



ICD-DMP-01

TECHNICAL REPORT

Integrated Community Development Demonstration Program The Vietnam Experience 2001-2003



Vietnam Productivity Centre
Directorate for Standards and Quality, Vietnam

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Director of Vietnam Productivity Centre
Ms. Nguyen Thi Bich Hang

Executive Summary

The Vietnam Productivity Center (VPC), together with the Asian Productivity Organization (APO) and the Ministry of Science, Technology and Environment (MOSTE) have successfully implemented the first Green Productivity (GP) Demonstration Projects at the community level. GP, a strategy used to address environmentally sustainable development was established by the APO in 1994. Internationally, GP programs have been applied to industrial and service sectors, Vietnam is the first country to implement GP at the community level.

Between 1998 and 2003, Green Productivity Demonstration Programs were successfully implemented in 81 villages of Vietnam. These programs were made possible with the financial support of the APO and the Directorate for Standards and Quality (STAMEQ). The VPC also had the cooperation and support of MOSTE, various Provincial Departments of Science, Technology and Environment (DOSTE), Departments of Rural and Agricultural Development (DRADs), the communities where projects were implemented, many research institutes and countless other organizations.

The application of GP methodology in villages is a cost effective way to improve the local environment and the overall standard of living. Water pollution, solid waste management, human and animal waste management and pesticide and fertilizer use, low income are the main issues that have been addressed in the villages contained in this report. Options to address these issues have included introducing techniques such as integrated pest management and natural farming to minimize pesticide and fertilizer use; water treatment facilities, capable of producing potable water to improve the health of villagers; building hygienic latrines that can deal with human wastes and introducing regular solid waste collection systems. Results obtained from implementing GP options such as these have been very positive, the villagers awareness on environmental issues has improved and the overall standard of living has increased.

GP methodology has become an important tool for community development in Vietnam. During 2001-2003, 81 villages across Vietnam are applying GP at the community level. It is hoped that more villages will recognize the benefits of the GP program through these 81 villages and will begin to initiate GP programs in their area, as ultimately our aim is for GP to become a self-sustainable nation-wide program.

TECHNICAL REPORT

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1 General information

1.1 Green Productivity (GP) Project 1998-2000

The GP in Communities program began in Vietnam in 1998 as a pilot program in 3 villages, Tinh Loc and Kha Ly Ha villages in Viet Yen commune, Bac Giang province and My Khanh B village in Cu Chi district, Ho Chi Minh city. In this phase, the primary areas of concern were identified as clean water supply, solid waste management, pesticide and chemical fertilizer use reduction and traditional career development. In Phase II 1999 – 2000, the GP program was expanded to 9 villages in the North, the Centre and the South of Vietnam in Bac Giang, Ninh Binh, Hue, Da Nang, Phu Yen, Ho Chi Minh, Can Tho and Vinh Long provinces. Table 1 summarizes the GP options which were implemented in phase I and phase II of the project.

Table 1 GP options implemented in phase I and phase II (1999 – 2000)

Clean Water:
<ul style="list-style-type: none">• Provision of potable water from a central water supply plant• Application of a filtration system to raw water supply before usage
Solid Waste Management
<ul style="list-style-type: none">• Formation of solid waste collection and treatment teams to manage domestic waste• Separation of useful or recyclable waste before disposal.• Construction of common rubbish bins• Periodic cleaning of the village road
Human and animal waste management
<ul style="list-style-type: none">• Application of anaerobic (biogas) treatment to human and animal waste to generate methane and fertilizer.• Composting of human and animal waste for use as fertilizers• Application of effective microorganisms (EM) to reduce odour from animal waste• Construction of hygienic latrines
Pesticide and Chemical Fertilizer Management
<ul style="list-style-type: none">• Application of Natural Farming (NF) to reduce the amount of pesticide and chemical fertilizer used in agriculture• Application of Integrated Pest Management (IPM)
Energy Conservation
<ul style="list-style-type: none">• Biogas systems that digest waste water to produce gas for household cooking• Construct energy efficient stoves to reduce energy use and pollution generated
Income Generation
<ul style="list-style-type: none">• Establishment of Mushroom Farming as an additional income source• Development and recovery of traditional handicraft village industries such as rattan-bamboo, fish sauce production and rice vermicelli production.

- Application of VAC, fish farming/vegetable production/waste water system.

Increase environmental protection awareness

- Promote environmental protection using community information distribution systems including, leaflets, posters, billboards and loudspeakers
- Establishment of environmental regulations in the village
- Organize GP contest within the villages for information sharing within and between villages
- Organise clean environment campaigns within villages

2 Green Productivity Program (2001 – 2003)

2.1 Introduction

In response to the success of stage 1 and 2, 1998-2000, the Green Productivity (GP) program was expanded so that in 2001 – 2003, GP has been brought to 81 villages in 21 provinces: Ha Noi, Hai Duong, Quang Ninh, Ninh Binh, Bac Giang, Thai Nguyen, Hoa Binh, Ha Tinh, Nghe An, Hue, Da Nang, Quang Nam, Gia Lai, Kon Tum, Ho Chi Minh, Can Tho, Vinh Long, Vung Tau, Ben Tre and Ca Mau Vietnam. In addition to the GP options in phase I and phase II, additional GP options were generated and implemented. These include planting trees to prevent sand erosion, worm farming, bee keeping at a household level and the use of a foliage colour table to control nitrogenous fertilizer use in rice farming. Additional GP options for environmental protection and income generation were generated and implemented widely in this phase.

2.2 Methodology

2.2.1 Program announcement and selection of villages

GP program has been prominent in both local media as well as in governmental briefs. The villages can register to participate in the program to their provincial Department of Science and Technology (DOSTE) or Department of Agriculture in the case of Ho Chi Minh City. To register the villages need to send a formal letter and proposal, which includes summary information such as natural condition, socio-economic condition, common problems and possible options which can be applied in their region.

Based on the information from the provincial level, the VPC will review and organize the initial survey to the registered villages. The selection of participating villages will be based on requirement and commitment of villages and province.

In order to participate in GP program, the villages need to meet the following criteria:

- Village and province need the certain budget for GP option implementation
- Commitment of local authorities for GP implementation
- Commitment of villages/commune for GP implementation

2.2.2 Setting Priorities

Villages will be classified based on priority falling into either first priority, second priority and third priority

- First priority: Provinces who participate in the GP program in the first year
- Second priority: Provinces who have participated in GP program in phase 1 and phase 2
- Third priority: The village have implemented in previous phase, and just expand and maintain in this period

The onsite visits for VPC staff to the province will be based on priority ranking

First priority: The average number of onsite visits is 8

1 st time:	Agreement between VPC and provincial DOSTEs
2 nd time:	Training on GP concepts and methodology, GP options generation and selection and Development of a implementation plan for GP options
3 rd time:	GP options training (integrate with monitoring)
4 th , 5 th time:	Monitoring
6 th time:	Exchange with other GP teams
7 th time:	Prepare for GP contest
8 th time:	GP contest at village

Second priority: The average number of site visits is 7

1 st time:	Agreement between VPC and provincial DOSTEs
2 nd time:	GP options generation and selection; Develop plan to implement GP options
3 rd time:	GP options training (integrate with monitoring)
4 th , 5 th time:	Monitoring
6 th time:	Prepare for GP contest
7 th time:	GP contest at village

Third priority: The average number of onsite visits is 5

1 st time:	GP options training
2 nd , 3 rd time:	Monitoring
4 th time:	Exchange experience with other GP teams
5 th time:	GP contest at village

Appendix 1 provides further detail on the priority ranking system and the number of onsite visits based on the priority

2.2.3 Partnership

2.2.3.1 Steering Committee

The GP process involves various organisations at different levels such as:

- The Central Steering Committee
- Provincial Steering Committees
- Green Productivity Teams

The Central Steering Committee includes representatives of the Asian Productivity Organisation (APO), the Directorate for Standards and Quality (STAMEQ), the Vietnam Productivity Centre (VPC) and external technical experts. This Committee has responsibility for overall coordination of the project, technical experts' support and monitoring the project's progress.

A steering committee has also been formed in each province to implement the GP program. These committees include representatives from the provincial Department of Science, Technology and Environment (DOSTE), the village head and local experts who support villagers in implementing GP projects. The Provincial Steering Committees are important for ensuring commitment and support from provincial and community managers. The main responsibilities of provincial steering committees are to monitor the project activities in their province and to adjust the implementation plan as the situation changes. Table 2 is an example of Steering Committee in Hai Duong.

Table 2 Steering Committee in Hai Duong

	Steering Committee	Position
1	Ha Bach Dang – Committee Head	Director – Hai Duong DOSTE
2	Nguyen Duy Sach – Committee Deputy Head	Deputy Director – Hai Duong DOSTE
3	Bui Thi Hoan	Vice President – Provincial Women's Union
4	Nguyen Thi Ngoc Bich	Secretary of the district's Youth Union
5	Nguyen Van Que	Vice President of the Commune's People's Committee
6	Nguyen Van Thung	President of the Commune's People's Committee
7	Nguyen Van Tinh	Vice President of the Farmers' Union
8	Hoang Phuong – Project Secretary	Head of the Environment and Science Department

GP teams were formed in each village. The team members are representatives from local unions or associations such as the local Women's Union, Youth Union and Farmers'

Association. The GP team system encourages and empowers the team members who become directly involved in promoting project activities and helping their fellow villagers to understand the benefits of the program. Through the GP teams, GP options have expanded widely in the surrounding communities.

A typical GP team includes 8-10 members. However, the number of team members may change according to the scale of each village. Each team member has a responsibility for particular problems such as provision of clean water supply, solid waste management system and chemical and pesticide controls. The teams develop self-governing regulations, in which member responsibilities, team meeting schedules and venues are stipulated. The regulation is a framework for the GP team’s activities. GP teams meet frequently to identify the problems that are faced by the village and propose solutions to solve those problems. For each GP solution, team members will be responsible for monitoring its implementation. Table 3 contains the GP members in Ninh Binh as an example.

Table 3 GP team in Vuon Thi village, Gia Hoa commune, Gia Tan district, Ninh Binh Province

TT	Member	Position
1	Tran Xuan Thiep – Team leader	Cell Secretary, Head of village
2	Dinh Van Quy – Deputy team leader	President of the Farmers’ Union
3	Tran Van Hien – Secretary	Secretary of the Youth Union
4	Bui Van Thu – Member	Head of Veterans Union
5	La Thi Dung – Member	President of Women Union
6	Do Ngoc Canh – Member	Clinic

Organization structure of Steering Committee was described in Figure 1

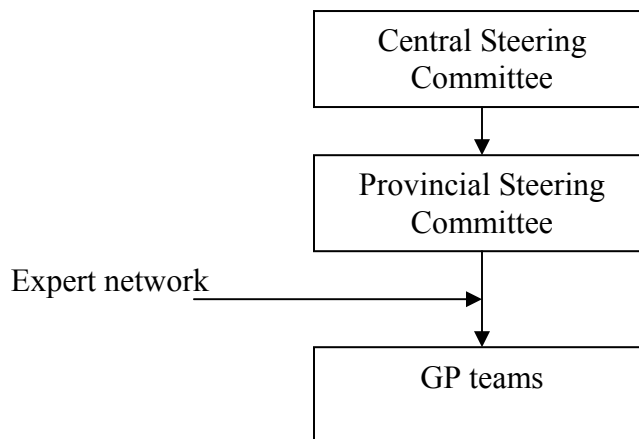


Figure 1 Steering Committee

2.2.3.2 Project Coordinator

In order to evaluate and monitor the project's progress, a network of coordinators was established from national to village level. The organization of project coordinator is presented in Figure 2

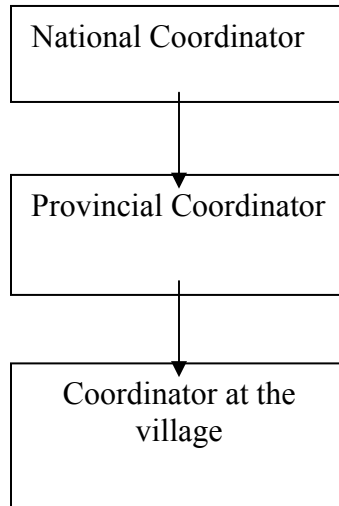


Figure 2 Project Coordinator

At the national level, a group of coordinators were established. Each coordinator responsible for monitoring in several provinces.

Each province is assigned one coordinator to monitor the progress of projects at provincial level and report to VPC. The coordinators at the village act as a bridge between village and provincial organisations

2.2.4 Initial meeting in each province

After selection of a village to participate in the program, the VPC sends a general implementation plan of the GP program to each province. Based on this plan, the province will establish a detailed plan. The general plan is detailed in Appendix 2

After receiving an implementation plan of province, VPC will organize meeting with each province to finalize provincial implementation plan as well as organize a survey to implementation village to have some idea if the implementation plan is suitable or not

2.2.5 Network of experts

GP teams and the other coordinators of project activities in the province are trained in GP methodologies. The network of local technical experts is established with reference to the identified problems and proposed GP options for each area. The Department of Science, Technology and Environment coordinates and implements GP options with the

collaboration of technical experts from various fields such as energy, agriculture, clean water supply and forestry extension. These experts will train and transfer relevant technical information and expertise to GP team members and villagers. Table 4 presents an example of expert network in some provinces

Table 4 Examples of Networks of experts in provinces

Province	Network of expert
Hai Duong	<ul style="list-style-type: none"> • Plant Variety Centre • Food Processing Department - DARD • Encourage Agriculture Department • Farmers Union • Applied Science Centre
Thai Nguyen	<ul style="list-style-type: none"> • Department of Agriculture and Rural Protection • Plant Protection Department
Hoà Bình	<ul style="list-style-type: none"> • Energy Institute • Bi-technology Centre – Agriculture Genetics Centre • Viet Nhat Development Centre • Hoa Binh Sanitary Clean Water Supply • Encourage Agriculture Department
Đà Nẵng	<ul style="list-style-type: none"> • Centre for Environmental Protection • Environmental Technology Centre • Encourage Agriculture Department • Centre for Energy Research • Da Nang National University

2.2.6 Coordination with other local programs in the province

Most GP options are implemented in conjunction with other local programs in the provinces such as the Mountain Rural Development Program, the Rural Clean Water Supply Program or the Poverty Alleviation Program. The main objective of the GP program is to increase the quality of life of people whilst protecting the local environment and achieving sustainable development. Most of community development programs have the same objective. Therefore, the integration of these programs with GP can strengthen these programs' contribution to socio-economic development in rural areas.

2.2.7 Promotion

GP Promotion and Dissemination activities are a very important factor in the success of the GP program. Depending on the project goals and contents, a number of channels are used to promote GP including:

- Banners, slogans and posters
- Establishing a promotion campaign on mass media, i.e. TV and radio
- Organizing study missions on GP practices

- Facilitating GP Demonstration Village visits
- Conducting GP competitions
- Reporting on GP Programs through TV, local and national media
- Organizing training courses, seminars or conferences on GP Practices

The main methods of promoting GP methodology and news in villages is through the use of banners, slogans, posters, local radio, TV, and notice boards. The aims are to disseminate the benefits of GP Solutions as well as appeal to people to actively join the Program. This has been most successfully used in Hai Duong, Phu Yen, Da Nang and Ho Chi Minh City.



GP contest in Binh Chanh commune – Ho chi Minh city

Another GP promotion method is visiting the demonstration villages that have successfully implemented the project to learn and share GP practical experiences. These visits can be both locally organised by provincial authorities or occur to share information between provinces and are organized at a national level. This method of promotion provides villagers with opportunities to learn and share experience on GP implementation. The achievements gained from implementation of a GP demonstration projects are practical and visual, facilitating program enlargement.

The GP competitions are a way to motivate local people to participate in the program. At the competition, contestants are questioned on Green Productivity, GP Solutions, project implementation and benefits. These competitions are an effective way to promote GP activities and are usually organized in conjunction with entertainment activities at the villages.

Recognizing the benefits of the GP program serves as a driving force for the villagers to initiate GP programs in their area. The competition in Hai Duong had attracted more than 1000 participants.

Publicising the GP program on TV and in local or national press as well as organizing GP conferences, seminars to share experiences and expertise of villagers are also very useful tools for GP promotion. In order to help with the nation-wide expansion of GP, two conferences on GP methodology were held in Ninh Binh and Ho Chi Minh Cities that provided an opportunity for villagers of all regions to exchange GP practices. Moreover, in cooperation with local and national TV, the VPC has made programs about GP methodology and practices to disseminate its benefits to all Vietnamese people.

2.2.8 International and National Cooperation: APO, NGOs and VPC

Asian Productivity Organization (APO)

APO support regarding provision of experts, training and promotion of GP:

Experts and training: APO supported VPC to establish a network of GP experts in Vietnam in previous phase. In this phase, the support of expert from APO is through TES program

Budget: APO provide financial support for international and national experts to provide training, report writing, production of manuals and guideline for GP implementation, publication, promotion seminar and workshop, study mission between villages

The VPC and other National Cooperation Bodies

VPC is responsible for project implementation in conjunction with MOST (STAMEQ) and DOSTE, DARD.

Expert: VPC staff support province in term of provide TOT for GP methodology implementation, establish implementation plan, GP promotion through seminar and workshop for information exchange. In addition, province can get the external expert support for GP option implementation.

Funding: STAMEQ provided financial support for coordinators (staff from VPC), the use of VPC's facilities, logistical arrangements, expenses for organizing training courses (venue, supporting facilities, tea break, etc.), communications, interpreters when required and administration.

Department of Science, Technology and Environment (DOSTE) and Department of Agriculture and Rural Development (DARD):

In addition to financial support from STAMEQ, there is financial support of DOSTE directly or indirectly through integration with other program in province. The GP program has received the support of local authorities in term of integration with other community development program and experts, promotion. GP program has integrated with not only other program but also the management regulation at province.

At community: GP program has received the support of villagers with the participation of different Unions, commune authorities. GP implementation plan was integrated with the village's regulation, therefore the GP options can get the successful results.

3 Introduction of villages under GP program

3.1 General characteristics

Villages from the North, South and Central Vietnam participate in the GP program. The characteristics of villages under GP program vary, but they are broadly classified as:

- Mountainous
- Plain
- Tourist
- Coastal
- Traditional villages
- Urban
- Minority

Table 5 summarizes the characteristics of villages according to above classification

Table 5 General Characteristics of villages under GP program

TT	Province	Village/commune	Mountainous	Plain	Tourist	Sea	Urban	Traditional	Minority
1	Ha Noi	Hoang Long village					x		
2	Hai Duong	Man De village						x	
3	Quang Ninh	My Cu 1 village				x			
4	Thai Nguyên	Thanh Lap village		x					
5	Bac Giang	Kha Ly Ha village	x						
		Tinh Loc village	x						
		Ap village	x						
		Binh An village							
		Cho Moi village		x					
		Dong Huong village		x					
		Lai village	x						
		Thuan village		x					
		Trung Dong village		x					
		Kim Son village					x		
6	Ninh Binh	Thang Thanh village	x		x			x	
		Van Thi village						x	
		Vuon Thi village	x	x					
		Tri Chinh village			x		x	x	
		Kien Thai village							x
7	Hoa Binh	Lac village			x				x
		Dam village							x
		Trai village							x
8	Ha Tinh	Xuan Thanh commune				x			

		Thach Chau commune				x			
		Ky Loi commue				x			
9	Nghe An	Quynh Luong commune				x			
		Nghi Thu commune				x			
		Hung Nhan commune		x					
10	Hue	Phu Hau village		x					
		Phu Hai commune				x			
		Thuy Chau commune		x					
11	Da Nang	Nam O 2 village				x	x		
		Thanh Vinh 1 village					x		
		Hoa Phu commune	x						
12	Quang Nam	Phuoc Kieu village						x	
13	Gia Lai	PleiKhun village							x
14	Kon Tum	Konhrachot village							x
15	Phu Yen	Hoa An commune		x					
16	Ho Chi Minh	Xuan Thoi Thuong commune					x		
		Binh Chanh commune					x		
		Thai My commune						x	
17	Can Tho	Dinh Phuoc village		x					
		4 village		x					
		Nhon Loc village		x					
18	Vinh Long	Phuoc Hau commune		x					
		Phu Thanh village		x					
19	Vung Tau	Lang Lon commune	x						
		Phuoc Hai commune					x		
20	Ben Tre	An Phong village	x						
		An Binh village	x						
		An Loc village	x						
21	Ca Mau	Ba Dieu village					x		
		Cai Ro					x		

3.2 Socio-Economic Condition

The socio-economic conditions of villages varies. However, most, 90%, of villages in the GP program are agricultural. The type of village is also different. For example, the total area of Lac, Dam and Trai village are only 4 km², 1 km² and 4 km² respectively while other have large area (Man De village – Hai Duong province: 155 ha). Average income is different either (poverty rate in Ky Loi village – Ha Tinh province is 35 % compared with 5% in Thanh Lap village – Thai Nguyen province). Table 6 summarize the socio-economic condition of villages who participate in GP program.

Table 6 Socio-Economic of villages in GP program

TT	Province	Village/ Commune	General Information			Socio-Economic Condition						Poverty Rate (%)	Agriculture (Household/%)	
			Total area (ha)	Population (People)	Households	Average income (thous. dong/pers on/month)	<100000 dong/m	100 – 300 000 dong/m	300000 – 500000 dong/m	(500000 – 1000000d /m)	>1000000 d/m			
1	Ha Noi	Hoang Long village		789	212	250								80%
2	Hai Duong	Man De village	155ha	2750	610	284								85%
3	Quang Ninh	My Cu 1	849.1 m ²	1171	324	125	15%	66%	15%	4%				98%
4	Thai Nguye n	Thanh Lap village	34,5 ha	650	161		5%	30%	65%					147
5	Bac Giang	Kha Ly Ha village	72 ha	1509	364	375								85%
		Tinh Loc village	169,93 ha	1270	317	330								95%
		Ap village	100 ha	682	126	417		20%	60%	15%	5%			95%

		Binh An village	60 ha	535	135	250	28.9%	43.7%	3.5%				97%
		Cho Moi village	22,24 ha	290	60	290	8.7%	84%	7%				100%
		Dong Huong village	180 ha	1700	380	225	15%	65%	15%	5%			95%
		Lai village	154 ha	974	211	200	85%	10%	5%				100%
		Thuan village	106,24 ha	998	218	225	25%	75%					100%
		Trung Dong village	35 ha	421	88	250	15%	65%	15%	5%			95%
		Kim Son village	36,21 ha	460	128	250	1.5%	69.0%	21.8%	7.2%			95%
6	Ninh Binh	Thang Thanh village		1200	285								95%
		Van Thi village	158,8 ha	2678	624								94%
		Vuon Thi village	10,5 ha	223	55								
		Tri Chinh village	8 ha	1812	439								119
		Kien Thai village	270 ha	2780	1513	240							58%
7	Hoà Binh	Lac village	4 km ²	447	101		50%	50%					
		Dam village	1 km ²	517	113		25%	55%	20%				95%
		Trai village	4	459	111		10%	65%	15%	10%			98%
8	Ha Tinh	Xuan Thanh village	8,58 km ²	4.476	1.057		78,5%	12,8%	9,3%	0,4%			80%

		Phu My village – Thach Chau commune	1,93 km ²	2.235	538		29.3%	55.3%	10.8%	3.6%	0.9%		95%
		Ky Loi village	512,4 ha	1254	285	120	40.6%	40.5%	17.4%	1.5%		35%	50%
9	Nghe An	Quynh Luong commune	511 ha	6300	1230	300 - 500	5%	44%	30%	20%	1%		70%
		Nghi Thu commune	369,65 ha	3000	770		15%	60%	20%	5%			
		Hung Nhan commune	609,04 ha	3826	823		12.8%	77.7%	9.5%				94,8%
10	Hue	Phu Hau village	117 ha	7562	1366								
		Phu Hai commune	338,9 ha	7491	1371								
		Thuy Chau commune	1791 ha	9431	1996								
11	Da Nang	Nam O 2	10,24 ha	3534	710		3.2%	19%	42.9%	27.6%	7.3%		5,8%
		Thanh Vinh 1	52504m ²	1350	297	250	3.6%	61.4%	22.9%	12.1%			45 hộ
		Hoa Phuoc village	63	527	124		5.6%	9.8	40.3	40.3	4		100
		Hoa Tho village	20	415	90	150	16.7%	61.1	22.2				95.5
		An Chau village	50	320	66	200	28.8%	71.2					100
		Dong Lam village	83	670	158	100	94.3%		5.7				

		Hoa Hai village	115	387	76	200	26.3%	60.5	13.2				17.1
		Phu Tuc village	4000	364	94		74.5%	25.5					93.6
		Dong Lang village	28	199	41	80	12.2%	87.8					100
		Hoi Phuoc village	124	623	151		3.3%	86.7	8.6	1.3			63.1
		Hoa Phat village	30	464	95	300	10.5%	80	9.5				100
		Hoa Xuan village	13.5	93	27	250	3.7%	96.3					71.1
12	Quang Nam	Phuoc Kieu village		514	126	75							28%
13	Gia Lai	PleiKhun village	260 m ²	546	121	150							100%
14	Kon Tum	Konhrachot village	105 ha	1318	191	120	18%						
15	Phú Yên	Hoa An commune (5 village)	1318 ha	15800	3482	106							
16	Ho Chi Minh	Xuan Thoi Thuong commune	1.856,24 ha	17.978	3.523							8,7%.	32%
		Binh Chanh commune	814,2 ha	14.824	2.615		35%	25%	25%	12%	3%	8,7%	20%
		Thai My commune	2.402 ha	10.334	2.444		45%	26%	11%	8%	3%	3.31%	58%
17	Can Tho	Dinh Phuoc village	168 ha	1721	337							19 hộ (5.6%)	

		4 village	303ha	2287	502								
		Nhon Loc village	164.38 ha	1037	213	325							
18	Vinh Long	Phuoc Hau commune	923.91 ha	8995	1909								
		Phu Thanh village	212 ha	1385	297								
19	Vung Tau	Lang Lon commune	4192	11292	2157								93%
		Hai Tan village, Phuoc Hai commune	606,63 ha	2176	473							47 hộ (16%)	
20	Ben Tre	An Thach commune	379.18 ha	5427	1556		8.69	13	45.5	22.5	13.31		
21	Ca Mau	Ba Dieu village	237 ha	1100			0,5	30	50	18	1,5	120 hộ (11%)	
		Cai Ro village	202 ha	905			17.2%	60.66 %	22.13 %				

3.2.1 Common problems

The villages cover a range of different socioeconomic conditions and have differing environmental conditions and problems. Some of the problems that are commonly faced are:

- Human and Animal waste water pollution owing to lack of treatment facilities and unsuitable management methods.
- Polluted potable water supply
- Pollution due to storm water runoff
- Inappropriate use of chemical fertilisers and pesticides
- Solid waste disposal
- Inefficient use of cooking fuel
- Deforestation
- Inadequate Rural infrastructure
- Environmental awareness of villagers is limited, especially regarding the application of new technologies for environmental protection.

Common problems of villages participated in GP program was summarized in Table 7

Table 7 Environmental Problem of villages in GP program

TT	Province	Village/commune	Human and Animal Waste	Clean Water	Waste Water	Solid Waste	Pesticide and Chemical Fertilizer	Energy	Income Generation	Awareness	Lack of Advanced Technology	Rural Infrastructure	
1	Ha Noi	Hoang Long village		x			x						
2	Hai Duong	Man De village	x	x		x	x		x	x	x	x	
3	Quang Ninh	My Cu 1	x	x	x	x			x				
4	Thai Nguyen	Thanh Lap village		x		x	x						
5	Bac Giang	Kha Ly Ha village	x	x			x				x		
		Tinh Loc village	x	x			x				x		
		Ap village		x		x	x						
		Binh An village	x	x		x	x		x				
		Cho Moi village	x	x			x		x				
		Dong Huong village	x	x			x		x				
		Lai village		x		x	x						
		Thuan village					x					x	
		Trung Dong village	x				x	x					
		Kim Son village					x	x					
6	Ninh Binh	Thang Thanh village	x			x	x		x				

		Van Thi village			x	x						
		Vuon Thi village	x		x	x		x				
		Tri Chinh village										
		Kien Thai village	x		x	x		x				
7	Hoa Binh	Lac village	x	x		x	x	x				
		Dam village	x	x		x	x	x				
		Trai village	x	x		x	x	x				
8	Ha Tinh	Xuan Thanh village		x		x		x				
		Phu My village – Thach Chau commune		x		x		x				
		Ky Loi village		x		x		x				
9	Nghe An	Quynh Luong commune	x	x	x	x	x					
		Nghi Thu commune	x	x	x	x	x					
		Hung Nhan commune	x	x	x	x	x					
10	Hue	Phu Hau village	x		x							
		Phu Hai commune	x									
		Thuy Chau commune		x		x						
11	Da Nang	Nam O 2				x		x	X			
		Thanh Vinh 1	x									
		Hoa Phuoc village	x									
		Hoa Tho village	x									

		An Chau village	x									
		Dong Lam village	x	x		x						
		Hoa Hai village										
		Phu Tuc village	x									
		Dong Lang village	x		x							
		Hoi Phuoc village	x									
		Hoa Phat village	x									
		Hoa Xuan village	x	x								
12	Quang Nam	Phuoc Kieu village	x	x	x	x						
13	Gia Lai	PleiKhun village	x					x	x			
14	Kon Tum	Konhrachot village	x	x		x						
15	Phú Yên	Hoa An commune (5 village)	x	x		x			x		x	
16	Ho Chi Minh	Xuan Thoi Thuong commune	x		x	x	x					
		Binh Chanh commune	x		x	x	x					
		Thai My commune	x		x	x	x					
17	Can Tho	Dinh Phuoc village	x	x		x	x					
		4 village	x	x		x						
		Nhon Loc village	x			x	x					
18	Vinh Long	Phuoc Hau commune	x	x		x	x					
		Phu Thanh village	x	x	x	x	x					

19	Vung Tau	Lang Lon commune	x	x			x					
		Hai Tan village, Phuoc Hai commune			x	x						
20	Ben Tre	An Thach commune	x	x							x	
21	Ca Mau	Ba Dieu village		x				x				
		Cai Ro village		x				x				

3.3 Problem analysis

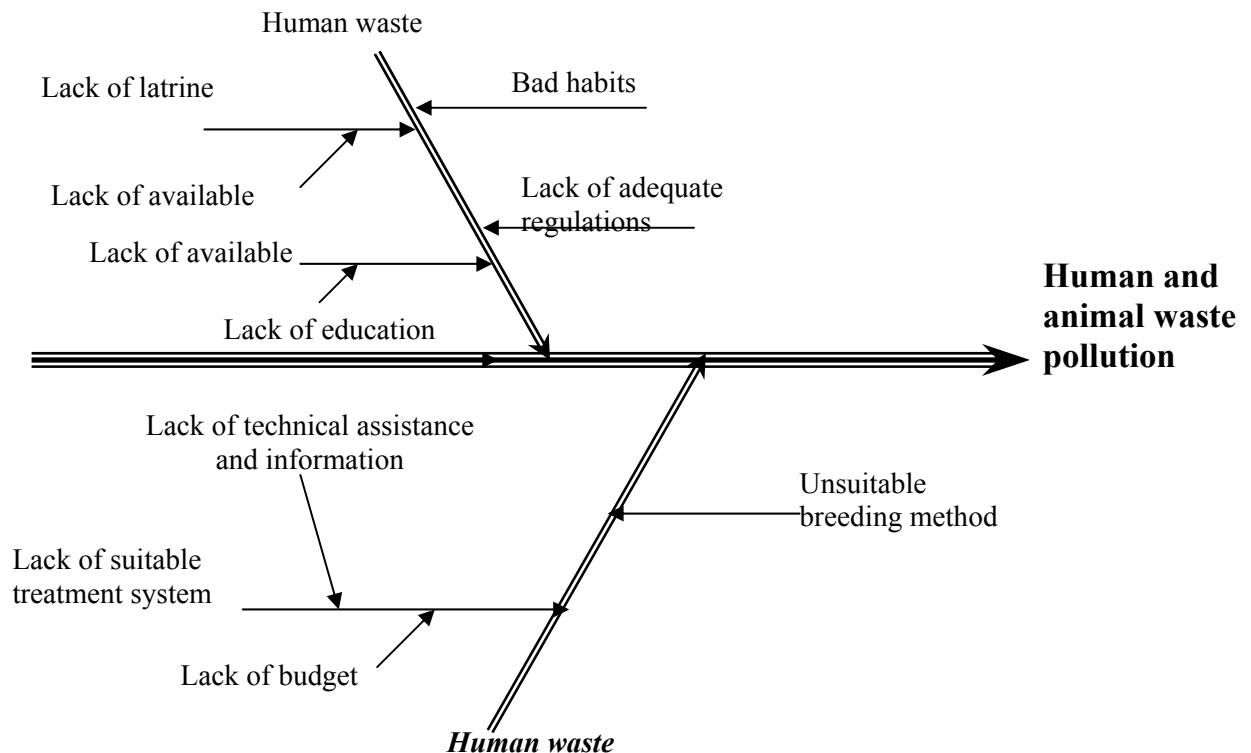
3.3.1 Human and animal waste pollution

The primary causes of human and animal waste pollution are:

- Facilities: old breeding facilities, limited of knowledge on construction of breeding facilities and limited of budget.
- Technology: there is a lack of understanding of the options available for rearing animals. This may be options to make the area more hygienic or treatment options.
- People: Awareness of people on environmental protection is not high
- Management: Local regulations are not adequate or enforced, the cooperation between each governmental level is weak and regular meetings to consider environment protection issues are not convened
- Lack of funds for construction of latrine
- Lack of treatment system

The causes of human and animal waste pollution can be summarized in Figure 3

Figure 3 Causes of human and animal waste pollution



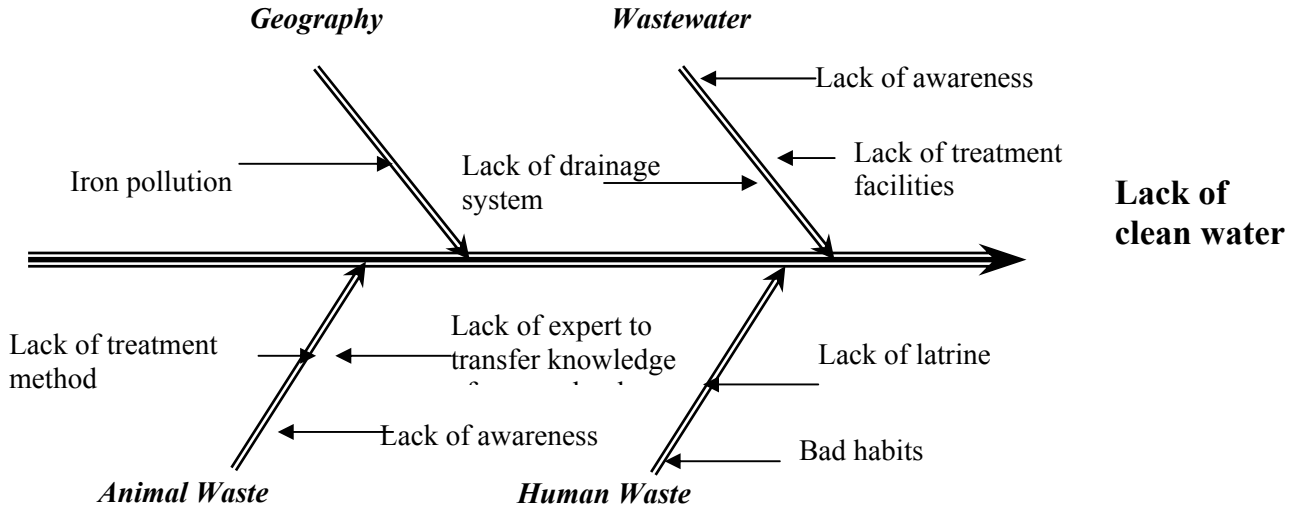
3.3.2 Clean water and wastewater

The main causes for lack of clean water in rural area can be listed as following:

- Geographic conditions (iron and manganese pollution)
- Groundwater pollution
- Human and animal waste pollutes ground water
- Unsuitable treatment method
- Lack of budget and facilities for clean water treatment

The cause for lack of clean water in rural area can be summarized in Figure 4

Figure 4 Cause for lack of clean water



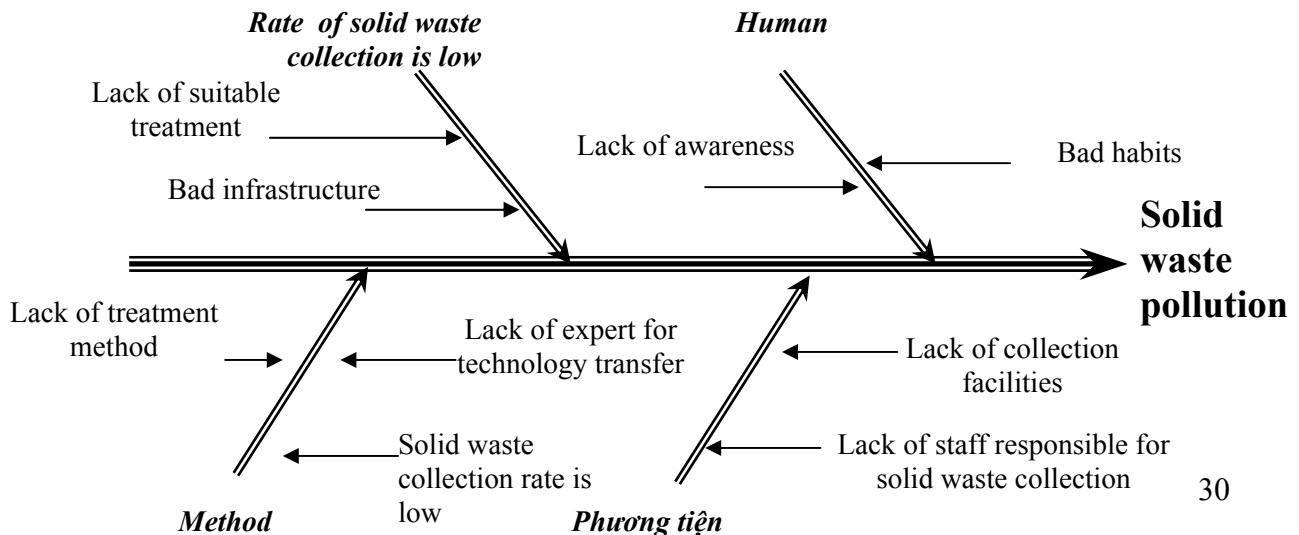
3.3.3 Solid waste

The main cause of unsuitable solid waste management can be summarized as:

- Lack of knowledge of solid waste treatment
- Lack of collection facilities and solid waste classification procedures
- Lack of infrastructure for solid waste collection and treatment
- Lack solid waste collection team
- Lack of regulations for solid waste management

The main causes of solid waste pollution can be described in Figure 5

Figure 5 Causes of solid waste pollution



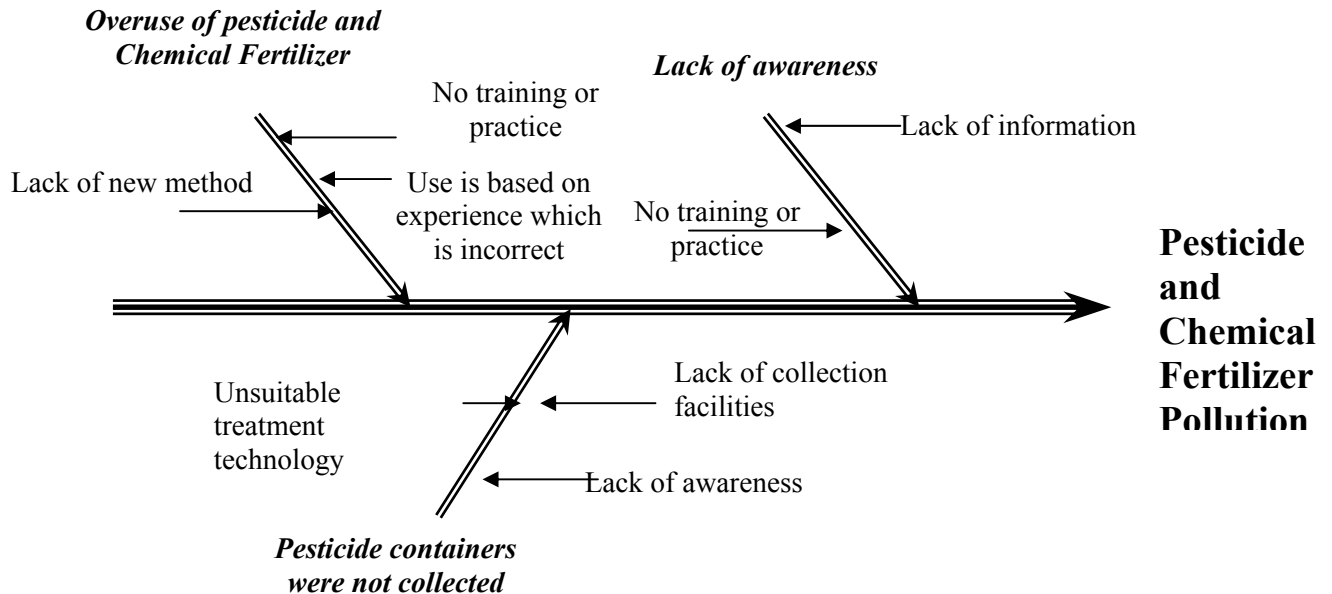
3.3.4 Pesticide and Chemical Fertilizer

Causes for pesticide and chemical fertilizer pollution can be summarized as following;

- Lack of awareness on pesticide and chemical fertilizer application
- People do not recognize the hazards from over use of pesticide and chemical fertilizer
- Lack of knowledge on new technologies for reducing use of pesticide and chemical fertilizer
- Lack of advance technology to apply to reduce application of pesticide
- Pesticide containers were not collected

Cause of pesticide and chemical fertilizer pollution can be summarized in Figure 6

Figure 6 Cause of pesticide and chemical fertilizer



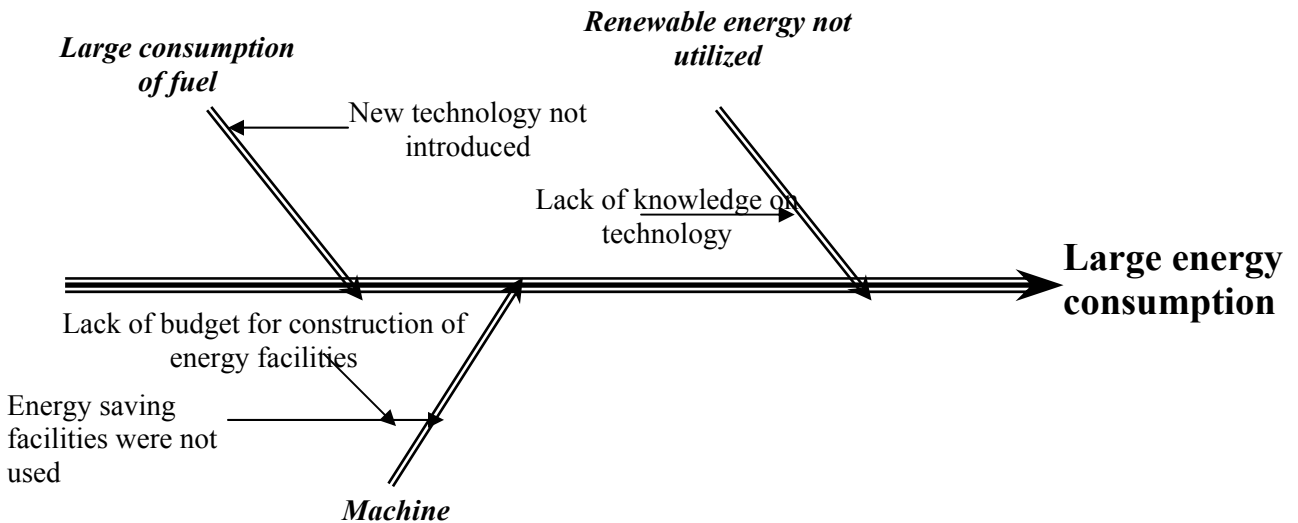
3.3.5 Energy

Main causes which lead to large consumption of energy can be summarized as:

- Lack of knowledge on available technology for saving energy
- Renewable energy is not utilized
- Lack of budget for the application of new technology

Figure 7 summarizes the causes of large consumption of energy

Figure 7 Cause of large energy consumption



3.3.6 Income generation

The main causes of low income in rural area can be summarized as:

- No alternate occupation/by-trade
- unstable market prices for agricultural products
- Not enough capital for investment
- Lack of information on available technology
- Poor economic returns for crops

3.4 GP options

GP options were generated based on the problems identified in each community. The most feasible GP options in terms of economic, environmental and social impact were implemented. Table 8 summarizes implemented GP options

Table 8 GP options

Problem	GP options
Animal waste pollution	<ul style="list-style-type: none"> • Construction of clean pig breeding facilities • Construction of clean cow breeding facilities • Construction of Biogas plants • Construction pig breeding facilities suitable for

	<ul style="list-style-type: none"> combining with a biogas model Application of a composting model
Human waste pollution	<ul style="list-style-type: none"> Construction of private latrines Construction of public latrine
Lack of clean drinking water	<ul style="list-style-type: none"> Improve or update wells Construct simple water treatment processes, filtration, settling or flocculation. Construction of a water treatment plant Construction of rain water tanks
Wastewater pollution	<ul style="list-style-type: none"> Install water treatment facilities in each household Construction of border and drainage systems around common community wells Improve drainage system
Improper use of pesticide and chemical fertilizer	<ul style="list-style-type: none"> Conduct training course on the proper use of pesticides Use of high yield rice crop variety which also has high pest resistance Application of Integrated Pest Management (IPM) on rice and vegetables Application of biological instead of chemical fertilizers Proper use of pesticide on fruit Application of “safe vegetable” limit to the concentration of chemical fertilisers. Application of bio-fertilizer and bio-pesticide to replace chemicals. Application of natural farming Application of plant colour table to control the use of chemical fertilizer
Solid waste pollution	<ul style="list-style-type: none"> Establishment of environmental protection regulations Set up a solid waste classification system Establish solid waste collection system Construction of common rubbish bins Launch of a cleaning campaign Construction of bins for pesticide container collection Construction of landfill
Cooking fuel was used inefficiently	<ul style="list-style-type: none"> Construction of energy efficient stoves
Income generation	<ul style="list-style-type: none"> Construction of Advanced furnaces for processing of agricultural products Mushroom cultivation Worm farming Bee keeping at household level

	<ul style="list-style-type: none"> • Pilot planting of species with higher economic returns, for example "gio bau" (lemons without seeds) and 30 "coc" plants from Thailand. • Pigeon breeding • Frog breeding • Develop traditional careers (fish sauce, rattan-bamboo and straw handicrafts) • Improve quality of cattle breeds • Rice-fish, rice-shrimp model • Pig rearing • Planting of orange trees with high pest resistance • Planting high yield corn • Application of row sowing machine • Application of rice cutting machine, developed from weed machine
Increase forest coverage area	<ul style="list-style-type: none"> • Tree plantation • Planting trees to prevent sand erosion
Inadequate rural infrastructure	<ul style="list-style-type: none"> • Construction of concrete roads
Awareness of villagers is limited, especially on application of new technology and environmental protection	<ul style="list-style-type: none"> • Conduct training course to enhance environmental awareness of people

4 Results

Through its 5 year implementation period (1998 – 2003), the GP program has brought significant benefits for people in rural area in terms of living standard enhancement and environmental protection. The visible achievement of program such as Biogas, energy saving stoves, hygienic latrine, etc and also invisible achievement such as awareness enhancement of people about their role for environment protection.

4.1.1 Training

Training and promotion are effective methods to increase



GP training course in Hoa Binh

local people's awareness of environmental protection. Through the training courses, people have opportunity to learn technical information that can help them to improve their quality of life and local environment. The training courses are vary greatly depending on problems faced as well as related solutions proposed by the GP team. Training in the GP concepts and methodology was held in the 21 provinces with the participation of 1857 people. Training courses on new rice varieties has attracted more than 1000 people in Hai Duong, Enhancing Environmental Awareness Enhancement has attracted 200 people in Phu Hai – Hue; Integrated Pest Management in Ha Tinh, Ho Chi Minh, Nghe An, Phu Yen has more than 700 participants

Through these training courses, people have an opportunity to learn about new GP options, which may help them improve their living standards as well as the environmental conditions in their area. The first training courses were delivered by APO and VPC. The participants then become experts to transfer this knowledge to other households. Table 9 summarize the training courses which were conducted in GP program.

Table 9 Training courses were conducted in GP program

Province/village	Training course	Number of participants
Hai Duong		
Man De village	GP methodology and principles	29
	Training courses on new rice variety and cultivation techniques which protect the environment	1000
	Integrated Pest Management (IPM)	40
Hoa Binh		
Trai village	GP methodology and principles	108
Dam village	GP methodology and principles	81
Lac village	GP methodology and principles	101
Hue		
Phu Hai	Enhance Environmental Awareness	200
Phu Hau	GP and Environmental Protection	40
	Establishment of Environmental Protection Regulations	21
Thuy Chau	Natural Farming	29
Thái Nguyên		
Thanh Lap	GP Methodology and Principles	70
	Mushroom Cultivation	66
	IPM	75
Hà Tĩnh		
	GP Methodology and Principles	32
Hồ Chí Minh		
Binh Chanh commune	GP Methodology and Principles	21
	IPM for Vegetables	25 people/class
	Natural Farming and Application of BE (Bio-extract)	67

	Worm Farming – chicken breeding technique	67
Xuan Thoi Thuong	GP Methodology and Principles	30
	Proper Application of Chemical pesticides and fertilizers	75
	IPM for Vegetables	25 people/class
	Natural Farming and Application of BE (Bio-extract))	50
	Use of “safe vegetable” Technique	30 classes for whole commune
Thai My	GP Methodology and Principles	49
	IPM for vegetables	25
	Natural Farming and Application of BE (Bio-extract)	50
	Worm Farming as a Chicken Breeding Technique	50
Cà mau		
Ba Dieu village	GP Methodology and Principles	26
Cai Ro village	GP Methodology and Principles	38
Bến Tre		
	GP Methodology and Principles	24
	Water Treatment to Remove Iron and Microorganisms	36
	Plantation of Oranges with High Pest Resistance	93 hộ
	Plantation of High Yield Corn	26 hộ
Vũng Tàu		
Lang Lon commune	GP Methodology and Principles	30
Phuoc Hai commune	GP Methodology and Principles	21
Gia Lai		
Khun village	GP Methodology and Principles	32
Nghệ An		
In 3 communes	GP Methodology and Principles	20
Quynh Luong	Plantation of Sesame	80
	Waste Treatment at Household and Community Level	70
Hung Nhân	Use of “safe vegetable” Technique	75 households
	Integrated Pest Management (IPM)	175 hộ
	Construction of Biogas and Efficient Stoves	75 hộ
Nghị Thu	Use of “safe vegetable” Technique	132
	Integrated Pest Management (IPM)	154
Bắc Giang		
Tĩnh Lộc	GP Methodology and Principles	49
Cho Moi	GP Methodology and Principles	39

Dong Huong	GP Methodology and Principles	36
	Construction of Efficient Stoves	60
	Using Effective Micro-Organisms (EM) in Agriculture	59
Ap	GP methodology and principles	42
	Using Effective Micro-Organisms (EM) in Agriculture	59
	Construction of Energy Efficient Stoves	61
Kim Son	GP Methodology and Principles	39
	Construction of Energy Efficient Stoves	65
	Using Effective Micro-Organisms (EM) in Agriculture	70
Bao Dai	GP Methodology and Principles	44
	Construction of Energy Efficient Stoves	53
Binh An	GP Methodology and Principles	27
	Using Effective Micro-organisms (EM) in agriculture	59
Trung Dong	GP Methodology and Principles	21
	Using Effective Micro-Organisms (EM) in agriculture	19
Lai	GP Methodology and Principles	25
Thuan	GP Methodology and Principles	27
Ninh Binh		
5 villages	GP Methodology and Principles	43
Kien Thai	GP Methodology and Principles	48
	Straw handicraft Production	60
Tri Chinh	Environmental Awareness and GP Techniques	50
	2 training courses on the construction of biogas chambers, efficient stoves, solid waste bin, penetrate hole for waste water treatment	10 people/class
Van Thi	Environmental Awareness and GP Techniques	52
	2 training courses on the construction of biogas chambers, efficient stoves, solid waste bin, penetrate hole for waste water treatment	10 people/class
Vuon Thi	Environmental Awareness and GP Techniques	52
	2 training courses on the construction of biogas chambers, efficient stoves, solid waste bin, penetrate hole for waste water treatment	10 people/class
Truong Yen	Ecological Management and Development	51

Quang Ninh		
My Cu	GP Methodology and Principles	55
	GP Options for Environmental Protection	150
Quảng Nam		
Phuoc Kieu	GP Methodology and Principles	
	Biogas Construction and Solid Waste Management	60
	Identification of Objectives and Target for GP	27
	Environmental Protection and Best Environmental Practices	90
	Biogas Construction	60
Da nang		
Hoa Phu	Worm Farming, Bee Keeping and Mushroom Cultivation Techniques	182
	Water treatment and Solid Waste Management	57
	Biogas Construction Techniques	32
Thanh Vinh	Water Supply Treatment and Solid Waste Management	27
	Introduction of Biogas, hygienic latrines and energy saving	32
Phu Yen		
Vinh Phu	Environmental Awareness	54
	IPM, Solid Waste Management and Clean Water	79
	VAC Model, Mushroom Cultivation and Worm Farming	80
	Biogas, Composting and Energy Efficient Stoves	69
Hoa An	Effective Microorganisms (EM)	127
	Mushroom Cultivation Techniques	120
	Construction of Biogas Chamber and Energy Efficient Stoves	130
	Integrated Pest Management (IPM), Integrated Nutrient Management (INM) and Worm Farming	126
	Pigeon and Frog Rearing	127
	Environmental Regulations and Air Pollution Control	129
	Natural Farming	131
Vinh Long		
Phuoc Hau	GP Methodology and Principles	12
	GP Options for Community Development and Environmental Protection	100

	Application IPM for “safe vegetable” Program	80
	Application of IPM and the Integration of Fish Farming and Rice Cultivation	30
	Proper Use of Pesticide and Insecticide on Fruit	80
	2 Classes on Composting Techniques	60 people/class
	Worm Farming	5 farmer
	Biogas Plant Construction and Maintenance	10 households
	Water Treatment by Pond Filtration at a Household Level	10 household
	Solid Waste Classification and Solid Waste Treatment	60
	Rice-fish and rice-shrimp Models	60
Can Tho		
4 villages	GP Methodology and Principles	
Dinh Phuoc village	GP Methodology and Principles	
Kontum		
Konhrachot village	GP Methodology and Principles	

4.1.2 GP options

The needs of the villages in the various provinces differ greatly and the options selected for the different regions vary. Some of the problems experienced that GP aims to rectify are:

- Animal waste pollution.
- Human waste pollution
- Lack of clean drinking water
- Pollution from storm water runoff
- Improper use of pesticides and chemical fertilizers
- Environmental pollution from solid waste
- Inefficient use of cooking fuel
- Need for additional income in the community
- Deforestation
- Inadequate rural infrastructure
- Limited environmental awareness of villagers

Based on the problems faced in area, the GP team has identified the root causes of problems and generated GP options which are appropriate. The most suitable GP options in terms of social, economic and environmental aspects are implemented. For example in Kha Ly Ha and Ap (Bac Giang), Thanh Lap village (Thai Nguyen), Lac (Hoa Binh), GP options focus on clean water, IPM, solid waste collection bins, human and animal waste and construction of Biogas Plant. In other villages, GP options not only focus on environment protection, but also on income generation. In Hai Duong, the application of

advanced furnaces has improved product quality and created jobs for people in the village as well as in the neighboring area. Through the application of this option, the average income has increased from 300,000 dong to 400,000 dong/person/month. Mushroom cultivation in Hoa Binh and Bac Giang, bee keeping in Da Nang and pigeon and frog farming in Phu Yen have all successfully generated alternative income for the locals. Plantation improvement in Gia Lai, breeding of a new cow variety in Vung Tau, pig farming in Vinh Long, rice-fish model in Vinh Long and the plantation of a high yield corn in Ben Tre has achieved considerable success.

4.1.2.1 Human and animal waste

GP options were implemented to solve human and animal waste are as following:

- Construction of clean pig breeding facility
- Construction of cow breeding facility
- Construction of Biogas plant
- Construction of plastic bag Biogas model
- Construction of pig breeding facilities suitable for combining with a biogas model
- Composting model
- Construction of hygienic latrines
- Construction of public latrines



Construction of Biogas plant

Table 10 summarises the results obtained in the area of human and animal waste

Table 10 GP options for human and animal waste

Area	GP option	Province	Results
Animal waste pollution	Construction of clean pig breeding facility	Da Nang	Construction of 2 pig breeding facilities
		Hải dương	180 pig breeding facilities
	Construction of a central cow breeding facility	Kon Tum	Construction of 10 breeding facilities and inclusion of 20 households who have 100 cows under their floor to these facilities
	Biogas Construction	Hai Duong	01 Biogas plant (10 m ³)
		Thai Nguyen	03 Biogas plants
		Hoa Binh	10 Biogas plants

		Ninh Binh	Construction of 05 Biogas plants (three 7m ³ and two 10 m ³)
		Bac Giang	Construction of 51 Biogas plants in 10 villages
		Hue	Construction of 01 Biogas plant with volume of 5 m ³
		Phu Yen	Construction of 08 Biogas plants
		Da Nang	Construction of 15 Biogas plants (ten 6m ³ and two 8m ³)
		Ho Chi Minh	Construction of 2 German-Thai Biogas models
	Construction of plastic bag Biogas model	Vung Tau	Construction of 5 plastic bag model biogas plants
		Vinh Long	Construction of 16 plastic bag model biogas plants
		Quang Nam	Construction of 9 plastic bag model biogas plants
		Can Tho	Construction of 10 plastic bag model biogas plants
	Construct pig breeding facilities suitable for combination with a biogas model	Da Nang	Development of 2 models
	Composting model	Vinh Long	Application in 10 households
		Kon Tum	Construction of 12 composting models
Human waste pollution	Construction of hygienic latrines	Hai Duong	Construction of 65 two-compartment latrines
		Phu Yen	hygienic latrines constructed in 50 households
		Da Nang	28 hygienic latrines

			Construction of 1 latrine in the kindergarten
		Quang Nam	20 hygienic latrines.
		Gia Lai	10 hygienic latrines
		Kon Tum	20 hygienic latrines for 30 households
		Ha Tinh	20 hygienic latrines
		Nghe An	200 hygienic latrines
		Can Tho	10 hygienic latrines
		Hue	05 hygienic latrines
		Ho Chi Minh	75 hygienic latrines with septic tanks
	Construction of a public latrine	Da Nang	1 public latrine for households who do not have latrines

GP options for human and animal waste have brought practical benefits for people in terms of environment and productivity. For example, construction of pig breeding facilities has had significantly contributed to a cleaner environment, reduced the incidence of disease in animals, productivity enhancement and pollution reduction. Through application of Biogas technology, villagers can treat pollution from human and animal waste and produce the fuel for cooking, protect people health from prevention of smoke from traditional cooking. The benefits from application of GP options for human and animal waste are summarized in Table 11

Table 11 Benefits of GP options for human and animal waste

Option	Benefits		
	Economy	Social	Environment
Construction of pig breeding facilities	Income generation through livestock development	Livestock development, income generation, job creation, disease reduce associated with human and animal waste	Reduce pollution from human and animal waste
Construction of breeding facilities		Change the cow breeding methods of minority people under their house and reduce impacts on human health	Reduce pollution from animal waste
Construction of hygienic latrines and community latrines		Reduce disease due to human waste pollution	Reduce pollution from human waste, reduce surface and ground water

			pollution from animal waste
Composting		Reduce diseases due to animal waste pollution.	Reduce pollution from animal waste
Construction of Biogas Plant	Application of Biogas will save 700000 – 1000000 dong/household for fuel. The payback period is 3 – 4 years.	Provide safe fertilizer, protect human health	Reduce air and water pollution from human and animal waste

4.1.2.2 Water Pollution

GP options implemented for water pollution in rural area are as following

Potable Water

- Improve wells
- Simple water treatment method to remove iron
- Construction of water supply plant
- Construction of rain water tank
- Water treatment to remove iron and biological pollutants
- Water treatment by water treatment powder, filtration tank and settling tank

Wastewater

- Install water treatment facilities in each household
- Construction of drainage system around common well
- Improve drainage system
- Construction of drainage system



Happiness with clean water in Hoa Binh province

Table 12 summarized the results of GP program in term of clean water

Table 12 GP options for clean water

Area	GP options	Province	Results
Lack of clean water for domestic purposes	Improve well system	Hoa Binh	10 well systems
		Kon Tum	Improve 3 wells
	Simple water treatment method to remove iron	Ha Tinh	8 models
		Quang Nam	04 water treatment tanks
		Hue	05 counter current water treatment tank

	Construction of water supply plant	Phu Yen	01 water treatment plant
	Construction of tank for rain water collection	Quang Ninh	50 tanks
	Water treatment to remove iron and pathogens	Ben Tre	03 water treatment model
	Water treatment by water treatment powder, filtration tank, filtration pond	Vinh Long	<ul style="list-style-type: none"> – Water treatment powder: 3000 bag (each bag can treat 2 m³ water) – filtration tank: 20 (1,5 m³/tank) – Filtration pond: 4 (capacity: 1,5 m³/ngày)
Wastewater pollution	Install wastewater treatment facilities in each household	Ninh Binh	34 wastewater treatment facilities
		Da Nang	2 wastewater treatment facilities
		Quang Nam	02 water treatment facilities
	Construction of border and drainage system around common well	Da Nang	01
	Construction of drainage system	Hai Duong	3000 m drainage system
	Improve drainage system	Quang Ninh	1250 m drainage system

Implementation of above GP options has provided clean water for people in rural areas, thus increasing the number of rural people with access with clean water. Some GP options are quite simple, easy to implement with low cost such as rainwater collection tank. Table 13 analyse the benefits from GP options for clean and wastewater

Table 13 Benefits of GP options for clean and wastewater

Options	Benefit		
	Economy	Social	Environment
Wastewater treatment	Reduce disease associated with wastewater pollution and reduce expenses for hospital treatment due to disease due to pollution	Increase people awareness on their role for environmental protection; create beautiful landscape for village.	Reduce wastewater pollution and mosquito population

Water treatment to remove iron and microorganism in Ben Tre	Reduce expenses for clean water in dry season (10,000 dong/m ³ compared with 400 dong/m ³)	Reduce skin and gastric disease prevalence	Increase number of people who can access clean water
Other GP options for clean water		Reduce skin and gastric disease prevalence	Increase number of people who can access clean water

4.1.2.3 Pesticide and Chemical Fertilizer

GP options was implemented to reduce pesticide and chemical fertilizer use are as following:

- Conduct training course on the proper use of pesticides
- Use of high yield rice variety which also has high pest resistance
- Application of Integrated Pest Management (IPM) on rice and vegetables
- Application of biological instead of chemical fertilizers
- Training in the correct use of pesticide on fruit
- Application of “safe vegetable” limit to the concentration of chemical fertilisers. Application of bio-fertilizer and bio-pesticide to replace chemicals.
- Application of natural farming
- Application of plant colour table to control the use of chemical fertilizer



Cabbage growth rates (1) with and (2) without natural farming.

Table 14 summarizes the results of GP option in term of pesticide and chemical fertilizer

Table 14 Results of GP options for pesticide and chemical fertilizer

Options	Province	Results
Training course on how to use pesticide properly	Hai Duong	for a training course was held for 500 people on pest management, proper application of pesticide and chemical fertilizer
Plantation of high yield rice variety which also have high rest resistance	Bac Giang	Application of high yield rice variety on 17 ha
	Vinh Long	Application of high yield rice variety on 16 ha

Application of Integrated Pest Management (IPM) on rice and vegetable	Vinh Long	47 households apply IPM on rice
		Application of IPM on fruit for 80 households
Application of bio-product instead of chemical fertilizer	Hai Duong	50% household use bio-fertilizer
Proper use of pesticide on fruit	Vinh Long	Application on 30 ha of fruit
Application of “safe vegetable” limit through the use of bio-fertilizer and bio-pesticide	Ho Chi Minh	Application of 2 plot. Each plot have area of 15,000 m ²
Application of natural farming	Hoa Binh	Application of Natural farming on 10.5 ha for rice and vegetables (corn, peanut)
	Hue	Application on 17 ha for vegetable
Plantation of safety vegetable	Nghe An	Application on 162,2 ha
	Vinh Long	Application on 6 ha
Application of colour table to control application of chemical fertilizer	Can Tho	Provide 100 colour table

Through application of GP options, the use of pesticide and chemical fertilizer has reduced. This brings benefits, not only through reduced risks of chemical usage, but also reduces the financial burden. For example, through the use of a color table to control application of chemical fertilizer was applied to reduce extra application of nitrogenous fertilizer. Appropriate use of nitrogenous fertilizer can reduce the rice lost, which can cause 30 – 40% yield reduction. Through the application of a color table, farmers can reduce the nitrogenous fertilizer from 100 to 50 kg/ha. At a cost of 2 800 vnd per 1 kg of nitrogenous fertilizer this represents a cost saving of 140,000 dong – 280,000 dong/ha.

Table 15 analyze the benefits of GP option for controlling application of pesticide and chemical fertilizer

Table 15 Benefits of GP options for pesticide and chemical fertilizer

Options	Benefit		
	Economy	Social	Environment
Training and promotion on appropriate use of pesticide and chemical fertilizer		People take more responsibility for pesticide application	Enhance awareness of environment protection issues
Plantation of high yield rice variety which also has high	Increase income by reducing production cost of buying		Reduce pollution from chemical fertilizer

pest resistance	chemical pesticides and fertilizers		
Application of Integrated Pest Management (IPM) on rice and vegetables	Reduce costs from chemical pesticide and fertilizer	Reduce adverse impacts on those who apply chemical pesticides and fertilizers in the field	Reduce the use of chemicals and thus reduce pesticide pollution.
Application of bio-product instead of chemical fertilizer		Reduce adverse effects on the health of farmers and consumers.	Reduce fertilizer pollution
Use of safe vegetable regulation through the application of bio-fertilizer and bio-pesticide	Reduce production costs from unnecessary chemical pesticide and fertilizer use	Reduce adverse effects on health of farmers and consumers.	Reduce pollution from pesticide and fertilisers
Application of natural farming	Reduce costs from chemical pesticides and fertilizers	Reduce effect on health to farmers and consumers	Reduce pollution from chemical pesticides and fertilizers
Application of a colour table to control application of chemical fertilizer	Reduce costs from extra nitrogenous fertilizer	Reduce effect on health to farmer and consumers	Reduce pollution from chemical fertilizers

4.1.2.4 Solid waste management

A common problem in rural areas that GP works to solve is solid waste management. This is done through the establishment of solid waste collection teams and in some instances, through the mobilization of local authorities by constructing a landfill. Solid waste management has been integrated with cultural activities of area, such as solid waste collection campaigns at celebratory times in village. In addition, the establishment of environmental protection regulations have had significant benefits in villages. Table 16 summarizes achievements in relation to solid waste



Clean the village in the GP propagation day

management.

Table 16 GP options for solid waste management

GP options	Province	Results
Establishment of environmental protection regulations	Hai Duong Bac Giang Quang Ninh Vung Tau Da Nang Vinh Long	
Set up a solid waste classification system	Phu Yen	Construction of 66 compartmentalised separation systems for solid waste classification
	Vinh Long	Application in 60 households
Establish a solid waste collection system	Hai Duong	1 solid waste collection team
	Quang Ninh	1 solid waste collection team
	Hoa Binh	3 solid waste collection teams in 3 village
Construction of common rubbish bin	Ninh Binh	42 common rubbish bins.
	Ho Chi Minh	90 bins in 3 communes (Binh Chanh, Xuan Thoi Thuong, Thai My)
	Nghe An	16 bins
	Ha Tinh	35 bins
Launch cleaning campaign	Hai Duong Da Nang Hue	
Construction of bin for pesticide container collection	Hai Duong	10 collection bins (80x80x80 cm)
Improve rural roads to improve solid waste transportation	Da Nang	250 m ³ of soil was used to improve the rural road
Construction of landfill	Ninh Binh	Construction of one common landfill
	Quang Ninh	Construction of a 700 m ² landfill
	Hue	Construction of 2 temporary holding areas

The application of solid waste management in the communities has contributed to improving environmental conditions in the area, reducing adverse effects to human health through pollution of the environment. The awareness of people has been also enhanced through their daily activities.

4.1.2.5 Energy

The inefficient use of cooking fuel is common in rural areas. Efficiency saving stoves is one GP option which was generated and implemented to solve this problem. The application of energy efficient stoves has contributed to reduce smoke as well as reducing the amount of fuel utilized, therefore saving money for villagers. Application of efficient saving stove is suitable for rural areas. I reduce the time needed for cooking and reduce energy consumption by 20-30%, they reduce air pollution. Application of this stove also reduce smoke and dust, thus improving the health of villagers, particularly for women, children and the elderly who spend more time in the home.



Efficiency saving stove

Another option for energy saving is the construction of Biogas plant as mentioned in previous section. People can save cooking fuel by application of this option. Table 17 summarize the achievement of GP program in energy area.

Table 17 GP options for energy saving

GP options	Province	Results
Construction of energy efficient stoves	Hoa Binh	30 fixed stoves and 320 mobile stoves
	Ninh Binh	25 energy efficient stoves
	Quang Ninh	30 energy efficient stoves
	Bac Giang	260 energy efficient stoves in 10 villages
	Ha Tinh	24 energy efficient stoves
	Phu Yen	50 energy efficient stoves at 50 households
	Da Nang	17 energy efficient stoves
	Quang Nam	03 energy efficient stoves
	Gia Lai	10 energy efficient stoves

4.1.2.6 Income Generation

The GP program can also contribute to income generation for rural people. Many GP options have brought significant benefits for people. Application of advanced furnaces is one example. This furnace contains a separate dry chamber to ensure improved hygiene and high product quality. Worker's health also protected since smoke is released through a high chimney. In economic terms, the return for high quality product is greater. The product price from this furnace is 1000 dong/kg of product which, when considered with an output of 6 ton/5 months/village, the villagers' income is higher when compared with the application of a traditional furnace. The application of an advanced furnace also save 5% of fuel.



Mushroom cultivation in Hoa Binh province

Table 18 summarizes the achievements of GP program for income generation

Table 18 Achievement of GP program in income generation

GP option	Province	Results
Construction of Advanced furnace for processing of agricultural products	Hai Duong	200 advanced stoves
Mushroom cultivation	Hoa Binh	30 tons of material
	Bac Giang	30 tons of material
	Da Nang	1 household
	Vinh Long	10 households
Worm farming	Phu Yen	02 households
	Da Nang	04 households
	Vinh Long	02 households (20kg worm /household)
Bee keeping at household level	Da Nang	5 households
Pigeon rearing		05 households
Frog rearing		05 households
Develop traditional careers	Da Nang	Recover fish sauce traditional career
	Ninh Binh	Develop straw handicraft traditional career in Hoa Lu

Improve the garden and plant high economic value trees	Gia Lai	Improve 3.5 ha of garden. The trees with low economic value were replaced with high ones such as durian, rambutan, logan.
Improve cow breed	Vũng Tàu	Provide 31 female “sind” cow and 2 male “sind” cow for 14 households.
	Gia Lai	Provide 7 cow
Rice-fish, rice-shrimp model	Vinh Long	8 models
Pig rearing	Vinh Long	Provide 06 pigs
Plantation of orange with high pest resistance	Ben Tre	93 households
Plantation of high yield corn	Ben Tre	26 plots

Table 19 analyses the benefits of some GP options for income generation

Table 19 Benefits of GP options for income generation

Option	Benefit		
	Economy	Social	Environment
Worm farming		Improve living standards of people	Utilize waste product (straw rice) and human waste
Mushroom cultivation		Make use of free time; increase income for people	Utilize waste products (straw rice)
Bee keeping at household level		Career development, income generation.	
Frog rearing		Increase income for people	
Improve the garden and plant high economic value trees	Increase income for people from high economic value products.	Increase living standard of people in rural area	
Improve cow breed	Career development and income generation		
Plantation of orange trees with have high pest resistance	Reduce plant disease and increase land use efficiency, farmer have high return		

Plantation of high yield corn	Increase income		
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4.1.2.7 Other section

In addition to the above mentioned areas, GP options also concentrates on other area such as plantation of tree to prevent erosion and the plantation of tree to increase coverage area. Table 20 describes other sections implemented in GP program.

Table 20 Other section in GP program

Sector	GP options	Province	Results
Increase forest coverage area	Tree plantation	Ninh Binh	Plan 100 trees in Van Thi, Gia Tan
	Planting trees to prevent erosion	Ha Tinh	1 ha
Poor rural infrastructure	Construction of concrete roads	Hai Duong	7000 m of road

5 Difficulties and advantages

5.1 Advantages

- Development of rural communities is one of the priorities in development strategy of government. The GP programs fit well into this
- The GP program has strong support of governmental authorities at different levels such as the Ministry of Science and Technology, the Ministry of Natural Resource and Environment, the Departments of Science, Technology and the Environment (DOSTE), the Departments of Agriculture and Rural Development and various Research Institutes
- A network of experienced experts has been established in the provinces in the GP program
- The GP project has mobilized the participation of people from top to bottom level. Steering Committee at provincial level has monitored the progress of project while the GP team has participated in the whole cycle of project (planning, implementation and monitoring)
- The GP teams are participated in by a number of Unions at the village level (Farmer Union, Women Union and Youth Union) which play a important factor for the success of project.
- The GP methodology is simple and easy to apply in rural areas. Most of GP options has brought benefits for villagers. Therefore, the GP program has expanded to more household and villages
- The project has mobilized contribution from the Government, local authorities and villagers

5.2 Difficulties

Difficulties that villagers have met in implementing GP Project are:

- Changing mindset of the villagers on alignment of Productivity and Environmental Protection
- Environmental protection is not a high priority in local community or even at the local authorities
- Some GP options depend on the time. For example, mushroom cultivation should be conducted at harvesting time, bee keeping should be conducted in the flower season (March) to have maximum yield and biogas plants run into difficulties in the rainy season when ground water level is high.
- A common problems is how to maintain the GP activities after the completion of implementation, where external funding ceases.
- People always look at the investment from government to solve their own problems and do not recognize that environmental pollution is caused by their actions.

6 Recommendations

It is difficult to maintain the GP activities after implementation period. Gp leaders have made the following recommendations for future improvement:

- GP activities depend on the leadership of the local authority. The creativity and independence of the GP team are very important as well. Therefore, local authority has to select the GP team carefully basing on the required criteria. Members of the team should be enthusiastic and have prestige in the community.
- It is essential to select the families who are in good condition and enthusiastic enough to participate into some specific models and define them as typical models for other people to observe, study and multiply. In order to effectively implement, the local authority should combine with GP teams to implement step by step seriously and scientifically.
- Mobilize the support from the local leaders to smoothen the GP team activities during the implementation.
- Integrate the GP activities to the daily management system in local such as doing monthly overall cleaning activity, signing village environmental protection regulations and set up specialised communities.
- Creating practical and effective models combining with the environment propagation activities will make great impact on people mind and they themselves will find it necessary to multiply the models and make contribution into the GP activities maintenance in local areas.
- The local authority should integrate the environmental protection criterion into their annual agenda. The most effective method of dissemination about GP is still “word of mouth” which can occur in formal occasion such as meetings and festivals as well as informal and through the local radio in combination with poster, panel and environment news boards. These activities

should be done frequently to maintain awareness in the community to keep villages civilized, green, clean and beautiful.

- Creating jobs, increasing productivity upon which increasing income and improving living conditions in community are playing very important role in environmental protection at a local level.

7 Conclusion

During five years of implementation, the Green Productivity Program has significantly contributed to rural development in terms of social, economic and environmental protection. The GP options vary, based on the different conditions of each village. GP has become part of people's lives and can be considered an effective tool for enhancing productivity and socio-economic development in the direction of sustainable development. The concept of GP promotes the ideology that environmental protection should be viewed as an essential element in any development and should be integrated into the global community. Given the grass roots approach of this program, it is widely accepted and has been highly successful throughout the community.

The GP program has received much of support from many agencies including the Ministry of Science and Technology, the Ministry of Resource and Environment, the Department of Science, Technology and Environment (DOSTE) and the Department of Rural and Agricultural Development. Through the GP program these agencies have built effective relationships, which have strengthened other programs such as Clean Water and Clean Environment and the program on Socio-economic Development in Rural Areas. This in turn benefits the extension of the GP program.

With such successful results, it is evident that productivity can be enhanced through environmentally sustainable development. Vietnam is the first country where the GP program has been applied at the community level. Knowledge from these and existing projects will be used to promote the GP movement throughout Vietnam and to encourage other APO member countries to apply GP programs for local socio-economic development. On August of 2002, Vietnam in cooperation with APO organized workshop on Green Productivity and Integrated Community Development at World Summit in Johannesburg with the purpose of sharing experiences with other countries on the achievements and experiences of the program.

Appendix 1 Working time based on priority

Area	Village/ commune	Priority level	Concentrate	Required visit	Required time (days)
North					
First priority					
Hanoi	Hoang Long village	<i>First priority</i>		8	8.5
Thai Nguyen	Thanh Lap village	<i>First priority</i>		8	8.5
Hai Duong	Man De village	<i>First priority</i>		8	8.5
Quang Ninh	Me Cu village	<i>First priority</i>		8	17
Nghe An	Nghi Thu commune	<i>First priority</i>		8	25.5
	Quynh Luong commune				
	Hung Nhan commune				
Ha Tinh	Xuan Thanh village	<i>First priority</i>		8	25.5
	Phu My village				
	Ky Loi village				
Second priority					
Hoa Binh	Lac village	<i>Second priority</i>		7	6
	Trai village				
	Dam village				
Phu Tho	Lang Dai village	<i>Second priority</i>		7	6
Concentrated					
Bac Giang	Dong Huong village	<i>First priority</i>	<i>Concentrate</i>	8	8.5

	Cho Moi village				
	Ap village				
	Lai village				
	Kim Son village				
	Thuan village				
	Trung Dong village				
	An Binh village				
	Tinh Loc village	<i>Third priority</i>	<i>Concentrate</i>	5	4
	Kha Ly Ha village				
Ninh Binh	Van Thi village	<i>Second priority</i>	<i>Concentrate</i>	7	6
	Vuon Thi village				
	Tri Chinh village				
	Kien Thai village				
	Thang Thanh village	<i>Third priority</i>	<i>Concentrate</i>	5	4
Central area					
First priority					
Gia Lai	Khun village	<i>First priority</i>		8	8.5
Quang Nam	Phuoc Kieu village	<i>First priority</i>		8	8.5
Second priority					
Hue	Phu Hau village	<i>Second priority</i>		7	6
	Phu Hai commune				
	Van Cu village				
	Thuy Chau commune				
Phu Yen	Hoa An commune	<i>Second priority</i>		7	6
	Vinh Phu village				
Concentrate					
Da Nang	Thanh Vinh I village	<i>First priority</i>	<i>Concentrate</i>	8	8.5

	Hoa Phu commune				
	Nam O 2 village	<i>Third priority</i>	<i>Concentrate</i>	5	4
South					
First Priority					
HCMC	Thai My commune	<i>Third priority</i>	<i>Concentrate</i>	5	4
	Xuan Thoi Thuong commune	<i>First priority</i>	<i>Concentrate</i>	8	8.5
	Binh Chanh commune				
Ca Mau	Ba Dieu village	<i>First priority</i>		8	8.5
	Cai Ro village				
Ben Tre	An Binh village	<i>First priority</i>		8	8.5
	An Loc Thi village				
	An Phong village				
Second priority					
Vung Tau	Lang Lon commune	<i>Second priority</i>		7	6
	Phuoc Hai Commune				
Can Tho	Dinh Phuoc village	<i>Second priority</i>		7	6
	4 village				
	Nhon Loc 1 village	<i>Third priority</i>		5	4
Vinh Long	Phu Thanh village	<i>Third priority</i>		5	4
	Phuoc Hau village	<i>Second priority</i>		7	6

Appendix 2 GP implementation Plan

No	Task	In charge	Outputs	Years													
				2001			2002										
				10	11	12	1	2	3	4	5	6	7	8	9	10	11
I	Preparation and Planning																
1	Proposal from provinces	DOSTE	Activities and budget proposal														
2	Agreement between VPC and provincial DOSTEs	ENCOMD, DOSTE	Agreement on proposal														
3	Selection of local experts and local coordinators	DOSTE	List of local experts and coordinators														
4	TOT preparation																
	Content	ENCOMD															
	Materials																
	Selection of participants from provinces	DOSTE	List of participants														
5	5-days TOT conducting																
	TOT Danang	ENCOMD															
	TOT Hanoi		Transfer GP methodology to participants														
6	GP Team formation																
	Implementation plan of provincial GP team and coordinators	DOSTE, communities	GP team formation at local communities														
	Register provincial GP team and coordinators		List of registered GP teams														
II	Implementation of GP options																
	GP team training	DOSTE	Training on GP methodology, tools and techniques														

14	Project Evaluation																					
	Criteria for evaluation	ENCOMD	Criteria																			
	Select experts for evaluation	ENCOMD	List of experts																			
	Evaluation	Experts	Reports of evaluation																			
15	GP workshops																					
	GP workshop in Hanoi	ENCOMD	Workshop on GP experience																			
	GP workshop in HCMC	ENCOMD																				
	GP workshop in Danang	ENCOMD																				
16	Web design for communities	ENCOMD, OP 3	Web site																			
	Information, data collection	ENCOMD																				
	Web design	OP 3																				
	Post on the internet	OP 3 + ENCOMD																				
	Web maintenance	OP 3 + ENCOMD																				
17	GP Award																					
	GP award categories	ENCOMD	Categories																			
	Provincial GP award council	DOSTE	List of council members																			
	National GP award council	Council	List of council members																			
	Guidelines for GP award Councils	ENCOMD	Documented guideline																			
18	GP National Convention																					
	GP team contest at provinces	DOSTE	Selected GP teams																			
	National GP Team contest	ENCOMD																				

