DONRE)	. Build detail zoning for aquaculture within village boundary . Organize collective actions to protect members' rights and to manage aquaculture environment, to cover disease outbreak	. Set up household net enclosure aquaculture system . Participate in activities to protect household net enclosure and delegated VFA water surface . Take action to manage aquaculture environment, to cover disease outbreak at household level
<b>Waterway system – Mobile fishing zone</b>	. Plan and manage waterway system (DFEMRP, DOT, PPC, DPC, CPC) . Control destructive fishing methods (DFEMRP) . Apply open access regime to artisanal mobile fishing	. Participate in activities of opening the waterway system . Organize self-management activities within village lagoon against destructive fishing and to protect members' rights . Solve conflicts among fishers	. Participate in VFA activities against destructive fishing . Decide scale, method and location for exploitation at household level

Government agencies normally have different missions, jurisdictions, internal regulatory standards, interests and goals. They merely focus on their sectoral, temporal, and spatial mandates without paying attention to consultation with other partners and stakeholders. In this case, the interagency cooperation is weak. Additionally, when many agencies are involved in the management, it is difficult to define clearly their responsibility and jurisdiction in the cooperation. Therefore, no single actor feels fully accountable for the actions of the cooperation. Moreover, the management of the lagoon mostly about specific lagoon exploitation activities are within the lagoon boundary. However, the lagoon is not a separated system. It is adjacent to agriculture system and urban area. It is affected by the waste water from these systems. In addition, the lagoon is a classic common pool resource. It has characteristics of a common pool resource: non-excludability, subtractability and mobility. The lagoon is non-excludable in terms of costly prevention of the wastewater intrusion and its impact. And, the lagoon is subtractable in the sense that the water quality, once degraded by upland wastewater, placed an adverse impact on net enclosure aquaculture system particularly and lagoon fisheries resource generally. In addition, the mobility of the wastewater and lagoon water flow makes it difficult to pinpoint and visualize the impact of the wastewater in the lagoon resource system. It is unlikely for the Dinh Cu villagers to identify who discharges what, where, when and how the wastewater impacts their aquaculture.

## 5. Discussion and conclusion

Net enclosure in Dinh Cu village is one of the most important sources of living of the local people. Yet, the base of this activity - the lagoon is adjacent to agriculture system and affected by the wastewater from this system. Agricultural discharge causes lagoon water quality degradation and places an adverse impact on net enclosure aquaculture, which leads to the conflict between Dinh Cu aquaculturers and upland agriculture community. Indeed, there is a clash of the interest of the two communities; upland agriculture community needs to discharge its wastewater and lagoon community requires good quality water for their aquaculture activity. Hence, a conflict between the two is certain. This is match with the definition of resource conflicts by Food and Agriculture Organization of the United Nations, which defines natural conflicts as disputes regarding use of resource and emerging when the benefits of parties collide (FAO, 2000).

Over different periods of time, the property rights in the lagoon have changed, which makes it difficult to deal with the externality (i.e. upland agricultural waste water). The property regime was shifted from common pool resource or collective resource to private property. The shift was partly due to a



lack of effective management mechanism in the collectivization and renovation periods (Boonstra and Nhung, 2011; Huong, 2010). Taking advantage of customary rules which still had some effects, fishers privatized part of the lagoon for fishing and aquaculture (Boonstra and Nhung, 2011; Huong, 2010). It is partly a result of official allocation of coastal land and water for aquaculture development, which is associated with various types of government permissions (Huong, 2010; Phap *et al.*, 2002). Early 2000s, community based management and co-management were initiated as alternatives to top-down management method. That makes diversion of property regimes as well as property rights over the lagoon, which co-exists and overlap in various types of Tam Giang lagoon uses. These property regimes and property rights receive different legitimacies ranging from high to low level or unclear.

Under the effects of property right changes and the local government's guideline of aquaculture development, almost the Dinh Cu village's lagoon has been fenced off for net enclosure aquaculture. This type of aquaculture also has strong effect on lagoon environment degradation (Phap *et al.*, 2002). First of all, as net enclosures are set in lagoon water, the waste from net enclosure aquaculture (e.g. residual feed, prawn droppings) goes directly into the lagoon without treatment. Secondly, the fencing off of the lagoon by layers of net to breed aquatic species prevents water circulation. It prevents organic wastes from inside the net and wastes from upland escaping out to the sea, which partly causes lagoon pollution. Additionally, the change in property rights to the lagoon resource has been a factor conditioning the interaction with upland community. A large area of both coastal land around the lagoon and lagoon water have been conceded to private users for aquaculture. There is no abandoned coastal land for building sedimentation basins to treat the waste water before it goes into the lagoon. Besides, the fencing off of the lagoon obstructs the waste water from upland community, which aggravates lagoon water pollution. The net enclosure owners get angry as they reckon that their private property is impinged by the waste. Furthermore, the property rights with different types of legitimacy make it difficult for the net enclosure aquaculturers perform their private rights, especially when the idea "land is private, lagoon is common" remains popular in both fishing and agriculture community. The net enclosure aquaculturers; therefore, could not act against the upland community regarding waste water discharge. In case of presence of externalities, property rights are believed to be an effective solution for them (Hardin, 1968). However, in the context of overlapping and unclear use rights, resource authorities could not function effectively (Berkes *et al.*, 2001). Hence, externalities are unlikely to be effectively addressed.

In terms of management practice of the lagoon, there is a wide range of agencies being involved in the management of Tam Giang lagoon. They have different responsibilities and functions in relation to lagoon management, which sometimes overlap. Unlikely, each of the agencies are fully accountable for managing the lagoon. Moreover, the management of the lagoon is mostly about specific exploiting activities. However, the exploiting activities happen in the same system and have a close relation to each other as well as activities of adjacent systems. The lagoon has classic characteristics of a common pool resource, which comprise of non-excludability, subtractability, and mobility (Acheson, 2006; Agrawal, 2001; Ostrom *et al.*, 1994). In relation to activities of adjacent agriculture system, the lagoon water is affected by agriculture waste; but, it is difficult to stop this as well as to pinpoint and visualize the impact of the wastewater in the lagoon resource system generally and on net enclosure aquaculture particularly. And, the management of the lagoon has not taken this issue in consideration.

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