

CO-MANAGEMENT: THE MOST EFFECTIVENESS AND EFFECTIVE
MANAGEMENT SOLUTION FOR FISHERIES OF SMALL RESERVOIRS

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Abstract

Thousands of small man-made water reservoirs (water bodies with water surface from five to some hundreds ha) have been developed in mountainous regions for water supplying or hydroelectricity purpose, these areas are usually residence of poor, backward minority groups which often lacks of food supplying resources. Development of fisheries (both of fishing and aquaculture - farming or ranching) bring to them benefits both economic and socio-economic. However, managing the fisheries there always meets some troubles and conflicts in water usage, stable water supplement, and sustainable development of fisheries resources because of free approach.

Studying the management at Tam Hoa reservoir in Hung Vu, Bac Son district, Lang Son, the reservoir locating in the remote minority region in North of Vietnam, we can draw many lessons about sharing benefit and responsibility among communities who concerns the reservoir as common asset and uses water resource for different purposes. The sharing rights and responsibilities between government authorities and local communities in development of fisheries thru the cooperative model here by combining state institutions with the traditions and customers of community brings very good success in fisheries management of this reservoir. By applying of co-management, the fisheries resources in this reservoir are protected and developed sustainable and made benefit not only for fishers but positively impacted to the ecological environment and contributed to economic and cultural development of the region; and poverty elimination for local minority groups.

The experience of co-management of Tam Hoa reservoir is very useful for searching the adaptable measures for thousands of small man-made water reservoir in Viet Nam as well as in other countries

I. INTRODUCTION

In Viet Nam – a country with topography of three of fourth is mountainous and a monsoon climate, the reservation of water for agricultural purposes, for rice farming in particular, is very important. Therefore, for last several decades thousands of water reservoirs have been built. Besides for the agricultural and electrical production purposes, reservoirs are creating the large fisheries resources and fisheries development potential for country and creating not only the large nutrition and food source but jobs and income for the people, in particular for the people of minority groups in mountainous regions. However, management of fishery resources in reservoirs is a very difficult problem due to various factors such as difficulty to exploit and the usage of water resources is multi-purposely, and approach to conduct fisheries in almost of reservoirs is open.

Before 1990, almost of fisheries in reservoirs were laid under state exploitation and management but this management seemed ineffectively. Almost of state-run fisheries company at reservoirs were disbanded and reservoirs were felt into unmanageable. At the beginning, the fisheries resources in reservoirs from newly building are always abundant, but gradually those become declined by reasons of bad management, illegal fishing and lack of additional stocking.

The decline of the fish stocks, therefore, necessitated a refocus and the innovation of the fisheries management regime in reservoirs in Vietnam and finding the sound fisheries resources management for the water reservoirs.

Various experimental management of fisheries in reservoirs models have been performed and conducted such as applying bidding system for fishery resources use right, cooperatives,... but, the management of fisheries resources has not been successful.

From 1993 when the concept of 'co-management' was adopted, there were some implementations of pilot study of co-management to be conducted in reservoirs fisheries management, particularly as the followings:

(1) The pilot study of implementation of co-management to manage fisheries in Thac Ba (Yen Bai Prov.) hydro-electric reservoir was implemented by Institute of Fisheries Economics and Planning funded by International Center for Living Aquatic Resources Management (ICLARM, now is WorldFish Center). This small project helped to improve the management of fisheries resources in reservoir by upgrading the resources protection knowledge and allocating the fishing areas for the fisher's communities who are locating in coastal villages of reservoir to manage

(2) The project on "Managing fisheries in reservoirs " implemented by Research Institute of Aquaculture N0 3 in Nha Trang funded by Mekong River Commission

The first reservoir was selected for implementing the co-management was Easoup and the work had begun from June, 1998. Co-management approach was established in the form of Fisheries Association. Followed the Easoup the co-management was conducted in Buon Tria Reservoir (2001) and Lak Reservoir (2002).

The modes of management of these reservoirs were not similarly. Though with the adoption of the co-management approach for fisheries resources management at these reservoirs had done, some positive results have been yielded, such as improved

relationship between the fisheries managing organizations and the communities of users, participatory licensing, formulation and review of fisheries regulations by the fishers. In almost reservoirs where the model of co-management was applied the fisheries resources have been well approved. However, up to day, many problems were appeared at all of those reservoirs such as the weakness in compliance of regulation, low effective in enforcement activities as well as the impasse of core groups.

Tam Hoa reservoir is another case. In the surveys that had been made in the 2009 under the sub-project of evaluation the project “Support to development of the commercial and environmentally sustainable aquaculture through small proprietors cooperatives, as an instrument of alleviate the poverty in Vietnam” that is funded by AECID (Cooperation Development Spanish Agency) developed by AIDA Association (Aida Exchange and Development) and RIA 1 (Research Institute of Aquaculture) as Vietnamese partner we recognized that though at this reservoir not any implementation of co-management pilot study has been conducted but basing on the cooperative formation and the policy of root democracy has been heightened, the management of Tam Hoa reservoir has carried out the characteristics of community-based co-management where the fishers assembled in their cooperative and set regulation by themselves. And their own common regulation has been developed basing on integration of state legislations and local customary. This way of integration makes the management of fisheries resources in Tam Hoa becomes effective, realizable and sustainable.

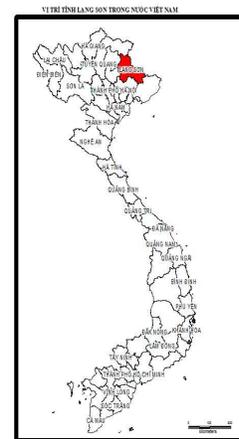
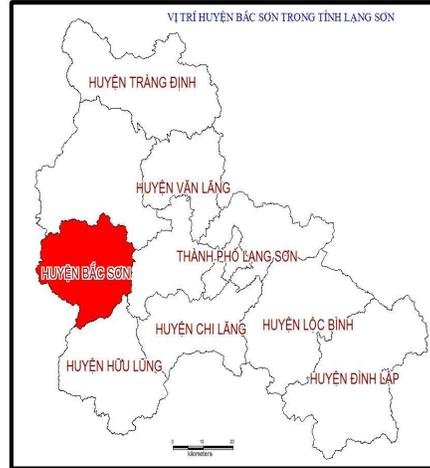
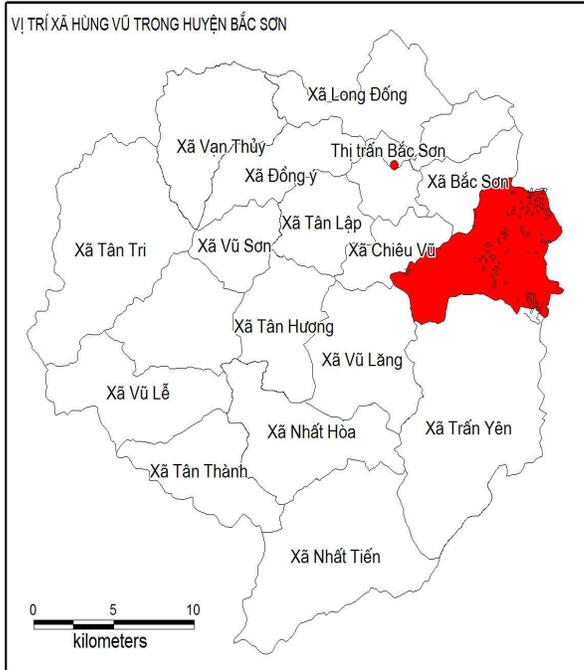
This paper, therefore, examines presentation of fisheries resources management of Tam Hoa reservoir and author want to conduct this form as a effect form of community-based co-management for fisheries resources management in reservoirs

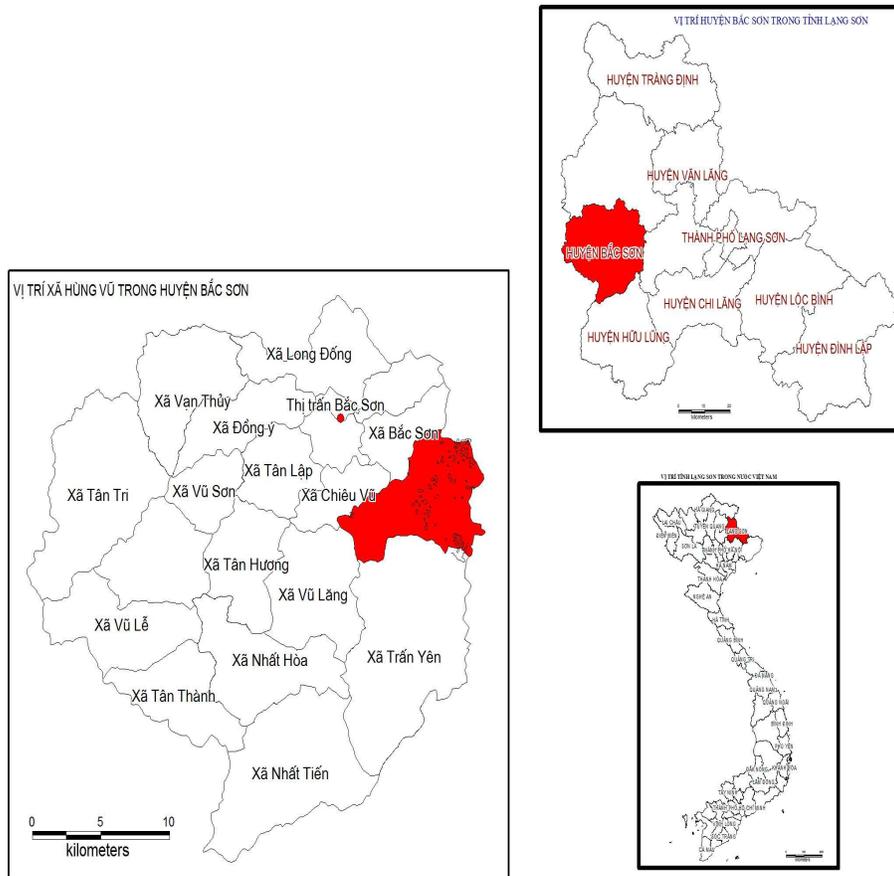
II. GENERAL INFORMATION ABOUT FISHERIES IN TAM HOA RESERVOIR

Tam Hoa is man - made irrigation reservoir in Hung Vu commune of Bac Son district, Lang Son province and locating in North of

Co-management: The most efficient and effective management solution for fisheries of small side reservoir

Vietnam.





Hung Vu commune is a home of different ethnic minorities. Total population the commune in 2006 is 4.521 people, of which 92.35 percent is Tay minority, following by Kinh majority (6.44%), Nung minority (1.06%) and the rest of 0.15% are other minorities as San Diu, San Chi, Cao Lan etc. The Hung Vu commune is comprised from 15 villages with a total area of 4,467 ha. Hung Vu located in mountainous area, more than 80% the area of the commune is mountains and forest, of which, the forest cover is about 12% and the rest is rocky and uncultivable mountains. Cultivable agricultural area is about 290 ha and accounted for 8.71% of the total area. Regarding to the area for aquaculture and fishing, the water body area of the whole commune is about 41.53ha, accounted for about 1% area of the commune. Of which, there are 38.25ha of reservoir and the rest of 4.28ha are household ponds (Table 1).

Table 1: Distribution of land by type

Land type	Area	Percentage
Total area	4467.00	100.00
Agricultural area	389.00	8.71
Resident area	16.77	0.38
Forest area	535.03	11.98
Upland crop area	118.69	2.66

Dedicated area	91.09	2.04
Uncultivated area	210.00	4.70
Others (mountain)	3064.89	68.61
Water area	41.53	0.93
<i>Of which:</i>		
- Reservoir	38.25	0.86
- Household pond	4.28	0.10

Source: Hung Vu's statistical data, 2006 [1]

Located in North Vietnam, the climate feature of Hung Vu commune is characterized by clear distinction between seasons of cold and dry in winter and hot and high rainfall in summer. According to Vietnam Statistical General Department, average annual temperature is ranging from 17°C to 22°C. Annual rainfall is about 1,200 to 1,600 mm. And annual humidity is around 80 to 85 per cent.

The population of the Hung Vu commune is divided into 915 households, of which 60 households (6.6%) involve in fishing and aquaculture in either reservoir or household ponds.

Economy of Hung Vu commune is based in agriculture. Within the labor force, almost 90% are involving in agricultural production, about 7% of the labor is working in fisheries and the rest of 3% are directly involving rural services, rural industry, handcraft etc. Fishery production is also considered as a noticeable occupation for local farmers in term of diversifying the family income sources. Because, almost households are involving in agricultural production therefore the living quality is relatively low and considered a relatively poor commune. The average annual per capital income is about 4.3 million VND (less than USD 270) and about 11.04% households are poor (according to Poverty Line of 180,000 VND per month). Hung Vu commune is one of the 1,700 poorest communes in Vietnam and was strongly supported by the Government of Vietnam through Program coded 135(that is aiming to support poorest commune to have the basic infrastructure for development: electricity, roads, schools, medical aid station and market).

There are several advantages for aquaculture and fishing development in Hung Vu commune. They have an area of 38.25ha of water bodies, there is an abundance of labor resource, which are potentials for aquaculture and fishing development. Aquaculture and fishing have contributed significantly to sustaining livelihoods of local people as well as social and economic development.

III. DESCRIPTION OF THE TAM HOA FISHERIES COOPERATIVE

Tam Hoa Reservoir is the water irrigation reservoir and was built from the year of 1964. In the years of sixties to eighties of the last century fisheries in Tam Hoa reservoir belong to state-run company. This company made both in fishing, ranching and protecting fish resources.

Though the state company was established aiming to exploit and manage the reservoir's resource more effectively, it has still exposed the weakness in management.

The illegal fishing activities of local people living around the reservoir cannot be controlled.

Other reason was the less number of re-stocked fingerlings which partly resulted in lower fish production in the following harvested year. How many fingerlings would be re-stocked depends on a financial capacity of the company and support from government and the availability of fingerlings. And the stocking fingerlings was stopped when the subsidies from central government was finished

From 1994, the state company stopped its activity due to less effectiveness. A partnership cooperative has been established to manage and exploit fisheries in reservoir.

At beginning, the cooperative had 65 households. In 1997, the cooperative admitted one more member households and the total number of the member currently is 66 households. From each household, one member of the household become representative

Table 2: Household head information

	Mean \pm SE ¹	Min	Max
Age of respondent	46.78 \pm 1.87	27.00	68.00
Sex			
Male (%)	85.00		
Female (%)	15.00		
Education level (year)	6.95 \pm 0.34	0	12.00
Ethnicity			
- Tay (%)	100		

Source: *household survey, 2006* [1]

To be member of the cooperative, each household have to contribute a member's fee 150,000 VND (about US10\$). It can be seen as a way to glue up between benefits and obligations of cooperative's members. All households responded that they join the cooperative with main objective to create more jobs and of course increase their household income.

Fishery cooperative is carrying out enhance fisheries production in the reservoir and contribute a significant role in livelihoods as well as socio-economic development of the commune. Almost aquaculture and fishing activities are carried out by the cooperative as common work backward techniques and simple equipments and facilities. Fingerlings are stocked in the reservoir with feeding of grass and green stuff without feeding of pellet feed. Since the reservoir constructed, fish stocked in the reservoirs are mainly crucial, local common carp. In last few years, grass carp, Indian carp and silver carp were introduced and stocked in the reservoir. In parallel with stocking of fingerlings, fish catching is conducted year-round. However, due to simple fishing gear and poor techniques the catches is not high and just provide local demand only.

Members of the cooperative have right to access reservoir. However, the cooperative has its regulation to manage catching on the resources. Due to almost the land of the cooperative member was flooded to develop the reservoir, the livelihoods of local people become dependent on the reservoir. Households in the cooperative are involving in not only fisheries but also agriculture and forestry. At present, there are 13 households have fish ponds and currently practicing fish culture. Though the reservoir is common, but fisheries resources in reservoir are a common property, only members of cooperative where fingerling is stocked and fishing is carried out by the cooperative.

Fishing, activities are planned and carried out by cooperative and member household. Members of the cooperative are assigned to catch following the plan. Due to complication of the bottom of the reservoir, catching fish also faces difficulties and can not catch the big fish.

Table 3: Information of the cooperative

Number of member households (HH ²)	66
Number of households have fish pond (HH)	13
Proportion of poor household (%)	15.15
Total population (persons)	326
Total labour (labors)	168
Annual household income (.000 VND)	10,000

Source: Hung Vu's statistical data, 2006 [1]

Fishing activities were carried out in different times in the year. It is more popular in the period of June to October. During the year, partial fish harvesting and re-stocking were carried out by the cooperative. Harvesting depends partly on changes in fish market prices and partly on the time of draining the reservoir for crop irrigation. The distribution of fish production was not much different between harvested times (see Figure 2)

² HH: Household

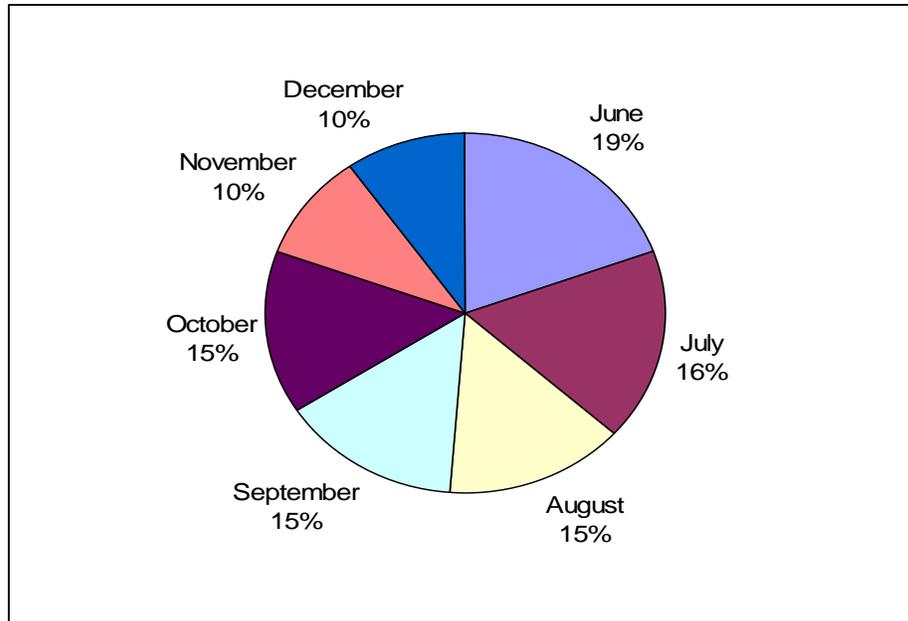


Figure 1: Distribution of production by month

To solve the problem of imbalance between fishing and natural growth rate of fish in the reservoir, and also increase the productivity of the reservoir, Tam Hoa cooperative under supported extension program of province, has re-stocked fingerlings into the reservoir annually. Species composition of cultured fish is given in Table 2. Of which, three main species re-stocked were silver carp and Indian carps (Rohu and Mrigan). However, the amount of fingerlings re-stocked has changed from year to year. In some years, rohu was taken as the largest proportion while in other one that species was replaced by silver carp (40 per cent of the total). This was due availability and price of seed source in each year

Among surveyed households, about 38 per cent of farmers have involved in fishing activity (Table 7). At very beginning, local farmers carried out the fishing with an aim of improving household's food consumption. The rest from family consumed was then sold to local market. Traditionally, farmers who were living around the reservoir used different kind of methods for catching natural fish which was ineffective and exhausted. The establishment of Tam Hoa cooperative aimed to manage fishing activity effectively and generate more income for its member. A part from fishing, to increase annual production the cooperative also applied re-stocking activity with the main species of silver carp and Indian carps. No other kind of aquaculture production has been recorded. This should be concerned by local authorities for introducing cage culture in reservoir.

Under the cooperative, fish is often caught by a fishing group assigned by management board, and then gathered and sold by the cooperative. Due to lack of capital resources for investment, very poor catching equipments found in the area which resulted in low fishing productivity. Normally, fishing activity has been divided into two main parts as division of labor in the family. Fishes are cached by men first and then they'll be sold by women. The cash from selling then divided for all member households equally.

Table 4: Proportion of household directly involve in fishing and reason to involve

	Proportion (%)
Carrying out fishing	37.50
Reason to carry out fishing	
For household consumption	20.00
Increase household income	80.00

Source: *household survey, 2006* [1]

In term of interactions between aquaculture and other activities, presently there are only the activities of re-stocking and fishing. Almost all farmers interviewed show that fish in the reservoir are capable of feeding on natural food at different depths of the water column. In addition, they also fed fish with vegetable and livestock manual from agriculture. According to local authorities (2006), monthly each household member had a contribution of 40 kg of livestock manual to feed the fish. The cash from selling fish, in turn would be re-invested in other activities. About 22.5 per cent of farmers indicated that the fishery action has support other production in term of money investment.

IV. THE ROLE OF CO-MANAGEMENT

Fishery cooperative of Tam Hoa reservoir in Hung Vu commune *is a typical community-based co-management model*, and is the typical success full Co-management model for reservoir fisheries.

This model clearly defines crucial contents of co-management:

1. Defining the ownership of fisheries resources and fisheries activities of reservoir belong to community
2. The community who owns the fisheries resources and fisheries right is *determined in both dimensions: boundary, activity scope and number of this community members*

The boundary of community is the Tam Hoa reservoir locating in Hung Vu commune, the activity scope of members of community is all relative to fisheries resources and exploitation activities such as: resources protecting, fishing, and culturing, ranching, entertainment.

The number of community members had been determined only 66. This number of members is kept not change up to now. They were people who loosed rice-land and garden when building reservoir and people locating around the coast of the reservoir each household in community is a member and each member has only one representative person but other members of household can replace their representative in protecting resources, fishing or selling fish activities. To protect and exploit fish resources and other production and protection activities, labor force is mobilized from members of cooperative following the partnership. The members of the cooperative can hire other people to do the cooperative's works assigned them

3. The members of this community have basic right, power, advantages, ownership right, responsibilities for their fisheries in reservoir: protecting, stocking, exploiting, trading, using, sharing income from fisheries, controlling and

- monitoring, electing Managing Board (Cooperative Chairman's or Cooperative managing Board), transfer and inheriting their rights
4. The Community Assemble of Members is the congress of community members is organized in every 5 year. Community Assemble of members elect the Cooperative Managing Board and define the production orientation
 5. Only the Community Assemble of members can decide the community regulation and rules, production and distributing income plans, elect by voting the members of Managing Board (Cooperative Chairman's or Cooperative managing Board). Cooperative Chairman's or Cooperative managing Board as mentioned above has 11 members including : Chairman, Vice-Chairman, 2 managing members, 1 clerk (accounter), 3 in monitoring committee, 3 are heads of the production groups
 6. The participation of commune government and the organization of reservoir water management (Irrigation Company) as main stakeholders is thru their representatives in Cooperative Managing Board

The role of commune government is very important. It helps the commune to resolve the conflicts and violatings and it helps cooperative to get approach to the Central government for getting prior development policies such as policy of support the seed price and transportation for mountainous regions,... Annually, Cooperative Managing Board must to report all cooperative activities to People Commity of Hung Vu Commune

The Irrigation Company has very important role too. It regulates the incharge and discharge warter for diffrent purposes that has strong effect to fisheries in reservoir. But as a member of managing board it must to follow the decision of government when government will be adviced by managing board. As a member of communisty, Irrigation Company each year gets about 2-4% total cooperative income [2]

7. The community has defined strictly a regulation developed by it's members themselves with very just strict and clear awards and penalties:
 - All members have responsibility to protect fisheries resources by participating in patrol and mount guard. The member cannot do these works thus his share of income must be deducted about 10%. The people who cannot go to guard or patrol one time must to pay penalty of 15,000 VND if they don't have reasons for this and 8.000 VND if they have reasons
 - The same level of award and penalty for the common services of cooperative
 - The member who conceals or covers the violation of other people is considered as the violating person and must be carried out the same level of penalty

At Tam Hoa fishery cooperative the new cooperative regulation has been developed based on strictly tradition of ethnic on award and penalty for violating , for example, it shows in the regulation that : “ when there is a alarm who doesn't participate the protecting resources will be punished followed the community regulation. Who upsurps the fisheries resources in reservoir must to pay compensation for all loses and damages created by their behavior and all of means and proofs will be confiscated and at the same time the violeting people must pay punishment from 20,000 to 500,000 VND and if violating is serious the violating person will be bring to court”. “ if one person from cooperative member family is violating, thus that member must carry out the results” “Who has the contribution to resources protection will get responsible award: having receive 70% the pay for punishment of violating people, in the case of participating to

hunting for violating person but can find out him thus who find out the violating proofs will be awarded from 20,000 to 100,000 VND” [5]

V. ADVANTAGES OF CO-MANAGEMENT BASED CO-MANAGEMENT IN TAM HOA COOPERATIVE

Because of fisheries resources are common of community (cooperative) thus the members of cooperative have following advantages:

1. Receipt the share of cooperative production income
2. If they participate directly in fishing activities they will get 10% of total production they fished
3. The members of cooperative have priority to buy cooperative fish to make detail saling in the markets, so more jobs for cooperative members, wormal particularly, are created.
4. Besides of fishing activities, the member of cooperative will get payment for other cooperative works if they should be mobilized

Due to better management and cooperative action in the community-based management mode the production of fisheries of cooperative has kept rather sustainable for 15 last years about around 30 T/year and income of cooperative members are increasing continuously. Every member of cooperative has average total income from fisheries about 10,000,000 VND (550-600 USD)/year from their works and income share

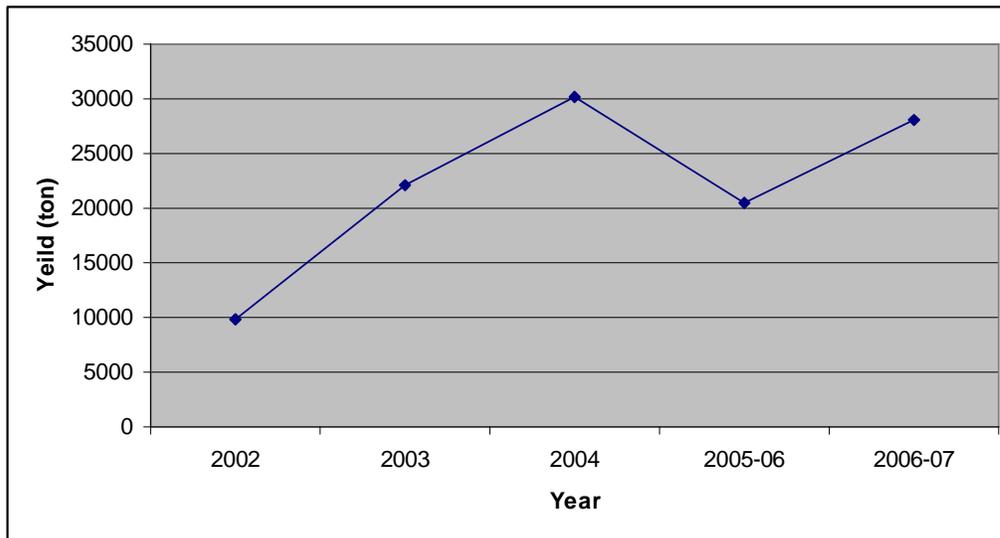


Figure 2: Production of fish in Tam Hoa reservoir [2]

The regulation of cooperative has been strictly followed and almost the resources thieves and fishing by illegal fishing gears are not appeared. When asking about members’ satisfaction about activity of the cooperative, 100% farmers responded that they are benefited from cooperative and they satisfy with the management board. However, in order to continuously increase income and benefit, it is necessary to develop capacity of the management board to meet increasingly requirement from the members.

Almost all cooperative activities are monitored by members, and due to transparency of return and expenditure of cooperative and it can be controlled by every member, the corruption, however, difficult to be appeared

VI. CONCLUSION

Fishery Cooperative at Tam Hoa Reservoir is the typical community-based co-management and is the successful model for fishery resources and fisheries management in small reservoirs in Viet Nam. Here, all of the factors for managing the fishery resources and fisheries in reservoirs are determined and converged: the harmoniously combination, integration and collaboration, supporting each other between government and community, between stakeholders and beneficiaries of water and fishery resources in reservoir as well as among the people who can effect to fishery resources of reservoir

The community-based co-management model at Tam Hoa reservoir has been developed basing on the solid basics: ensuring the realistic of rights, power, benefit and responsibility of stakeholders, members of community and direct beneficiaries. The community – based co-management at Tam Hoa reservoir has harvested the successes and has been being sustainably because here the core problems have been resolved : the ownership of fishery resources in reservoir has been determined belong to concret community but the use right of fishery resources in reservoir being the ownership of each concret member of community, the scope of management and bounder of community as well as the list and number of members of community has been determined concretly; the clear and strict regulation had been developed based on the the participation and negotiation of all members of community. The principles of regulation is developed based on the morals and tradition of community.

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