

Community based coastal resources management behind changes in surface water environment and land policy: A case study in the Tam Giang Lagoon, Central Vietnam

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Abstract. This paper attempts to examine the changes in surface water environment and community based coastal resources management activities in the Tam Giang Lagoon, Central Vietnam. The results show that the lagoon's surface water has been polluted. BOD₅, COD and nutrient concentration have increased in the lagoon's surface water environment. It proved that there was a present of organic substances. Due to the globalization of seafood products and changes in lagoon's water quality by aquaculture development; the local government has issued many regulations to manage lagoon's resources. Among those policies, the establishment of fisheries association and/or self-management team is considered as appropriate solution to develop aquaculture and capture aquatic resources in the lagoon. However, the benefit and power of the resource users have not been stipulated for both fisheries association and self-management team. Instead of this, it is only member's responsibilities and duties in using lagoon's water surface areas. As a result, most of resource users in the study area have not participated in these organizations as their members. The resource user must do all activities in relation to aquaculture by themselves, without supporting from above organizations.

Keywords: Community Based Resource Management, Biochemical Oxygen Demand, Chemical Oxygen Demand, Surface Water Environment, Self-management Team, Tam Giang Lagoon.

1. Introduction

Globalization of sea food products and climate change are the great challenges to manage and use natural resources in the developing countries. Several theories and arguments have emerged as a result of

experience in fisheries resource management around the world, for example those relating to community based management in coastal regions. Community based resource management, as explained by Korten [1], includes several elements such as a group of people with common interests, mechanisms for effective and equitable management of conflict, and broadly distributed participation in the control of resources within the community.

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Sajise [2] has argued that community based resource management is a process by which the people themselves have the opportunity and/or responsibility to manage their own resources, define their own needs, and make decisions that affect their socioeconomic welfare. According to Ferrer and Nozawa [3], community based resource management is people-centric, community-oriented, and resource-based. The idea has grown from the basic premise that people have the innate capacity to understand and act in order to solve their own problems. Building on their current experience people can, together as a group further their knowledge and create a group consciousness. Meanwhile, Rivera [4] has argued that community based resource management is a process of governance and political decision-making, geared toward the formation of partnerships and power sharing. It is consensus-driven and geared toward achieving a balance of interests. The emphasis is on communities and at its core, the community organization. With the debates as mentioned above, it can be said that there is no definitive model of community based resource managements which can be referred to in order to manage natural resources, because the relevant terms and concepts originate from geographical contexts, historical circumstances, and the specific culture of each country. In the case of coastal and lagoon resources, McCay [5] stated that “current top-down and bureaucratic fisheries management approaches, based on centralized government interventions, are unable to address most of the contemporary problems, such as rehabilitation of stocks, resolving user group conflicts and sustaining livelihoods of fishing communities”. This is because people have not been granted the rights to manage and fish on common fishing ground. Due to these reasons, Pomeroy [6] suggested

that fisheries often cannot be managed effectively without the cooperation of fishing communities. Instead, fishermen should be organized into formal associations and should be granted the right to manage and exploit the fisheries resources by themselves. If the fishermen conceive that the resources being exploited are their own property, this will give a greater incentive to the fishermen’s community to create their own management system.

In coastal region of Central Vietnam, the rural communities still rely heavily on natural resources for their livelihood. Accordingly, their access to common property such as coastal/lagoon resources and its water surface area are substantially important. However, the management of use rights and access to resources in practice seem to create conflicts among the users either in groups, organizations or individuals because of changes in policies, regulations, and customary use. It may lead to greater vulnerability for the poor who are strongly dependent on the lagoon resources and new conflicts among members inside and outside communities. It also causes the environmental degradation due to the discharge of untreated sewage, pesticides and fertilizers from aquacultural and agricultural activities. The changes of opportunities of using resources and rapidly aquaculture development are becoming as a part of potential society conflicts for communities around the lagoon. Some researching such as Ton That Phap [7], Truong Van Tuyen [8] have tried to describe issues of co-management in planning of waterway system, dynamics of property rights, lagoon’s activities and social organization of the fishermen in the Tam Giang Lagoon. However, those researches only introduced sketchiness and they are not concerned with the details of changes of water environment as well as rural

residents' livelihood. Moreover, those researches did not also mention to changes in natural resource management policies under the impacts of aquaculture development, land allocation policy as well as globalization of sea food products. In order to compensate for the flaws as described above, the authors carried out the field work in Phu An commune, located in the Tam Giang Lagoon, Central Vietnam in September, 2009. In this paper, the authors attempt to examine the changes of surface water environment and community based resources management activities.

2. Study site

Phu An Commune is one of 21 communes and towns of Phu Vang District, Thua Thien Hue Province, Central Vietnam (Figure 1). It is located on the shore of the Tam Giang Lagoon, one of the biggest lagoons in Asia whose area is about 22,000 hectares with a length of 70 km along the coast. About 6,140 households are directly participating in exploitation and aquacultural activities in the lagoon. Among them, about 900 households live on the lagoon's water surface [9].

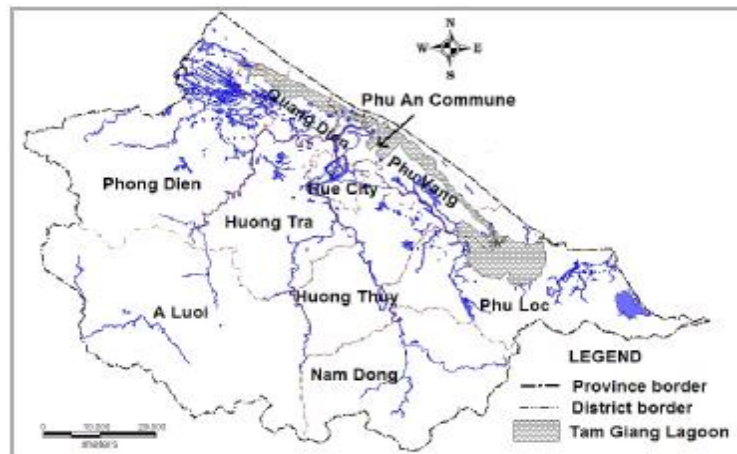


Figure 1. Location map of the study area; arrow indicates Phu An Commune.

The total area of Phu An Commune is 1,128 hectares and over 500 hectares are occupied by Tam Giang Lagoon, which is utilized for fishing and traffic. Community settlements exploit the lagoon's resources such as fishes, shrimps, shellfish, edible seaweeds and farm on the sandy land at its edge. The area used for food production is 269 hectares, of which 220 hectares are planted spring paddy crop (from December to April) and 49 hectares for summer paddy crop (from May to September).

Administratively, Phu An Commune is divided into four villages. The population is

8,749 persons with 1,583 households as of 2006. About 82 percent of households are involved in agriculture and/or aquaculture, 13 percent in only fishing including net-enclosure and five percent in services such as distilling rice liquor, woodworkers, barbers and retailers. The proportion of households who use electricity is about 95 percent. The proportion of households who use tap water for daily use is 85 percent. The rest use water from ponds, wells and/or the lagoon. The average income per capita per year is about 327 USD.

3. Methodology

In order to conduct this research, the authors used diverse sources of data including (i) a secondary researched review of published literature, and legal and policy documentation in relation to changes in lagoon's resource management policy, aquaculture development activities under land policy and globalization of seafood products as well as changes in surface water environment by element of BOD₅, DO, COD and other nutrients concentration, and (ii) information collected via key informants such as the local authorities, the local resident groups in the Phu An commune, and the managers in Thua Thien Hue Fisheries Resources Protection Agency and Thua Thien Hue Department of Fishery. Among the interviewees, seven key informants provided us directly useful information for this research. The personal characteristics of them are the farmers, the fishermen and the officers. They provided us confident information, we believe, because: (a) most of them are over 60 years old and (b) they have experiences with relation to changes in historical lagoon's utilization and management. We used software tools such as Mapinfo 8.5 and Excel in order to modify maps and reckon the surveyed data. And we also used the comparative method to collate Viet Nam standards with other countries in relation to environmental elements.

4. Results and discussion

Changes in lagoon's surface water environment behind aquaculture development

The "Doi Moi" policy initiated by the Vietnamese Government in 1986, and the

consequent widening of the export market for marine and farm products between Vietnam and countries across the world, have been fueling the rapid changes in rural society of Vietnam, especially in the field of natural resources use and management. This has motivated households to participate strongly in production activities as independent economic units for improving their lives. Following the increased in globalisation of sea food, shrimp aquaculture in the Tam Giang Lagoon was introduced by the local government in 1999 as an alternative to fishing in order to improve the income of the fixed gear fisher and the mobile gear fisher as well as to reduce exploitation on the lagoon's resources. However, the implementation of the master plan for management and reduction of exploitation on the resources was delayed until 2003. Prior to this period, there were no fisheries management plans. Provincial governments did not implement many laws and regulations fearing that they would cause severe disruption and hardship to small-scale fishers. This has led to more encroachment of the fishing ground by fishermen and farmer to earn additional income as well as an increasing number of participators, intensification of exploitation, higher risk of environmental degradation and rapid exhaustion of the lagoon's resources. Negative environmental impacts are increasing in recent years. The chemical and organic fertilizers along with the feeds are added to increase production. Results in Table 1 show some changes in the lagoon's surface water environment in the period of 1998-2007.

Table 1. Changes in the lagoon's surface water environment in the period of 1998 - 2007

Element	Unit	Year					
		1998 ¹⁾	2004 ¹⁾ (June)	2006 ²⁾			2007 ²⁾ (May)
				April	May	Nov	
BOD ₅	mg/l	0.15	1.21	0.90	2.00	0.40	1.70
DO	mg/l	7.60	5.60-6.50	7.10	6.00	5.50	-
COD	mg/l	1.50	4.12	9.00	4.00	7.00	9.80

Source: Nguyen Van Hop, et.al [10].

Result in the Table 1 indicates that BOD₅ (biochemical oxygen demand) increased in dry season in the period of 1998-2004, from 0.15mg/l to 1.21mg/l. Especially, BOD₅ accelerated to 1.70mg/l in 2007. As a result, DO (dissolved oxygen) was also decreased. Result in the Table 1 also shows that COD (chemical oxygen demand) in the water of the Tam Giang Lagoon increased in the period of 1998 – 2004, from 1.50mg/l to 4.12mg/l, and especially COD accelerated to 9.80mg/l in 2007. In the research of Nguyen Van Hop, et.al [6, p.12], the authors concluded that “the anxious problems of the lagoon water quality were organic pollution (high COD concentration), bacteria pollution (high total coliform and fecal coliform concentration) and level of nutrients (nitrogen and phosphorus) potential to eutrophication”. Although, nitrate (NO₃) concentration was not very high (<0.26 mg/l) compared with the Vietnam Standard TCVN 5942-1995 (≤ 15 mg/l) for surface water used for multi-purposes, the total nitrogen (TN) level in several areas of the lagoon is higher than international standards [6, p.20]. According to American standard, total nitrogen (TN) applied to coastal water (TN < 0.9 mg/l), Chinese standard to fish culture (TN < 0.5 – 1.0 mg/l) and Japanese standard to coastal water (TN < 0.03 – 0.05 mg/l), that TN level in some areas of the lagoon exceeded the requirements (1.72 mg/l in May, 2006 and 1.28 mg/l in May, 2007 respectively [6, index B2 and B5]) applied

for coastal ecosystem conservation and aquaculture. In addition, this research stated that phosphorus was the limiting factor in the lagoon and phosphate (PO₄) concentration was 0.01 mg/l-0.03 mg/l [6, p.20]. As a result, it can be said that the lagoon has been in eutrophic condition. Do Cong Thung [11] also stated that microorganism pollution in the Tam Giang Lagoon water was higher than allowable standard from three to 30 times. Average concentration of total coliform in the lagoon water (ranging from 2,900 to 69,000 MPN (Most Probable Number)/100 ml) exceeded the permitted level of Vietnam standard TCVN 5943-1995 (<1000 MPN/100 ml) of water quality used for multi-purposes [6, p.22]. Thus, it can be affirmed that there was present of organic substances in the water environment in the Tam Giang Lagoon and the lagoon's water has a polluted sign.

According to the authors' survey, other reasons which also caused directly changes of BOD₅ and DO contribution above are: (i) the households who involved in aquacultural activities did not treat strictly waste water and redundant food in the process of shrimp pond sanitation, and (ii) chemical fertilizer of agricultural activities, waste industry of brewery and oil storage around the Tam Giang Lagoon. Due to these changes, it caused increasingly failed rate in shrimp aquaculture activities as mentioned in Table 2.

Table 2. Changes in household's shrimp aquaculture activities in the Tam Giang Lagoon

Catalogue	Year			
	1998		2007	
	Household	%	Household	%
Profit	1,445	80	2,294	37
Loss	89	5	1,096	17.85
Breakeven	268	15	2,750	44.79
Total	1,802	100	6,140	100

Source: Thua Thien Hue Department of Fishery [10, 11].

Result in the Table 2 shows that participated households in aquaculture activities accelerated in the period 1998-2007, from 1,802 households to 6,140 households. The participation of crowded resource users meanwhile lack of clearly institutions management such as the master plan for management and exploitation of the lagoon's resources was a main reason of unprompted build of earth ponds, freely encroachment of water surfaces and performing of different calendar among households in aquaculture seasons. As a result of unprofessional production, rate of failed households by shrimps/fishes disease increased 17.85% in 2007 meanwhile this was only 5% in 1998.

According to a statistic of Thua Thien Hue Department of Fishery [12], the acreage of shrimps/fishes aquaculture has been decreased in the year of 2003, 2004, 2005 and 2007 was 167 ha, 1,368.5 ha, 635.2 ha and 1,053 ha, respectively. Besides, rate of profited households decreased to 37% in 2007 (this rate was 80% in 1998). Rate of breakeven households has increased to 44.79% in 2007 (this rate was only 15% in 1998). Due to the failure of shrimps/fishes aquaculture, some of them are not being able to invest additional money to continue shrimp aquaculture. The decrease in their revenues due to serious disease

during these periods made them unable to cover the costs for feeding and prevention of disease. Moreover, the high pressure from loan interest for the initial investment pushed them to abandon shrimp aquaculture [13].

Changes in policies at provincial level in the 2000s

Under the pressure of lagoon's resources exploiting, the provincial government and related agencies have promulgated many decrees and regulations in order to manage the lagoon's resources. The remarkable documents are indicated in the Table 3.

Contents in the Table 3 show that, provincial government has started to pay attention to the lagoon's resource management by determining the core of issues as follows: (i) The households have to join in the Fisheries Association (hereafter called FA) as its members if they want to receive an exploiting right in the lagoon; (ii) To define the fishing rights in the lagoon for the resource user; (iii) Shrimp aquaculture by earth pond form will be reduced building to a maximum; and (iv) Depending on ecological characteristics of each region, the provincial government would stipulate the use time and grant the fishing right one year, five years or ten years.

Table 3. Decrees in relation to the lagoon's resource management

Name of Decree	Main contents	Issued authority
Decree No.3667/2004/QD-UBND. Decision of the Provincial People's Committee approval of the overall planning for the management and exploitation of fishery resources on the lagoon system of Thua Thien Hue Province towards 2010.	<ul style="list-style-type: none"> - New subjects (labors, boats, fishing tools) are not allowed to freely participate in the exploitation of fishery resources on the lagoon - All exploitations in the lagoon have to need permission certificate. - Fish corral exploitation is banned for three months/year 	Provincial People's Committee
Decree No.4260/2005/QD-UBND. Decision promulgating the regulations on the management of lagoon fisheries in Thua Thien Hue.	<ul style="list-style-type: none"> - Individuals and household's participating in lagoon fisheries have to organize themselves in fishing associations at the village's level, inter-village or commune levels. The State will only delegate the power of lagoon fisheries management to the fishing association at the grassroots level. - The fishing rights in the lagoon area include the rights and responsibilities to timely prevent acts of fishery law violation, responsibilities of protecting fishing grounds, developing aquatic resources, ensuring free access to water ways, preventing degradation of the water environment and ensuring submission of taxes to the State. - Only issue fishing certificate for one year (or hand over authority to Communal People's Committee to organize auction annually), five years and ten years depending on the lagoon's zone to the fishing associations 	Provincial People's Committee
Decree 1068/2007/QD-UBND Decision of the Provincial People's Committee approval of the planning for fisheries production in the lagoon until 2010, towards 2020.	<ul style="list-style-type: none"> - Shrimps aquaculture by earth ponds will be reduced to a maximum. - No extension of land allocation, no legalization of net enclosure ponds - Grant the use right to Fisheries Association. 	Provincial People's Committee

Source: synthesized from documents at Thua Thien Hue Department of Fisheries, 2009 by the authors.

With these regulations, the resource users, instead of independent unit in using the lagoon's resources as before, have to join in the FA. When they become the FA's member, they will have legal personality to receive the water surface use right for fishing in the lagoon. However, according to the authors' survey, it still exists a form of *de facto* ownership of

water surface in the lagoon. The local people still have the ownership on the area where they have encroached in the past. This right has not been mentioned in the Vietnamese Laws. Thus, it can be challenged legally in the process of community based natural resource management and policy changes of the authorities.

Endeavor of community based the lagoon's resources management and its inadequacy in communal level

To implement the decree No.4260/2005/QD-UBND, the Phu An People's Committee established the FA in 2005. Number of members was 101 households out of 382 households who are directly participating in fishing and aquaculture activities in the lagoon. The FA is managed by the People's Committee and related agencies in term of specialty. Functions of the FA can be summarized as follows: (i) to help its members raising awareness on protection and development of lagoon's resource management policies such as dissemination of new decrees/regulations in relation to aquaculture; (ii) to discuss experiences on aquaculture, help each other when having disasters, diseases, and financial difficulty, and (iii) resolving conflicts in fishing grounds and about resources among individuals and/or household members. However, the water surface of households was currently self-management by themselves in reality. In other words, the households are keeping *de facto* ownership which has been handed from their ancestor. As a result, role of the FA has been faded in aspect of the lagoon's resource management. The process of suggestion for granting a fishing license has not been promoted because many households did not participate in the FA as its members. Fishing and aquaculture activities are continuing as the time without the FA. The Communal People's Committee still manages the lagoon's activities such as collecting taxes, solving conflicts, and coercing the repeat of encroachment of households to water ways for aquaculture.

According to key informants, the unsuccessfulness of the Phu An's FA is due to following reasons: (i) lack of stable financial

resources to put plans to actions because the FA is a voluntary organization; (ii) lack of awareness among members/community on mandate, powers, responsibilities and benefits that vested in the FA. It has not a detailed decentralization to the FA while there are many responsibilities they have to do as mentioned above; and (iii) lack of awareness and knowledge among members in relation to aquatic resources management for sustainable utilization. The resource users continue to exploit resources without considering fisheries size, even some individual use electric tools for fishing.

In the process of finding a sustainable and effective management, the Phu An People's Committee has also established six self-management teams (hereafter called SMT) in 2008 as another model of community based the lagoon's resource management. These teams exist parallel with the FA and it is controlled directly by the Phu An People's Committee. The function of SMTs has been stipulated as follows: "SMT has responsibilities of preservation, management, help each other in exploiting and aquaculture within its team". There are 75 households who participated in these teams. Some of these members are also the households that have been mentioned in the FA above. It means that they are member of both the FA and SMT.

The results of survey show that over two three other households of 382 households in the commune did not participate in these organizations because:

(i) they said that the FA as well as SMTs could not help them in aquaculture activities such as supply shrimps/fishes breed, consultancy on shrimps/fishes diseased treatment, and finding markets for selling their aquatic products. In other words, they have not

received any economic benefit or technique from the FA or SMT. They themselves must do all these activities without supporting from above organizations;

(ii) they believed that the local government has still not reasonable and sustainable policies to manage the lagoon's resources. The proof is that the granting of fishing license has not been implemented at the time of the author's survey although the related decree issued from 2005;

(iii) they did not know how the policy will change because it has not a sure guarantee of the government like agricultural land in relation to the use time and the water surface ownership where they are doing aquaculture activities; and

(iv) as the Sampan people, the easily risked group has not been received any support and guarantee policy related to the ownership in using lagoon's resources. They continue to access to the open-access area for their livelihood.

It can be said that, establishment of SMT and the FA has revealed a confused in the lagoon's resource management of the local government. This realized due to:

(i) according to decree No.4260/2005/QĐ-UBND of provincial government, the fishing license only grants to the FA. Meanwhile, the Communal People's Committee established SMTs and suggests the district level to grant the fishing license to these teams. This is surely impossible because of opposition to the provincial decree;

(ii) the benefit and power of resource users has not been stipulated for both SMT and the FA. It is only member's responsibilities and duties in relation to the using lagoon's areas; and

(iii) as for households who have been granted certificate with the use time of five years or ten years, the local government gave a

legal use right on the allocated areas. However, if granting the fishing license to the FA, there will be an overlapping on the use right of allocated areas, for example: whether the local government will revoke the use right of the allocated households or not; and how to use their water surface areas after deadline for use right. These are the challenges to the local government in setting up sustainable lagoon's resource management institution and guarantee of local people livelihood.

4. Conclusions

This paper attempts to examine the changes of surface water environment and endeavor of community based resources management in the Tam Giang Lagoon. Result of the research pointed out that in the period of 1998-2007, BOD₅, COD and nutrient concentration have increased in the lagoon's water environment. Total nitrogen level applied to coastal water in some areas of the lagoon exceeded the requirements of international standards applied for coastal ecosystem conservation and aquaculture. Moreover, average concentration of total coliform in the lagoon water exceeded the permitted level of Vietnam standard of water quality used for multi-purposes. It proved that there was a present of organic substances and the lagoon's water has sign of pollution. This is one of main reasons, which led to an increasing rate of failed shrimp aquaculture during the period of 1998-2007 in households as well as the decreasing yield of fisheries exploitation in the period of 2001-2003.

Under pressure of exploiting resources, the local government at levels endeavored to build an institution of resource management based on community. The core of this institution is to grant the fishing right to the community through the FA or SMT in the specified territory. However, the benefit and power of the

resource users have not been stipulated for both fishing association and self-management team. Instead of this, it is only member's responsibilities and duties in relation to the using lagoon's areas. As a result, most of resource users in the surveyed area have not participated in these organizations as their members. The resource user must do all activities in relation to aquaculture by themselves, without supporting from above organizations. Whether these models bring benefits and a sustainable resource management to local communities or not is the great challenge for both resource users and local government. The core issue needs to be affirmed in the process of the lagoon's resource use and management is to give clearly the authority and the benefit to the resource user. In other words, it is necessary to decentralize to the resource user. They only have a motivation to manage sustainable resources in case of they know the benefits that they will be received in long term. When the law and/or decree have still not granted the rights clearly, coupled with benefits to the resource user, the current resource management is continuing to be *de facto* ownership. As a result, this can be challenged by legislation. The success or failure of these models is the great challenge to the policy makers currently.

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