Vietnam agricultural science institute
Project: VIE/00/018/08

Report on Participatory Rural Environment Management in the Red River Delta

(Hop Tien commune, Nam Sach district, Hai Duong province)

Research team: *MSc. Bui Thi Thai*
Le Manh Dung
Dang Kim Khoi
Tony Swan
Le Son Thanh

Hanoi, Vietnam
2003

1. Introduction

1.1. RESEARCH PURPOSES

- Study community perceptions and awareness of the rural environment situation;
- Study methods and approaches to manage the rural environment;
- Work with the community to find solutions and design an action plan to solve environment problems in rural areas;
- Propose policy recommendations and recommendations for institutions responsible for managing the rural environment based in part on community participatory assessments and analyses.

1.2. METHODOLOGIES

1.2.1. Choice of research zone

The research zone chosen was Hop Tien Commune, Nam Sach district, Hai Duong province, which is located in the Red River Delta in northern Vietnam. Hop Tien commune has 2 rice seasons and 1 vegetable season which is typical for intensive cultivation areas in the Red River Delta. However, Hop Tien has a relatively large proportion of land dedicated to winter vegetable crops and a highly intensive and developed animal husbandry industry. The number of pigs and poultry is higher than average number of the district (Table 1). Traditional food processing is also well developed in the commune, focussing on agro-products such as onion and garlic.

Within Hop Tien commune, two communities were identified as having typical environmental problems resulting from intensive agricultural production: La hamlet and Ben hamlet. La hamlet is more intensive in animal husbandry while intensive crop production is more important in Ben hamlet.

An important question that we considered was "What is the best or most appropriate community level for this study?"

A community can be understood as a group of people having similar characteristics about culture, employment, point of view, and sources of welfare (Petite Robert Dictionary, 1998).

According to Tonnies, a rural community is a group of rural people based on 3 relationships:

- Blood relationships (Dartigues Laurent, 25 March 1997);

- Relationships based on land (such as relationships between people in the context of the land they live in or the relationship between people and land through cultivation practices);
- Relationships based on spirit, culture, awareness, point of view of farmers (Dartigues Laurent, 25 Mars 1997).

In Viet Nam, a ‘’village‘’ or a ‘’hamlet’’ is considered a social unit due to its close social organization or specific characteristics about culture, production etc.

Therefore, we chose the hamlet level as representative of Viet Nam rural communities. Village and hamlet are both social units in rural areas. The ‘’hamlet’’ is used to imply an administrative unit, and “village’’ refers to a community.

Table 1. Socio-economic information for the study area.

Criteria	Unit	Nam Sach district	Hop Tien commune
Total population	Person	137500	7351
Density	Persons/km2	1035	1143
Land:			
Residential area	m2/ person	-	78
Cultivation land/person	m2/ person	483	500
- Pond/person	m2/ person	54	77
Cultivation	m2/ person		
Surface of Spring Rice	m2/ person	425	466
Surface of summer rice	m2/ person	330	351
Vegetable surface/head		229	258
Productivity of rice	ton/hectare/ year	6	06
Husbandry			
In which: + Pig heads	heads/person/year	0.55	2.85
+ Cattle	Heads/person	0.05	0,04
+ Poultry	Heads/person/year	5.67	6,89

1.2.2. Collect basic information

The research group collected basic information about the community through meetings, discussions with local authorities, social organizations and some farmers in community (Annex 1). Secondary information from reports of authorities and different organizations of commune was also collected. This information allowed the identification of social structures and targeting groups for community research purposes.

1.2.3. Participatory rural appraisal (PRA)

The research group adopted participatory rural appraisal methods which aim to identify:

- Problems faced by the community
- The willingness of farmers in promoting the role of the community in rural environment management
- Capacity and conditions of the commune to accept and apply new policies relevant to the environment
- The expectations of the community in environment management
- Knowledge of farmers about rules, regulations, and attitudes of the community

1.2.4. Implementing steps

Participatory rural appraisal includes the following 3 main steps:

1.2.4.1. Preparation and organization of an appraisal committee of the community

The research group explained the purposes and methods of the project to people in the community by a megaphone system in each hamlet. The research group then worked with the community to choose members to participate in an appraisal committee for each of the two hamlets. Ten persons were chosen for each committee based on agricultural activities and social structures of each community. The committee included authorities and other organizations and representatives of target groups in the community. These included livestock farmers, intensive cultivators, food processors (La hamlet), bamboo weavers (Ben hamlet), non- livestock farmers, non-food processors, women representatives, and prestige persons in the hamlets (Annexes 2 and 3).

1.2.4.2. Assessment of community and community issues

With the assistance of the research group, each community organized meetings to identify and discuss community problems the community perception and awareness of these problems and the institutions relevant to these environmental problems. Depending on the topic, the research group helped the appraisal committee of each community divide into different groups to discuss the issues meetings as well as in the field. At the end of this step, the research group had substantive information about the community, the problems, and ranking a of problems based on perceptions of priorities in the community.

1.2.4.3. Sum up and reporting of research results

Research results of each appraisal committee and the research group were made available to all farmers in a final meeting. The final meeting was open to all of the

community. This allowed a better understanding and accounting for any differences between the perceptions of the appraisal committee and the community. In this meeting, the appraisal committees presented an action program to the community to improve and manage the rural environment. This action program included problems for which the community expressed a need for a solution. Short-term and long-term strategies were discussed as were roles and participation of each actor in the community in order to solve the identified problems.

1.3. IMPLEMENTATION OF THE PROGRAM

- **Meet communities**

a. Present the contents and purpose of the project

b. Present participatory rural appraisal method

c. Study environmental history of hamlets

- **Organize working days with the participation of community** (Table 2)

In a meeting between local authorities and the two communities, the research results about problems and action programs of two communities were gathered and described. Attendees were representatives of People's Committee of each commune (PCC) and the social organizations of the commune. The two communities also described their proposals about their problems, urgent matters relevant to the environment, and proposed solutions. These were relevant to policy making at the local area and higher levels of government with the hope of improving the rural environment.

Table 2. Content of community meetings

Purposes of meetings	Methods	Expected results
Day 1: Identify priority problems of community, location of environmental problem	Use PRA methods like logical framework building, voting, and choosing options for solutions.	Identify problems of rural community: Poverty, diseases, environmental issues - The role of the environment in these problems?
Day 2: - Study the community awareness and assessment about the environment - Identify criteria to assess pollution levels - Identify causes of pollution - Identify polluters and those impacted	- Use maps, diagrams, and transects - Use PRA games in order to help players identify pollution and the pollution level	Communities assessment: - Location of pollution (inside or outside village)? - Pollution level (What are the criteria of farmers, including, parameters, and ranking) - Type of activities causing pollution. What resources are polluted : Air, water, soil etc. - Who causes pollution? What is the mechanism ? What are the impacts of pollution on the community's health? - What is the perception about environmental quality over time ?

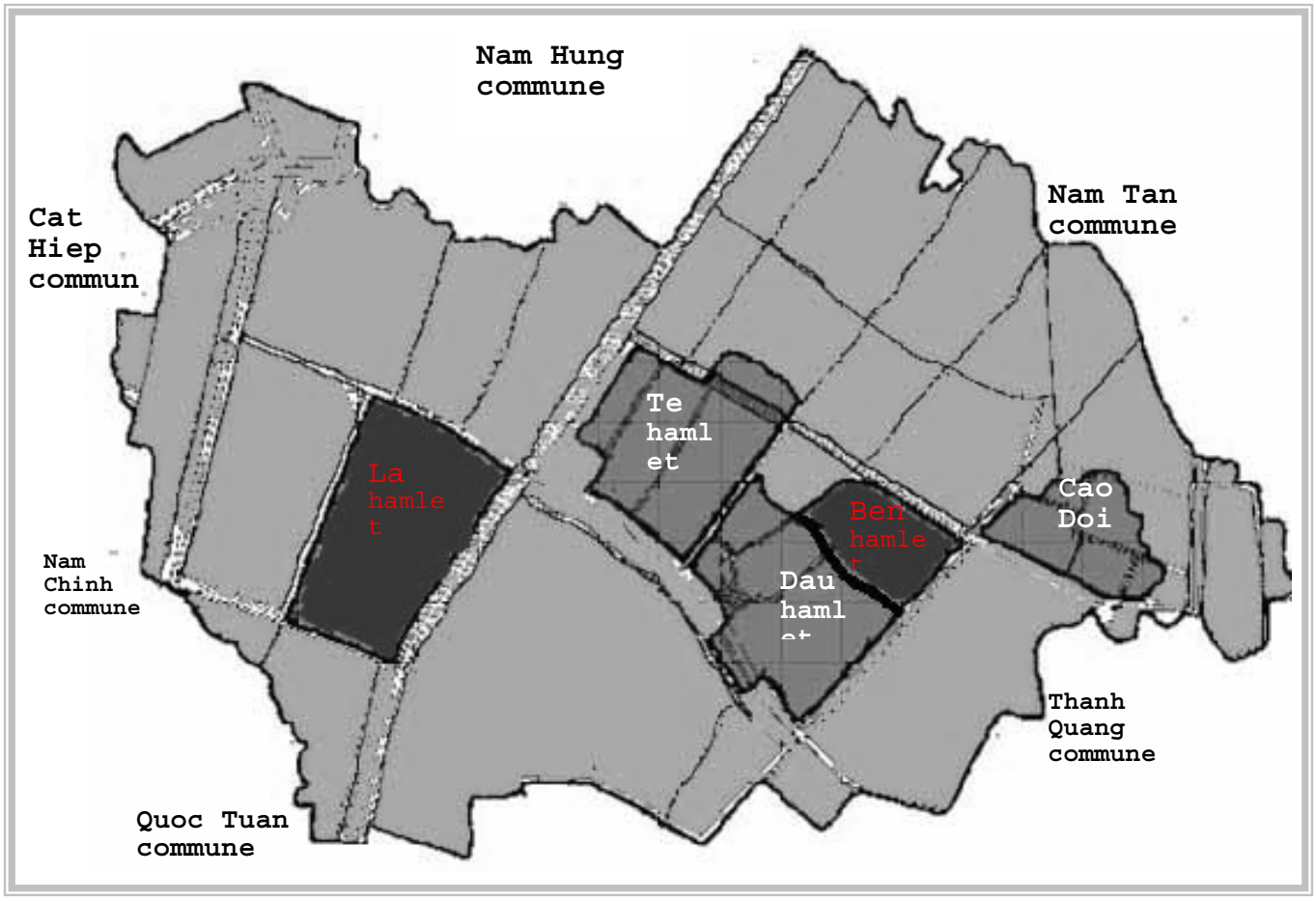
Day 3: Solutions and recommendations of communities	Members of ACC hand out solutions for each problem. Use PRA methods.	Identify solutions to each type of pollution aiming to improve environmental quality. E.g. Regulations, and policies of the community; Financial solutions; Short-term and long-term solutions.
Day 4: Design action program for the community	PRA methods such as program calendar.	Identify the goal of each phase; also the role of each actor in each solution, and who will work on each task, and financing.

2. General information on the research area at Hop Tien commune.

2.1. GEOGRAPHIC LOCATION

Hop Tien commune is located in the North of Nam Sach district, 6 kms from Nam Sach town and district center, 16 kms from Hai Duong city. This commune is next to Thanh Quang, Hiep Cat, Quoc Tuan, Nam Hung, Nam Tan, Nam Chinh communes. There are 5 hamlets in the commune (Map 1)

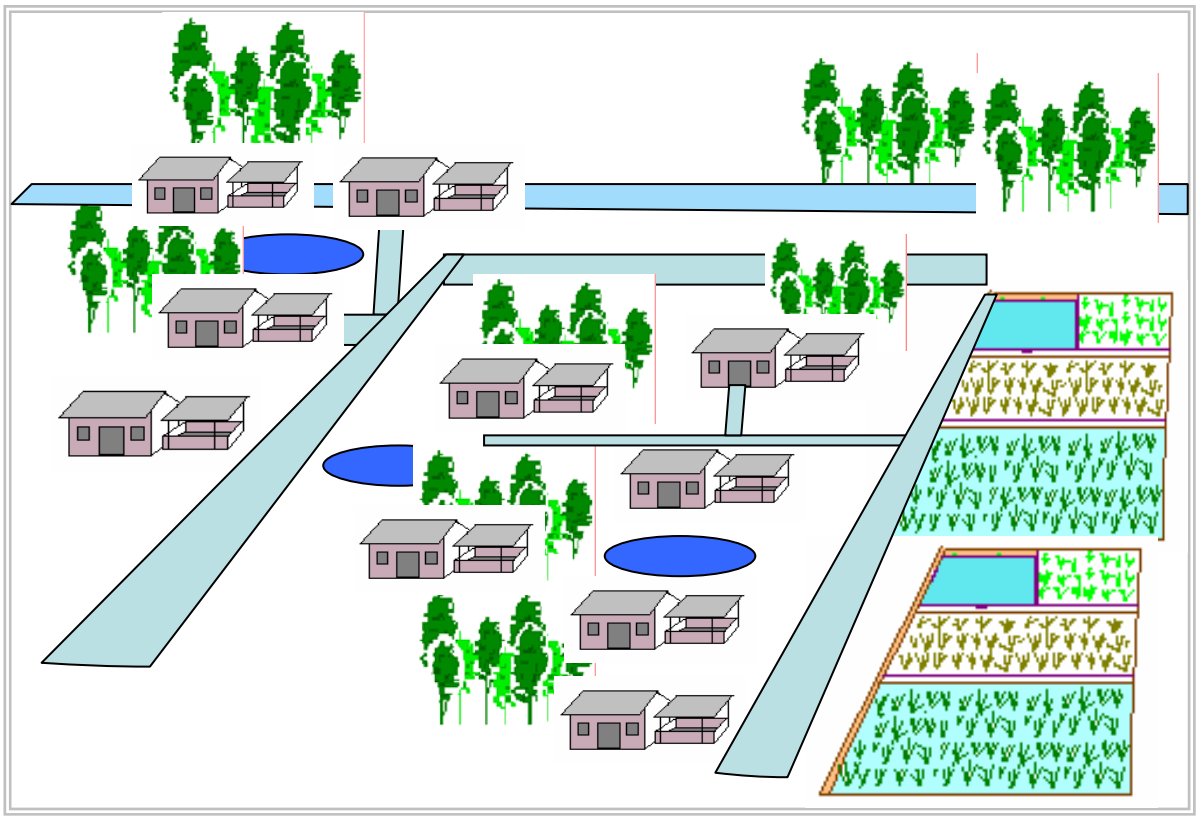
Map 1. Administrative map of Hop Tien commune



2.2. ENVIRONMENTAL CHARACTERISTICS

Located in the Red River Delta, Hop Tien has a monsoon tropical climate typical of Northern Viet Nam. Average temperature is about 23.4^{o}C, average humidity 87 percent, and

the total yearly rainfall is about 1879.5 mm (*Data source: Department of science, technology, and environment of Hai Duong*). Bordered on the Kinh Thay River, the terrain of the commune is rather flat, and the soil is relatively fertile. Generally, the climate of Hop Tien is temperate and natural calamities such as flooding and drought occur very rarely.



Map 2. Residential arrangement in Hop Tien commune

2.3. GENERAL SITUATION OF COMMUNE

Hop Tien is one of largest communes in Nam Sach district (Annexes 4,5,6,7,8,9), with 2005 households and 7125 persons. 1965 households derive the majority of their income from the agricultural sector. In 2002 98% of the households on the sector. Hop Tien has 4000 male laborers in 5 hamlets. At present, a large proportion of male youths go outside the commune to be hired as labour. In the village, there are mainly women and middle-aged people, who play an important role in cultivation, animal husbandry, and other activities.

Kinh is the only ethnic group in the commune. Buddhism is the main religion. Ancestral worship is also practised.

The commune has a post office and all households access the adequate national electricity system.

Total length of all roads in the commune is 16 kms, in which 70% are concrete. The commune has 3 big roads but they are made of stone - soil mixture and are dusty. There are many inter-commune roads. Many roads in residential areas are flooded in the rain season, causing difficulties for transportation of goods.

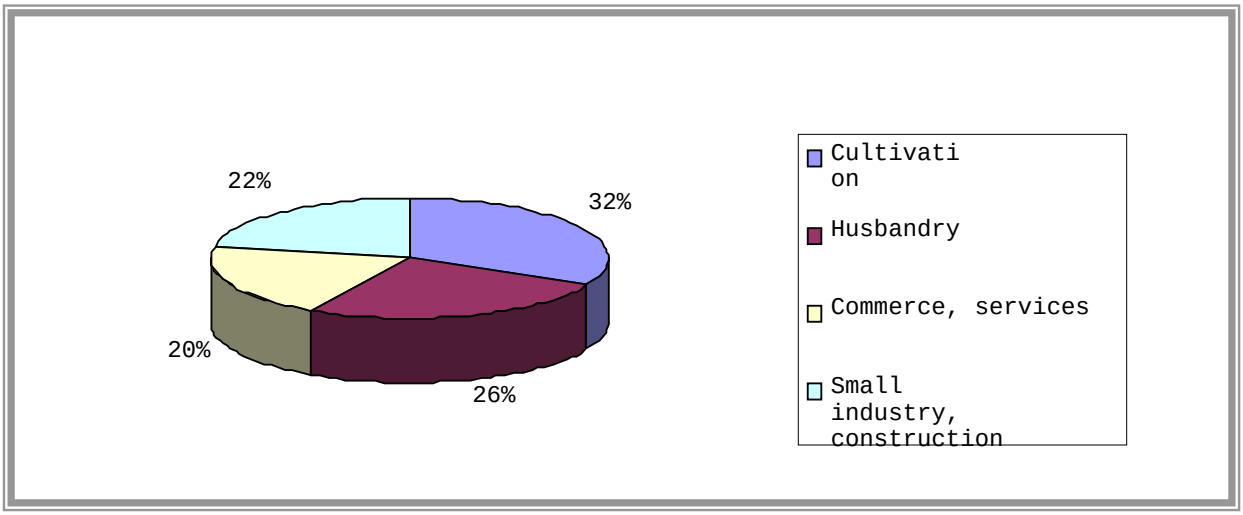
Each hamlet in the commune has a cultural house where people gather for festivals, training, and general meetings. The commune has a broadcasting station near the PCC house. This station broadcasts information relevant to resolutions of the communist party, national policies, regulations of the province, district, and commune. Information from the agricultural extention service and on agricultural production is also given. due to powere shortages, people cannot always hear the information of the station and sometimes they are not provided with updated and timely information.

In the commune, there are 2 markets in Dau and La hamlets, these 2 markets are open every day. Farmers can buy and sell, exchange agro-products, tools, and general materials. Besides, farmers can buy and sell goods in the district market, which is 6kms from the center of the commune.

2.4. THE ECONOMY

Hop Tien is a particularly well developed commune in Nam Sach district. Households have diversified activities such as: cultivation, husbandry, food processing and other non-agricultural activities. Total production value of the commune in 2002 was 34.8 billion dong. Value compositions are given in Chart 1: cultivation 32%, husbandry 26%, service 22% and small industrial activities, processing, construction 20% of total production value of the commune.

Chart 1: Economic structure of Hop Tien commune (2002)



Source: Hop Tien PCC

2.5. PRODUCTION

Like many rural areas in the Red River Delta, farmers here combine livestock raising (pigs, poultry, fish etc) with cultivation. Households here maintain husbandry activities almost throughout the year. Cultivation activities are carried out by all farmers at the same time: spring season from February to May, summer season from June to September. Winter vegetables begin from September in the preceding year to February following year. The main vegetable crops of the winter season are onion, garlic, maize and potatoes.

2.5.1.Cultivation

The land surface for rice production is 369,34 hectares, and productivity is relatively high at 11.6 tons/ha/year, (2002) (average productivity of district is 10.8 tons/ha/year). Average rations per person is very high 610 kgs/person/year (average rations per person in Red River Delta is 450 kgs/person/year).

Table 3: Expenditure per 1 ha of rice per season of farmers

Expenditure	Unit	Amount		%
		Year 1993	Year 2002	2002/1993
1. Seed rice	t[1]	1,10	0,80	73.0
2. Muck	t[1]	6,25	6,98	111.7
3. Nitrogen fertilizer	kg	170	220	129.4
4. Phosphate fertilizer	kg	72	323	448.6
5. Potassium fertilizer	kg	0	115	
6. Insecticide	1000 VND	200	352	176.0
7. Herbicides	1000 VND	0	98	

The data in Table 3 shows that expenditure of farmers in 2002 is extremely high in 1993, especially investment in fertilizer and pesticide.

Winter vegetables are an important crop of households as the product value of winter vegetable is high, averaging 12 million dong per hectare (2002). The land area of winter vegetable crops occupies 70% of land area dedicated to cultivation, equivalent to 258 ha. Main vegetables are onion and garlic occupying 60% surface, maize and potato about 32%, and other vegetables, such as root vegetables, about 8% surface.

Table 4: Some technical parameters per 1 ha of winter vegetable plantation

Parameter		Before 1993	2002	% 2002 / 1993
Nitrogenous fertilizer	kg/ha	417	555 - 694	140-170
Phosphate fertilizer	kg/ha	556	738	135.0
Potassium fertilizer	kg/ha	83	167	200.0
Applications of pesticide	per year	1.5	8	540.0

From the above table, we can see that farmers invest highly in vegetable cultivation. Expenditure in fertilizer for vegetables in 2002 was much higher than in 1993 by around 35-200%. Farmers have substantially increased pesticide use, spraying in 2002 was 5 times higher or 400% higher than in 1993.

2.5.2. Animal Husbandry

Hop Tien is a commune which has a well developed animal husbandry sector, especially pig farming. The total number of cattle in the commune is about 571 , which are mainly used for ploughing and supplying muck. Poultry raising is rather developed, since 2000. Many households have changed to raising poultry as a main source of income (reaching output of hundreds of heads per year). Recently, the Viet Nam Agricultural Science Institute helped many farmers raise high quality pigs, thereby increasing activity. Households that have over 20 pigs per year occupy around 20% of total households in the commune. There are many households raising from 80 to 150 pigs per year, especially in La hamlet.

Table 5: Scale of domestic animal herd of farmers in Hop Tien commune

Scale of herd	Unit	Numbers
- Total pigs	con	21.000
- Pigs per household	con/household	10
- Total cattle	con	294
- Total poultry (‘000)	con	51

Source: Agrarian system department 2002

Since a few years ago, pigs and poultry of households increased rapidly compared to 1993. Meanwhile, the residential land surface per household has not changed compared to 1993 Parents have to share their land with their children when they get married. Households have increased the number of cattle; however they do not have enough area to construct systems to process animal manure and waste water. This leads to increased soil and water pollution in the communities.

2.5.3. Small industrial activities, commerce and services

Activities include frying garlic and onions, bamboo weaving, and selling pesticides and fertilizers.

These activities have rapidly developed in recent years. In 2003, total revenue from these activities reached 14.6 billion dong occupying 42% of the total production value of the commune. Activities include: frying garlic, frying onion, bamboo knit, and selling pesticides fertilizers etc.

2.6. Characteristics of the two communities under study: Ben hamlet and La hamlet

After discussions with local authorities and social organizations in the research zone we chose 2 communities as the focus of our research. They are La Doi and Ben hamlets. Some general information of these 2 communities is shown in Table 6.

Table 6: General situation of the two communities

Parameter	Unit	La Doi	Ben hamlet
1. Total population	Person	2576	500
- Male	Person	1159	230
- Female	Person	1417	270
2. Age and labour			
- Labour age	%	68,5	60
- Under 16 years old	%	15,8	20,8
- Aged people (over labour age)	%	15,7	19,2
3. Economic situation			
- Percentage of rich household	%	25	20
- Percentage of medium household	%	68	65
- Percentage of poor household	%	7	15
4. Percentage of households having well	%	75	80
5. Main activities of households			
Cultivation			
- Surface of spring rice	m^2/ person	490	520
- Surface of summer rice	m^2/ person	390	410
- Surface of vegetable per person	m^2/ person	285	300
- Productivity of rice	ton/ha/year	5,8	6
Husbandry			
- Pig head	head/person	8,5	1,25
- Cattle head	head/person	0,07	0,09
- Poultry	head/person	10	6,5
Small industrial activities			
- Kilns to fry onion	Kiln	120	0
- Weaving bamboo	Household	0	20

From the above table, we can see that La hamlet is relatively more populated and also has an extremely high average number of pigs and poultry per person. This is also a hamlet which has a lot of activities such as cultivation, food processing, and husbandry. In particular, many households here have begun to adopt raise exotic pigs. Meanwhile, Ben hamlet seems to be less developed; the number of pigs and poultry per person is much lower that in La hamlet. However, cultivation is the main activity of this community and is very developed. Data in the table shows that land area of rice and winter vegetables per person is higher than in La hamlet.

3. Results of environment assessment

3.1. PROBLEMS RAISED BY THE COMMUNITIES

The appraisal committees (ACC) identified the problems of the communities by methods of assigning points and then ranking problems based on a point system. The ACC agreed with the degree of ranking: the minimum point is 1, maximum point is 3 for each problem. Maximum point of each problem is 30 (3 point x 10 person= 30). Results of the assessments allow us to understand the awareness and degree of interest in the community on problems over time based on general economic and agriculture factors (Table 7). Before applying the Doi Moi policy, environment quality was not identified as a problem based upon this method of assessment. Earlier the biggest problems were low income, a lack of education and knowledge, and a lack of technology (low intellectual standard). Over he the next ten years with the new policy, agricultural production increased, especially from crop cultivation. This period is characterized by a change in land policy. Land was handed over to households based on length of time each household had been using particular pieces of land. The new land policy encouraged farmers to invest intensively in their land and to increase the farming effort. However, over this period, environmental problems were not given priority.

Table 7. Problems solving rankings based on the community priorities, by time period

Problem	Period before 1986		Period from 1986 to 1996		Period from 1997 up to now		Forecast for future	
	La	Ben	La	Ben	La	Ben	La	Ben
1. Low income	30	30	30	30	30	30	30	30
2. High input cost of production	24	20	27	20	29	25	26	23
3. Low intellectual standard	26	27	27	24	27	14	17	20
4. Difficult to sell agro-products	20	15	26	20	24	15	27	23
5. Lack of job	22	24	25	25	23	29	20	28
6. Population increasing	24	23	24	15	20	-	15	13
7. Pollution	*0*	*0*	*5*	*5*	*17*	*10*	*25*	*15*
8. Poor infrastructure	23	23	20	21	12	8	13	16
9. Poor health	18	16	17	18	12	12	10	11
10. High interest rate loans from banks	10	5	23	-	6	-	23	-
11. Lack of land for cultivation	15	15	20	20	-	28	15	22

From 1997 to now, environmental problems have become much more important and this is expected to continue.

Low income is a major problem of the 2 communities. Other problems such as high cost of inputs to production, low intellectual standard, unstable output, lack of job etc are reasons directly influencing income levels of people in the community. Table 7 shows that income is the main interest now and environmental problems are also of some concern.
However, reflecting differences in conditions and characteristics of production, the degree of concern differs. For example:

La hamlet has more developed animal husbandry and food processing so people there pay more attention to the environment compared to Ben hamlet.

- The main activity of people in Ben hamlet is cultivation so they pay more attention to the cultivation of land and jobs for members of their family. Environment is of less concern.

According to the assessment in the 2 communities, we can see that environmental problems are a concern for farmers and this concern is increasing.

3.2. THE ENVIRONMENTAL PROBLEMS AND SITUATION OF THE COMMUNITIES AT PRESENT

Assessment results of communities show that people in the community are aware of environmental problems. But what is the environmental situation? What are main activities causing pollution? Where is pollution located, inside or outside of residential areas? What is the degree of pollution? These are questions that needed to be answered by thus participatory appraisal.

This is a way to facilitate farmers` discussions in order to find solutions, to develop an action program, and to propose recommendations to different authority levels to improve the living and working environment.

3.2.1. The environmental situation

According to farmers, the water, air, and soil resources are all seriously polluted at different levels. The perceptions of farmers are presented in the following sections.

3.2.1.1. Water resource

Farmers in the communities use many water resources for household use, drinking, and other production activities (Table 8).

Table 8. Situation of water uses in each community

Water resources	Purposes of using	Rate of users (%)	
		La hamlet	Ben hamlet
Rain water	Drink, cooking	80	80
Underground water:			
Drilling well	Take a bath, clean, wash	70	80
	Drink, cooking	20	20
	Use for cattle (drink and wash cages)	60	80
Digging well	Take a bath, clean, wash for people	30	40
	Use for cattle (drink and wash cages)	30	60
Ponds	Contain waste water	100	60
	Wash	0	30
	Raise fish	20	100
Water of Kinh Thay river	Irrigate crops	90	100

a. Rain water

According to the opinion of the communities, the quality of local rain water is not much affected by agricultural production activities, but affected rather seriously by smoke and dust of factories (Pha Lai thermo-electricity factory, 7 kms from the community). People here usually use rain water for drinking and eating from the 4th rain of the season. Rain water early in the rainy season is often black, containing a lot of dust and dregs. At present, a hygienic water resource does not exist, so farmers have to use rain water for drinking and eating. the local health station keeps data on this situation. In Table 8, it is seen that about 80% of the people use rain water. However only 40% have a capacity to store rain water for 10 months. In the remainder of the year they have to use water from drilled wells Furthermore 20% of the population use other undefined water resources because of lack of money to build tanks to contain rain water.

b. Underground water

In former times, people used water from digging wells as their main water resource for daily life. According to them, the quality of water from digging wells has become dirty due to pollution, so a lot of people replace water from digging wells by water from drilling wells. The assessment of the communities about this water resource is as follows:

According to perception of communities, drilled wells of a depth from 20m to 25m provide water which is able to be used for drinking, eating, and other daily life needs, only if this water is filtered well. The opinion of farmers is that because the water from drilling wells is very deep it is not affected by waste water. However, in a report from the Department of science, technology and environment of Hai Duong, water from wells in Hai Duong province (including Nam Sach district) has a level of purity, smell, iron, organic and microorganisms which is below the allowed standards of daily water and underground water (*September, 1998, Department of science, technology, and environment*).

According to the communities:

- Water of dug wells of La Doi hamlet is affected strongly by waste water from pig raising activities. About 70% of these wells have a fishy smell, and black colour.
- Water from the dug wells of Ben hamlet is less polluted. The water can be used for daily life such as taking a bath, washing, and cleaning.

c. Water of ponds

- According to farmers, water of ponds in residential areas of Ben hamlet is not seriously polluted, a many households still raise fish.

Table 9. Pollution levels of ponds in residential area: appraisals by communities

Criteria	Unit	Ben hamlet	La Doi hamlet
Total number of ponds in commune	Pond	5	34
Ponds able to raise big fish	Pond	5	3
Polluted ponds only able to raise small fish	Pond	0	27
Polluted ponds unable to raise any fish	Pond	0	4

- On the contrary, according to La Doi community, most ponds in La Doi hamlet are seriously polluted. Water in ponds are often dark green, with a lot of surface growth. Here, most ponds are used to raise small fish, when these fish are about 100 grams, they have to be changed to other ponds for further growth

or to be sold. Small fish are able to be raised in these ponds as they require less oxygen than larger fish. In some ponds, such as the pond of Mr Moc (team 8), fish cannot be raised at all. This phenomenon began in 1999 when pig farming developed strongly.

The ponds outside of villages (exchanging zone) are not seriously polluted due to their larger size and the lower density of population (residential surface per household is about 1000m^2 comparing to inside village of about 300 m^2).

According to report of Department of science, technology and environment of Hai Duong, water in ponds in rural areas is polluted in regards to color, organic and microorganism levels. This water should not be used for daily life. But in fact, some households still use this water for bathing and washing.

d. Water in channels

According to the ACC, channel water is very polluted, but there is a marked difference between water inside and outside the village. Inside La Doi hamlet, channel water is black, has a strong stench, and is viscous. On the contrary, channel water inside of Ben village has less stench, and is not so black. However, channel water in the fields has been seriously effected by pesticides in recent years. Farmers do not dare to wash their hands and feet in channels near fields when pesticides are sprayed for rice and winter vegetables**.**

3.2.1.2. Air

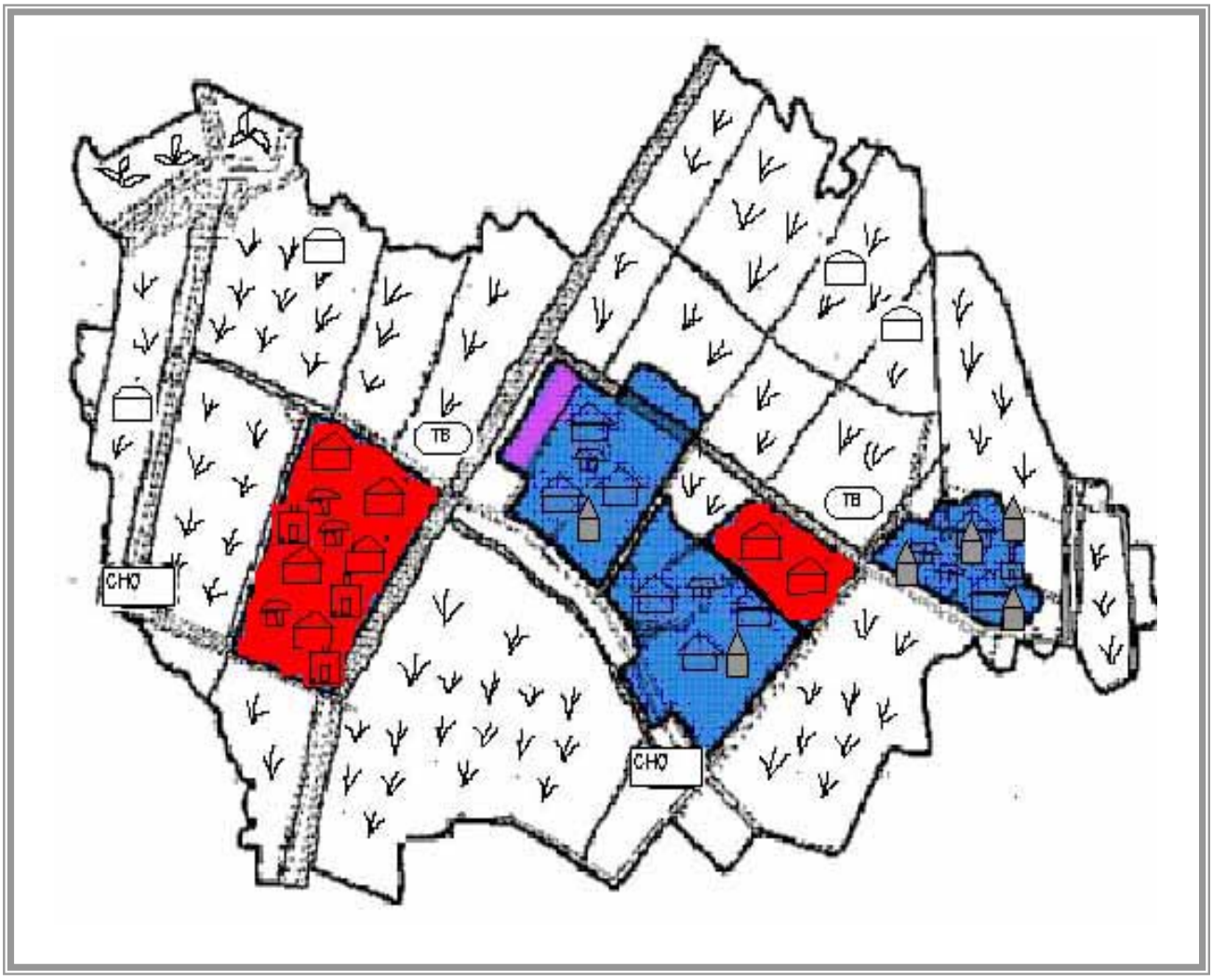
According to the ACC, air pollution in La hamlet is rather serious. Farmers smell the stench from cattle manure and waste water in most of the residential zone.

People of Ben hamlet think that air pollution from waste is not serious, but pesticide pollution from the crop fields is serious. For residential areas near fields, the smell of pesticides is very bad, especially areas that catch the wind. The farmers also complain about the smell of smoke from the Cau Binh abattoir and Pha Lai power plant.

Some areas near the river on the border of the village are near brick kilns and are seriously polluted from the kiln smoke.

3.2.1.3. .Soil

Map 3. Land and soil use in La and Ben hamlets



Chó thÝch:

House Nhµ ë

TB Pumping stationm

Cemeter y

Chicke n house

Pig sty

Onion kiln

Rice

Dry land crop

CS Changing usage land

Soil pollution in residential areas: Soil is black, pasty, a lot of flies, bugs because of waste water from husbandry. *(Picture: Waste water from husbandry in team 8 , La hamlet)*

In fields: Soil is solid, not fertile like before.

3.2.1.4. Natural fauna

According to the community, there has been a substantial decrease in the amount of natural fauna. The number of birds has decreased by around 90% compared to the period prior to "doi moi" economic reforms. While people now raise substantial amounts of fish, the amount of wild fish and other natural fauna such as tortoises, trionychid turtles, snakes, and frogs have decreased substantially. According to people in the community, livestock and daily life wastes influence water based animals. Meanwhile, wild animals on land are decreased due to hunting and pesticide. Mr. Mai Van Hoa, team 9, La Doi hamlet tells us that only eels are not affected by waste of livestock, and pesticide because eels to live deep in the mud. However, this is a personal opinion, because most households think that eels have decreased in numbers also. Most households are afraid that, because of pollution, a lot of useful animals have decreased and that this is also a potential danger to trees. Some harmful animals such as mice are developing very fast, especially in 2000. According to Mr. Suc in team 8, La Doi hamlet :"Nowadays, the number of mice has increased suddenly and cannot be controlled, especially from 2002 up to now. After using some Chinese chemicals for killing mice, we have found that some mice are deformed, having a black color, or only 3 legs".

We can sum up the environmental assessment and practice in Table 10 and Table 11

Table 10: Environmental assessment and practice of local farmers

Resources	Parameter	Description	Measures to mitigate	Risks, losses
1. Rain water	- Color - Level of sediment	In 4 early rains: - Black colour - A lot of sediments	Not use rain water from 1 to 4 early rains	Health
2. Under ground water	- Colour - Smell - Health	- Black colour - Water of digging wells near livestock zone has a stench - Skin and eye diseases	Change from dug wells to drilled wells Build filtering system	Health Cost
3. Water from ponds	- Color - Spume - Smell -Usage purpose	- Green colour of algae - Spume - Black colour - unsuitable for washing	Change usage purpose Raising small fish Change to ponds outside residential areas	Influence to ecology, environmental balance
4. Water in residential area	- Color - Smell - Insect	_Black color, stench and many flies.	Make small channels cross the roads in residential area	decreased rural beauty, health for humans and animals
5. Water in channel	- Color - Smell	- Black water, scum, froth - stench		decreased rural beauty
6. Air	- Smell - Health of community	- Bad smell due to pesticide, livestock waste, onion frying, brick kiln, and power plant - Headache, dizzy, hard to breath, affects eating and sleeping	-Some households use nylon to cover windows	Serious Influence to health
7. Soil	- Color - Number of earthworms - Soil quality	- Not fertile, gray - No earthworm - Hard to plough	Increase chemical fertilizer Increase ploughing	Decreased fertility Increased labor

Table 11: Difference in environmental practice between the two communities

Resource	Environmental practice	
	La hamlet	**Ben hamlet**
1. Rain water	Drinking, eating: 80% population	Drinking, eating: 80% population
2. Underground water	30% population use: Drinking, eating Daily life: washing, cleaning Drinking Water for cattle	20% population use: Drinking, eating Daily life: washing, cleaning Drinking Water for cattle
3. Water of ponds	- Raising small fish - Rarely washing	- Raising big fish - Washing
5 Channel water	Not used to wash hands and feet	Not used to wash hands and feet

By the above analysis, we have some conclusion:

- The environmental situation of the 2 communities is not similar
- Pollution and potential pollution dangers occur both inside and outside residential areas but pollution in residential area is more important with different pollution effects in waste water, underground water, pond water, air, soil.
- Pollution inside residential areas causes danger to the health of the population in community and causes economic loss of farmers because of health effects.

3.2.2. Community awareness of pollution problems

ACC used time periods to study the environmental changes in the communities. The three periods are: (1) before1986 – period of under developed production, low intensive cultivation, low husbandry; (2) from 1986 to 1993 – the period when Viet Nam moved from a planned economy to a market economy, and is characterised by the change from low productivity to intensive cultivation; and (3) from 1994 up to now – a period of strong economic development with intensive and professional production, such as pig farming on a large scale in households (Table 12).

Over time, the environmental awareness of farmers has changed. Farmers see that rain water quality, and quality of other resources have decreased, and the natural fauna is decreasing rapidly. According to the assessment of farmers, the quality of the environment is worse over each of these periods, and in the future is expected to be even more worse (Table 12); Quality assessment points are from 0 to 5 for each resource*: 5 points x 6 resources = 30 points is maximum for a quality environment.

Table 12. Environmental assessment of different resources in each period

Resource quality	**Before1986**		**From 1986 to 1993**		**From 1996 up to now**		**Forecasting for future**	
	La	Ben	La	Ben	La	Ben	La	Ben
Rain water	5	5	5	5	4	4	4	4
Ground water	5	5	5	5	3	4	2	4
Underground water	5	5	4	5	3	5	2	4
Air	4	4	4	4	3	4	3	4
Soil	5	5	4	4	3	4	3	4
Natural fauna	5	5	3	3	1	1	0	1
Total	29	29	25	26	17	22	15	21

** Note: 5. very well; 4. Rather well; 3. Medium; 2. Rather bad; 1. bad; 0. Very bad*

According to farmers in the community, the situation and quality of the environment is becoming worse in parallel with economic development of the country as well as the locality. Quality of environment of La Doi hamlet is worse than Ben hamlet, especially water quality: in pond water, well water, underground water, air, soil and all fauna system.

3.3. IDENTIFICATION OF ACTIVITIES CAUSING POLLUTION

3.3.1. Environmental problems

The ACCs of the two communities give a list of environmental problems met by communities. Rating from low to high (from 1 to 10) they identified a sphere of influence, degree of seriousness of problems, as well as influence of environment to community health. As a result, Ben and La Doi hamlets ranked priority environmental problems (Table 13). The most serious problem in La Doi hamlet is waste water pollution from husbandry followed by flooding. Pesticide use and inappropriate disposal of pesticide containers are the two worst problems identified in Ban hamlet.

Table 13. Ranking of environmental problems met by community

Order	La hamlet	Ben hamlet
1	Pollution of waste water from pig raising	Smell of pesticide
2	Flooded roads	Bottles, bags of pesticide
3	Smell of pesticide	Flooded roads
4	Daily life waste	Smell of smoke of the Cau Binh abattoir
5	Smoke of coal, smell of onion	Smoke and dust of thermo-electricity of Pha Lai factory
6	Smell of manure, muck	Pollution of waste water of pig raising
7	Bottles, bags of pesticide	
8	Waste water of onion processing	
9	Smoke brick kilns	
10	Smoke of transportation	

a. Waste water from pig farming

At present, about over 30% households in La Doi raise a lot of pigs (over 20 heads per year). About 10% raise from 60 to 200 heads per year. This hamlet has the most pigs in Hop Tien commune – an average surface area 0.74m^2 per 1 pig compared to an average of 1.17m^2 for the commune (Nguyen Xuan Hoan, 1999). While many households raise pigs on a large scale, the system to treat waste is poor. According to the community, about 95% amount of pig manure is treated in a rudimentarily way. Farmers compost pig manure (inside cages and on yards) to make muck for crops and trees and food for fish. Waste water goes directly to ponds or channels of the village. Waste water from pig raising without treatment is the main cause of pollution. Waste water includes urine and some manure lost while cleaning through pig sties.

Another factor causing pollution in La doi is the poor sewage system of the locality. Waste water cannot flow so it is stagnant in many parts of the channel in the hamlet. The main reason is that some farmers build houses and pig cages on land that was once part of the sewage system of the community.

In Ben hamlet, waste water from pig raising is not a serious problem of the community. At present, the number of people who raise many pigs in the hamlet is very low, only about 5% of population (over 20 heads per year). However, pollution from pig raising will become a problem in Ben hamlet in the near future if pig raisers do not apply modern methods to treat waste. At the moment, pig raising in Ben hamlet is starting to develop strongly.

b. Pesticide usage

The problems from pesticide use largely stem from usage of banned pesticides or legal pesticides at very high dosages. According to the ACCs, about 60% farmers still use forbidden pesticides such as Wofatox and Monitor, with the dosage 1.5 to 2 times higher than recommended. Main reason is that farmers do not believe the quality of pesticide in the markets. Pesticide in most of pesticide stores in the commune are not monitored as to type and quality. Besides farmers do not know the optimal time of spraying pesticide so they usually spray over too long a period. This is especially the case in La Doi. Also farmers do not have access to biological pest control techniques. In the commune, there has been only one course on integrated pest management (IPM) training course but this only attracted 30 to 50 persons. Others did not know about the course.

Pesticides are problematic to the community through their smell and solid wastes such as bags and bottles of pesticides. A lot of farmers throw these solid wastes directly into banks of channels, causing water pollution. While La Doi hamlet has built tanks to contain this

waste, a lot of people still throw solid waste outside the tanks due to poor awareness and a lack of regulation. This is the case even though money and labor to build these tanks were voluntarily contributed by farmers (1000 VND per person). In Ben hamlet, waste containing tanks have not been built so farmers often leave bags and bottles directly in channels and banks of fields. Moreover, the communities are concerned with their inability to process bags and bottles after collection.

c. Flooding

Flooding is a very serious environmental problem in both communities. However, the level and causes for each of the hamlets are different.

In La Doi community, there are 3 main reasons causing their situation. Firstly, in 2003, the PCC transferred space from common ponds (1 pond about 4320 m^2, 4 ponds about 360 m^2 per pond) to some households to build houses and pig cages. These ponds collected water runoff of the locality during the rainy season. Because these households did not obey the regulations of the commune (it is necessary to leave some space to build channels with a width of 1m) many floods have occurred in the village when it rains. There are some serious positions in La hamlet, with teams 8 and 10.

Secondly, a problem is caused by fish farmers by the division process to make big ponds into a number of smaller ponds. Before 2002, farmers tendered ponds together and they used ponds alternately, one household per year. But a lot of households thought that it was not reasonable and proposed PCC to divide big ponds to some smaller ponds in order to them to raise fish in a same time.

To do this, households built brick banks to prevent fish going from pond to pond. Households usually only build a very narrow gate with a filtering net between the ponds, with a width of about 10 cm allowing water flow. These gates are often blocked, causing flooding in the locality.

Thirdly, waste of daily life and livestock. Livestock waste water, solid waste and daily waste (mentioned in following part) from households are directly brought to channels. This causes partial blocking of flow.

In Ben hamlet, causes of floods include some households building houses and cages occupying parts of the channel and decreasing the flow. The flood problem in Ben hamlet is less serious than in La hamlet.

d. Waste of daily life

In La Doi community, waste of daily life is a big challenge of the community. One of the reasons is that most of the people do not make a conscious effort to keep common areas clean; they throw away garbage instead of gathering it into a zone. One reason for this is that the community does not have rubbish dumps and methods to treat waste, especially nylon bags.

At present, in community, a lot of households raise dogs without control. This is causing additional pollution.

This is not a problem in Ben hamlet. Ben is a small hamlet, with underdeveloped animal husbandry, less waste water. It is easier for people in community to encourage others to keep the village clean.

e. Odor from the abattoir and smoke from the power plant

According to Ben community, smell from a nearby abattoir and the smoke from the power plant seriously impact on the health of the community, particularly children and aged people. The abattoir and power plant are 2kms and 7 kms from communities, respectively. This pollution occurs year round, especially on windy days.

La Doi hamlet is less polluted from these activities than Ben hamlet.

f. Frying onions

La Doi community reports that from December to February of the lunar calendar, the air in the hamlet is seriously polluted due to the drying-room of households involved in this processing, which is scattered in the hamlet. Two main pollution sources of this activity is the smell of peat burning, processed products and waste water. Waste water is usually the result of onion soaking and washing water. Waste water is not treated before being discarded. About 40% of the households, which are near ponds and channels etc., discard waste water directly to these ponds and channels. The remainder of households live far from channels or ponds and discard to their garden, and waste water is absorbed into the soil.

g. Smoke from brick kilns

In La Doi hamlet smoke from brick kilns have little impact on the health of farmers, except on windy winter days for some households living closer to the kilns (about 5% of the population). However this activity seriously impacts on vegetable and rice production of the

community (the heat of smoke kills vegetables). Owners of brick kilns usually have to compensate losses of vegetables and rice to farmers, on an annual basis Another potential danger is the exploitation of soil for brick production near the dyke system. This can causing a landslide of on dyke during the rainy season. According to community, there are some pits dug to a depth of 20 m.

h. Transportation

Pollution from this activity is increasing, in particular due to main roads still being made of soil and with increasing use of vehicles, such as motorcycles, tractors etc. Pollution mainly comes from dust in the air, and smoke, and smell of petrol.

We can summarize environmental problems and causes in following table:

Table 14. Activities and acts causing pollution

Community	Activities causing pollution	Act causing pollution	Reasons	Ways to mitigate
Common problems	Pig farming	Untreated waste water discarded directly to environment	Awareness of community is not good Communities do not have money to treat wastes	Biogas, 3 containers tanks , Use pipe to transfer waste water directly to ponds. No method to solve fully
	Using pesticide	Using with too high dosage, over a long time, illegal pesticides Used Bags, bottles are not gather, and treated	Do not have chance to participate training courses Do not build tank to contain bags and bottles of pesticide Do not have methods to process wastes of pesticide	Households living near fields close windows and use nylon to cover windows and door to exclude the smell of pesticide
		Some households fill ponds, build houses, cages, blocking water flow. Some households build weirs to divide pond to smaller ponds There are a lot of solid wastes	Regulations of PCC are not applied	Do not have measures
Problems of La Doi hamlet	Agro-product processing	Untreated waste water discarded directly to the environment. Smoke of peat, smell of onion	Lack of technique to build proper frying-rooms. Do not have money to replace peat with other energy sources.	Do not have measures
	Daily life waste	Waste, garbage are not gathered	There are no common garbage dumps There are teams to gather garbage	Do not have measures
	Brick making	Constructed near residential areas	Lack of the determination of PCC to solve problem	Do not have measures

	Transportation	Poor quality roads (dust) Smoke and smell of vehicles	Lack of government investment	In dry sunny days, people living near roads spray water in the roads to decrease dust
Problems of Ben hamlet	Cau Binh factory	Smell of the operation. Constructed near residential areas	Lack of technology	Do not have measures
	Pha Lai factory	Smell of smoke Constructed near residential areas	Lack of technology	Do not have measures

By the above assessments of the communities, we can see that there are 3 potential dangers causing pollution in Red River Delta communities generally as well as our research zone.

- *Interior Pollution*: mainly comes from specific community activities, e.g. intensive cultivation, animal husbandry, and diversified supplementary works.
- *Exterior Pollution*: Pollution outside activities that are increasing rapidly due to urbanization and industrialization.
- *Interactive Pollution among communities*: For example: brick kilns, pesticide use and waste water of one hamlet impacting other hamlets.

Firstly, interior pollution is the type of pollution that community causes and suffers from. They are mainly from agricultural production activities such as spraying pesticide, raising pigs, processing food etc. With this type of pollution, the community itself has to be the main actor in solving these problems. The head of hamlet has an important role in taking the initiative, by supervising and inspecting activities. Local authorities need to make legal arrangements corridor for such activities.

The third form of pollution, namely interactive pollution, can involve different communities that are quite distant from each other. To solve these problems, it is necessary to identify a linkage among communities. If all communities are located in the same commune, the commune authority can be expected to be an arbitrator to help communities (hamlets) to solve the problem. If communities locate in different communes, the commune authorities need to design a common action plan. The district authority could help this procedure.

The second form, namely exterior pollution, is caused by activity which is located very far away, from 2km to 10km. distant. With these problems, there needs to be appropriate regulation and monitoring of these polluting activities by government departments, such as the Hai Duong Environment Department. Prior to allowing new developments to occur, there needs to be an approval process that explicitly takes into account the need for compensation to communities if they are going to be negatively impacted.

From the above analysis, we can see that it is necessary to establish linkages within communities, between communities, and between communities and government authorities.

3.3.2. Seasonal aspects of the environmental problems during the year

Polluting activities occur throughout the year, at different levels of intensity (Table 15). Pollution is highly dependant on the variation of price of agro-products in the market and on the economic situation. For instance, when price of pork and poultry increase, so does the

pollution level. Some other activities causing pollution are seasonal such as spraying pesticide, drying onions, and making bricks. The following table describes the timing and intensity of environmental problems over a typical year in La Doi hamlet.

Table 15. Activities causing pollution and levels of pollution over 12 months: La Doi hamlet

Months lunar calendar	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Water pollution	****	*****	*****	***	***	*****	*****	***	***	***	***	****
Air pollution	****	*****	*****	***	***	****	****	***	***	****	****	****
Soil pollution	***	***	***	**	**	*****	*****	**	**	***	***	***
Health of community	****	*****	*****	**	**	****	****	**	**	***	***	****
total points	15	18	18	10	10	18	18	10	10	13	13	15
Environ-mental problems	Waste water of pig raising											
						Flooding						
		Pesticide				Pesticide				Pesticide		
	Garbage of daily life											
	Smoke of peat smell of onion											Smoke of peat smell of onion
	Smell of pig manure, pig cages											
	Bags, bottles of pesticide											
	Waste water from onion frying											Waste water from onion frying
	Smoke, dust of transportation											
											Brick making	

From the above table, we can see that in the period from February, March, June, July and December of lunar calendar (or March, April, July, August and January following year of solar calendar) is the time that there are most activities causing pollution. There are most environmental problems to community is this time.

Meanwhile, in Ben hamlet, serious pollution occurs mainly in times of spraying pesticides, which is worse in June and July of lunar calendar (July and August of solar calendar). In this period, farmers usually spray both insecticide and fungicide on summer rice. For spring rice and winter vegetable, farmers often use fungicide (See Table 16).

Table 16. Activities causing pollution and level of pollution in 12 months: of Ben hamlet

Months lunar calendar	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Water pollution	**	***	***	**	**	***	***	**	**	***	***	***
Air pollution	**	***	****	***	***	*****	*****	***	**	***	***	***
Soil pollution	**	***	***	**	**	***	***	**	**	***	***	***
Health of community	**	****	****	**	**	*****	*****	**	**	***	***	***
Total point	8	13	14	9	9	16	16	9	8	12	12	12
Enviro tal prob	Pesticide											
	Pig raising											
	Smoke of Pha Lai		au Binh factory									

3.4. POLLUTER AND "POLLUTION SUFFERERS"

Pollution at present mainly comes from agricultural production activities. The polluters are the producers, mainly pig farmers in La Doi hamlet and cultivators in Ben hamlet. Those impacted are also producers and households living in these polluted areas.

In La Doi hamlet, polluters are (1)farmers who raise a lot of pigs, (2) farmers who build houses and cages blocking water flow; and (3) food processors. Pollution sufferers are houses

living in intensive pig raising areas and areas prone to serious flooding (team 8, 9, 10 in the map).

The ACC of La hamlet identified those who cause pollution, the percentage in total population and those impacted, and the, percentage in the total population (Table 17).

Table 17. Polluters and pollution sufferers in La hamlet

N	Environmental problems	Polluters	% of pop.	Pollution sufferers	% of pop.
1	*Pollution of waste water from pig raising*	farmer who raise many pigs	30%	neighboring households	80%
2	*Flooded roads*	People who fill pond, occupy channel, block water flow	5%	Households in teams 8, 9, 11	40%
3	*Smell of pesticide*	Cultivator	90%	People working in fields	90%
				Households living in the edge of villages	40%
4	*Daily life waste/garbage*	All population	100%	All population	100%
5	*Smoke of coal, smell of onion*	Onion fryer	15%	neighbor households	50%
6	*Smell of manure, muck*	Pig farmer	60%	neighbor households	60%
7	*Bottles, bags of pesticide*	Cultivator	80%	Farmers working in fields, households living near fields	90%
8	*Waste water of onion processing*	Onion fryer	5%	neighbor households	10%
9	*Smoke/dust of transportation*	People who walk on roads		Households living near big roads	10%
				People who walk on roads	
10	*Smoke of brick kiln*	Owner of kiln	1%	Owner of kiln	1%
				People living in the north of village	10%
				People having vegetable in the north of village	5%

Polluters in Ben hamlet are most of the population in the community, they are cultivators and some households building houses and cages blocking water flow, and causing floods in the hamlet. Furthermore, communities also mentioned two other pollution causes, those are the Cau Binh abattoir and the Pha Lai power plant. Those impacted are farmers working on the fields and in households near the fields, in flooded areas, and on the of the village.

Table 18. Polluters and pollution sufferers in Ben hamlet

N	Environmental problems	Polluters	% of population	Those impacted	% of population
1	Smell of pesticide	Cultivator	Near 100%	Farmers working in fields	100%
				Households living in the edge of villages	100%
2	Bottles, bags of pesticide	Cultivator	80%	Farmers working in fields, households near fields	100%
3	Flooded roads	People who fill ponds, occupy channels, and block water flow	2%	Households in flooded areas	5%
4	Smell of smoke of Cau Binh abattoir	Cau Binh abattoir		All population	100%
5	Smoke and dust of power plant at Pha Lai	Pha Lai power plant		All population	100%
6	Pollution of waste water of pig farms	Pig farmers who raise many pigs	5%	neighbor households	10%

3.5. IMPACTS OF ACTIVITIES CAUSING POLLUTION TO WOMEN

The research team suggested that the communities to compare the pollution on men and on women. According to community, of the top 10 environmental problems, women usually suffer more than men. This reality comes from traditions in Viet Nam where rural women have to do more housework and fieldwork than men. Also, at the moment, a lot of men in the commune now go outside the locality to do other work. Therefore, women have to do more production work, such as cleaning pig sties, spraying pesticide, drying onions etc. Thus, women have to face more pollution sources.

Table 19. Comparison about pollution suffered degree between men and women in 2 hamlets

Environmental problems in La hamlet	Women	Men	Environmental problems in Ben hamlet	Women	Men
Pollution of waste water from pig raising	+	-	Smell of pesticide	+	-
Flooded roads	0	0	Bottles, bags of pesticide	+	-
Smell of pesticide	+	-	Flooded roads	0	0
Daily life waste	0	0	Smell of smoke of Cau Binh factory	0	0
Smoke of coal, smell of onion frying	+	-	Smoke and dust of thermo-electricity of Pha Lai factory	0	0
Smell of manure, muck	+	-	Pollution of waste water of pig farming	+	-
Bottles, bags of pesticide	+	-			
Waste water of onion processing	+	-			
Smoke of transportation	0	0			
Smoke of kilns	0	0			
Total	6+	6-		3+	3-

Note: + implies more pollution

- implies less pollution

3.6. CHANGES OF THINKING ABOUT ENVIRONMENTAL PROBLEMS, OVER TIME

The research team invited some aged persons to contribute to this research. Aged people were asked to suggest some important historical trends and events relevant to pollution.

Table 20. Events and trends relevant to environmental problems

Period	Year	Activities relevant to environment	Impacts to environment	Special events	National policies
Before 1997	1960	1 brick kiln began operation Road system was improved	transportation more convenient	Establish 4 first cooperatives of commune	Movements to establish cooperative were very strong
	1962	Spraying pesticide 666 by machine, use rat poisons	Some cattle died	Each cooperative had a machine of spraying pesticide	
	1963	Began activities on sanitary conditions and environment such as digging common wells, 2 container toilets etc.	Better sanitary conditions		
	1968	Began to dig private wells	Cleaner water	Hop Tien commune was established basing on 5 cooperatives	
	1979	Brick kilns developed (40 to 50 kilns in village)	- Trees lose leaves due to high heat - Vegetable die. - Pigs and chickens were ill		

Period	Year	Activities relevant to environment	Impacts to environment	Special events	National policies
	1982	Diphtheria disease	- 4 children died		In 1981, Direction 100: about contracting a product to producers
	1986	Spraying much pesticide; especially Wofatox	- Smell of pesticide is very strong in field, in residential areas near fields in spraying time		
	1987	Make papanh brick in residential areas	- Air pollution due to smoke, dust, and steam from coal burning. - Obstruct traffic		
	1988 1989				In 1988, Resolution 10: recognize household is a economic unit
	1993	Increase in spraying pesticide	- Water pollution, air pollution, influence on health of people		In 1993, Law of land was promulgated. Cultivated land was allocated to farmers for long term use.

Period	Year	Activities relevant to environment	Impacts to environment	Special events	National policies
	1994	Started frying onion	- Pollution of air, water, soil		
	1994	Transportation increased rapidly	- Dust, smoke cause pollution	Development of motorcycles and tractors	
From 1997 to now	1997	Frying onions increased	- Heavy air pollution inside village		
	1997	Pig farming increased a lot.	Pollution of air, water, soil	Establishment of groups and cooperatives on high quality pig farming	
	1997	Smoke of Cau Binh factory and Pha Lia plant	Pollution of air		
	1997	Garbage increased	Pollution of soil, roads of village	Development of nylon bags. Dogs out of control. Monitoring of households	
	1998	Households start drilled wells	Rarely use water of ponds or dug wells		
	2001	Change brick kiln to new market zone			

Period	Year	Activities relevant to environment	Impacts to environment	Special events	National policies
	2003	Industrial livestock farming starts	Pollution of air, water, soil	Number of livestock per household increases	

3.7. IDENTIFY POLLUTION POINTS AND THE LEVEL OF POLLUTION

3.7.1. Pollution points

According to the ACC, water, air, soil, and health of the community are highly polluted.

3.7.2. Location and degree of pollution

3.7.2.1. Air pollution

According to the assessment of La community, pollution locations are very obvious and concentrated in residential areas, on the edge of the village, and in the fields of rice and vegetables.

Table 21. Position of air pollution in La Doi hamlet

Pollution location	Pollution level	Pollution reason	Pollution description	Loss
Centre of village (team 8, 9,11)	serious	Waste of pig farms	Bad odor	Common diseases
In fields	Very serious	Pesticide in 3 seasons	Very strong smell	Chickens died, headache
At southeast edge of village	Very serious	Pesticide in 3 seasons	Very strong smell	Headache, want to vomit
At northeast edge of village	serious	Pesticide of winter season	Bad smell	Feel uncomfortable, nauseous
At north edge of village	Serious	smoke of kiln	Bad smell	Some trees died

According to the community, the air pollution situation in La Doi hamlet is generally rather serious. At present, 80% of the people think that sources causing air pollution come from pig manure, ponds, and channels in the community. Lung diseases are common.

At the time of spraying, farmers working in field and households living near the edge of village suffer a lot from the smell of pesticides . According to people, at that moment, about 30% people have head aches, dizziness, and nausea.

Some areas near the river, at the edge of the commune, or near the brick kilns are influenced by smoke of kilns. Mortality of vegetable and domestic animals is seen up to 50m from the kilns.

On the contrary, in Ben hamlet, the worst pollution problem is that pesticides are used with high frequency (Continuously over 3 seasons). This hamlet is very small and a many households are near the fields. From October to December of the lunar calendar, people in the hamlet have to tolerate smoke from the Pha Lai power plant. From March to august they are troubled by the smoke from the Cau Binh abattoir.

Table 22. Position of air pollution in Ben hamlet

Pollution location	Pollution level	Pollution reason	Pollution description	Loss
Centre of village	Serious	Pesticide of spring season and summer season	Bad smell	Lung disease
	Serious	Cau Binh abattoir	Bad smell	Sore throat, coughing, lung disease
	Serious	Pha Lai power plant	Bad smell	Sore throat, coughing, lung disease
In field	Bad smell	Pesticide in 3 seasons	Very bad smell	Headaches, nausea.
At southeast edge of village	Very serious	Pesticide in 3 seasons	Very bad smell	Headaches, nausea, hard to breathe
	Very serious	Cau Binh abattoir	Very bad smell	Uncomfortable
At southeast edge of village	Serious	Pesticide of winter season	Rather uncomfortable smell	Sore throat, coughing, lung disease
	Very serious	Pha Lai plant	Bad smell	Sore throat, coughing, lung disease

3.7.2.2. Water pollution

According to the views of La community, water in dug wells, ponds and channels is seriously polluted. About 70% of the wells have a strong stench, black color or scum. Pond water is viscid, dark green, and scummy. Living things cannot survive in this water environment.

Table 23. The situation of water pollution in La Doi

Pollution location	Pollution level	Pollution reason	Pollution description	Loss
Residential area	Extremely serious	Waste from pig farming, garbage, processing of products.	Colour of water is dark green, a lot of scum and bad smell	Itchy when taking a bath. Ponds only good to raise small fish. Big fish die
In the field, in channels	Very serious	Waste from pigs, garbage, food processing	Colour of water is black with scum	There is no natural fauna

In Ben hamlet, water pollution is less serious in residential areas. People are still raising fish in ponds inside the village. In the fields, water pollution is relatively serious. Many living creatures cannot live in. the water.

3.7.2.3. Soil pollution

According to the ACC, the soil pollution situation in La Doi hamlet and Ben hamlet are similar. Both hamlets have households that discard waste water from animals and households directly to streets and gardens causing black and putrid water in flooding zones. These are areas that facilitate the development of mosquitoes and flies. But the most serious environmental problem is flooding after big rains. This obstructs traffic, causes skin diseases such as fungus, scabies, and feet illness. According to assessments of farmers, soils in fields are worse because of intensive cultivation causing impoverished soil. Soil fertility is dropping.

Map 4 . Polluted locations in La hamlet and Ben hamlet in June and July

Note: Light yellow shows the location of impoverished soil, red shows

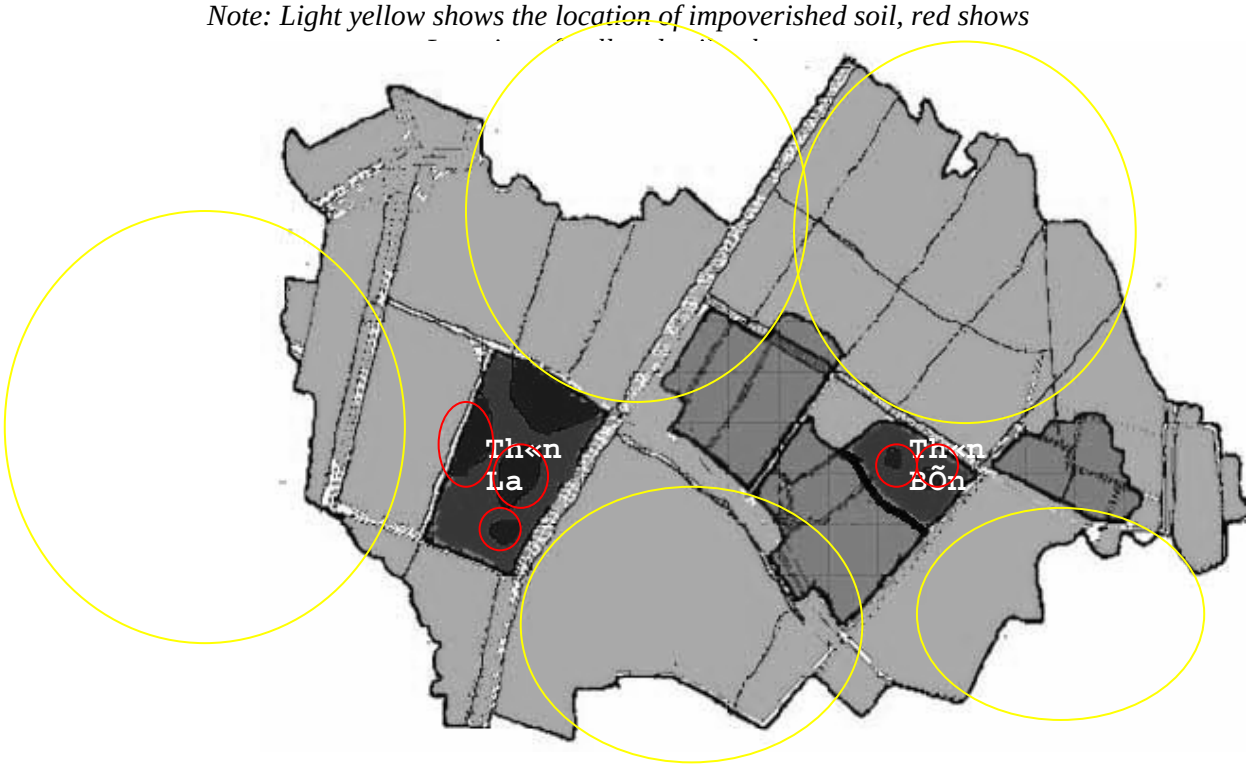


Table 24. Locations of polluted soil in La Doi and Ben hamlets

Pollution location	Pollution level	Causes of pollution	Description of pollution level	Impact
Residential area	Extremely serious	Flood	The water is 0.5m deep, even 1m when it floods	Skin diseases. Diseases in cattle. Traffic blocking.
	Very serious	Wastewater from livestock, and garbage discarded by roads	Soil is black, viscous, malodorous, with a lot of flies	Danger of intestinal diseases
	Rather serious	Wandering dogs and cattle	Manure of dogs, cattle on roads	Decrease rural beauty
In field	Serious	Use a lot of pesticide, intensive cultivation	Soil has less earthworms, soil is rigid, harder to plough than before	Economic: less fertile soil, so farmers have to use more fertiliser than before.

3.7.2.4. Natural fauna

(See part 3.2.1.4)

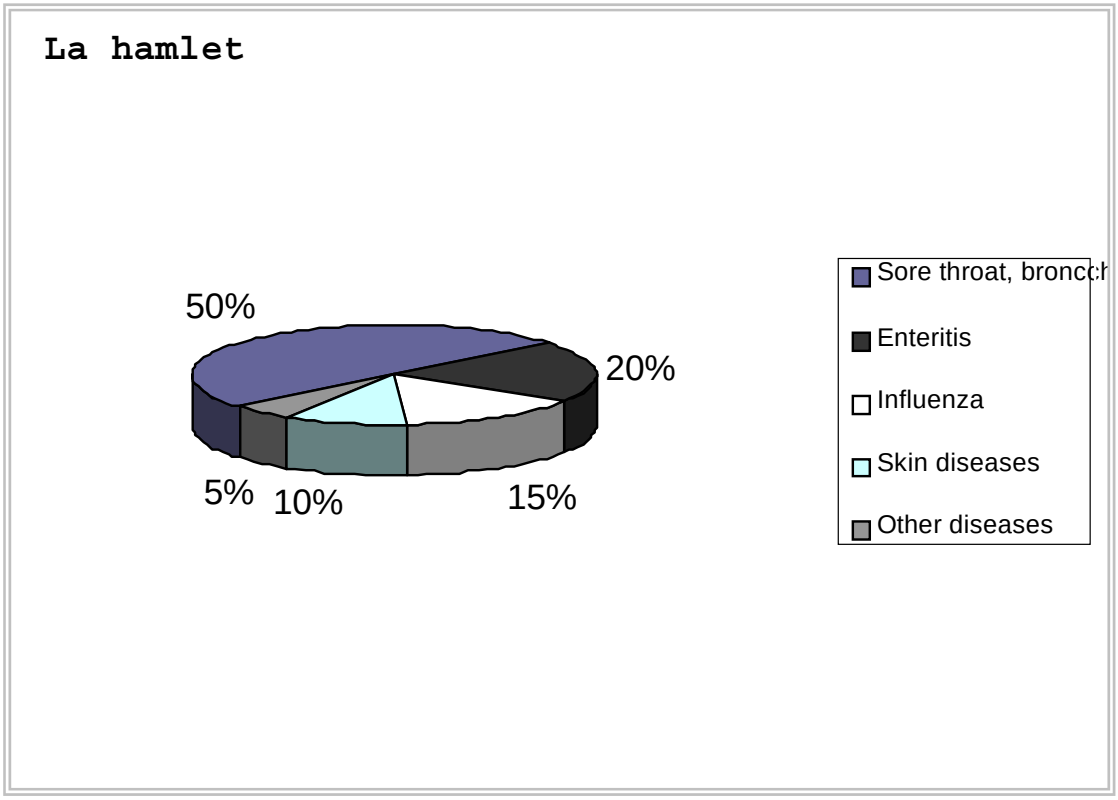
3.7.2.5. Pollution affecting to community's health

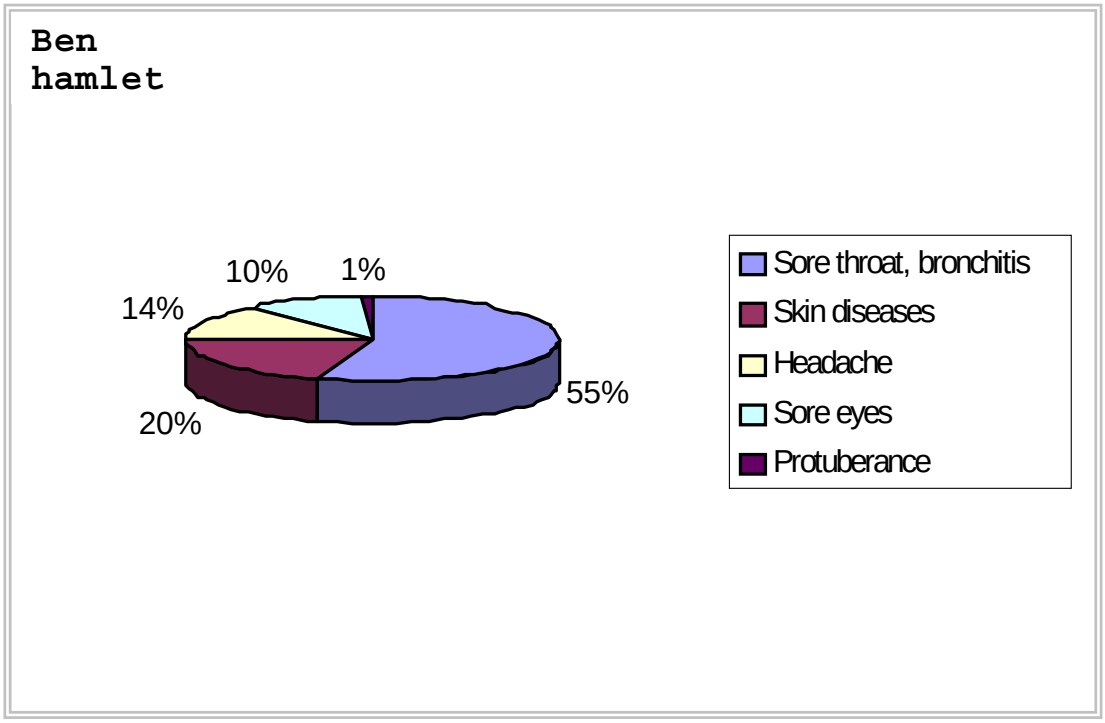
According to the La Doi community, about 40% of households that raise pigs suffer from headaches, nausea and dizziness and other negative health effects. Some people have had to go for medical treatments at the district hospital 3 to 4 times since they began to raise pigs intensively. Households raising pigs in Ben hamlet do not have these symptoms. The number of farmers with throat disease in La Doi hamlet and Ben hamlet is increasing, with people suffering from dizziness, headaches, sleeping difficulties, and loss of appetite during the time of spraying pesticide.

During periods of flooding, many people of La Doi and Ben hamlets develop skin diseases such as feet illness due to water, fungus and scabies.

Households processing food and some of their neighbors suffer from headaches, dizziness and breathing difficulties due to the smell of coal and agro products.

Chart 2. Some common diseases of La hamlet community and Ben hamlet community due to pollution





Source. Estimation of the ACC of the year 2002

3.8. SOLUTIONS AND ACTION PROGRAMS TO IMPROVE ENVIRONMENT

3.8.1. Solutions

The communities organized meetings and handed out possible solutions and proposals from farmers to communes and higher government officers. The purpose was to provide the farmers suggestions to improve the rural environment.

a. La hamlet

According the ACC, the community priority is to solve three problems:

- Water polluted by pig farming
- Flooded roads
- Air pollution due to pesticide

The ACC chose these three problems because they seriously and negatively impact on the daily life and health of the community, and on the natural resources.

Solutions recommended by the community :

Table 25. Community solutions; La hamlet

Solution 1. Establish an institution (organization) responsible for the local environment	Human resource: 1 person per hamlet assigned by PCC based on proposals of the community	Finance: For veterinary fees (each farmer yearly contributes 3 kg of rice)	Duties of this person: - Propagate, educate, monitor the implementation of regulations relevant to environment - Manage environment of each hamlet to provide information relevant to the community's environment - Consult PCC to implement policies and activities relevant to the environment
Solution 2. Improve broadcasting system in community	Implemented by commune broadcasting station	Finance: Commune budget	Purpose: guarantee all households can hear information from megaphone system about information relevant to environment and to warn persons who cause pollution

Table 26: Solutions for specific environmental problems at La village

Solution 1. Improve the drainage system			
Implementing activities	**Financial budged**	**Implement by**	**Expected results**
- Planning the water system, require households during any pond filling and house building, to leave room for drainage pipelines according to the land allocation agreement between the PCC and the households - The provides a regulation to prohibit fish weirs in the fish ponds - Establish a team to clean drainage systems.	Commune budget	Entire community	Waste water flows without local effects
Solution 2. Treatment of waste from pig farming			
Implementing activities	**Financial budget**	**Implemented by**	**Expected results**
Drainage system improvement	Commune's budged	Entire community	Reducing the water pollution
Built Biogas tank Built Septic tank	Government, with local contribution		
PCC moves some larger pig farms to a transition area	breeding household	Pig farmer	Reduces the pig density in the residential area

Solution 3. Reducing the pollution from inappropriate pesticide use			
Implementing activities	**Financial budget**	**Implemented by**	**Expected results**
1. Technical training for cultivators And farmers	Plant Protection Department, Agricultural extension organisation, Office of the Agriculture Ministry	Encourage and train agricultural extension officers, Plant protection Department officers arrange training, , PCC announces the training schedule	Identify proper pesticides and insecticides, Practice safe methods.
2. Forecast the increase of damaging insects situation and take preventive action for each area.	Plant Protection Department; Botanical Protection Organisation at the district level, Agriculture co-operative	District Plant Protection Department, Agriculture co-operative	Prevent/reduce the use of insecticides over a long time and in large areas
3. Broadcast information about the suitable time for insecticides spraying	PCC	Commune broadcast	Prevent/reduce the use of insecticides over a long period of time and over a large area.
4. Severely controlling quality of insecticides sold by local insecticides suppliers	Plant Protection Department of province, of district, PCC	Plant Protection Department of province, of district, PCC	Control/minimize the supply of illegal pesticides.

b. Ben village:

Insecticides

- Technical training to enhance the farmers' knowledge of the effective use of insecticides and minimizing of environmental pollution.
- Information by loud speaker broadcast about when particular insecticides would be effectively used
- Controlling of insecticides quality and types at local suppliers.
- Recommend experiments on the use of microbiological insecticides usage on crops.

Waste from insecticides use

- Build tanks for collecting wrappings and packaging of insecticides in the fields.
- on the spot treatment of wrappings and packaging wherever possible

Water Flood

- Both the ACCs for La and Ben villages recommended that the commune PCCs check and severely punish households which violate regulations (to prohibit raising fish weirs in the fish ponds, and for dimensions of irrigation channel for the community, according to the land tenure agreement between PCCs and the households).
- Establish the drainage system clearing team in the community.

3.8.2. Implementation programme:

La hamlet

Based on public opinion, the several solutions mentioned-above are difficult to be solved by the community alone. Support from the government and authorities in terms of regulations as well as partial finance support is necessary. For instance, in order to solve the problem of waste from pig farming, villagers expect to be supported in terms of technical training and partial finance resources to build biogas tanks and 3-tier filter-beds. Some solutions need to be based on by the authorities and be subject to supervision on such matters as building appropriate drainage and clearing away fish weirs. People in the community are willing to contribute partial expense and labour to these environmental activities (Table 24).

Ben hamlet

According to the ACC, the community is likely to build tanks for containing used pesticide containers. This is a controversial issue among the farmers but it has strong support from the hamlet executive committee. About the solution of building trenches to deliver water, the ACC thinks that the flooded households will pay the partial expense and labour to

build the water draining system as soon as the PCC forces the violating households to give back land areas that they have illegally invaded (Table 28).

Table 27. Action programs of La village

Solutions	Implemented by	Methods of implementation	Expense	Period of implementation	Supervisors	Expected results
1. 3-tier tanks	Households raising less than 10 pigs/farrow	Households breeding	Non-family support ~ 30%, Family - 70%	Best from quarter 1 2004	Assistant officials or commune officials	Waste treated before discharged into the environment
2. Biogas cellars	Households raising more than 10 pigs/farrow	Households breeding or employing workers	Non-family support - 50% Family – 50%	Best from quarter 1 2004		
3. building silage pits (1m wide, 1m deep)	Households buying ponds, people's committee of the commune, the community	Households invading the drainage have to execute regulations of the people's committee	Budget of the commune	Best from quarter 1 2004 to quarter 3 2004	commune officials, the hamlet head	Clearing off water ways, avoiding flood during heavy rain

Solutions	Implemented by	Methods of implementation	Expense	Period of implementation	Supervisors	Expected results
4. clearing away fish weirs in the fish ponds	Households raising fish	Households raising fish comply with the regulations of the PCC	Households raising fish	Best from February 2004 to June 2004	Commune officials and the hamlet leader	Clearing the pond surfaces

Table 28: Action program of Ben village

Solutions	Implemented by	Methods of implementation	Expense	Period of implementation	Supervisors	Expected results
1. Building tanks for pesticide containers	People in the hamlet	The hamlet head to hold a meeting to discuss about financial supports.	Each household pay 1000VND	From quarter 1 2004 to quarter 4 2004	The community leaders	Tanks built for pesticide container waste in the fields
2. Building pits (concrete)	Flooded households	PCC has methods to force the households which are trespassing on ditches to give back the land.	Flooded households provide money and labour.	Best from quarter 1 2004	Commune officials and the hamlet leader	Clearing off the ditch system

In brief, the community has posed practical solutions for the risk of local pollution, especially technical solutions such as building biogas systems and 3-tier filter-beds. Besides the required effort of the community, support by local and other authorities is needed for the communities to carry out the solutions and programs they have proposed.

Prior to this project, the environmental impact of agricultural waste and garbage do not seem to have been given high importance by the community or were considered too difficult to deal with. Given the expected increases in the intensity of crop cultivation and animal breeding placing further pressure on the local environment, a substantial change in the attitude of the community is needed. Apart from the above mentioned solutions, any diversification of production that leads to less polluting activities that lead to pollution should be considered.

***Regarding to external pollution risk affects to community environments*:**

This matter is an overarching problem. To overcome the situation, district and provincial authorities have to issue a policy to force large polluters, to implement pollution control measures or be made to compensate the community for their impact on the environment. At present, it seems that environmental authorities do not have a strong mandate for monitoring and implementing regulations on this matter.

Furthermore, the community has not had an opportunity to submit their opinions and ideas in relation to large developments that may negatively impact on their environment. There needs to be acknowledgement by authorities (provincial and district) that there are negative impacts from the development of industries on local communities and that a system for obtaining community opinions and recommendations is needed.

4. Community systems and regulations related to the environment:

4.1. THE STATUS OF REGULATIONS

4.1.1. Regulations of the commune authority:

a. Prohibit building weirs in ponds and require a minimum standard for containers of animal manure (such as pig manure tanks with doors away from the direction of the road). This regulation is from the commune communication board and approved by The PCC according to Regulation of “Country civilization lifestyle” from the Communication Department of Hai Duong province. This Regulation was given effect in 2002.

b. Prohibit building objects or any business activities that obstruct traffic on local roads (issued by traffic board of commune)

c. Prohibit keeping cattle on the road (issued by communication board of commune)

d. Prohibit unleashing free dogs without muzzle (issued by public security board of commune)

e. Prohibit the households from leaving wrappings, packaging of insecticides in the site.

f. Prohibit occupation of public land to become private land .

g. Regulations of the village:

According to the community board, village regulations are prepared by the head of the village, then agreed to by a village forum. Village regulations then need to be approved by the Party cell and then submitted to the PCC and the district to be approved.

4.1.2 Regulation of the community

Guarantee unchecked water flow in channels and the sewage system in residential areas

Given the seriousness of flooding in hamlets, since early 2002, the heads of hamlets have arranged with staff to remeasure the depth and width of channels and to demand that households maintain them. The leader of the hamlet will work with social organizations to motivate persons in hamlet to unblock channels and households will have to pay 10000 to 15000 VND per day to unblock channels under their responsibility. These activities occur once every 3 months. For channels not belonging to any household, the leader of the hamlet will demand that some people in community unblock them and also pay for the work at the same level as that given above. The budget for this activity is from the irrigation fund. The activity occurs once every 3 months.

However, according to the farmers, this regulation is not applied due to a lack of determination by the local authority.

4.2. COMMUNITY ACTIVITIES RELEVANT TO ENVIRONMENT MANAGEMENT

The ACC listed all activities relevant to the environmental management in the localities. This included details on such matters as initiated the activities, the methods, the financial sources, and the difficulties in implementation.

4.2.1. Activities implemented by the promotion of community and social organizations

a. General cleaning during the traditional new year festival

Communities encourage households to clean their villages on an annual basis during the 25th and 26th lunar calendar. Each household has at least one member participating in this activity. On December 24th, the heads of hamlets usually appeal to each household to contribute some money to organize two cleaning activities. These activities include cleaning roads and unblocking channels. This is a traditional community activity.

b. Regular cleaning of village roads

Since 2003, cleaning activities of village roads are carried out once a month by the commune youth unions. Members of youth unions in each hamlet do the cleaning and gather garbage from the roads. Funds for these activities come from the commune welfare budget. The costs are about 50.000 to 60.000 VND per day. However, according to feedback from the communities, these activities occur quite rarely, and do not promote positive responses.

c. Covering abandoned latrines and manure containers facing on the roads

This activity was started in April 2003 in both La Doi and Ben hamlets. Heads of hamlets demanded all households to obey this regulation or receive penalties. For example, after the head of the hamlet checks and identifies households which are not obeying the regulation, he delegates some young men in the Youth Union to go to the households and cover the latrines. These households then have to pay 50000VND for materials. However, in the winter season many households break into the latrines to obtain fertilizer.

d. Requirements for households that make papanh brick to move outside the residential areas

Households making papanh bricks in residential areas usually gather bricks in common places, blocking traffic. Therefore, in 2001, header and social organizations required these households to move to the exchanging zone.

4.2.2. Activities implemented by the promotion of PCC and social organizations

a. Environment days

Environment activities are implemented in the commune on environment days such as World Environment Day on June 5 and during the week on fresh water and on the

environment cleaning dates. These activities involve encouraging farmers in hamlets to clean roads and gather garbage. These activities are voluntary.

b. Mediation of environment conflicts

In the commune, there are some conflicts levels about the environment. Yearly, the PCC has to solve a few conflicts relevant to pollution. The main solving method is through mediation.

Box 1.

Solving conflict about chicken manure pollution

In Cao Doi hamlet, in 2003, there was a conflict between Mr Thuy (a retired soldier) and Mr Quan (chicken raiser). Reason of conflict is that Mr Quan usually places bags of chicken manure near the windows of Mr Thuy. Mr Thuy was very annoyed and he complained to Hop Tien PCC. President of Hop Tien PCC authorized Mr Cong, head of this hamlet to solve this conflict. Mr Cong invited these 2 households to his house to mediate. Generally, these 2 households are reconciled, Mr Quan agreed to move his bags far from Mr Thuy's windows

4.2.3. Activities implemented by the health station

The health station usually organizes open inoculation times and checks water usage of people. On the 25th day of each month, the station organizes injection times for children and medical examinations for women. Injection activity attracts many people. However, examinations for women is unpopular because women have to pay for the service and medical drugs. In fact, at present, the station has very few staff so it is only able to give examinations the hamlets of Ben, Dau, and Te. These hamlets are near this station. Farmers in La Doi and Cao Doi hamlets mostly go for medical examinations in other communes.

The station conducts regular inspections of water usage in May and September. The station does not have scientific equipment to analyse water quality. Therefore, the station has to base water cleanliness on the dimension of the cisterns and indicators of water quality for drinking and household use. Any household that has a rain water cistern over 3 m^3 with a cover will be recognized as household using clean water according to a standard of the health preventive centre of Hai Duong province. According to the community, at present, there is no y solution to help poor households to build a cistern for clean water. However, households having cisterns will allow the ones without cisterns to use their rain water when supply permits. The

community expects that the agricultural extension service to subsidize the poor to build cisterns.

4.3. COMMUNITY ASSESSMENT ON ENVIRONMENTAL REGULATIONS AND ENVIRONMENTAL ACTIVITIES OF GOVERNING BODIES AT THE CENTRAL, PROVINCIAL, DISTRICT AND COMMUNE LEVELS.

The ACCs report that up to the present, the people do not know of any legal documents of central, provincial, district governments concerning the environment. These offices have not discussed solutions to environmental problems. There are no training courses or discussions about legal documents and national policies on the environment. Although the broadcasting system of the commune has informed some households of documents relevant to environment, farmers do not believe that these documents will solve environmental problems, in reality.

The commune authorities have made some regulations relevant to the environment, but because the supervision and verification process of implementation is not good, many people do not obey the regulations, and punishment is not enforced, so regulations are not effective.

The health station raises awareness about water usage, inoculations and personal health. However the assessment of water quality is seen to be too qualitative. Because the health station is under staffed, supervising and verifying and the propagation process are not good. The PCC assigned the health station as the unit responsible for environment in the locality but in fact, farmers do not know about this.

The ACC reports that regulations are not applied regularly, and the punishments are not strict, and there is little social pressure placed on people who break these regulations. At the commune level supervision is weak and the implementation of these regulations is not good.

Large organizations such as the Youth Association of the commune also organize some activities such as road cleaning and environment days and other related. However, these activities are not ongoing and results are limited.

The ACC has developed a set of indicators to monitor and assess the effects of applying village and community regulations including the attendance of people in the

regulation development process and improving the villagers' knowledge on these regulations (Table 20).

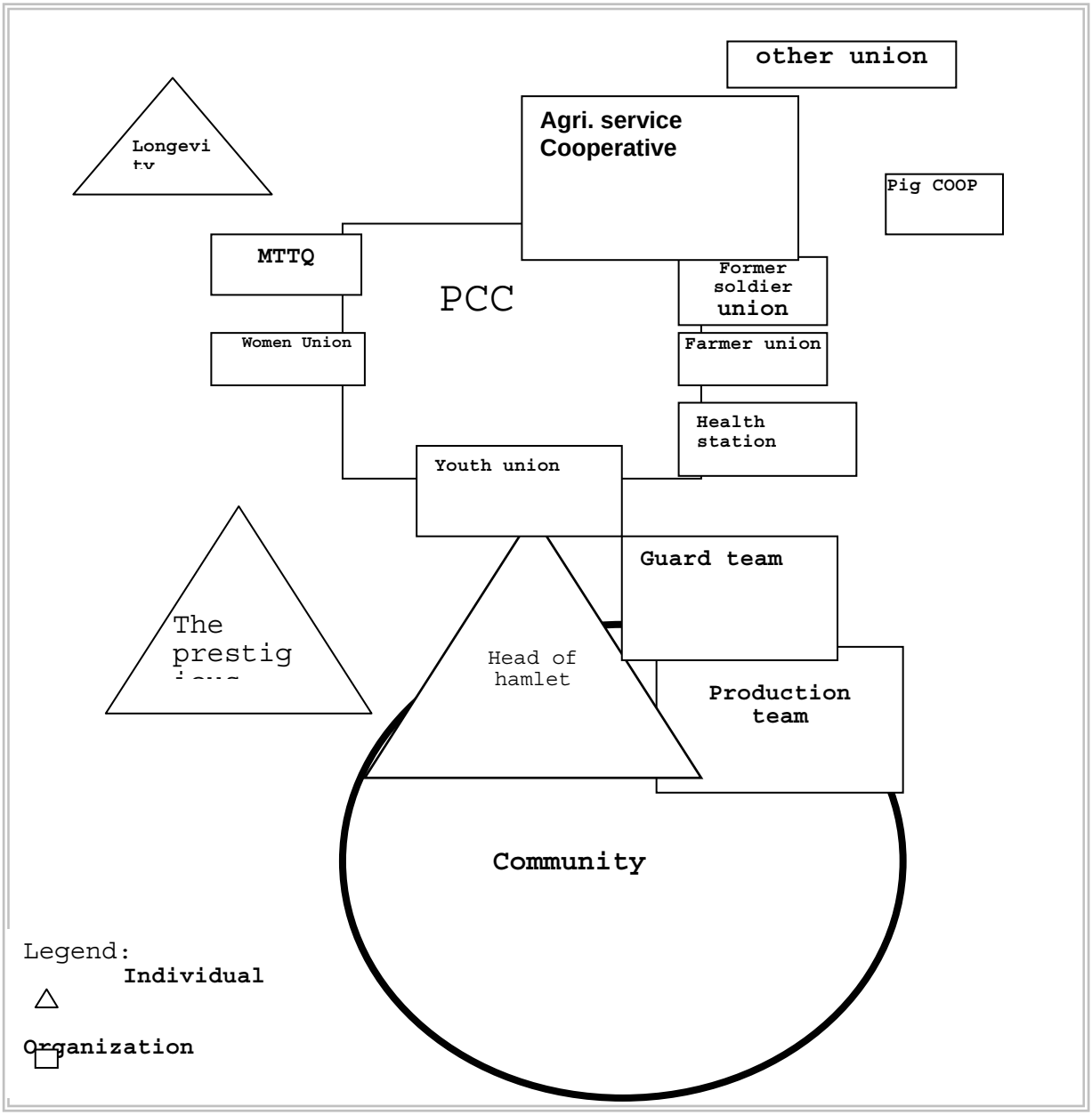
Table 29. Effect of regulations on environment in the villages

Regulations for the people in the community	Issuer	Community involved in making regulations ?	People informed?	Effect	Reasons
Keep cattle off the road Do not permit building of toilets or containers of animal manure with the door facing to the road	Council of information and culture	No	Yes	Low effect	Warrant required; no coercion
Do not permit an operation/business that disturbs transportation	Council of transportation	No	Yes	Low effect	Warrant required; No coercion
Don't permit the dogs running on the road without muzzle	Police of village	No	Yes	No effect	Regulation is not suited to actual conditions
Obey regulations on the size of irrigation channels Don't permit use of public land of the village	Cadastral Council	No	Yes	No effect	No warrant and no coercion
Don't permit families to throw chemical bottles/covers on the fields	Head of hamlet proposed and approved by PCC	Decided by communities	Yes	No effect	Without warrant, No coercion

4.4. ASSESSMENT OF EXISTING VILLAGE INSTITUTIONS AND THEIR IMPORTANCE

The ACC listed all existing organizations and individuals in the village, their importance and relations within the community. In the chart below, the big circle represents the community. Other organizations are arranged near the circle. The closer the organization/individuals are to the circle, the more important these are to the community.

Chart 1. Institutions which are related to the community environment



The ACCs of the two villages ranked individuals and organizations according to their official importance to the community. The results show that Village PCC to be the most important institution. It issues regulations and has power to decide issues related to the socio-economy and living conditions, including environmental issues. In fact, the actual importance

of the PCC to the community is not so great. As shown in the chart and it ranks 7th in the arrangement table, which is shown below and compiled by the ACC. The head of the commune is the second most important institution, however its actual importance to community is seen to be the highest as it ranks first in the arrangement table. The head of the commune is the person who has the most influence on regulations and activities on environment which most directly impact on people in the community. In the community, the production team and protection (guard) team are also important to the community as they are responsible for implementing regulations. At the moment, among all the social organizations in community, the Youth Union is the only one who has much of an impact in terms of environmental management. The Woman's Union and other mass organizations and cooperative have not yet had an impact.

.

Table 30. Importance and level of effect of institutions on local environment management regulations

Potential importance	Actual importance	Institution
1	7	Commune People Committee
2	1	Head of village
3	9	Agri. service cooperative Hop Tien
4	2	Production Team
5	3	Guard team of commune
6	4	Youth Union
7	5	Health care station of village
8	8	Father land front, Women's Union, Veteran's union, Farmers` Union
9	6	Group of prestige people (aged people, retired soldiers)
10	10	Husbandry Cooperative of high quality pigs
11	11	Heads of clan
12	12	Others associations (Horticulture group, Badminton organization, aged people union, etc.)

Based on this, the ACC has made suggestions for different levels of government aimed at improving the environmental conditions in the hamlets.

5. Suggestions from the communities

Village level

- It is necessary to have a network that has responsibility for the environment of village and commune. This network takes part in guidance and supervision to help local government and the community in problem solving.
- People should take part in developing local policies that relate to the environment.
- Strictly penalize persons breaking environmental regulations in the locality.
- Improve the loudspeaker broadcasting system (La hamlet) to help farmers know when to spray pesticides and to receive other information of the socio-economy and the environment.
- Garbage dumps of the village and commune should be planned
- Regularly check the legality of pesticides sold in the village.
- Prohibit the location of brick kilns.

Extension organization

- Coordinate organizations to train, consult and support farmers in correcting water pollution from animal farming in La Doi hamlet .
- Guide farmers in the community on how to identify the quality and use of farm chemicals, and on IPM.

Plant protection organization

- Forecast pest and fungus build up with better accuracy for each zone in order to avoid unnecessary spraying of pesticides.
- Manage quality and types of pesticide in shops in the locality.

Research institute

- Research mechanism of processing garbage, particularly bottles and containers/covers of chemicals
- Research on dryers for traditional food processing in order to reduce environmental pollution

Different level of government and high power organizations from center to local

- There should be institutions managing the environment at the commune level
- Make regulations and methods to remove pollution sources from industrial activities in residential areas. Examples are the abattoir and the power plant.
- Design regulations and organize the gathering and treatment of waste from pesticide use.

Units producing pesticide

- Bags of pesticide should be made of nylon instead of glass because glass is very difficult to treat in community.

A summary, according to the community:

Firstly, we can see that informal regulations about environment do not exist or exist very rarely in communities now. Meanwhile, farmers do not know of many formal regulations. This leads to a very weak environmental management system.

Secondly, there exist barriers to communication from the community level to higher levels of government. Because of this, proposals and demands of communities concerning environmental management are rarely listened to. The above diagram about institutions can partly explain this. The main reason is that the PCC - the office which is able to make policies in locality does not have a close two way relationship with the community at the village level. The head of hamlet is the person closest to community but he or she has a lot of duties, and environment management is not usually a high priority.. Therefore, establishment of a commune level institution dedicated to environmental issues is very important. This institution would help communicate environmental issues, problems and proposals to government authorities on higher levels, helping the community participate more actively in environment management.

6. Conclusions and recommendations of the research team

Conclusions

Recently, the agricultural production and other activities in rural areas are relatively well diversified and developed. This process has caused damage to the environment and will cause further pollution in the future. While it is important that environment problems be solved at the community level, research undertaken indicates that communities need to be encouraged to believe that they can make a difference to their environmental situation. The problem is not so much a lack of awareness of environmental problems but an inability of households to gather enough momentum across the community in order to make lasting improvements to the local environmental management system.

Recommendations for improving environmental management must also take into account the priorities of local communities. While the environment is a concern, it is only ranked at the 7th or lower position out of 11 problems of the two researched communities.

At the local level, a large number of environmental regulations exist but are not very effective due to poor implementation and, in some cases, inappropriately focusing on issues which are not important. Households have little awareness of their rights and responsibilities at all levels of government in regards to environmental protection.

This participatory environment appraisal was paid substantial attention by people in the two researched communities. They stated that this is the first time a research program has tried to closely understand real issues in the community by listening to what the people have had to say on these issues.

Recommendations

While this report contains many recommendations described in detail, the following recommendations are listed in order to provide a flavour of the measures needed to improve the environment management system at the community level:

1. Households are aware of many problems that impact on their well-being. However, this does not mean that they understand the nature of the problems, why they occur, and the cost and benefits of adopting other methods that do not result in environmental problems. Consequently, there needs to be ongoing campaigns to educate, inform and train farmers on ways in which they can help improve their local environment. There needs to be a common understanding that each person in community has responsibility for the environment.
2. It is necessary to have a close linkage between households, local authorities at the village and commune level as well as social organizations, such as the women's union, seniors organizations, and farmers` organizations so that all institutions communicate on issues related to the environment.

3. Encourage communities to participate in the design of regulations about environment management and protection at higher levels of government.

4. It is necessary to establish an institution at the commune level which is focused on environment management and maintaining local environment management networks at the village level. This network has the responsibility for propagating, supervising and controlling environmental activities each locality.

5. Encourage farmers to adopt technical innovation in cultivation and animal husbandry through training courses, such as on IPM methods.

6. Government can help speed up improvements to the environment through co financing and providing capital for environmentally friendly infrastructure. This may include biogas tanks, filtering cisterns, drilled wells, and containers for pesticide bottle and bag waste.

7. While many environmental problems can be solved at the community level, there are sources of pollution from outside of the community. Examples of this include air pollution from large factories, power plants and brick kilns. Many improvements can be made to the environment management system at levels higher than the community level (district and provincial government). In this report however, the emphasis on the role of the communities. It is important that the community be able to voice its opinions on these matters. Their opinions and their welfare need to have a direct influence on the way these external environmental problems are dealt with.

Annexes

Annex 1. List of members of the local authority collecting information

Organizations	Job	Name	Sex
Commune authority	Chairman of commune People's Committee (PCC)	Le Van Hong	Male
	Vice chairman of commune PC	Tran Viet Tien	Male
	President of cooperative of agricultural service	Nguyen The Mung	Male
	Administrative staff of commune	Nguyen Duc Sinh	Male
	Head of cultural committee of commune	Nguyen The Thap	Male
	Head of health station of commune	Nguyen Van Nam	Male
Social organization	Head of father land front of commune	Le Quang Hoi	Male
	Head of farmer union of commune	Vuong Dinh Thach	Male
	Head of women union of commune	Mac Thi Mao	Female
	Head of youth union of commune	Tran Van Ha	Male

Annex 2. List of members in the environment ACC in La hamlet

Job	Name	Sex
Head of hamlet	Nguyen Van Suc	Male
Head of women union of hamlet	Mac Thi Mao	Female
Head of youth union	Tran Van Ha	Male
Large pig farmers	Mai Van Chinh	Male
Medium pig farms	Do Van Ky	Male
Small pig farmers	Vuong Dinh Tuyen	Male
Large food processing	Nguyen Van Ket	Male
Small food processing	Vuong Dinh Ton	Male
Prestige person, without food processing and animal husbandry	Pham Dinh Bay	Male
Aged person, without food processing and husbandry	Pham Van Thang	Male
Cultivation	Pham Thi Thieu	Female

Annex 3. List of members in environment ACC of Ben hamlet

Job	Name	Sex
Head of hamlet	Le Quang Quyen	Male
Vice president communist party of hamlet	Le Thi Toan	Female
Cultivation	Pham Van Trang	Male
Cultivation	Can Thi Ha	Female
Cultivation	Le Thi Vinh	Female
Pig farming	Le Cong Nghiep	Male
Pig farming	Mac dang Thanh	Male
Bamboo weaving	Le Van Dieu	Male
Onion frying	Vu Van Hai	Male
Senior elder	Le Van Tien	Male

Annex 4. Population structure and resources

Source: PCC of Hop Tien commune

N	Criteria	Unit	Total
1	Total population	Person	7351
	Male	Person	3563
	Female	Person	3968
	Agricultural population	Person	6961
	Non- agricultural population	Person	390
	Race of Kinh	Person	3347
	Other races	Person	4
2	Total households	Hé	1997
	Agricultural households	Hé	1967
	Non-agricultural households	Hé	30
3	Total labor	Person	2796
	Male labor	Person	1420
	Female labor	Person	1376
	Agricultural labor	Person	2720
	Non agricultural labor	Person	76
4	Rate of population increasing	%	0.7
	Households in/year	Person	12
	Households out/year	Person	14
	Born/year	Person	51
	Death/year	Person	12

Annex 5. Land situation of Hop Tiens commune in 2002

Source: Data of PCC of Hop Tien commune

Soil type	Surface (ha)
Total natural soil/land surface	643,08
I. Agricultural soil/land	368,28
1. Soil of rice, soil of vegetable	343,10
2. Soil of fixed garden	25,05
3. Soil used for livestock	0,12
4. Water faced soil to raise water animal	53,73
II. Specific soil	
1. Soil for construction	6,03
2. Soil for traffic	69,05
3. Soil for irrigation and specific water	39,4
4. Historical Heritage soil	0,7
5. Soil for cemetery	7,8
6. Other specific soil	
III. Residential soil	57,3
IV. Waste soil	
1. Unused water soil	2,98
V. Coefficient of cultivation	2,7

Annex 6. Situation of infrastructure of Hop Tien commune

Source: Data of PCC of Hop Tien commune

N	Criteria	Unit	Datang
1	Rural transportation		
	Total length of rural road	Km	17,50
	Total length of concrete road	Km	15,8
	Total length of soil and stone	Km	1,7
2	Irrigation		
	Total length of channel level 1	Km	2,4
	Total length of channel level 2	Km	11,6
	Total length of concreted channel	Km	2,36
3	Electricity		
	Households use electricity	Hé	1997
4	Information		
	Households have TV	Hé	786
	Households have telephone	Hé	180
	Power of megaphone system	W	800
	Number of megaphones	megaphone	10
5	Markets in commune	Market	2

Annex 7. Production situation of some main crops in 2002

Source: Data of PCC of Hop Tien commune

No	Crop	Surface (ha)	Yield (ton)
1	*Food crops*	710, 2	4260
	Spring rice	351,4	2073,26
	Summer rice	351,4	2108,4
	Summer/winter corn	7,4	23,9
	Sweet potato	11,1	11,998
2	*Winter vegetable*	258	
	Onion, garlic	136,1	
	Potato	8,44	
	Short-term veg	9,25	
	Other vegetables	104,21	

Annex 8. Animal Husbandry situation in 2002

Source: data of Hop Tien PCC

Kind	Amount
Pig	7230
Buffalo	180
Cow	300
Poultry	50.680

Annex 9. Natural resources usage

Natural resource	Accessing methods	Accessing cost (VND)	Usage purpose	Percentage of users
Rain water	build cistern	1.500.000	Drinking water	80%
Underground water	Drill well	300.000	Bathing Cooking Husbandry Processing food	70% 20% 60% 20%
	Dig well	2.000.000	Bathing Husbandry Processing food Not used	30% 30% 10% 70%
Surface water of ponds in residential areas	Use directly	0	Contains waste water of husbandry, processing food	60%
		0	Contains water from daily use	100%
		Tax of using water	Raise fish	20%
Surface water of ponds in exchanging areas	Use directly	Tax of using face of water	Raise fish	10%
		0	Contain livestock manure	1
		0	Contain waste of daily life	1

Natural resource	Accessing methods	Accessing cost (VND)	Usage purpose	Percentage of users
Surface water of channels, sewage system	Use directly	0	Waste water from livestock	4
		0	Contains house waste	10
Water of Kinh Thay river	Irrigation system	Irrigation fees (14kg per 360m^2 per season)	Cultivation	9
Soil	Build house, cage, kiln	Tax of residential land (10700 per household)	Husbandry, food process, other activities	10
	Cultivation	Tax of agricultural land (11 kg of rice per 360 m2 per season)	Cultivation	9