Self-Recruiting Species in Aquaculture: Their Role in Rural Livelihoods

Participatory Rural Appraisal in Ban NongWeng
Case Study 3
(PRA Report from 2001)

Institute of Aquaculture
University of Stirling, UK

Department of Fisheries,
Thailand

AARM-SERD
Asian Institute of Technology

AOP Udorn Thani

May 2002

Table of contents

Nong Weng Village

Introduction

Background

The status of aquatic systems in this province particularly in this village has not been established. For an outsider, knowing the general background of the village is very important. The information to be gathered can be used to develop new programs or development activities in the area. It is also very important that the information is generated from and with the primary stakeholders – the farmers/villagers.

Objectives

The main objective of the study is to have a clear picture of the livelihood activities in the village as a whole and to establish rapport with the villagers. To attain this main objective the following are the specific objectives:

1. To assess the local conditions in the village;
2. To gather baseline information on the status of aquatic animals in the area;
3. To work with the villagers and facilitate the identification of issues in the community.

Participatory Rural Appraisal Team

Mr. Somkiat Pongsirichan	- Chief, DOF-Sisaket
Mr. Theerachai Pongjanyaboon	- Biologist, DOF-Sisaket
Mr. Jamigone Pilatam-on	- Biologist, DOF-Ubol
Miss Boontharika Siri	- Biologist, DOF-Udon
Miss Benchamart Busikeaw	- Biologist, DOF-Ubol
Dr. David Little	- University of Stirling –IoA
Mr. Danai Turongruang	- CPM, AOP-Udon Thani
Mr. Boonmee Maneerat	- AOP-Udon Thani
Mr. Sittipol Laosingla	- AOP-Udon Thani
Mr. Prasit Dayoung Ram	- AOP-Udon Thani
Mr. Thawatchai Viriyaphap	- AOP-Udon Thani
Mr. Sangob Khamseantia	- AOP-Udon Thani

Schedule of Activities

The workshop was held for four days, with the first day devoted to getting general information about the commune and the village. During this time, a visit to the village was done to set an appointment with the villagers. Mapping exercises were also conducted during the first day.

The second day was spent in generating more information about the village and its different activities. The last day of the workshop was used for the presentation and validation of information.

Table 1 Schedule of Activities during the PRA in Nong Weng Village

Dates	Activities
15 May 2001	Collection of secondary data Introduction of the project with village head Village profile Identification of PRA participants
16 May 2001	PRA exercises (Between social group and gender)
17 May 2001	Processing of PRA outputs
18 May 2001	Presentation of PRA outputs

Srisaket Province

Description

Location and Boundary

Situated on the southern part of northeast Thailand and an approximate distance of 571 km away from Bangkok. The total area is approximately 8,839.976 sq. km (883,997.6 hectares). The province has the following boundaries:

Northern boundary : Roi-et province
Eastern boundary : Ubon Ratchathani province
Southern boundary: Cambodia
Western boundary: Surin province

14-15^0 latitude; 104 – 105^0 east longitude

Administration and population

The whole province composed of 20 districts. The district has 206 sub districts and with a total number of 2,411 villages. The population is about 1,445,356 individuals.

Main occupation:

Rice cultivation, crop, vegetables, corn, onion, garlic, and animals. In some areas, villagers grow rubber tree, rambutan, durian in Kantrararak, Kunharn and Pushing district.

Topography

Is plateau alternate with rice fields. Some areas have mountains and forest in southern part province. The area is sloping down to northern and west side. In this area have streams, swamp and marshes.

Average rainfall per year: 1, 172.5 MM

Water resources:

Chi river, moon river, Huay Samran, Huay Khayoong, Huay Nya, Huay Tabtan, swamp and marsh land.

Communication and transportation:

Travelling by car – 600 km to Bangkok
Travelling by train – 515 km to Bangkok

District Commune Description

Namklieng District

Location and Boundary

The district is located at the southeast of Srisaket province. An approximate distance from the province proper of 30 km. The total area of the district is approximately 257.82 sq. km (25,782 hectares).

The district has the following boundaries:

Northern – Muang Srisaket and Kantrarom
Southern – Srirattana district
East - Nonkoon district
West - Pha Yu district

Topography

Generally plain area but sloping on the southern part thereby creating a water bodies like swamps (Huay Kha Yoong, Huay thar, Huay rawee etc.)

Administration and population

Sub districts : 6
Number of villages: 66 villages
Number of household: 7,825 HH
Population : 41,589

Occupation

Main occupation are rice cultivation, crops (cassava, corn, kenafs)

Water resource

Huay Kha Yoong, Huay Tarmaid, Huay Thar, Huay Rawee

Village Description

Ban Nongweng
Koop Sub district
Namklieng District
Srisaket province

Number of families: 154 families
Main occupation: rice cultivation, crops and animals
Migration: Most of the young people go to Bangkok for work and come back to the village during rice planting and harvesting. Some migrants just send remittances to their families.
Topography:

Generally plain

Distance from the district : 7 km

Water Resource:

Huay Kha yoong - 2 km away on the east side
Huay Thar – 3 km away on the north side
Nong lung - 2 km away on the south
Spillway – 0.6 km on the west side

Selection Process for the Village

The village was selected after visiting the district office and getting background information about the villages in the district and commune. During the visit a brief interview was conducted with the district personnel and several questions were asked specifically regarding the agricultural as well as socio-economic background. The village was selected according to its topography and its relative distance from the perennial water (Moon river). The village is situated between two rivers. Aside from the topography, the available water resource and economic status of the village were also considered.

Specific Methods Used

Village (Resource) Map – Mapping of the resources was conducted to generate information about the different resources present in the village and how these resources impact the villagers.

Timeline – This activity was conducted to trace the development trends in the village. This activity also showed the different "shocks" the village encountered from past to present.

Well-being Ranking. Mapping of the socio-economic context of the village was done. This activity determined the different social groupings in the village and how villagers naturally grouped themselves.

Seasonal calendar. This illustrates the different situations in the village during the year. Information about the weather, traditions and festivals, economic activities, when people migrate and the health conditions were included in the calendar.

Activity profile. This activity was meant to identify the common activities in the village and to differentiate the priorities of each group.

Aquatic animals identification/ranking. This was accomplished to find out the available and unavailable aquatic species in the area. This activity also determined how important each aquatic animal is to the villagers

Aquatic animals' seasonality. This activity showed the status of each aquatic animal during the year. The location where aquatic animals can be caught and the gear that can be used were also included in the seasonality diagram.

Aquatic animals' trend. This activity showed the perception of the different groups on the status and condition of the different aquatic animals in the village. The causes of the increase as well as the decrease of a particular aquatic animal were also understood.

Transect. Established "ground truths" to cross check the map.

Process

The workshop was divided into three parts. The first part was done with the key informants during the first day. The mapping (village map) exercise was done with a group of key informants in the village headed by the village headman. The list of all households in the village was obtained from the village headman. This was used in the well being ranking activity. Names were written down in cards and farmers or informants grouped the different names according to what they think is the well being of the farmer/villager.

Using the results of the well being ranking, participants for next day's activity were identified. Representatives from the poor and rich groups were listed down. A total of four groups were identified: two groups representing the poor men and women, and another two groups of rich men and women.

During the second day the four groups performed the same task of describing and discussing the situations of the village in the year. Four seasonal calendars were done showing the complete picture of the village in the whole year: agricultural activities, migration, health status, weather and traditions. The major activities in the village and its importance were also discussed. Beans were used to rank the different activities according to its importance. Beans were also used in identifying and ranking the important aquatic animals in the village. Each group has different sets of aquatic animals identified and ranked using their own criteria.

Setting the Context

Mapping the Current Resource Context

Land resource. The topography of this village is basically plain or flat. Land is being use mainly for rice cultivation and other farming activities. Most of the rice fields in this village are situated on the sides.(see Figure 1). Although the topography is generally flat a small part of the village has higher elevation and this part is being used in planting kenaf tree.

Water resource. Being adjacent to two streams, this village is rich in water resources. On the northern part of the village farmers have access to *Salakdai* stream where they can get their water for their farm and livestock. This can also be source of aquatic animals. To the west, *Kayang* stream is the major source of water. Aside from the two streams the village also has small land depression/swamp. This area is being used by the village as their community pond.

Physical and social resources. One major physical resource in this village is the laterite road which traverse the village. All areas in the village are accessible due to this road. Services like school, health centre, well and temple are also present in the village. As a community the area is updated to what is happening through the broadcast tower.

Houses in the village are all situated close to the road and more or less concentrated in one area.

Mapping the Development Context

Figure 2 shows the development history in the village. The village started since 1938 as Ban Kun with 6 families migrants from Nonkhun. It was only 1952 when the village changed its name to Nongweng. During this period the area is abundant with wild resources in the forest and aquatic animals.

The development in this village started as early as 1948 when they started building the school. From that period other development activities followed. Major changes happened in the village after the improvement of the road in the year 1965. Improvement with communications, modern technologies in farming, alternative livelihoods started coming into the village and even up to the present.

The development of aquaculture in the village started late. From the beginning of the village until 1957 wild fish were abundant and so villagers have full access to them. Trap pond was first introduced in the village in 1970 and from that villagers started digging. It was also during this period when exotic species like Tilapia, was introduced in the village.

Problems with the resources in the village were brought indirectly by the development activities. The massive planting of kenaf that cleared the forest caused the decreased of wild animals. Trap ponds to some extent also caused the decrease of aquatic animals in the wild. Villagers are now practicing whole harvest thereby collecting the brood stocks and juveniles.

Aside from the 'negative' impact of development, natural calamities like flooding and drought also caused some problems in the village. Although flooding in one way increased the population of wild fish. In 1982 severe flooding took place in the village and villagers remembered that the population of wild aquatic animals increased during this particular time. Fish diseases started in the village in 1977 and this was observed after the intensive use of pesticides in that community.

Figure 1 Village/resource map of Nongweng village

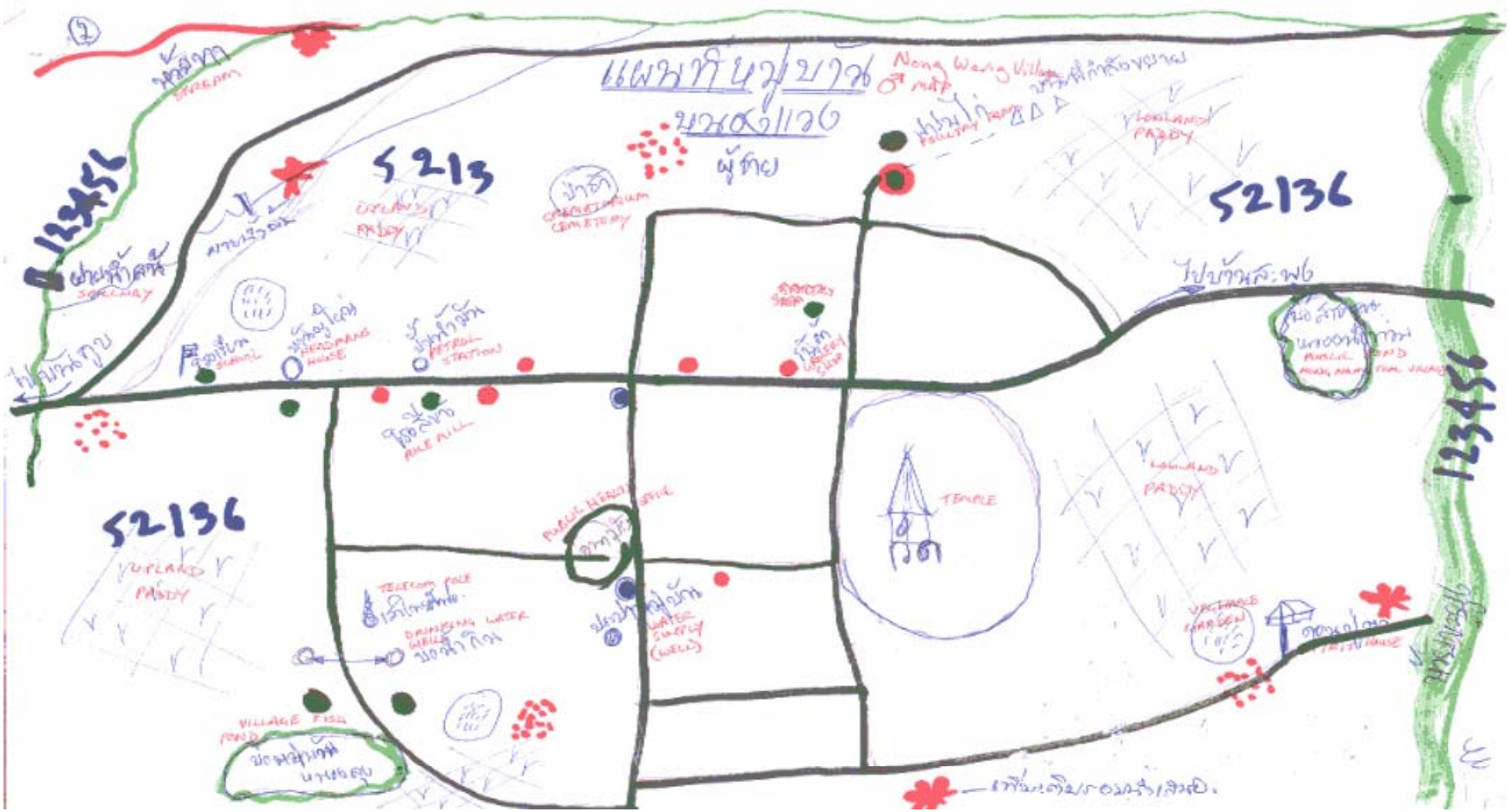
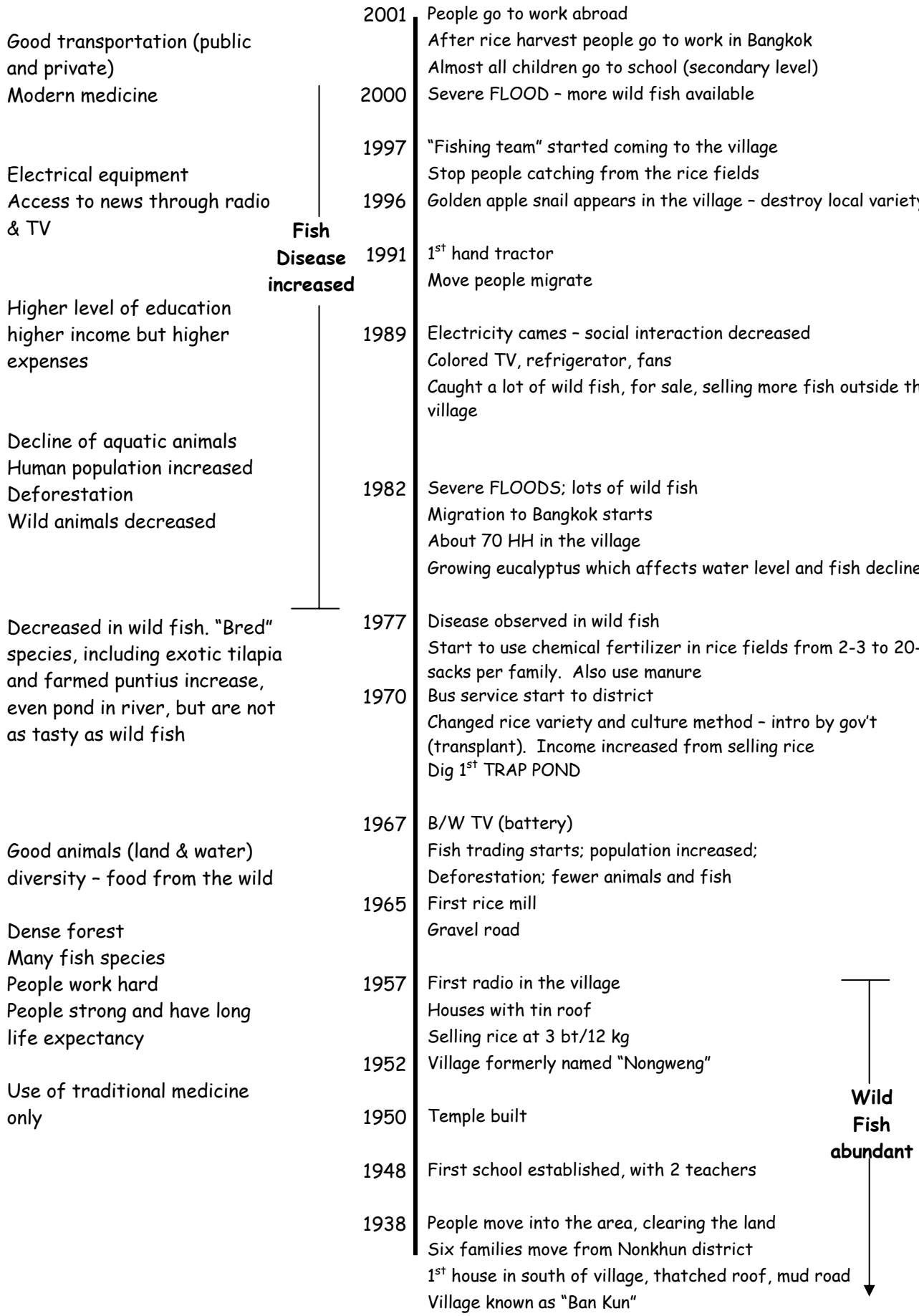


Figure 2 Mapping the Development of Nongweng village



Mapping the Social Context

In general the village is relatively poor in the district. Although agricultural activities are the major sources of income villagers still need to have alternative livelihoods to improve their well being. Using the villagers' criteria, the village can be grouped into six socio-economic groups. Different criteria were used in grouping the villagers although the sources of income and land ownership are the major criteria.

Characteristic of economic group

Land ownership. Land is a major criteria in the village for the well-being. Some families under the low resource level have small piece of land and some do not own anything. On the average the land owned by poor group ranges from 0 – 3 rai. In

Table 2, it shows that middle to better off families own bigger area of land. On the average better off families own land from 10 – 30 rai.

Source of income. Wage labour in other farms is the most common activity of poor families in this village. Farmers that do not own land can work for better-off families or even migrate to other places where they can earn more. For better off families aside from farming they can also get income from trading, renting their land and equipment. Some members of better-off families hold permanent jobs with the government.

Education. Education is always a limited privilege among poor families. Majority of the members of poor families did not go to school. They cannot even send their children to good schools or to avail of a higher level of education. Education is not a priority in poor families. Secondary level or even a Bachelor's degree are the highest level of education that better-off families can get from this village. Although they considered farming as their main source of income, better-off families consider having a higher education as also an advantage in terms of getting a better job.

Access to credit. Because of having good income, most of the families under the better off group has less loans although they have the capacity to get credit from lending organisations. In most cases poor families cannot get loans from formal credit organizations. Some families can loan from the BACC but most families have bigger loans from informal credit groups and sometimes from their relatives.

House. Small and unfinished are the common characteristics of houses of poor families in the village. Some families use leaves and light materials in building the walls and roof of their houses. For rich families, generally they use cement and wood in building their houses. Better-off families also have bigger houses and it's very common to have second floor in their unit.

Livestock. The number of livestock can also dictate the well being of families in the village. For poor families livestock are sometimes lacking or in very few cases families can own 1 livestock that they can use in their farm. Better-off families own several livestock like cow and buffalo. Some families can earn also from this livestock especially during planting and harvesting.

Farm equipment. One of the basic needs in farming is to have one's own equipment. Generally in this village poor families do not own good and modern equipment in farming. Poor farmers usually have simple machine or tools in farming like hoe and rake. Better off families use tractor in cultivating their land. They also use this tractor in transporting their farm products and inputs.

Transport. Aside from two-wheeled tractor, which can be used as form of transport, middle to better-off families can have cars and bicycle for their transport needs. Poor families may only have bicycle or none at all.

Table 2 Well-being ranking in Ban Nong weng

Rank	Village headman	Women	Poor (old man)
I	Many member in the family 0-3 rai land owned No loan Daily wage Small house	No land Stay with children No income and children low income Cannot send children to school House not in good condition No livestock	No hand tractor Daily wage Landless – some have small land Small houses
II	Poor quality of house Few household appliances Well dressed No livestock Less than 10 rai of land	0 – 10 rai land grow rice, but not enough daily wage low income because land is flooded Cannot send children in school Small house No livestock	No hand tractor Have loans Own small land
III	House in good condition 10-20 rai land Rice for consumption and selling Have some loans Have hand tractor Have livestock Grow chilli Daily wages 20% of the group have water pump	5 – 10 rai of land grow rice Daily wage (harvest chilli) Main income from selling rice Cannot send children to school Bigger house than poor group Own 2 cows and other poultry	Have hand tractor More loans Owns land more than the first two group
IV	20 – 30 rai of land More loans 30% own hand tractor Have livestock Chicken farmer Own water pump Have car Grow chilli as main crop	10 – 20 rai land grow rice, chilli for selling Main income from selling rice Have some loans Can send children to school Big houses and complete appliances Have hand tractor Own 3 – 10 cattle and other poultry	Own hand tractor Own rice mill Have livestock A family member works with the government
V	Teachers Government officials Own shops Own 20 – 30 rai of land	20 – 30 rai land grow rice, chilli for selling Daily wage Main income from rice selling Own shop, rice mill Poultry Can have loans Can send children to school Big house with house appliances Motor cycle, hand tractor Car 6-10 cow/buffalo	Own shop Have hand tractor High status in the village Have rice mill Have livestock Earn from weaving

VI		Big land Main income from business Government officials More income less loans Send children to school Big house with appliances Motorcycle, hand tractor Car No livestock	Have good job (teacher) Own shop (Petron station) Own hand tractor Have car Have rice mill Own buffalo Large area of land

Activity profile

Table 3 Summary of important activity in the village

Economic group	Gender	
	Men	Women
Rich	Rice cultivation Chilli production Livestock Fishing Government work Charcoal Wood sawing	Rice cultivation Weaving Washing clothes Religion Poultry raising Looking after children Household work Chilli and onion Collect mushroom
Poor	Rice production Collection of Aquatic animals Raising livestock Daily wages Making charcoal Collect insect Making fishing gear Household maintenance Collect food in the wild	Housework Rice production Religion Daily wage Chilli and onion Weaving Livestock Collecting aquatic animals

Priorities of people sometimes vary depending on the group of people. In this village, although the main sources of income is rice, the group of poor women did not ranked rice cultivation as their most important activity. They only consider this activity second most important to household choir. The family is more important to them. For the group of men in both poor and better-off, all of their activity are productive activities and income earning. In women groups they still consider reproductive activities as important as other activities.

In this village although was not ranked high, collection of aquatic animals were also important from men both rich and poor group and also with poor women group. Poor men ranked collection of aquatic animals as second highest important because they also gain income from this even during dry season.

Seasonality

Weather. There is no big difference regarding the experience or perception of all groups regarding weather. The rich and poor group illustrated the changes of climate during the year. A slight difference on the start of rain between the groups. For the rich group rain start on May and have the peak and flooding during the month of August and September. For poor group June is the month when rain starts and flooding were never mentioned although during the presentation flooding were remembered to occur. The start of cold season is also experienced early by rich group although the length or numbers of months are the same. (see Annex 1 and 2)

Tradition/culture. Celebration of festival and traditions in the village are the same in both groups. Most of the celebrations are part of the religious activities like Bhuddist festival and the like. Villagers also celebrate festival in relation with farming activities like rice ceremony, harvesting and festival for the product produced. For poor groups all months in the year have festivals/celebration but in rich group only the month of June has no events written and also this is the time when the peak of activities in the field are going on.

Economic activities. As one of the flat area in the province, majority of the economic activities and also important activities are related to agriculture. In the rich group, aside from agricultural activities they also have non-farm economic activities or alternative livelihoods. During the year both groups are busy in their economic activities. Rice cultivation in rich group starts one month earlier than poor group. In chilli cultivation both groups are doing it but richer group also lesser months gap compared to poor group.

Other economic activities of rich group, which are non-farm (Table 4) are being done before and after the farming season. For poor group only fishing is the non-farm economic activities although some are selling livestock during dry season. For fishing activities, the rich group can collect aquatic animals the whole year and changes the location depending on the season. During May, which is normally dry some poor families cannot collect aquatic animals unlike richer group.

Table 4 Summary of Economic activity in the village

Economic group	Activities
Rich	Chilli Rice cultivation Daily wage Wood sawing Charcoal Fishing Weaving
Poor	Rice cultivation Chilli production Livestock Fisheries

Migration. Working in another area is common in the village regardless of the well-being group. This is one alternative source of income for the family. In most cases

adult and young villagers work in Bangkok during off- season for farming and return to the village during planting and harvesting season.

Health. The condition of life of better-off families is 'better' as compared to resource poor. During off-season poor families are more worried about their livelihood. Poor families experience illness during the change of weather. From August to September poor families are working hard in the field as labourer or in their farm. In general the health condition in the village is better. No serious epidemic has been experience during the year. Only common sickness like, flu and cold causes by the change in temperature.

Role of aquatic animals

Being surrounded by water bodies like swamp and stream, aquatic animals in this village play a significant role in the life of the villagers. Villagers collect aquatic animals in this area not only for their consumption but also for additional income.

Source of Food. In all groups the importance of aquatic animals depend o how they can consume the species. All groups consider the taste and versatility of the species on cooking as one of the most important characteristic of aquatic animals for being important (see Table 6).

Source of income. Additional income is not so important to the group of men both poor and rich group. The good price did not came out as important characteristics from the two groups. It's only women group mentioned the price as criteria. The reason for this is mostly it's women who are selling the species and mostly men are responsible for collecting. Easiness in catching was ranked high both by rich and poor men because men are more responsible in catching these species.

Important aquatic animals

Most of the important aquatic animals identified by the villagers can be found in the natural water bodies. In all groups snakehead (Chana sp) and walking catfish ranked as the most important among other aquatic species. As presented in Table 5), big fishes are more important than small fishes and non-fish aquatic animals.

Among the non-fish species that are considered important in this villages are frogs, freshwater shrimp, and pond snail. These species are commonly found in the rice-fields especially during planting season. Although good price was not mentioned as the most important criteria in ranking the importance, its very obvious on the list that most of the aquatic animals identified are high value species. In all groups, species that was ranked high are the same.

Source

Most of the aquatic animals identified are wild and can be catch in any water bodies present in the village. Big fishes like snakehead and catfish can be caught trap ponds, stream and lakes during dry season. In rainy season most of the aquatic animals are in the rice fields. Non-fish aquatic animals are mostly in the rice fields although in some season they can be also caught in river and streams.

Gear

Among the fishing gear available in the area, cast net is still the most common gear being used in collecting aquatic animals (see Annex 11 – 12). Gears being used in the village depend on the user and the area also. Sometimes it is also depending on the species they want to collect. Small aquatic animals and non-fish need different gear to be collected. Women do not normally used cast net in collecting aquatic animals. They usually used hand net, hooks, blue net and dip net. Children can set up traps and also uses blue net in shallow water. In the field, mostly women and children collect snails by using small shovel and sometimes by their hands.

Table 5 Summary of important aquatic animals in the village

Economic group	Gender	
	Men	Women
Rich	Snakehead Walking catfish Freshwater shrimp *Hemibagus* Frog Spotted spiny eel	Walking catfish Snakehead Rasbora Climbing perch Wallago attu Small toad
Poor	Gunther walking catfish Snakehead *Hemibagus* Climbing perch *Pangasius larnadii* Freshwater snail	Walking catfish Ophicephalus Spotted Spiny eel Anabas Yellow mystus Irredescent mystus Silver barb

Table 6 Summary of the criteria used in identifying the importance of aquatic animals

Economic group	Gender	
	Men	Women
Rich	Easy to catch High demand Versatility in cooking	Taste Preservable Good price Versatile Easy to catch Few bones Not allergic
Poor	Taste Easy to catch Few bones Preservable Versatility In trap ponds	Taste Easy to catch Not allergic Few bones Versatile Preservable

		Good price

Seasonality of aquatic animals

In the village the farmers identified three distinct seasons. Rainy seasons begins early May and end up to October. November to January is the cold season and from February to April is the hot season. The quantity and quality of the species varies according to season.

During rainy season most of the aquatic animals are abundant (see Annex 11-12). The quantity remains the same even up to the start of cold season. There are few differences in terms of perception of the quantity of aquatic animals among socio-economic groups. For poor group most of the important aquatic animals are abundant or increase in number during hot season but for richer group only *mystus* species increase in the quantity and the rest decreased in numbers.

Among gender, women catch aquatic animals in all seasons. However most women in poor group catch small aquatic animals like shrimp and rasbora. During rainy season women from rich group do not catch shrimp. They collect shrimp during cold and hot season using blue net and dip net. They also uses trap for shrimp.

Trends of aquatic animals

Although was not performed by the villagers some information about the trend of aquatic animals was shown in the historical development/timeline of the village (see Figure 2). The population of wild aquatic animals now is decreasing as compared to the past when forest and environment were not yet exploited. The introduction of aquaculture and other species contribute in sustaining again the population of aquatic animals. Flooding in one way also increases the population of wild animals.

From the past 20 years, aquatic animals had been decreasing due to several factors. Fish diseases, increased in population, modern fishing gear, illegal fishing and agrochemical used are some of the example. The conflict between cash crop and subsistence in trap ponds, which encourage farmers to harvest all the stocks also contributing to the decline of the population of aquatic animals in the village.

Farmers' meeting

After the analysis and collating of outputs on the third day, the group prepared material for presentation and validation to the villagers. Although not all of the participants attended the meeting, some villagers who did not attend the workshop also came to see and discuss the presented output to the villagers. Villagers agreed and clarified things, which are not cleared in the output presented.

Annexes

PRA outputs

Seasonal Calendar

Annex 1 Seasonal calender of rich group

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Weather	Cold	Start to warm	Warm	Very hot	Rainy season →			Rain Floods	Heavy rain Flood	Cold →		
Tradition/ culture	Buddist festival				Rocket festival		Buddist festival	Rice ceremony		End of buddist lent	Money tree (Offering to monks)	End of the year
	New year	Spirit house Sticky rice		Songkran								
Chilli/onions	Cultivation									Cultivation		
Rice cultivation					Grow rice →							
Daily wage		Harvest chilli										
	House construction →											
Wood sawing	Wood sawing →											
Make charcoal	Making charcoal →											
Fishing	Fishing →						Collect fish & frogs using cast net, rod and gill net →					
Weaving	Weave →				Grow silk worm →							
Migration	Work outside the province (Adults)								Work outside the province (young)			
Health				Dengue fever →	Flu; colds; dengue and foot disease →							

Annex 2 Seasonal calendar of poor group

	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Culture	Married	Buddist festival Songkran	Rocket festival	Wedding	Buddist lent	Buddist festival		End of buddist lent	Wedding	Rice harvesting	New year Weeding	Buddist festival
Weather	Sunny	Very hot	Slightly rain & warm	Rainy season →			Heavy rains	End of rainy season	Start to cool	Cold	Cold	Cold start to warm
Rice production				Seedbed preparation	Transplanting → Fertilizer application			Harvesting early rice		Rice harvesting		Transporting
Chilli/onion	Harvesting →								Seedling	← Growing →		
Livestock	Selling cattle											
Fisheries	Collect small fish			Frogs and tadpole	Frog Collect by line		Gill net & fishing rod to collect big fish		Gill net; fish rod	← Cast net and gill net →		
Migration	Go to Bangkok		Back home								Go to Bangkok	
Health	Worry	Sick	Happy	Okey		Hard work				Happy		Sick

Group activity profile

Annex 3 Activity profile of rich men group

Activities	Farmer				Total	Rank
	I	II	III	IV		
Chilli/onions	8	2	5		15	2
Rice production	5	7	9	10	31	1
Livestock		3	3	3	9	3
Fishing		3	2	2	7	4
Charcoal making		2	1	1	4	6
Wood sawing				1	1	7
Government		3		3	6	5
Total	13	20	20	20	73	

Annex 4 Activity profile of rich women group

Activities	Farmer					Total	Rank
	I	II	III	IV	V		
Poultry raising	4			2	4	10	5
Weaving		5	6	4		15	2
Sericulture							
Household work				3	5	8	7
Religion	4	4		3	2	13	3.5
Cattle raising							
Child raising		4	5			9	6
Rice cultivation	8	3	9	5	2	27	1
Chilli & onion	4				1	5	8
Fishing							
Collecting mushroom				1		1	9
Washing clothes		4		3	6	13	3.5
Total	20	20	20	21	20	101	

Annex 5 Activity profile of poor men group

Activities	Farmer					Total	Rank
	I	II	III	IV	V		
Rice production	6	7	5	3	4	25	1
Making fishing gear	4				2	6	7
Collecting AA	5	5	4	1	3	18	2
Making charcoal		3	2	1	2	8	5.5
Raising animals	2			7	6	15	3
Daily wages	3	3	3	3		12	4
Household maintenance			2	3		5	8
Collecting insects		2	3	1	2	8	5.5
Collect food in the wild			1	1	1	3	9
Total	20	20	20	20	20	100	

Annex 6 Activity profile of poor women group

Activities	Farmer					Total	Rank
	I	II	III	IV	V		
Housework	5	4	4	3	4	20	1
Rice production	5	3	4	3	4	19	2
Chilli + onion	3	3	2	2	1	11	5
Weaving		3	1	3	3	10	6
Religion	4	2	2	4	3	15	3
Daily wages	3	5	3		1	12	4
Collecting AA			1	2	1	4	8
Raising animals			3	3	3	9	7
Total	20	20	20	20	20	100	

Role of Aquatic Animals

Annex 7 Species identification and ranking of aquatic animals by group of rich men

Species	Criteria				Total	Rank
	Taste	Easy to catch	High demand	Versatile in cooking		
Snakehead	8	4	6	4	22	1
Walking catfish	6	3	3	1	13	2
Climbing perch	2	2		2	6	12
Rasbora	3	4		2	5	16
Spotted spiny eel	2	3	3	1	9	6
Puntius (Golden little barb)	2	1	1	2	6	12
3 spot gourami	1	2	0	1	4	20
Hampaladispar	2	1	1	1	5	16
Irredescent mystus	1	2	1	0	4	20
Hemibagus	4	1	4	1	10	4.5
Silver barb	3	1	2		6	12
Tilapia	2	2			4	20
Swamp eel	3	2	2		7	8
Sand goby	2	1	4		3	24.5
Channa lucius						
Pond snail	3		1		4	20
Golden snail						
Red tail botia	1		1		2	28.5
Wallago attu	2					
Acanthopsis sp	2		2		4	20
FW garfish						
Stripped croacking gourami	2		5		7	8
Green blowfish						
Betta splendens						
Mrugal (Cirrhinus)						
Parambassis siamemsis						
FW shrimp	4	3	3	2	12	3
Black rice crab	4	2			6	12
True water bettle	3				3	24.5
Giant water bug	3		2		5	16
Frog	3	3	2	2	10	4.5
Small toad	4	3			7	8
	2	2				
Back swimmer	1	1			2	28.5
Sheath catfish	2				2	28.5
Kryptopterus	3				3	24.5
Osteochilus	3				3	24.5
Trichogaster	1				1	31
Siamese rockfish						
Noteptums	3	2	1		6	12
Mornlius pritolepsis	2	2			2	28.5
Total	89	47	44	19	199	

Annex 8 Species identification and ranking of aquatic animals by rich women group

Aquatic animals	Criteria							Total	Rank
	Taste	Easy to catch	Good price	Versatile	Preserv-able	Few bones	Not allergic		
Walking catfish	5		4	4	2	3	1	19	1
Snakehead	4			6	4			14	2
Rasbora		2		2	6			10	3
Spotted featherback *(Notepterus)*	4							4	18.5
Climbing perch	3	2		1	3			9	4.5
Silver barb	2		2	1				5	13
Puntius	3				3			6	11
Irredescent mystys	1			2	1			4	18.5
Hemibagus	2	2						4	18.5
Tilapia	2			2				4	18.5
Common carp				2	2			4	18.5
Rohu				2				2	30
Sand goby	1					1		2	30
Ompok kratensis	2							2	30
Hampata dispar	2							2	30
Acanthopsis	2			2				4	18.5
Swamp eel	2		3			2		7	8.5
Armed spiny eel	2					2		4	18.5
Spiny eel	2							2	30
Wallagu attu	3		3			3		9	4.5
Stripped croaking gourami	1			2				3	24
Trichogaster pectoralis					3			3	24
Pristolepis					2			2	30
FW Prawn	2		2	1	2			7	8.5
	1							1	39
Pond snail	3	2		2				7	8.5
Golden snail	1							1	39
	2	2						4	18.5
Clams	1							1	39
Insect	2	1						3	24
Giant water bug	3		2		2			7	8.5
True water bug	1							1	39
	1							1	39
Cricket	3		2					5	13
Small toad	4		4					8	6
	1							1	39
Black rice crab	2							2	30
Small toad	2		3					5	13
	2							2	30
	1							1	39
	1							1	39
	3		4						
	2							2	30
Bull frog	1							1	39
Frog									
Total	82	11	29	29	30	11	1	193	

Annex 9 Species identification and ranking of aquatic animals by poor men

Aquatic animals	Criteria						Total	Rank
	Taste	Easy to catch	Few bones	Preserv-able	Versatility	In trap ponds		
Snakehead	6	5	5	3	5	5	19	2
Gunther walking catfish	5	5	5	2	4	4	25	1
Climbing perch		7		4			11	4
Rasbora		5		4			9	8
Barbichthys								
White lady carp								
Hemibagus	7	5	4				16	3
Irredescent mystus								
Wallagu attu	4							
Giant catfish								
Ompok Krattensis	4							
Pangasius larnaudii	5		5				10	5.5
Spotted spiny eel								
Swamp eel	5						5	17
Pond snail	4	4					8	9
FW snail	4	6					10	5.5
Clams								
Trichogaster pectoralis								
Trichogaster tricopterus				4			4	18
Tilapia								
Common carp								
Silver barb								
Channa micropeltes	5		4				9	8
Twisted jaw sheatfish								
Micronemia apogon	4		5				9	8
Siamese rock catfish								
Sand goby	4		3				7	11.5
Hampala dispar								
Pristolepis faciatus								
Osteochilus	4	2					6	14.5
Acanthopsis								
Bagarius sp								
Common frog	3	3					6	14.5
Small toad	4	3					7	11.5
Bull frog	3						3	20
Giant water bug	3						3	20
True water bug	3						3	20
Insect	3	3					6	14.5
Mole cricket	3	3					6	14.5
Total	83	51	31	17	9	9	200	

Annex 10 Species identification and ranking of aquatic animals by poor women

Aquatic animals	Criteria							Total	Rank
	Taste	Easy to catch	Few bones	Not allergic	Good price	Versatile	Preserv-able		
Walking catfish	7	5	6			5	6	29	1
Betta splendens									
Ophicephalus	6	5		6	5	5		27	2
Fluta alba									
Anabas	6						3	9	5.5
Momlius		3						3	19
Rasbora		4		3				7	8
Green blowfish									
Yellow mystus	5		4					9	5.5
Rohu									
Irredescent mystus	5	4						9	5.5
Common sheatfish	2							2	26
Tricopterus									
Silver barb	5			4				9	5.5
Trichogaster pectoralis									
Spotted spiny eel	5		1	4				10	3
Acanthopsis									
Red tail botia									
Palamumbuca				3				3	19
Barbichthys nitidus	2	4						6	9.5
Sand goby									
Nampala dispar	4							4	13
Nile tilapia	3							3	19
Notepterus	3							3	19
Jullien's mud carp									
Golden little barb	3	3						6	9.5
White lady carp									
Mystacolencus sp									
Osteochilus	2							2	26
Pangasius larnaiidi									
Spiny eel									
Common frog	2	2						4	13
Small frog	9								
Giant water bug	5							5	11
True water bug	2							2	26
Insect	2							2	26
Cricket	6							3	19
	3							3	19
Pond snail	3							3	19
Golden snail									
Clams	2							2	26
FW prawn	4							4	13
Black rice crab	3							3	19
	3								
Grasshopper	3							3	19
Total	105	30	11	20	5	10	9	190	

Aquatic Animals Seasonality

Annex 11 Perception of rich group on the seasonality of important aquatic animals

Aquatic animals	Rainy season (May – Oct)			Cold season (Nov – Jan)			Hot season (Feb – Apr)		
	Quantity	Gear	User	Quantity	Gear	User	Quantity	Gear	User
Snakehead	10	Hooks; fish rods; gill net	Men	7	Dip net; gill net; sigh; trap hole	Men & women	3	Cast net	Men
Walking catfish	10	Hooks; fish rods; gill net	Men	7	Gill net; trap hole; sigh; traps	Men & women	3	Cast net	Men
Frogs	7	Spears; dip nets; net for tadpole	Men & women	10	Rod; frog trap	Men & children	3	Dig with shovel; hooked rod	Women
Rasbora sp	9	Seine net; dip net; trap	Men & women	9	Dip net	Women	2	Blue net	Men & women
Mystus							20	Blue net; gill net; pump	Men & women
Shrimp	9	Sigh; blue net (seine)	Men	10	Blue net (seine)	Men & women	1	Dip net; trap	Men & women

Annex 12 Perception of poor group on the seasonality of important aquatic animals

Aquatic animals	Rainy season (May – Oct)			Cold season (Nov – Jan)			Hot season (Feb – Apr)		
	Quantity	Gear	User	Quantity	Gear	User	Quantity	Gear	User
Walking catfish	Little	Cast net; pump	Men & women	Little	Gill net; fishing rod; traps	Men	Large	Hole trap; traps	Men
Snakehead	Little	Cast net; water pump	Men & women	Large	Gill net; fishing rod; traps	Men	Large	Cast net	Men
Rasbora	Few	Hand net	Women	Little	Bag net; trap	Men & women	Large	Trap; bag net	Men & women
Mystus	Large	Cast net	Men	Little	Fishing rod	Men	Large	Cast net	Men
Climbing perch	Little	Cast net	Men	Large	Bag net; trap (lop)	Men & women	Large	Hand net	Women
Shrimp	Large	Hand net	Women	Little	Hand net	Women	Large	Hand net; nylon mat	Men & women