GREEN PRODUCTIVITY -
INTEGRATED COMMUNITY DEVELOPMENT
FOR POVERTY ALLEVIATION

APO
DEMONSTRATION PROJECTS
IN VIETNAM
1998-2001

ASIAN PRODUCTIVITY ORGANIZATION

VIETNAM PRODUCTIVITY CENTER

2002
ASIAN PRODUCTIVITY ORGANIZATION

Green Productivity–Integrated Community Development for Poverty Alleviation
APO Demonstration Projects in Vietnam 1998-2001

ISBN: 92-833-2330-0

FOREWORD

The Asian Productivity Organization (APO) started its Green Productivity (GP) program in the mid-1990s in response to the challenges of sustainable development arising from the Earth Summit in Rio in 1992. The primary objective of the GP program is to integrate productivity improvement with environmental concerns. Hence, the APO's GP program is guided by the twin objectives of productivity enhancement and environmental protection. This linkage of productivity and the environment is a key feature of the APO approach to GP.

The implementation approach adopted by the APO for the GP program is demonstration projects, wherein factories or enterprises are chosen to demonstrate the feasibility and viability of combining productivity and environmental concerns. These projects serve as models for replication in other similar businesses, both within the country and in other APO member countries. The results achieved by the Green Productivity Demonstration Program (GPDP) are widely disseminated by the APO through the publication of documents, audio-visual materials, organizing workshop meetings and seminars, and sponsoring observational study missions to the GPDPs.

The initial GPDPs taken up by the APO were primarily in the industrial sector in general and small and medium enterprises (SMEs) in particular. Over the years, however, the GP concept has expanded to the agriculture as well as service sectors. The Vietnam Productivity Center (VPC) and the Vietnamese Ministry of Science, Technology and Environment (MOSTE) successfully implemented the first GPDPs at the community level under the APO support, thus exploring new avenues for GP application.

GP essentially addresses the triple bottom-line issues of economic profitability, environmental protection, and social fairness. GP application in communities is an excellent model in which the productivity principles are effectively applied to harmonize the triple bottom-line results for the ultimate goals of sustainable development and poverty alleviation.

Between 1998 and 2001, GPDPs were successfully implemented in eleven villages in Vietnam. This was an exemplary form of cooperation among various agencies such as the APO, the Directorate for Standards and Quality (STAMEQ), MOSTE, various provincial Departments of Science, Technology and Environment (DOSTE), Departments of Rural and Agricultural Development (DRAD), the communities where projects were implemented, many research institutes, and others.

It is heartening to note that in the next phase of the project, the Vietnamese Government is expanding GP projects to seventy-two communities in Vietnam.

I am very pleased to present this compilation of success stories of GPDP implementation in communities in Vietnam. The APO is proud to share these results with all the interested stakeholders in APO member countries as well as worldwide. I would like to express my profound gratitude to the VPC, STAMEQ and all other stakeholders from Vietnam for their contribution to these projects as well as to this booklet.

Takashi Tajima, Secretary-General
Asian Productivity Organization
August 2002

PREFACE

The Vietnam Productivity Center (VPC), together with the Asian Productivity Organization (APO) and the Ministry of Science, Technology and Environment (MOSTE), has successfully implemented the first Green Productivity (GP) Demonstration Project at the community level.

Between 1998 and 2001, GP Demonstration Programs were successfully implemented in eleven villages in 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 (DRAD), the communities where projects were implemented, many research institutes, and countless other organizations.

The VPC would like to thank all the above-mentioned organizations and also the following organizations involved in the publication of this booklet:

- The APO for providing a grant for the publication of this booklet;
- DOSTEs and various Provincial Departments of Standards and Quality for providing invaluable comments that have contributed to the success of this booklet; and
- The staff of VPC who compiled this booklet.

This booklet entitled "Green Productivity – Integrated Community Development for Poverty Alleviation" has been issued by the VPC. It provides details of GP methodology and GP in Vietnam, and gives information on the eleven demonstration villages both before and after project completion. It clearly demonstrates how GP can be successfully applied within communities.

Your comments and/or suggestions will help to make this booklet an invaluable resource that can be used to promote and expand GP programs in Vietnamese communities as well as internationally.

Vietnam Productivity Center
Directorate of Standards and Quality

ABOUT THE APO GP DEMONSTRATION PROGRAM

The Asian Productivity Organization (APO) realized that in most of its member countries, small and medium-sized enterprises (SMEs) make substantial contribution to national income and employment generation. Nevertheless, their production processes are often inefficient and wasteful of raw materials and energy and generate a heavy burden on the environment. This situation is probably due to their unfamiliarity with available preventive techniques and appropriate technologies and to a lack of financial and technical support.

In 1995, in an endeavor to find practical approaches for SMEs to improve their productivity and environmental performance, the APO introduced a Green Productivity Demonstration Program (GPDP) for National Productivity Organizations (NPOs) to put into practice the concept of Green Productivity (GP).

OBJECTIVES

The objective of the GPDP is to demonstrate empirically that environmental protection and productivity improvement can be profitably harmonized, even in SMEs. Under the GPDP, the APO, together with the NPOs, selects compaines where GP implementation will have a "multiplier effect," meaning that it will serve as a model to spread GP practices to other companies.

Since the program's inception, the APO has undertaken a total of 26 demonstration projects, covering diverse industries such as dyeing, tanning, precision tool and machine tool manufacturing, electroplating, printing, food processing, farming, and eco-community development. Every year the APO supports a number of new GPDPs based on the requests from the NPOs in its member countries. Typically, the GPDP is expected to be implemented over a period of one year.

IMPLEMENTATION

For the GPDP to be successfully implemented, a strong partnership between the various stakeholders involved is necessary. The APO covers the costs for international experts, along with necessary monitoring and laboratory analysis costs. It also pays for the dissemination of the GPDP results through technical manuals, videos, and dissemination seminars. NPOs contribute the local implementation costs. The demonstration site shoulders the cost of the hardware required for GPDP implementation.

Once the project is approved by the APO, local as well as international experts are deputed to work with the demonstration site. They identify GP improvement opportunities using appropriate feasibility studies. The selected GP options are then implemented by the demonstration site and the results are monitored to ensure that they yield the expected results in terms of improvements in productivity as well as environmental performance.

EFFECTIVENESS

From the experience of the implementation of the GPDP in various member countries, the approach and methdology adopted by the APO have been found to be effective in maintaining and improving productivity, quality, and environmental performance in the manufacturing sector. The six-step methodology that is now being used by many local and international organizations is a result of the many evolutions that have taken place during the course of GPDP implementation. The six-step methodology has now been incorporated into the APO training manual for GP.

ABOUT THE PRESENT GPDP CASE STUDIES

The case studies compiled in the following pages are a summary of the 11 GPDPs implemented at the community level in Vietnam during the years 1998-2001. More such compilations are available documenting the results of completed GPDPs in the industrial, agricultural, and service sectors.

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ACKNOWLEDGEMENTS

The Asian Productivity Organization
would like to record
its grateful appreciation
to all the communities
participating in the
Green Productivity -
Integrated Community Development
Demonstration Projects
and the project counterparts
for their contribution and
cooperation.

Grateful appreciation
is also extended to
Vietnam Productivity Center (VPC)
and
Directorate for Standards and Quality
(STAMEQ)
for preparing and coordinating
the technical contents and
the manuscript.

INTRODUCTION

ASIAN PRODUCTIVITY ORGANIZATION AND GREEN PRODUCTIVITY PROGRAMS

The Green Productivity (GP) concept was established in 1994 by the Asian Productivity Organization (APO) as an outcome of the Rio Earth Summit in 1992. GP is a strategy used to address environmentally sustainable development and aims to enhance productivity and socio-economic development while ensuring environmental protection. It applies environmental management tools, techniques, and technologies to reduce the impact of an organization's activities, goods, and services on the environment. GP is applicable to the manufacturing, agricultural, and service sectors. Nineteen countries throughout Asia and the Pacific are members of the APO, and GP methodology has been, and continues to be, applied to many different-sized enterprises within these countries. The benefits gained from GP implementation are significant in terms of productivity enhancement and environmental protection. Internationally, GP programs have been applied to industrial and service sectors. Vietnam is the first country to implement GP at the community level.

GP PROGRAMS IN VIETNAM

Since 1998, the Vietnam Productivity Center (VPC), under the Directorate for Standards and Quality (STAMEQ), has been succesfully implementing GP projects in community groups in Vietnam. Given that the majority of GP projects in other APO member countries have been implemented in industrial sectors and agricultural farms, Vietnam was the first country to implement the GP concept in community groups. As such, it was expected that the VPC would have several problems such as a lack of people with GP expertise in community groups and limited awareness of the Vietnamese villagers of GP concepts and techniques. The GP program in Vietnam is, therefore, different from those in other APO member countries as far as the nature and scope are concerned.

Projects implemented by the VPC have been completed with financial support from the APO. Other organizations throughout Vietnam, including various provincial Departments of Science, Technology and Environment (DOSTEs), have also supported the VPC and contributed to GP projects. In addition, many institutions have provided technical assistance, and local authorities and villagers have contributed to the implementation of projects. The combined efforts of all these organizations have made GP projects in Vietnam a success.

The first community project implemented by the VPC was the GP Demonstration Program *(SPE-GPDP-98)*. During 1998 and 1999, this project applied GP in three villages: Tinh Loc and Kha Ly Ha villages in the Viet Yen district of Bac Giang province, north of Hanoi; and My Khanh B village in the Cu Chi district of Ho Chi Minh City.

Through the GPDP project, the environmental conditions and living standards of the villagers have improved by implementing options such as utilization of biogas technology to manage human and animal waste, construction of centralized water supply plants to provide clean water to villagers, and the application of integrated pest management (IPM) to reduce the amount of pesticide and chemical fertilizer used.

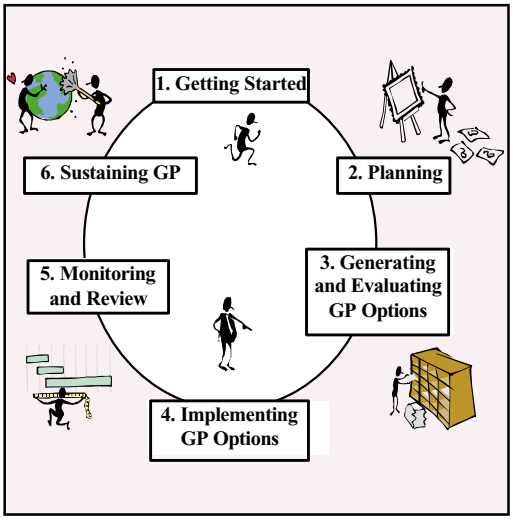
After evaluating the success of the first GPDP project, the program was initially expanded to three villages during 2000 and 2001 under the GP Development Assistance program. In addition, another eight villages implemented GP through 2000 and 2001 under the GP Integrated Community Development program. To date, there are eleven villages that have implemented GP. The VPC has currently received requests to implement GP in sixty villages covering twenty-one provinces throughout Vietnam. GP programs will be implemented in these villages during 2001-2002.

The objective of the GP program in Vietnam is to improve the environmental and socio-economic situation of communities and then to expand GP into the industrial sector. The approach within industries is to integrate GP with an environmental management system (EMS) such as ISO 14000. Currently GP is being implemented in two cement factories at Sai Son and Hoang Thach in Vietnam. The action plan of the VPC aims to have forty enterprises applying GP in 2003.

In addition, the VPC has conducted training courses to promote and expand the GP concept throughout Vietnam. These training courses taught participants about GP tools and techniques. Participants in training courses included consultants, staff from different companies and departments, and people from research institutes.

Given that Vietnam is the first country to apply GP at the community level, the results and experiences from GP projects there will help other APO member countries to implement GP programs at the community level.

OVERVIEW OF GP METHODOLOGY, TOOLS AND TECHNIQUES



The GP methodology consists of six primary steps with various tasks associated with each step (Table 1).

Step 1: Getting Started

Task 1 : GP team formation

This task involves forming a GP team that includes members from the village and supporting organizations such as the DOSTE.

Task 2: Walk-through survey and information collection

This task incorporates gathering information and data on the village and then undertaking a survey of the village to

identify problem areas and possible options for solutions. The survey is undertaken by the GP team and information recorded in a database for future reference.

Tools and Techniques

At the start of the GP process, flowcharts and process flow diagrams provide graphic representation of activities, processes, and material flow. A material balance may also be utilized, based on the process flow diagram, allowing for the quantitative assessment of material inputs and outputs.

Table 1: GP Steps, Tasks, and Tools

Steps	Tasks	Tools and Techniques
Step 1. Getting Started	1. Form a GP team 2. Walk-through survey and information collection	-Brainstorming -Benchmarking -Checklist -Flowcharts and process flow diagram
Step 2. Planning	3. Identification of problems and causes 4. Setting objectives and targets	-Brainstorming -Cause-and-effect analysis (Ishikawa) -Eco-mapping -Material balance
Step 3. Generation and Evaluation of GP Options	5. Generation of GP options 6. Screening and evaluation of GP options 7. Preparation of implementation plan	-Brainstorming -Cost-benefit analysis
Step 4. Implementation of GP Options	8. Implementation of selected options 9. Training, awareness building, and developing competence	-Training -Responsibility matrix
Step 5. Monitoring and Review	10. Monitoring and evaluation of results 11. Management review	-Prepare monitoring program -Audits -Solution effect analysis -Failure mode and effect analysis
Step 6. Sustaining GP	12. Incorporate changes 13. Identify new/additional problem areas for continuous improvement	The tools are repeated here, since the activities are looped back to the previous steps

Step 2: Planning

Task 3: Identifying problems and causes

When undertaking the walk-through survey, environmental (e.g., poor water quality), technical (e.g., no wastewater drainage infrastructure), and/or financial (e.g., lack of by-trade) problems and their causes are identified.

Task 4: Setting objectives and targets

When all the problems and their causes have been identified using an Ishikawa diagram, objectives and targets are set to address the problem areas. Performance indicators are also identified.

Tools and Techniques

Benchmarking is used to identify areas that can be improved by comparing the current status of a village to that of other villages. The GP team uses brainstorming to identify the possible causes of the problems. Ishikawa cause-and-effect analysis is another tool used to identify the reasons behind the problems. It is a diagram that illustrates the causes of problems and their effects, thus allowing a problem to be fully analyzed.

Eco-mapping may also be used to identify environmental problems. This is a simple and practical visual tool that provides a bird's-eye view of a village's operations, practices, and problems.

Checklists are used for collecting data over time to show trends and recurring problems. The information from these checklists is then stored in a village database.

Step 3: Generation and Evaluation of GP Options

Task 5: Generating GP options

Options are developed to meet the objectives and targets set in the planning stage.

Task 6: Screening and evaluating GP options

After generating GP options, they are screened and prioritized under the following aspects:

- Environmental
- Technical
- Financial
- Social

Task 7: Formulating GP implementation plan

The GP team then formulates an implementation plan to implement the suitable options selected in Task 6.

Tools and Techniques

GP options are generated and assessed using techniques such as brainstorming and cost-benefit analysis. This facilitates the comparison of options in terms of their monetary costs and the net benefits that can be obtained.

Step 4: Implementation of GP Options

Task 8: Training, awareness building, and developing competence

Training is provided to the GP team that imparts information about GP methodology as well as information on environmental aspects and methods to improve environmental management for the overall improvement of the living standards of the villagers. Issues such as solid waste management, importance of clean, potable water, human and animal waste management, and air pollution management are all included in the training programs.

Task 9: Implementing selected options

The GP team implements the options generated in Task 6.

Tools and Techniques

Options may encompass both simple and more complex changes, such as replacing inefficient traditional stoves with new, more efficient stoves to increase fuel efficiency and reduce air pollution, recycling manure and sewage for use as energy sources in biogas plants, waste stream segregation and the promotion of recycling, and reuse and recovery to reduce the amount of waste a village produces and improve waste disposal.

Step 5: Monitoring and Review

Once the selected GP options have been implemented, it is very important to check whether they are producing the desired results. This involves monitoring the overall GP system to ensure that it is proceeding in the right direction and that targets are being achieved as per the implementation plan. This step consists of two tasks:

Task 10: Monitoring and evaluation of results

The overall GP system is monitored by the VPC and the GP team to ensure that the program is proceeding in the right direction.

Task 11: Management reveiw

Findings of monitoring and evaluation (Task 10) are reported for management review.

Step 6: Sustaining GP

Task 12: Incorporating changes into the community's system of management

A GP program should become a part of the community's daily activities. The support from local authorities and villagers is very important for sustaining a GP program at the community level.

Task 13: Identifying new/additional problem areas for continuous improvement

All the above steps can be applied for any new problem areas that may arise within a community/ organization. Therefore, GP is a process of continuous improvement.

Tinh Loc and Kha Ly Ha Villages, Bac Giang Province

GP Programs Implemented

GENERAL INFORMATION

Tinh Loc and Kha Ly Ha were two villages that were selected for the initial Green Productivity Demonstration Program (GPDP) during 1998 and 1999. The Green Productivity (GP) program was extended in these villages during 2000 and 2001 under the GP Development Assistance program.

These predominantly agricultural villages are located within Bac Giang province. Both the villages are located in mountainous areas, about 60 km north of Hanoi.

Some characteristics of each village are as follows:

Tinh Loc Village, Nghia Trung Commune, Viet Yen District

Total amount of land: 169.93 ha.
Cultivated land: 96.44 ha., including ○ Vegetable plantation land: 75 ha., and ○ Lowlands used for rice cultivation: 21.44 ha.
Population: 1375 people within 301 households.
Average income: 2,300,000 VND/person/year.
Main production activities
Agriculture: 66% of the total income Breeding livestock: 16.8 % of the total income Breeding fish: 2% (1998 data) of the total income Other: 5.2% (construction, trading, service, etc.) of the total income

Kha Ly Ha Village, Quang Minh Commune, Viet Yen District

Total amount of land: 72 ha.
Cultivated land: 61 ha., including
○ Vegetable plantation land: 30 ha., and
○ Lowlands used for rice cultivation: 31 ha.
Population: 1450 people within 330 households.
Average income: 2,074,000 VND/person/year (1997 data).
Main production activities
Agriculture: 80% of the total income (85% of the population is involved in agricultural activities.)
Other: 20% from various services

MAIN ISSUES

- Wells, ponds, and lakes are often the main sources of water. However, these sources were often polluted and their use by villagers created many health problems.
- Sewage and manure disposal practices were inappropriate causing local air and water pollution.
- Methods for domestic solid waste disposal were contributing to air and water pollution. Waste was not collected and treated, and instead was either burned or deposited in gardens.
- Daily activities such as cooking and burning solid waste caused air pollution.
- The application of chemical pesticides and fertilizers was inappropriate and resulted in an increase in environmental degradation through water and soil pollution.
- Agriculture productivity was low, mainly due to inappropriate cultivation methods and external factors such as insect and rat infestation.
- Agricultural production is important to the economic condition of rural areas. This is also the main activity within both Kha Ly Ha and Tinh Loc villages. However, agriculture requires manual labor for limited time periods. During certain stages of the agricultural season, there is little work available. Hence, farmers in many villages seek a by-trade to subsidize their income. Both, Kha Ly Ha and Tinh Loc villages lacked a by-trade. Thus, it was important to establish a secondary income for farmers.

GP OPTIONS

(1) Install groundwater pump systems for supplying potable water.

(2) Apply biogas technology for treating sewage.

(3) Form solid waste collection teams for managing and treating domestic waste.

(4) Construct energy efficient stoves. These stoves reduce the amount of energy used, minimize air pollution, and improve the health of villagers.

(5) Apply Korean natural farming technology to rice growing to reduce the reliance on chemicals. This method using locally produced natural ingredients enables farmers themselves to prepare fertilizer mixtures.

(6) Apply integrated pest management (IPM) to reduce chemical use during agriculture production.

(7) Use effective microorganisms (EMs) in agriculture production to reduce reliance on chemicals, and in landfills to reduce odor problems and aid in decomposition.

(8) Distribute semicircular-shaped rat traps to the villagers. This will aid in reducing damage to vegetable crops caused by rats.

(9) Introduce mushroom cultivation techniques. Cultivating mushrooms will provide a secondary income as well as make use of agricultural waste like straw from rice production.

IMPLEMENTATION AND RESULTS

Installing a Biogas Chamber

Energy-efficient Stoves

- Two groundwater pump systems were installed in the two villages. These systems pump groundwater to the surface and filter the water to remove iron.
- Twenty biogas chambers were constructed within the two villages. The total volume of the chambers is 100 m^3. Animal waste, once dissolved, can also be used as fertilizer for vegetable cultivation. This will reduce air pollution and waste generation.
- One domestic waste collection team was formed in each village. The collection teams now dispose of solid waste into a landfill established as part of this program. Each household contributes money for the maintenance of the landfill and the collection teams.
- One hundred and fifty energy-efficient stoves were constructed within the two villages. Due to a reduction in their energy consumption, each household containing 4-6 people saves approximately $US10/year.

The energy-efficient stoves have the following advantages:

- Save time needed for cooking and also energy by 20-30%.
- Reduce air pollution.
- Lower the ambient air temperature by 5-7^{o}C, which is significant particularly in the summer months.
- Minimize the risk of fires occurring within households.
- Reduce smoke and dust and thereby improve the health of the villagers, particularly the women, children, and the elderly who spend more time inside the home.

- Seven hundred liters of EMs were supplied to the two villages. The EMs are used for rice cultivation and for treating solid waste. EMs are a catalyst for the decomposition of solid waste and reduce the odor from the landfills.
- Teams responsible for eradicating rats were formed in both the villages. By using the semicircular rat traps, teams in Kha Ly Ha village caught 10,000 rats within two months. These rats are suitable for pig food.
- Thirty tons of waste straw from agriculture were used for growing mushrooms. Therefore, this method utilized waste and generated a secondary income as earlier the straw was disposed of by burning. Mushroom growing increased the income of the villagers since they earn approximately $US90 for each ton of mushrooms.

Mushroom Cultivation

- The villagers are now aware of the need to protect their environment. GP methodology has become an environmental preservation technique for both the villages. It is now applied to any new production activity.
- The villagers established regulations for environmental protection and the maintenance of GP activities in their villages.

> *"After one year of the project implementation, the environmental awareness of the people in the village has increased. Environmental conditions in rural areas are better. The Green Productivity project has created a positive effect on people's awareness. This is the result of a combination between productivity and the environment."*
>
> Mr. Binh, GP Team Leader of Kha Ly Ha,
> Bac Giang province

My Khanh B Village, Cu Chi District, Ho Chi Minh City

GENERAL INFORMATION

My Khanh B village was selected for the initial Green Productivity Demonstration Program (GPDP) during 1998 and 1999. The Green Productivity (GP) program was extended in My Khanh B village during 2000 and 2001 under the GP Development Assistance program.

My Khanh B village is located in Thai My commune of Cu Chi district, approximately 45 km from Ho Chi Minh City.

Some characteristics of the village are as follows:

My Khanh B Village, Cu Chi District, Ho Chi Minh City

Total amount of land: 254 ha.
Cultivated land: 116 ha. of the total land
Population: 1285 within 302 households.
Average income: 2,800,000 VND/person/year.
Main production activities
Agriculture: Cultivation and livestock breeding.
Other: Handicrafts from rattan-bamboo (80% of the population are skilled craftsmen.)

MAIN ISSUES

- The villagers faced limited availability of potable water. This was due to the high iron levels, which resulted in local water not meeting the drinking water quality standards [505/BYT Potable Water Quality Standards (Ministry of Health)].
- The sewage was generally discharged directly into ponds and lakes due to insufficient number of hygienic latrines. This caused numerous environmental and health hazards.
- Given that the topography of the area is sloped, in flat or depressed land, water containing sewage formed ponds. This was a problem particularly in the wet season.
- The farmers were excessively dependent on chemical pesticides and fertilizers.
- Many villagers of My Khanh B are skilled rattan-bamboo craftsmen producing high-quality products that could significantly improve their income and standard of living. Thus, the villagers, had a second income-generating activity. However, much of the income was lost due to products sold through middlemen.

GP OPTIONS

(1) Devise a suitable water treatment model.

(2) Apply biogas technology for treating sewage.

(3) Install a drainage system for wastewater.

(4) Introduce methods for collecting and classifying waste before treatment.

(5) Incorporate the integrated pest management (IPM) technique in all cultivation activities to reduce reliance on chemical pesticides and fertilizers.

(6) Establish a rattan-bamboo production cooperative.

IMPLEMENTATION AND RESULTS

Water Supply

- All the villagers now use groundwater from wells rather than ponds for their domestic needs. This reduces cross-contamination from sewage in the ponds and prevents the spread of diseases in the village.
- One central water supply plant with a capacity of 30 m^3 per day was installed. This supplies drinking water for 30 to 40 households. Consumers pay the costs associated with the maintenance and operation of the plant. Other houses have applied a simple sand filtration system in their households. The water from this system was found to meet the potable water quality standard [505/BYT Potable Water Quality Standard (Ministry of Health)].
- One biogas construction team was established in the village and members of the village GP team were trained. They now have technical knowledge about biogas construction. Several biogas chambers have been successfully installed in this village and in the other nearby villages.

Open Drains

- Two open drains with a total 3 km length were established within the village. These are designed to drain localized water in the wet season as well as wastewater discharges from households. It helps protect people from bacterial diseases.
- Training courses were conducted for IPM and an experiment using IPM on 6000 m^2 of rice fields was completed. After training and using this experimental plot, the villagers now are competent and confident in their knowledge and use of IPM.
- A rattan-bamboo production cooperative with 80 members was established in My Khanh B village. The members are technicians and craftsmen of rattan-bamboo in My Khanh B and other neighboring villages. The rattan-bamboo products will be sold in local markets and other markets throughout Vietnam. This will create jobs for the villagers of all age groups during the agricultural slack season and will enhance the living standard by increasing income for households. This, in addition, is a social activity which contributes to preserving the local culture.

> *The application of GP at the community level in Vietnam represents a pioneering effort to improve the quality of life at the community level. The successful completion of the project and the intention to extend it to thousands of villages in Vietnam will be watched with great interest by other APO member countries over the next few years.*
>
> Dr. Leong Yueh Kwong, Malaysia,
> *IGPA Newsletter*

Thang Thanh Village, Ninh Binh Province

GENERAL INFORMATION

Thang Thanh village had Green Productivity (GP) implemented during 2000 and 2001 under the GP Integrated Community Development Program.

Thang Thanh village in Truong Yen commune is located in the old capital city. It is home to the historic Temple of Dinh Le King. Thang Thanh is in the west Hoa Lu district, approximately 93 km south of Hanoi, and the Sao Khe River runs through this village.

Some characteristics of the village are as follows:

Thang Thanh Village, Ninh Binh Province

Population: 1050 people within 205 households.
Main production activities
Cultivation: 60% of the village's total income Other: breeding pigs, poultry, developing tourism, and extracting limestone

The average area cultivated by an individual is about 400 m^2. The productivity, however, is very low (5.4-5.6 tons/ha/year of rice). Villagers can increase their income and thus improve their quality of life by breeding pigs and poultry, developing tourism, and extracting limestone for export.

MAIN ISSUES

- Poor water quality was the predominant problem for people within Thang Thanh village. Thang Thanh had neither water drainage nor a regular water supply system. The main source of

potable water is rain and groundwater from a well. In the dry season, the well often dried up, resulting in water scarcity for domestic and drinking needs. In the wet season, polluted floodwater entered the well and contaminated the drinking water.

- The sewage management system was inadequate. There were few septic tanks in the village; rather concrete containers were used to store sewage. Once full, the contents of these containers were used as compost in fields and household vegetable gardens.
- The village lacked solid waste collection system. The villagers often disposed of their waste in their gardens, rivers, or ponds.
- Households used wood excessively in their traditional stoves for cooking.
- The farmers depended heavily on chemical fertilizers for their fields. The average application rate was about 20 kg of phosphate fertilizer, 3 kg of potassium fertilizer, and 8-10 kg of nitrogenous fertilizer/crop/360 m^2. The amount of chemical fertilizers applied was continuously increasing. The soil is acidic.
- The use of pesticides was not according to the guidelines provided by the manufacturers. Some households applied pesticides themselves without the control of the cooperative. The cooperative is responsible for cultivation activities in the village. Bottles that contained chemicals were not being correctly disposed of and were often left in mountain caves.

GP OPTIONS

(1) Set up village-specific environmental regulations and educate the villagers on environmental management including wastewater treatment, potable water, and environmental regulations.

(2) Construct a water supply plant capable of providing 2.4 m^3/hour of drinking water. This plant will be capable of supplying potable groundwater for 50 households.

(3) Construct septic tanks, biogas plants, and composting pits to treat sewage.

(4) Construct a wastewater treatment system in each household. This will prevent polluted wastewater from being discharged directly into ponds or streams.

(5) Set up a solid waste collection and management system.

(6) Construct energy-efficient stoves to reduce energy consumption and air pollution.

(7) Apply integrated pest management (IPM) to cultivated areas to reduce the reliance on chemical fertilizers and pesticides.

IMPLEMENTATION AND RESULTS

- The villagers established regulations for environmental protection. They were informed of these regulations through radio, newspapers, and posters and also at festivals.
- A competition was organized for GP. Hundreds of people from the Hoa Lu district attended. This helped increase environmental awareness among the villagers.
- Training courses on GP methodology were organized that were attended by over 200 people.

- A water supply plant was installed to pump and filter groundwater for potable purposes. This supply plant is capable of supplying potable water for 50 households. In addition, a water treatment plant was established for households too far from the water supply plant. This plant provides households with simple filtration systems capable of making their water suitable for drinking as per the 505/BYT Potable Water Quality Standard (Ministry of Health).
- Four wastewater treatment systems were constructed within different households.
- Five biogas plants and a compost pit (2 m^3) were constructed. EMONY, a biological product used to increase the speed of composting and to reduce odors, was added to the biogas plants and the compost pit. Three two-compartment latrines and four one-compartment latrines were also built.
- Thirty-one dustbins were distributed throughout the village and a landfill was constructed.
- Eleven energy-saving stoves were built.
- Initial results indicated that the introduction of IPM reduced pesticide and fertilizer use in the field.

Construction of Biogas Plant

Solid Waste Collection Bins

> *SPE-GPDE-98-2058 has contributed to the socio-economic development of our society. This project is the appropriate approach, which contributes to sustainable development.*
>
> Dr. Nguyen Huu Thien, General Director,
> Directorate for Standards and Quality

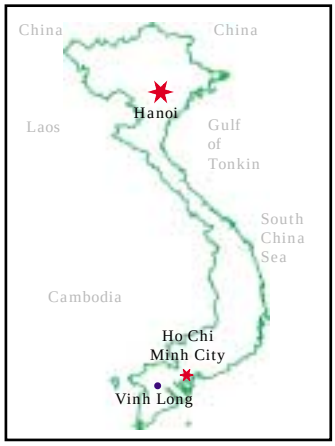
Phu Thanh Village, Tan Phu Commune, Vinh Long Province

GENERAL INFORMATION

Phu Thanh village had Green Productivity (GP) implemented during 2000 and 2001 under the GP Integrated Community Development Program.

Phu Thanh is a village near Tan Phu town in Vinh Long province. This village is 137 km west of Ho Chi Minh City. Phu Thanh village is located 20 km from the Tien River and 10 km from the Hau River and is next to National Highway 1A. It is low-lying with an average height of 0.5 to 0.7 m above sea level.

Some characteristics of the village are as follows:



Phu Thanh Village, Tan Phu Commune, Vinh Long Province

Total amount of land: 212 ha.
Cultivated land: 163 ha., and
Land containing fruit and vegetable gardens: 40 ha.
Population: 1385 people within 297 households.
Main production activities
Agriculture: cultivation
Other: breeding livestock and fish

MAIN ISSUES

- Surface and groundwater pollution due to direct discharge of untreated sewage into rivers and drains caused numerous environmental and health problems.

- Annual flooding led to problems such as contamination of potable water by sewage.
- Inappropriate use of chemical fertilizers and pesticides was also adding to the pollution of surface and groundwater and was reducing the fertility of the land.
- The solid waste was not properly treated. Most of the solid waste was disposed of near to the living areas. Only plastic and glasses were collected and sold for recycling.
- The potential income from fish production was not being achieved.

GP OPTIONS

(1) Treat water within individual households by use of a filter bag, sand, and tank.

(2) Install biogas chambers using plastic bags to manage sewage. The bag stores and decomposes excrement and produces a gas that is used as an energy source for cooking.

(3) Teach villagers how to compost organic waste from their households. This will reduce waste and increase the quality of soil where compost is applied.

(4) Establish waste collection teams to collect rubbish from houses and public areas.

(5) Apply the integrated pest management (IPM) technique within the village to limit the use of chemical fertilizers and pesticides.

(6) Introduce the Korean natural farming technique for livestock breeding and cultivation. This method uses locally produced natural ingredients and enables farmers themselves to prepare fertilizer mixtures.

(7) Organize promotion and training sessions to enhance the awareness of the villagers of environmental protection issues.

(8) Introduce mushroom farming to make use of straw waste from rice production that normally is burned.

(9) Introduce crayfish production to increase the income of the villagers.

IMPLEMENTATION AND RESULTS

- Eighteen GP team members from the two villages visited My Khanh B village and attended a GP team conference to learn about implementing some options.
- Two training courses on GP implementation within the villages were conducted. A total of eight different topics was covered during the course. The topics included establishing and applying biogas bags, potable water, and hygiene, status of waste management in rural areas, composting techniques, high-productivity rice cultivation techniques, mushroom-growing techniques, garden-pond-poultry model, and IPM application for rice cultivation.
- Water treatment using a filter bag, sand, and tank was implemented as it is a cheap, simple, and highly effective method.
- Sixteen pilot biogas chambers using plastic bags were installed. These solved some of the human and animal waste disposal problems and provided fuel for 16 households. The villages are now planning to remove all the unhygienic latrines from the rivers and main channels.

- Twenty-five households were supplied with 1,370 kg of new variety rice seeds. This new rice variety, together with IPM, will produce multiple crops per year and will rquire less fertilizer for production.
- Six natural farming models of fish-rice combination and fish-vegetable combination were completed, with initial results indicating a reduction in the amount of chemical use.
- Fifteen households implemented mushroom production.
- Eight households implemented crayfish rearing in the rice fields on a total area of 4 ha..

Nhon Loc Village, Nhon Ai Commune, Chau Thanh Town, Can Tho Province

GENERAL INFORMATION

Nhon Loc village had Green Productivity (GP) implemented during 2000 and 2001 under the GP Integrated Community Development Program.

Can Tho province is located approximately 168 km west of Ho Chi Minh City. Nhon Loc is a village near Chau Thanh town in Can Tho province and is located between the Can Tho River and Road Number 4. The distance between Nhon Loc and the Can Tho province center is 15 km.

Some characteristics of the village are as follows:

Nhon Loc Village, Nhon Ai Commune, Chau Thanh Town, Can Tho Province

Total amount of land: 164.38 ha.
Cultivated land: 156.38 ha of the total land
Population: 1037 people within 213 households.
Average income: 3,900,000 VND/person/year.
Main production activities
Farming: Growing fruits and vegetables for sale in markets
Other: Producing fish sauce, processing wood, processing rice, and breeding livestock.

MAIN ISSUES

- The water used for domestic purpose was of poor quality. Bore water was used by 90 households (accounting for 41.86%) while others used river water either treated with alum or used without treatment, and some households used rain water in the wet season.

- Most households use rainwater for drinking purposes. However, the drinking water used was not boiled and thus was unhygienic.
- Low level of environmental protection awareness was leading to a poor general state of the environment.
- Few households had hygienic latrines and most people excreted in the fish pond.
- Solid waste management was difficult as houses are located in close proximity to each other. Households generally disposed of their waste directly into the garden.
- Pesticide was used in large amounts, although with little effectiveness, as some fruit trees still did not resist damage from pests. Moreover, the use of pesticides and chemical fertilizers was also polluting the environment.

GP OPTIONS

(1) Construct a centralized water treatment plant using the main pipe along the river. The households will be responsible for installing the pipe in their houses.

(2) Create environmental awareness and encourage people to use clean water and to protect the environment.

(3) Construct hygienic latrines. Undertake primary treatment of human and animal waste before discharging into the canal system.

(4) Introduce crop rotation and use new plant varieties that have high pest resistance capacity and high productivity. This would reduce the amount of chemical pesticides and ensure a higher income from fruit harvesting.

(5) Apply integrated pest management (IPM) technology to reduce the use of pesticides and chemical fertilizers.

(6) Apply natural farming techniques to fruit trees and vegetables.

IMPLEMENTATION AND RESULTS

- Training courses and campaigns were organized to raise awareness of clean water and environmental hygiene. People were taught to apply solid waste management at the household level and to implement solid waste removal from the roads. They were encouraged to classify solid waste and to utilize it for other purposes.
- Training courses on natural farming in Nhon Loc were undertaken with the participation of 60 people.
- A pilot natural farming program was applied on a small scale.
- Villagers were trained in the proper use of pesticides and chemical fertilizers for fruit trees.
- A study mission was organized to share best practice experiences with other villages.

The following options were generated but not implemented:

- Construction of a centralized water supply plant using the main pipe along the river. The GP team generated this option. However, there was a lack of free land available among the houses within the village, and thus the construction of a water supply unit was not feasible.
- Construction of hygienic latrine and primary treatment of human and animal waste before discharging into the canal system. This option will be analyzed in greater detail before implementation.
- Crop rotation and use of new varieties that have high pest resistance to reduce the amount of pesticide used and to generate a higher income from fruit harvesting. This was a long-term option and its effect was not clearly identified at that moment. It is neccessary to have more detailed information on the natural environment such as climate, soil, etc. Therefore, this option was not suitable to disseminate through a demonstration model.

The main reasons for options not being implemented were as follows:

- The participation of local authorities is an important factor for the success of the project as they can combine this program with other existing programs. Their participation can mobilize the available resources in the village during implementation of the project. It is difficult to analyze the feasibility of GP options without their participation. The cooperation between Vietnam Productivity Center (VPC) and local authorities was not strong enough to support the GP team activities.
- The GP team is very active during the application of GP options that are easy to implement and require small amounts of money with recognized results. However, these options were only applied in some households and the dissemination remains limited.
- Some GP options need more time for feasibility analysis to ensure their suitability for the villagers.

Nam O II Village, Hoa Hiep Precinct, Da Nang

GENERAL INFORMATION

Nam O II village had Green Productivity (GP) implemented during 2000 and 2001 under the GP Integrated Community Development Program.

Hoa Hiep precinct in Lien Chieu district is located north of Da Nang and is the gateway to the city. National Highway 1A and the North-South railroad run through Hoa Hiep from the Hai Van mountain pass to Xuan Thieu resort. Hoa Hiep is a coastal precinct. It has a 20-km coastline that forms the precinct's eastern border. The northern boundary of Hoa Hiep is Da Nang Bay, the western boundary is Hoa Lien and Hoa Bac precincts, and the southern boundary is the Hoa Khanh industrial zone. Although Hoa Hiep precinct is an administrative unit of Da Nang, the living conditions of the villagers in Nam O II village of Hoa Hiep are more similar to those of many rural villages than an urban village.

Some characteristics of the village are as follows:

Nam O II Village, Hoa Hiep Precinct, Da Nang

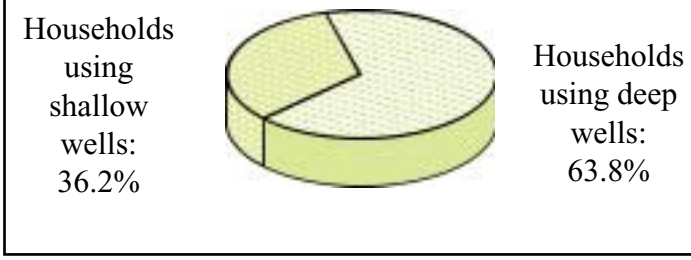
Population: 3,534 people within 710 households.
Average income: 2,800,000 VND/person/year.
Main production activities
Production: Firecrackers and Nam O fish sauce.

Fish sauce production came to an end sometime prior to 1995 as the firecracker trade was more lucrative at that time. However, in 1995 the Vietnamese government banned firecracker production, and as a result the villagers of Nam O II resumed fish sauce production. Their techniques, however, need modifications.

MAIN ISSUES

- The village lacked adequate drainage system. Wastewater from breeding cattle collected in the village and polluted the well water, despite the well being 7-15 m deep. Given that all households use groundwater for their domestic needs, this pollution was a big problem as 88% of households used well water without treatment.

Sources of Potable Water



- Human and animal waste disposal methods were inappropriate. Given that 88% of households did not have latrines, the villagers disposed of waste along the coast or in gardens. Animal waste mainly comprised pig excreta.
- Only 11.3% of the households separated their solid waste according to the type of material used (e.g., metal, paper, glass, etc.). The local environment company had established a solid waste collection team, yet only 40% of the total village waste was collected. People were not willing to pay money for solid waste collection. In addition, some roads within the village were too narrow for the collection van to reach all the households. Nam O village had one solid waste drop-off and collection point. The Urban Environment Company collected solid waste twice or thrice daily from there. Any remaining solid waste was burned or disposed of in gardens and along the coast.
- Fuel wood is available abundantly as the village is located by the coast. However, the use of traditional stoves led to excessive wood consumption.
- The traditional and main income source for the villagers is the production of firecrackers and fish sauce. Firecracker production has been banned, while fish sauce production needed further development. Many households produced fish sauce incorrectly and production was not organized.

GP OPTIONS

A GP team was established consisting of 10 members including representatives from local authorities and village associations. The GP team worked with experts to identify and select the following GP options.

(1) Conduct training courses on GP methodology, potable water supplies, solid waste management, and sewage management.

(2) Increase the awareness of the villagers of environmental protection issues and wastewater management through an awareness campaign and by establishing village rules. Rules can include fines for noncompliance and rewards for compliance. An administration team can be set up to implement environmental protection tasks.

(3) Modify the public well to prevent pollution. This will involve constructing a container around the well and building a drainage system to divert wastewater away from the well.

(4) Install a drainage system to minimize the amount of flooding during the wet season.

(5) Construct hygienic two-compartment latrines.

(6) Construct Vietnamese biogas plants and model Thailand-German biogas plants, each with a capacity of 6-8 m^3. These model biogas plants can decompose sewage.

(7) Organize a clean-up day for the entire village once every two months. This clean-up should focus on coastal areas.

(8) Improve the solid waste collection system; this includes expanding and improving the road system so that vans for rubbish collection can access the village. Facilities and manual labor for solid waste collection need to be increased and a schedule for solid waste collection needs to be established. This schedule is to be organized between the village and the Urban Environment Company that collects waste.

(9) Construct energy-efficient stoves. These stoves reduce fuel consumption by 30-50%. They also reduce the smoke output, money spent on fuel, and the time needed for cooking

(10) Hold a training course on new technologies available for producing fish sauce. This training should consider the quality of fish sauce as well as safety and hygiene aspects of food preparation.

(11) Establish a fish sauce production team. This team will teach individual households how to improve their production process.

IMPLEMENTATION AND RESULTS

- A training course on GP concepts and methodology was held within the village.
- Three training courses on managing solid waste, sewage, potable water, and wastewater were held. These training courses increased the environmental awareness among the villagers. They are now aware of health problems associated with poor environmental practices like discharging sewage into the sea.
- The villagers established village-specific regulations for environmental protection.
- A 500-m stormwater drainage system was constructed to link with the main drainage system of Da Nang.
- Eight biogas plants were established, each with 6 to 8 m^3 capacity. These plants are capable of treating both human and animal sewage.
- Twenty-six latrines were built with financial help of the local government and 50 latrines were built with the villagers' money. Within three years, 90% of houses should have latrines. This will reduce the amount of sewage being disposed of along the coast. The construction of hygienic latrines will be a community project. Each household will contribute 50,000 VND per month toward the construction of latrines. All households requiring latrines will continue monthly payments until all houses contributing have latrines.
- Six clean-up campaigns were organized in the village; the largest event was on the World Environment Day. Coastline clean-up was organized on this day and over 400 people participated in this event. In order to keep the coastline green and clean, two notice boards were also constructed to raise the awareness of people using the coastline.

- The solid waste collection system was improved by extending the road system throughout the village by approximately 3 km and constructing a 400-m concrete road. These new roads are adequate for solid waste collection vans to access the entire village. These improvements have increased waste collection from 40% to 80%.
- Five energy-efficient stoves were constructed.
- One training course on fish sauce production was conducted. This training course taught the villagers about improvements in traditional technology and how to produce fish sauce hygienically.

Energy Efficient Stoves

Van Cu Village, Huong Toan Commune, Thua Thien Hue Province

GENERAL INFORMATION

Van Cu village had Green Productivity (GP) implemented during 2000 and 2001 under the GP Integrated Community Development Program.

The main road from Huong Toan community to Van Cu is a section of National Highway 1A. The road system in Van Cu is in good condition and can be used even in the rainy season.

Some characteristics of the village are as follows:

Van Cu Village, Huong Toan Commune, Thua Thien Hue Province

Cultivated land: 75 ha. of the total land.
Population: 1642 people within 304 households.
Main production activities
Agriculture: 80% of the villagers Rice vermicelli production: 66% of households in the village produce rice vermicelli. The gross output is one-third of the total demand for Hue and the neighboring villages. Other: Pig farming

MAIN ISSUES

- Water pollution from sewage was the predominant issue. Of the 304 households within the village, only 30 had septic tanks while 50 had two-compartment latrines. Many of these latrines, however, were not hygienic. This, along with low standards of living and limited environmental awareness, was adding to the poor hygienic practices. Consequently diseases had suitable conditions to thrive in Van Cu, thereby affecting the health of the villagers and the hygienic standard of rice vermicelli.
- Waste from pigs causing water pollution in ponds and lakes was also an issue. With 70% of households owning five to fifteen pigs, waste generation was significant. However, the pigs fed on the starch waste from vermicelli processing and were thus important for the environmental sustainability of the village.
- The wastewater drainage system was limited. Wastewater from vermicelli production, domestic use, and animals was directly discharged into public ponds or onto the land, resulting in high pollution of both ground and surface water by organic matter. In addition, the main water source for vermicelli production is the Bo River. Its water was used without any treatment.
- Some of the solid waste from households was being deposited in public areas rather than the domestic waste compound, causing environmental pollution and aesthetic damage.
- An integrated model for rice cultivation, vermicelli production, and pig farming is popular in Van Cu. Yet, the agricultural productivity was low due to the high cost of pesticides and fertilizers. In addition, animal waste was not utilized for organic fertilizer or biogas production.

GP OPTIONS

GP was applied in this village to solve environmental pollution problems and to improve productivity. The village GP team has 25 members. Together with the VPC, the members developed the following options:

(1) Provide training to the villagers to enhance their awareness of environmental protection laws and teach them how to implement such GP options as pretreatment of wastewater and animal waste treatment (composting, biogas).

(2) Set up village-specific regulations for environmental protection and gain the committment of the villagers to abide by these regulations. This could be achieved through a reward and fine system.

(3) Implement a volunteer program entitled “help each other to construct a hygienic latrine.” The purpose of this program is to increase the number of hygienic latrines in the village. The VPC will initially fund the program; however, households wanting a latrine will contribute a certain amount of money per month to a fund until all houses in the program have latrines.

(4) Construct biogas plants; 50% of the funding for the plants will be from the village and 50% from a sponsoring agency (APO, SIDA). In addition, composting methods will also be applied to some households.

(5) Construct a treatment plant for wastewater from vermicelli production and pig farming within households. This wastewater will be treated separately from human waste. It will go through a

sedimentation and disintegration filtration system. Different filter materials will be used before the water is discharged onto the land.

(6) Teach the villagers how to manage domestic waste. The course will teach them how to separate solid waste and how to compost organic waste. It will also teach them how to recognize solid waste that needs special treatment, such as old chemical bottles.

(7) Conduct a training course on hygiene and good housekeeping in order to meet hygiene and safety requirements for food preparation. This course will be attended by the villagers from vermicelli-producing households.

IMPLEMENTATION AND RESULTS

- A six-day training course was conducted on how to implement GP options. Most people in the village attended the course. Through this course, most villagers became aware that they have a personal responsibility for environmental management. This knowledge made them more willing to participate in implementing GP options within the village. Group activities included solid waste segregation and plastic bag collection. All the villagers are now committed to meeting their environmental regulations.
- A program called “help each other to construct a hygienic latrine” was implemented. Five hygienic latrines were built during the program with technical and financial support from the VPC. Now, the villagers themselves construct latrines. It is expected that all participating households will have hygienic latrines within the next two to three years.
- Two water treatment plants were constructed to treat wastewater from vermicelli production and pig farming.
- Four biogas plants were constructed, each with a capacity of 6 m^3. This is effective for human and animal waste management and creates clean fuel for cooking.
- Most households now separate their solid waste into three categories: organic matter, plastics, and other domestic waste. Villagers then sell solid waste such as plastics and metals.
- Two training courses were organized on solid waste management, potable water management, wastewater management, and safety and hygienic practices in food preparation for the GP team and the interested villagers.

Phu Hau Ward, Thua Thien Hue Province

GENERAL INFORMATION

Phu Hau village had Green Productivity (GP) implemented during 2000 and 2001 under the GP Integrated Community Development Program. Phu Hau village is located in central Vietnam. Group 10, Phu Hau precinct was chosen for implementing GP.

Some characteristics of the village are as follows:

Phu Hau Ward, Thua Thien Hue Province

Total land: 117 ha.
Cultivated land: 21.68 ha. of the total land
Population: 7700 people.
Main production activities
Agriculture
Other: Operating small-scale industries

Recently, however, the cultivated land area has been reduced due to industrialization. This has resulted in an increase in unemployment for people who lost their agricultural land.

MAIN ISSUES

- In this village, 30% of households lacked potable water for drinking and domestic use. Wells and boreholes are the main source of water. However, these sources were polluted by iron and the water could not be used for drinking or cooking without treatment . Villagers bought potable water from a company located 1.5 km distant.
- There was no drainage system for wastewater and stormwater. The village is continually flooded in the wet season due to a lack of drainage system and because the land is low lying. Most people disposed of their wastewater directly onto the land, causing pollution of the groundwater that spread rapidly during the wet season.
- Lack of sewage management leading to environmental and health risks was the predominant problem in Phu Hau. Due to unawareness and low standards of living, a number of households did not have latrines. Even in those houses that did have a latrine, 40% were unhygienic. Many households that bred animals (mostly pigs) did not have a proper treatment process for animal waste.
- The roads were too narrow to allow the dustcart into the village to collect solid waste. Because of this, solid waste was either buried underneath the soil in gardens or left by the roadside.
- Vegetables and flower plantations are the main income source for the villagers. However, flower plantation was not very successful, as the flowers did not meet market needs. New productivity methods had not been applied in this village. New technologies include integrated pest management (IPM), use of new varieties of flowers and vegetable seeds, and better drainage. Pesticides and fertilizers were used excessively.

GP OPTIONS

(1) Organize training courses for the village GP team as well as the villagers on GP methodology, solid waste management, techniques of IPM, floriculture plantation, vegetable growing, and natural farming.

(2) Establish village-specific regulations for environmental protection in the village.

(3) Install a loudspeaker system to educate the villagers on the importance of protecting the environment.

(4) Upgrade the public well and install a water treatment system for this well. Villagers need to be encouraged to have wastewater treatment facilities within their houses.

(5) Dig a drainage system with the help of village volunteers to reduce local flooding in the wet season.

(6) Encourage villagers to upgrade their latrines themselves. The Women's Union will lend money to people to construct latrines.

(7) Establish a solid waste collection team and provide facilities for solid waste collection and transfer. Launch a cleaning campaign to reduce the amount of rubbish in the village.

(8) Construct energy-efficient stoves to reduce the cost of fuel for cooking within households.

(9) Encourage tree plantation to improve the environmental conditions as funding is available for this specific purpose.

IMPLEMENTATION AND RESULTS

- Three training courses were organized for GP teams and the villagers; altogether, a total of 50 people participated. The courses covered the following topics: GP methodology, environmental protection, solid waste management, IPM, and natural farming. The knowledge of participants on these topics increased after the training courses. Participants were enthusiastic and shared their knowledge with other people within the village.
- Three trips to other villages were made. These trips were to villages that had already implemented some GP options. The purpose was to show how GP methodology works and to look at different techniques that can be used for applied to floriculture plantations and vegetable cultivation.
- Village-specific regulations were established by the villagers to protect the environment. All households within the village made a commitment to follow these regulations.
- Loudspeakers were set up around the village. All the villagers are now continually updated on environmental procedures.
- One public well was improved; this well is a source of water for 80 households in the village. A drainage system was also established to direct wastewater to a primary treatment hole.
- A 250-m stormwater drainage system was constructed. This drainage system reduced flooding within the village during the rainy season.
- A volunteer team has been set up to remove old, unhygienic latrines and to construct new latrines. The new latrines will be constructed in at least 65% of the houses.
- A solid waste collection team was established; this team included two people from the GP team. Ten bins were placed in the main areas used by the villagers and collection and disposal facilities were organized. Eighty-five percent of the solid waste within the village is now collected.


Solid Waste Collection

- A monthly cleaning schedule has been set up for the entire village. Extra clean-up sessions will be conducted after festivals.
- Five energy-efficient stoves were constructed to reduce the amount of wood required by 30%.
- Approximately 2000 trees were planted all around Group 10 of Phu Hau precinct. The trees included eucalyptus and cajuputs. Even though tree plantation was not identified as a major issue, funding was available for this purpose and thus utilized under the GP program.

Vinh Phu Village, Hoa An Commune, Phu Yen Province

GENERAL INFORMATION

Vinh Phu village had Green Productivity (GP) implemented during 2000 and 2001 under the GP Integrated Community Development Program.

The Tuy Hoa town border (Highway 25) and the Ba River form the boundries of Hoa An commune.

There are six villages within Hoa An. Vinh Phu village consists of five hamlets: Nam, Trung, Tay, Dong, and Xoi.

Some characteristics of the village are as follows:

Vinh Phu Village, Hoa An Commune, Phu Yen Province

Population: 4780 people within 986 households.
Average income: 100,000 VND/person/month.
Main production activities
Agriculture: 80% of the population is dependent on agriculture
Other: carpentry, rattan-bamboo weaving, brick making, and rice paper making

MAIN ISSUES

- Potable water was limited and polluted. All households in the village obtained potable groundwater from wells. Approximately 10% of these wells had groundwater that was contaminated by iron and contained no water during the dry season. In the southern area of the village alone, approximately 70% of the wells contained water that was polluted with iron, even at depths of 14 m.

- According to a survey conducted in October 2000 by the GP team, more than 50% of the households in Vinh Phu commune did not have hygienic latrines and 35% of households had only temporary latrines that did not meet health requirements. Sewage disposal problems were the main cause of environmental pollution and the village health problems. Some of the waste from breeding livestock was collected and used as fertilizer. A large amount of sewage was filled into holes in the ground and covered without treatment. Apart from the human population, there were 2,000 pigs and 500 cows in the village. The villagers had no knowledge of biogas technology or of other methods for composting their waste.
- Around 300 tons of solid waste were produced annually. The main disposal method of domestic waste was by burning. In some markets, solid waste was put in mounds and left untreated, thus polluting the environment.
- The excessive use of pesticide and chemical fertilizer was also an issue. The living standard of the villagers in Vinh Phu commune is dependent on the income from rice cultivation. Therefore, a large amount of chemical pesticides and fertilizers was used to increase rice productivity. Cultivation methods in use were based only on past experience and the application of updated agricultural technology like the use of new seeds, integrated pest management (IPM), etc., was still limited. Money spent on cultivation was high and mostly spent on pesticides and fertilizers, but productivity was low.
- There was no integration between cultivation and animal breeding. These can be integrated using a model such as VAC (fishpond-animal husbandry-vegetable garden). These models integrate the cultivation of vegetables to benefit the breeding of livestock and fish.
- The income of the villagers was very low due to the above issues.

GP OPTIONS

(1) Organize training courses on GP methodology for water management, solid waste management, and human and animal waste management.

(2) Establish village-specific regulations for the protection of the environment. Ensure that the villagers care for their local environment.

(3) Introduce a simple water treatment method for households. A method that will be tried is the up-straight filtration system. This system is an efficient process that pumps water vertically up through the filter system and effectively removes iron.

(4) Construct a central water treatment plant capable of producing 2 m^3/hour of clean water located at the clinic in the center of the commune.

(5) Construct hygienic latrines. Hygienic latrines will be constructed using funding from the villagers. Each month households requiring latrines will contribute a certain amount of money to the village latrine-building fund and will continue giving money monthly until all households contributing to the fund have latrines.

(6) Introduce a composting technique for sewage.

(7) Construct biogas plants by integrating with latrine-building activities.

(8) Set up a collection and classification system for rubbish within individual households. This

system involves using a wooden frame to hold a bag for each kind of solid waste. The separated solid waste will be treated by composting, recycling, or reusing.

(9) Construct energy-efficient stoves. These stoves reduce smoke emissions and the time needed for cooking and fuel consumption by 30-50%.

(10) Conduct training courses on IPM and natural farming.

(11) Introduce mushroom farming to generate new income for the villagers and to make use of rice straw, which normally would be burned.

(12) Initiate worm rearing; this is an economic and technically feasible option that can provide a source of protein for ducks, fish, etc.

(13) Grow crops such as logan and seedless lemons that can be sold for high prices.

IMPLEMENTATION AND RESULTS

- Training courses were conducted in GP concepts and methodology, potable water and waste management, solid waste management, biogas, and composting methodology.
- Two information boards on GP methodology were constructed and a regular cleaning schedule was organized for the village. The GP concept and associated environmental tasks are now advertised over the loudspeaker system in the village.
- Two up-straight water filtration systems were constructed in Nam hamlet.
- One water treatment plant capable of producing 2 m^3/hour of clean water was constructed at the village clinic.
- Five biogas plants with a capacity of 6 m^3 were constructed. Some of the biogas plants integrated biogas technology with latrine construction purely for human sewage and some were designed to cater for both human and animal sewage. Two to three neighboring households can share one biogas plant designed for human and animal sewage.
- Fifty latrines were constructed during this project; more are under construction.
- Teams for constructing biogas plants and energy-efficient stoves were established.
- Sixty-six wooden frames were made for separating different solid waste types. Sixty frames were used for households within the village and one frame each for the clinic, school, kindergarten, and People's Committees.
- Fifty energy-efficient stoves were constructed. Many villagers saw the advantages of these stoves and are now paying to get a stove put into their own homes.
- Three training courses were conducted for GP team members and interested villagers on IPM, VAC, worm rearing, mushroom growing, and natural farming.
- A competition on GP and general environmental knowledge was organized and 1750 people participated in this competition. This was beneficial in improving the environmental awareness of the villagers.
- To increase the productivity of fish for sale, 2 kg of worms were bred for fish food. Worm breeding continues to expand throughout the village.

- Pilot planting of 50 “gio bau” plants, 20 seedless lemon plants, and 30 “coc” plants from Thailand. These plants receive higher selling prices and will thus increase the financial status of the village.

Cost-benefit analysis of GP options for Vinh Phu Village

GP option	Total investment (VND)	Savings per month (VND)	Cost recovered within (months)
Biogas plant with the capacity of producing 4.6 m^3	4,600,000	100,000	46
Integration of biogas model with latrine model	5,200.000	150,000	34.6
Simple filtration tank	500,000	60,000	12
Water supply plant	35,000,000	800,000	43.7
Energy-efficient stove	250,000	20,000	12.5
Latrine	200,000	50,000	4
Breeding worms	650,000	300,000	2.2
Wooden frame for solid waste classification	100,000	20,000	5

Bai Yen Village, Dan Chu District, Hoa Binh Province

General Information

Bai Yen village implemented Green Productivity (GP) methodology independent of the Vietnam Productivity Center (VPC). After the representatives from the Department of Science, Technology and Environment (DOSTE) attended a workshop, they decided to implement GP in Bai Yen village. The VPC provided training and DOSTE and the villagers provided the funding required for implementation. The project extended from 2000 to 2001.

Bai Yen village in the Dan Chu district of Hoa Binh province is located 70 km northwest of Hanoi.

Some characteristics of the village are as follows:

Bai Yen Village, Dan Chu District, Hoa Binh Province

Cultivated land: 53 ha.
Residential land: 3.4 ha.
Population: 467 people within 94 households.
Average income: 2,420,000 VND/person/year.
Main production activities
Agriculture: 323 villagers are involved

MAIN ISSUES

- General environmental pollution as a result of people's activities and a small forest area was a major issue.
- The water resources (surface and groundwater) were polluted as latrines and breeding facilities were located around the well. Moreover, polluted water was used without filtration.
- The breeding facilities and latrines were unhygienic in the village as human and animal waste was discharged directly onto the land without any treatment.
- The management of solid waste was improper.
- Chemical pesticides and fertilizers were used incorrectly by the farmers.
- Soil erosion was also a major concern for the village. Cultivated land was loosing a lot of top soil and was becoming sandy.
- The transportation system was inadequate and degraded.
- Agricultural productivity and the quality of agricultural products produced in the village were low.
- The villagers were unaware of environmental protection.

GP OPTIONS

(1) Increase the villagers' awareness of environmental issues.

(2) Upgrade the drinking water supply.

(3) Upgrade breeding facilities and latrines.

(4) Use effective microorganisms (EMs) to treat solid waste.

(5) Upgrade the drainage system.

IMPLEMENTATION AND RESULTS

- Nine training courses were conducted. The aim of the training was to raise the villagers' awareness of environmental issues. One hundred and twenty people participated in the courses.
- The villagers now have a positive attitude toward the environment. They have learned to protect and care for their environment.
- A small-scale water treatment system was established. Five boreholes were drilled, each with its own hand pump.
- Eleven sewage lines of total 50 m in length were installed in the main road.
- The Villagers are now willing to use hygienic latrines.
- The village drainage system was upgraded by constructing 2.5 km of drainage around the village.
- EMs are now used to clean the breeding facility, treat animal waste, and deodorize livestock breeding areas.

CONCLUSIONS

Green Productivity (GP) is a dynamic method for increasing productivity and environmental performance in all sectors including manufacturing, service provision, agriculture, and community development. As an outcome of the 1992 Rio Earth Summit, its purpose is to enhance productivity through environmentally sustainable development practices. GP is an effective approach to ensure that the environment is a primary consideration in development.

Community GP programs have drawn the attention of many organizations in Vietnam, including MOSTE, the provincial DOSTE, Departments of Rural and Agriculture Development (DRADs), and many research institutes. Vietnam's GP programs have been integrated with many existing programs from various organizations; such programs include the National Program for Mountainous Areas and Ethnic Minority Development, and the Hygienic and Clean Water Program. Combining these programs with GP methodology increased the benefits to villagers. Implementing GP programs within villages has improved the cooperation between organizations such as DRADs and other various associations and institutes at the local level. This cooperation greatly enhanced the effectiveness of all GP programs in Vietnam.

GP methodology has become an important tool for community development in Vietnam. During 2001-2002, more than 70 villages have been applying GP at the community level. It is hoped that more villages will recognize the benefits of the GP program through these 60 villages and will begin to initiate GP programs in their area; ultimately our aim is for GP to become a nationwide program.

PROJECT COUNTERPARTS

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Published by:
Asian Productivity Organization
Tokyo, Japan

Compiled by:
Vietnam Productivity Center
Vietnam

Design and layout by:
Edwin D'souza
Pune, India

Printed by:
Graphics 91 Pte Ltd
Singapore