



**Asian Development Bank
POVERTY AND ENVIRONMENT PROGRAM**

**Pilot Rehabilitation of
Agent Orange Affected Forestlands
in Quang Tri Province of Viet Nam**

FINAL CONSULTANT REPORT

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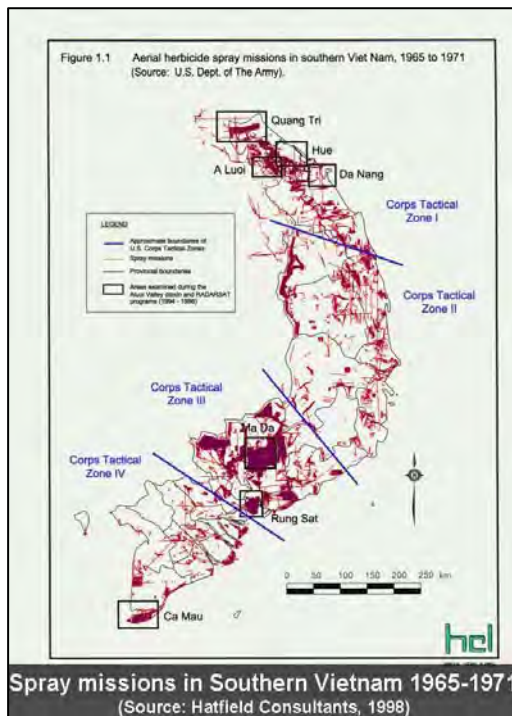
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1 INTRODUCTION

1.1 Background and Rationale

About 80 million litres of herbicides including Agent Orange are believed having been sprayed during the 1961-1971 war. More than 20,000 hamlets with a population of over 2 million were sprayed upon. The Government of Viet Nam has been focusing on



human and ecological restoration of the Agent Orange affected communities and lands. In 1998, a national project was set up by the Red Cross of Viet Nam, which provides USD 2.6 million in medical check-ups, orthopaedic operations and other physical treatments for 200,000 patients.¹

The total area of land in Vietnam and adjacent areas in Cambodia and Lao PDR affected by the herbicides amounts to 2.6 million hectares. Frequency of spraying varied between 1-10 times; about 35% of the area was sprayed more than 5 times. Large areas of forestland were affected and have not rehabilitated since. The immediate effects of spraying of herbicides were later aggravated by soil erosion and fire. Rehabilitation of such areas has mainly been tackled by donor-funded projects.

The ADB-Forest Sector Project (loan VIE 1515) had between 1999 and 2005 successfully piloted reforestation of agent-orange affected areas in Quang Tri province: The forestland can be rehabilitated and put under a forest cover fairly quickly if fire and grazing by buffaloes are controlled. Furthermore, by reducing the surface runoff of water and soil leaching, these reforestation efforts may also reduce the flow of harmful dioxins into lowlands, particularly local water sources, which in turn is believed to help reducing the health risks to people who live near Agent Orange affected areas.



While the approach applied by the Forest Sector Project emphasized a careful planting design making full use of micro-site conditions and existing forest succession as well as participatory approaches, it had to stay short of assessing the correlation between forest types and water quality in terms of Agent-Orange residues.

¹ Viet Nam News. Thursday, June 5, 2003. Agent Orange haunts third generation.

Under the project, the communes Cam Nghia and Cam Thanh Cam Lo district were selected in the Quang Tri province to pilot bottom-up approaches to integrated forestry and water resource rehabilitation and management that allow for maximum effects on rural livelihood improvement and poverty reduction. On 14th October 2004, the Steering Committee of the Poverty and Environment Program at ADB headquarters in Manila approved the proposal (see Annex 1) for **Pilot Rehabilitation of Agent Orange Affected Forestlands in Quang Tri Province of Viet Nam** (the Project).

1.2 Objectives and Outputs

Overall objective of the proposed TA was to pilot a community-based approach to Agent Orange-affected forestland rehabilitation linked to local water supply improvement. Specific objectives included: (i) increase forest cover in selected districts, which contributes to rehabilitation of agent-orange affected forest lands, biodiversity conservation and rural wage generation, and (ii) improve local water supply. Expected outputs included:

1. Increased and diversified forest cover in selected Agent Orange-affected forest lands,
2. Agent-Orange affected forest/watershed rehabilitation technologies for surface and ground water supply improvement, and
3. Initiation of decentralized forestland rehabilitation and water quality maintenance regimes.

The proposed TA was to focus on selected communes in Cam Lo and Gio Linh districts in Quang Tri province. Both districts had been involved in the ADB Forestry Sector Project [Loan: 1515-VIE: Forestry Sector Project (FSP)] and were therefore well acquainted with the approaches and methodologies applied in that Project. Communes to participate in the Project were to be selected by the Project Preparation Management Unit (PPMU) Quang Tri, based on needs, relevance for watershed rehabilitation and counterpart budget availability. Target groups were households in the selected communes and commune administrative units. Selected households in the communes were direct beneficiaries of the implementation of pilot interventions. The Quang Tri (S-DFP), the commune administrations, and the commune councils of the selected communes were the major stakeholders.

1.3 Process

Due to a rather lengthy administrative process involving a number of Government institutions on several levels, the "no objection" letter from the Ministry of Natural Resources and Environment (MONRE) in its capacity as the focal point of the Poverty and Environment Program was received only in April 2005. The corresponding Letter of Agreement between ADB and the Executing Agency was signed end of May 2005. Since the delays in bringing the Project on the ground had severely shortened the time available for field implementation, ADB and MONRE agreed in to prolong the project period to March 2007. The revised Letter of Agreement was sent by ADB to MONRE on 6th December 2006 (see Annex 2 for LOAs).

A first inception meeting with the Executing Agency and other institutions relevant to the Project was conducted on 2nd July 2005 in Quang Tri province (see Annex 3 for list of participants and minutes of meeting). During this meeting the Project concept was explained in detail, a number of issues were clarified, including the selection of the 2 pilot communes and the need to set-up a Management Unit, and the initial work plan was revised and further detailed, assuming start of the Project in August 2005.

The organizational set-up of the Project had been proposed by the EA to the Peoples' Committee of Quang Tri province briefly before the inception workshop on 27th November 2005, after ADB had initiated disbursement of the first instalment of the grant. Consultant recruitment was finalized in February 2006 (Team Leader and the Forestry Specialist), and April 2006 (Water Resource Management Specialist).

During the preparation and conduction of the inception workshop on 27th November 2005 (see Annex 4 for schedule and list of workshop participants), a number of outstanding administrative issues were clarified, and the work plan was reviewed and further adjusted in detail (see Annex 5).

Prior to the inception workshop the consultants had investigated possibilities for dioxin analysis and had found out that analyses could only be done outside Vietnam with costs of at least 1,000 USD per analysis which was beyond the Project budget. Since the consultants had got access to comprehensive data and information environmental impacts related to spraying of agent orange herbicide during the Viet Nam war collected in 1998 by Hatfield Consultants (see Annex 6) it was decided to cancel dioxin analysis and instead focus on other, more affordable means to assess water quality which could be carried out at the chemical laboratory of Hue University. This decision paved the way for shaping Project interventions in a bi-pronged approach: The quantitative aspects of water resource management were closely linked with the rehabilitation of the forest cover, while the qualitative aspects were tackled through low-cost investments into water quality improvement measures.

Implementation of the Project commenced in December 2005 with the preparation of the base-line survey which was conducted in February and March 2006. The survey report was finalized end of April 2006, after all collected water samples had been properly analyzed, and investments possibilities thoroughly discussed with local communities and assessed by PPMU and TA team. The investment proposal was approved by ADB on 14th May 2006

The first instalment of the operational budget for the EA was made in November 2005, shortly before the inception workshop conducted on 27th November.

Investment implementation continued throughout summer and autumn 2006 and was scheduled in such a way as to ensure that training, and particularly the regulatory conditionalities for the investments (i.e. village forest protection regulations) were in place before investment realization, and that the preparation of commune forest development plans was initiated.

The final workshop was conducted on 26-27 February 2007 (see Annex 7 for list of participants) and resulted in a number of findings and recommendations presented in chapter 5.

2 ORGANIZATION AND FINANCES

2.1 Project Management Unit

With decision no. 27/QN-UBND dated 1. January 2006 the Peoples' Committee of Quang Tri province formally established the Management Unit for the Project. The unit comprised the Director (Chairman) and a senior staff member of the Sub-Department for Forestry Quang Tri, the Director of the Department of Natural Resources and Environment (DONRE), and the Chief Accountant of the Sub-Department for Forest Protection as Chief Accountant for the Project. Furthermore a support team for field implementation was established, with staff members from involved province and district institutions, and the 2 pilot communes. All members appointed to these bodies worked on a part-time basis.

The main tasks of the Management Unit stipulated in the PPC decision include:

- To implement the Project in line with instructions and guidance of ADB consultants, Management Board for Forestry Projects (MARD), and MONRE
- To arrange for the necessary organizational and regulatory framework to receive and implement the Project
- To assume responsibility for Project management, including fund utilization in line with applicable regulations.

Further stipulations included in the PPC decision are:

- The office of Subproject management unit will be located at Sub-Department for Forestry at the address: 39, Tran Hung Dao Street, Dong Ha town, Quang Tri province.
- The project location is in the two communes of Cam Nghia and Cam Thanh in Cam Lo district, Quang Tri province
- The Management Unit is allowed to use the stamp of the Sub-Department for Forest protection for opening and operating the bank account, and official communication
- The Management Unit is permitted to mobilize their own staff for the implementation of the Project in part-time arrangements.

Although the Management Unit remains administratively under the Sub-Department for Forest Protection (SDFP), the rights and obligations of SDFP as stipulated in the Letter of Agreement between ADB and the Management Board for Forestry Project at MARD are by the decision of PPC transferred to the Management Unit. Consequently also financial management including opening and management of the Project account, and reporting are tasks directly fulfilled by the Management Unit.

The Management Unit reports to the Management Board for Forestry Projects of MARD in Hanoi, which regularly informs and consults with MONRE as the focal point of ADB's Poverty and Environment Program in Vietnam.

2.2 Budget Specification

The initial budget proposed and approved in the Project proposal was confirmed during the inception workshop as per following table:

Table 1: Project Budget (US-\$)

Item	Government Contribution	ADB Contribution	Total
Consultants		70.000	70.000
International (2 pm)		40.000	40.000
Local (10 pm)		30.000	30.000
Travel		9.000	9.000
Regional		1.500	1.500
Local		7.500	7.500
Pilot Interventions		100.000	100.000
Rehabilitation		80.000	80.000
Water quality measurement protocols		20.000	20.000
Equipment		15.000	15.000
Others		26.000	26.000
Regional workshop		5.000	5.000
Maps/reports		5.000	5.000
Field-surveys / stakeholder consultations		6.000	6.000
Water quality monitoring		10.000	10.000
Office space, personal time, equipments and transport	79.000		79.000
Contingencies		10.000	10.000
Total	79.000	230.000	309.000

2.3 Cost Norms

The workshop participants agreed that cost norms applied under the Project followed as much as possible cost norms already established in relevant ongoing projects, or agreed in the design of relevant upcoming projects² (see Annex 8). A list of relevant cost norms, as decreed by the PMU on 10 November 2005 and endorsed by the Management Board for Forestry Projects of the Ministry for Agriculture and Rural Development (MARD) in Hanoi, is presented in Annex 9.

As stipulated in the Letter of Agreement all personnel costs incurred by this project at different management levels were covered out of Vietnamese budgets. Travel costs for consultation and supervision at and between the various involved management levels were financed out of the ADB grant up to a maximum amount of US-\$ 7,500.

² The following projects were chosen as reference: 1) The ADB-financed "Forests for Livelihood Improvement in the Central Highlands" (FLITCH) project; 2) the ADB-financed "Forestry Sector Project" (Loan 1515-VIE) in Gia Lai province; 3) the World Bank-supported "Forest Protection and Rural Development Project" in Lam Dong province; 4) the ADB-funded "Silk Improvement Project" in Kon Tum province.

2.4 Payment Mechanism

As stipulated in the Letter of Agreement, ADB provided different instalments for operational expenses to the EA. The initial schedule for the instalments was confirmed during the Inception Workshop, but after the review mission in October 2006 further revised in such a way that the budget of USD 120,000 for pilot interventions was to be released in one disbursement upon request by the EA:

Table 2: Disbursement Schedule

Event	Initial Schedule	Amount (in USD)	Final schedule after revisions	Amount (in USD)
Establishment of Management Unit	November 2005	30.000	November 2005	30.000
Pilot interventions, equipment, and others in up to 3 separate instalments according to implementation plan	February 2006 June 2006 September 2006	60.000 20.000 40.000	1 instalment in January 2007	120.000
Submission of final report	December 2006	10.000	March 2007	10.000
Total Disbursement to Sub-Department for Forest Protection Quang Tri		160.000		160.000

Payments were made by ADB Manila directly to the Project Management Unit upon submission of payment requests endorsed by the designated project officer of the Management Board for Forestry Projects. Whenever applicable the request was accompanied by Statements of Expenditures also endorsed by the designated project officer of the Management Board for Forestry Projects.

Payments to individual households/group of households/communities, contractors, and Project personnel were made by the Project Management Unit, in line with budget provisions approved by ADB, and applicable Government and ADB regulations.

Unless stipulated differently in ADB regulations applicable for grant projects, procurement was undertaken in line with applicable Vietnamese regulations, including the ceilings for direct purchase procedure, 3-quotation procedure, and lowest-cost-bidder procedure applicable in Lam Dong province.

Payments were liquidated in accordance with applicable ADB procedures for grant fund disbursement, using the formats attached in Annex 10.

2.5 Reporting

The Project Management was required to submit quarterly financial and programmatic reports in English and Vietnamese language, to be submitted to ADB, and PPC/Management Board for Forestry Projects in Hanoi/MONRE. Reporting was to follow the standard ADB formats for the Poverty and Environment Program attached in Annex 11. However, for some periods PMU omitted the quarterly reports and rather linked reporting with financial reporting and disbursement requests

The programmatic reporting related to demonstrating progress with respect to the work plan and performance indicators articulated in the Project design. The financial reporting was based on the approved Project budget.

2.6 Consultants assigned to the Project

To support Project implementation, ADB recruited the following consultants:

- Consultant Team Leader / Chief Technical Advisor (2 person-months)
- Forestry Specialist (5.43 person-months)
- Water Resource Management Specialist (4 person-months).

Given the experiences of the EA and the consultant team from the previous ADB Forestry Sector Project, the position of an economist initially foreseen was during the inception cancelled, and the 2 person-months were shifted to the forestry specialist.

3 IMPLEMENTATION

3.1 Overall Work Plan

The indicative work plan prepared during the inception meeting on 2nd July 2005 was further revised and updated during the inception workshop. The work plan covers the period December 2005 to November 2006 and specifies the following activities (a detailed table informing about timing and responsibilities is presented in Annex 2):

- Collection and analysis of secondary data and information available from existing documents regarding occurrence of different types of forest plantations in Agent Orange affected areas; preparation of a map of forest plantation types in Agent Orange affected areas in Quang Tri province
- Conduction of qualitative and quantitative water measurements and analysis in selected water bodies in the catchment areas of the different forest plantations types in Agent Orange affected areas in Quang Tri province
- Preparation and conduction of base-line survey in 2 pilot communes
 - Collection and analysis of secondary data and information available from existing documents regarding the biophysical and socio-economic conditions and present land use in the 2 pilot communes of Cam Nghia and Cam Thanh
 - Training for members of survey team
 - Field survey Group A: Land, forest and water resource use (including analysis of water availability)
 - Field survey Group B: Socio-economic conditions in the 2 communes (including poverty mapping, analysis of livelihood constraints due to water limitations, and participatory identification of feasible livelihood improvement opportunities with focus on forests and water)
- Preparation of draft survey report
- Preparation of inputs for the planning of pilot interventions
- Preparation of final survey report
- Preparation of the plan for pilot interventions and submission to ADB for approval
- Identification of a method for land use planning and land allocation to be applied in the Project

- Conduction of participatory land use planning and land allocation in the 2 communes in view of ensuring proper forest protection and water resource management
- Implementation of pilot interventions
- Initiation of organizational and planning basis for community-based forest and water resource protection and development in the 2 pilot communes
- Preparation of draft final reports
- Regional workshop in Quang Tri to report the experiences of the pilot rehabilitation of Agent Orange affected forestland project in Quang Tri to a wider audience
- Preparation of final report and submission to ADB, MONRE and MARD

3.2 Base Line Survey

3.2.1 Background and locations

During the American-Vietnamese war the two pilot communes of Cam Thanh and Cam Nghia of Cam Lo district were sprayed with large amounts of Agent Orange. Consequently large areas of natural forest were destroyed and became erosion-prone barren land. The water resource was quantitatively and qualitatively heavily affected.

The baseline survey intended to analyse the effects of different forest plantation types on the local water resource and was meant to result not only in a planning base for Project interventions in the 2 pilot communes, but also to contribute to methodology development applicable for assessing the inter-linkages between different forest plantation types and ground and surface.



Participatory tools were used for the survey and subsequent investment planning, such as commune/village meetings, involving farmers in transect analysis, and household/group interviews. During the process present and future land use plans were reviewed and updated, wealth ranking of households established, a matrix for comparison and selection of tree species prepared, and an institutional analysis related to forest and water resource management conducted. Survey and planning activities were conducted from January to April 2006 (for details see Annexes 12 and 13).

3.2.2 Objectives

- To assess the effects of different types forest plantations on ground and surface water improvement in selected areas of Quang Tri province

- To initiate a participatory process in the 2 pilot communes to:
 - Map the incidence of poverty and assess the livelihood of the local people in the 2 pilot communes
 - Identify Techniques for reforestation suitable for improving the local water resource by making full use of micro-site conditions and existing forest succession, which naturally occurs in bomb holes and along small watercourses,
 - Determine approaches to organizational development for community-based forest and water quality rehabilitation and management, and
 - Plan Project interventions on commune, village and household level.

3.2.3 Survey method

The survey included 3 steps:

- In step 1, staff members from involved province institutions collected and analysed secondary data and information available from existing documents regarding occurrence of different types of forest plantations in Agent Orange affected areas, and prepared a map of forest plantation types in Agent Orange affected areas in Quang Tri province.
- In step 2, staff members from involved province institutions conducted water measurements and analysis in selected water bodies in representative catchment areas of the different forest plantations types in Agent Orange affected areas.
- In step 3, a baseline survey was conducted in the pilot communes, involving 2 teams working simultaneously to carry out the field survey, with one team focusing on the biophysical aspects and the other team on socio-economic aspects. Prior to the field survey secondary data and information about the 2 communes available from existing documents were collected and analysed. The survey was conducted in a participatory manner to ensure direct involvement of local institutions and communities. The survey also analysed land use and land ownership patterns, and prepared the basis for land use planning and land allocation to be conducted prior to commencement of tree planting scheduled for the planting season 2006 (October-November).



For land use planning, the Project consulted with other ODA parties in Quang Tri, particularly the "Quang Tri Rural Development Program - Phase 3" financed by the Government of Finland. This project has land use planning as one of its major focuses, and is prepared to assist Quang Tri province in determining province standards for land use planning assists among others the Cam Lo district, based on experiences available mostly from ODA-assisted projects. The inherent harmonization and standardization of land use planning approaches is much needed in the context of donor harmonization.

At the same time could the Project also link up with national guidelines for community forestry management being prepared by the "National Working Group for Community Forestry" attached to the Forest Department of MARD in Hanoi.

3.2.4 Working steps and timing

The survey was conducted according to the following steps:

- Collection of secondary biophysical and socio-economic data (December and January)
- Training for survey team members (second half of January)
- Field survey with commune and village workshops, interviews, transects, documentation by taking photos or video recording (January 2006)
- Analysis of the result and report writing as input for intervention planning
 - Draft report by March 2006
 - Proposal on pilot interventions for submission to ADB by end of March 2006
 - Final report by mid of April 2006.

3.2.5 Survey team composition

The team consisted of 18 staff members of the following institutions:

- QT Sub-Department for Forest Protection
- QT Department of Natural Resources and Environment
- QT DARD
- Cam Lo district administration
- Commune administrations.

Village leaders and key farmers completed the team. Consultants contracted by ADB (forestry consultant and water resource management specialist) as well as local experts (contracted by the Management Unit) were directly involved in the preparation and conduction of the baseline survey.

3.2.6 Survey results

The baseline survey took place in February and March 2006. The full report was available by April 2006, after the water samples collected during the survey had been identified in the chemical laboratory of the Hue University. The report is divided into a physical and a socio-economic report, and a water resource management report.

1) Forestry-related physical and socio-economic survey

Cam Thanh commune

Total area of Cam Thanh commune is 4430,96 ha, located in the South-West of the Cam Lo district and bordering to Cam Tuyen commune in the North, Cam Nghia commune in the South, Cam Lo district township in the East, Huong Hiep commune of Dakrong district in the West. The commune center is 10 km from the Cam Lo district township. The topography of Cam Thanh can be divided into two areas:

- In the western part is a hilly mountain range with an elevation of 50- 100m above sea level and rather steep slopes declining from West to East. This area is suitable for forestry development.
- The eastern part is low, flat land with slopes less than 50%. This area is appropriate for agriculture crops, particularly industrial crops and cash crops such as rubber, coffee, pepper and groundnuts.

The average rainfall in the district area is 2400mm/year. The rainy season extends from September to March, and the dry season from April to August.

Most of the land area formerly managed directly by the local authorities has been allocated to farmers for agriculture and forestry production. However, the need for more land to be allocated is still very high, with large unused land areas still under the authority of State Forest Enterprises and Army units

The population of Cam Thanh commune amounts to 7,402 persons in 1,694 households distributed over 16 villages. Average yearly income per capita is VND 3,500,000.

Animal husbandry plays an important role with 2,851 buffaloes/cattle, 1,500 pigs, 350 goats, 40 deer, 2000 rabbits and 700 poultry (which is rather low due to bird flew disease).

The main forest produce is fire wood, in 2005 the commune harvested c.3000 Stack m³, of which about 70% is used for own consumption and the rest is sold in the market. Recognizing the role of forest production some households have already invested in afforestation, by now harvesting from plantation could provide income for them with annual average VND 500,000 per ha.

There is small market in the area of Tan Lam and Tan Xuan, where people can sell and buy foodstuff. Other goods such as tools, equipment, agriculture material are available only in the district or province capital with a distance of 10 km and 20 km respectively. Agriculture products are sold to traders at farm-gate with prices 5-10% below market price.

Traditional income sources are being diversified, with some households operating small stores for trading essential foodstuff and agricultural inputs and tools. Other households have started rice mill, carpentry, blacksmith or small repair workshops at home, which are, however, in general economically not yet stable.

In the last years there have been different implemented projects in the commune:

- Afforestation projects with 327 program and KfW co-financed project (KfW2)
- The NGO Plan International supported a project related to education, health, and domestic water supply
- Agriculture diversification project.
- During the period 2000 – 2005, the Agriculture and Rural Development Section of the Cam Lo district together with the Plant Protection Station and Agriculture Extension Centre and the Farmer's Association organized different technical training courses in the commune such as home garden improvement, animal

husbandry, pepper growing, rubber resin tapping, weaving of bamboo and rattan products as well as rice and peanut cultivation as part of the Integrated Pest Management program (IPM).

Cam Nghia

Total area of Cam Nghia commune is 5549 ha, located in the West-South of Cam Lo district with a distance to the district township of 13 km. It is neighbouring to Cam Thanh commune in the North, Cam Chinh commune in the East, and Dakrong district in the West and South. Cam Nghia is an upland commune situated in a low mountain range stretching from North-West to South-East with elevation of 200-400 m above sea level, which is suitable for forestry development. In the North-East area of the commune the elevation is 50-100 m and hilly land, which is appropriate for agriculture purpose. Low land area is in the centre of the commune and has been used for settlement and agriculture. However this area is not large. The climate is similar to that of Cam Thanh commune.

Cam Nghia has a population of 5,750 people in 1,282 households distributed over 14 villages.

Agriculture land is used rather effectively for rice, cash crops, rubber, and pepper. The forest land has been used for afforestation in recent years with Eucalyptus and Acacia. However, large areas of unused land belong to the local Forest Enterprise and have yet been allocated to the commune for mobilizing other actors to work on reforestation. Average yearly income per capita is VND 4,000,000.

There are 1912 buffaloes and cattle 329 pigs and 9050 heads of poultry. Of forestry produce only firewood could be harvested so far and mainly for own consumption.

There is no market in the commune, only some households operate small shops for daily goods. Other materials such as equipment and agriculture inputs can only be purchased at district capital or province capital markets. As in Cam Thanh, traders buy local products at farm gate with prices 5-10% below market prices.

2) Water resource management survey

The following conclusions were drawn from the water resource baseline survey:

1. Forest coverage at the upstream of rivers and streams in the 2 communes region is low. Surface water sources at the 2 communes consist of rivers, streams, brooks and lakes and are mainly used for agriculture, irrigation, industrial crops, fish culture, exploitation of natural aquatic products, and domestic activities. The water sources for domestic activities (including the water sources from water supply stations at the 2 communes) are not treated as required.
2. Untreated dug well water is the main water source used for cooking and food processing. Bad quality of the well water has caused a lot of diseases such as gravel and gynaecological diseases. About 15 – 20% of the wells dry up in the dry season, which results in serious lack of domestic water supply particularly in Cam Thanh commune.

3. Prior to the Project there were no survey data of water uses and water sources (amount and quality) in both communes available. The network of community-based forest and water sources management had not been set up at the 2 communes.
4. Education programmes have in both communes neglected to enhance awareness of forest and water sources protection as well as environmental hygiene and their importance for health. Budget provided from central, province and district sources and international programs or projects to improve water sources have been very limited.

The survey concluded that there are a lot of difficulties with water sources and serious lack of domestic water, especially in Cam Thanh commune, and that financial and technical support to improve water sources and to reduce health risks are urgent for both communes, where Agent Oranges was sprayed during the war.

3.3 Forestry Investments

Project interventions in the pilot communes included investments into reforestation and water resource management. Communities were early on advised that investments could only take place in conjunction with the preparation of forest protection regulations, forest development and management plans, water resource development and management plans, and sound organisational schemes on grass-root level to achieve maximum impacts and sustainability of investments.

3.3.1 Reforestation of Agent Orange affected forestlands

1) Selection of sites, participating households and tree species

Based on the results of the baseline survey, an area of 200 ha bare land planned for afforestation was identified in the two communes, of which 42 ha were situated in Cam Thanh commune and 158 ha in Cam Nghia commune. A digital map for planning of Agent Orange affected forestlands was prepared for both communes

1. Selecting participating households

Based on the survey results, the project management board issued criteria of selecting households and solutions of forest planting at workshops at the commune level with the participation of the local authorities, mass organizations and village heads. After that, the villages and commune people's committees had meetings with local households to discuss and set criteria of selecting beneficiaries with priority to poor and Agent Orange affected families. The results of selection were then sent to the project management board.

2. Selection of villages

- 4 out of 16 villages of Cam Thanh commune were selected for afforestation and separated into 10 groups of households.
- 14/14 villages of Cam Nghia commune were allocated lands for forest planting by the commune people's committee on the basis of poverty rate and Agent Orange victims in each village and were separated into 39 groups of households.

- Households participating in forest planting in these two communes have agreed with the village community to deduct 15-20% of income collected from forest products to contribute to the development funds of village community.

3. *Selection of tree species*

The project management board, local authorities and people have selected *Acacia Auriculiformis* and *Auquilaria Crassna/Aloe* for the pilot rehabilitation of Agent Orange affected forestlands, in which the area of planting *Acacia Auriculiformis* combined with *Auquilaria Crassa* counts for 20% of the total area of reforestation.

2) *Land allocation*

Based on the survey results, the planning of land use was carried out in March 2006 and the activity plan was approved by ADB in May 2006. The project management board signed contract with the local partners to work out forestation techniques in the planned areas with the participation of the local people and authorities in two communes. This activity was completed in July 2006.

The area of planned bare land in two communes for reforestation was determined with 190.3 hectares (decreasing 9.7 ha compared to the plan because of unsolved land conflicts), of which:

- Cam Thanh commune: 37.3 ha (*Acacia Auriculiformis*: 26.9 ha; *Acacia Auriculiformis* alternating with *Auquilaria Crassa*: 10.4 ha)
- Cam Nghia commune: 153 ha (*Acacia Auriculiformis*: 130.5 ha; *Acacia Auriculiformis* alternating with *Auquilaria Crassa*: 22.5 ha)
- Budget: 28,245,000 VND.

The area of land allocated to villages is summarized as follows:

Table 3: Land Allocation carried out under the Project

No.	Village	Compartment	Number of plots	Area (ha)	Tree Species
Cam Thanh commune					
1	Phan Xa	I	02	9.8	Acacia
2	Tan Tuong	II	02	7.3	Acacia
3	Tan Xuan 2	II	05	18.8	
			02	8.4	Acacia
			03	10.4	Acacia+ Auquilaria
4	Tan Xuan 1	III	01	1.4	Acacia
	Total		10	37.3	
Cam Nghia commune					
1	Dinh Son	I	03	9.3	Acacia
2	Nghia Phong		03	10.4	Acacia
3	Tan Son	I	03	16.2	Acacia
4	Dong Lai	I	04	17.1	Acacia
5	Bang Son 1	I	05	19.4	Acacia
			03	10.1	Acacia
			02	9.3	Acacia+ Auquilaria
6	Bang Son 2	I	04	17.2	Acacia
7	Bang Son 3	I	07	31.9	Acacia
8	Cam Lo Phuong	II	04	13.2	Acacia+ Auquilaria
9	Hoan Cat	III	01	3.8	Acacia

10	Quat Xa	III	01	2.6	Acacia
11	Thuong Nghia	III	01	2.5	Acacia
12	Phuong An 1	IV	01	3.4	Acacia
13	Phuong An 2	IV	01	3.0	Acacia
14	Cu Hoan	IV	01	3.0	Acacia
	Total		39	153.0	

3) *Training*

Technical trainings of forest planting, tending and protection for participating households were organized in the two communes. Facilitators specialized in forestry provided theoretical and practical guidelines to local people, giving answers to their inquiries relating to reforestation.

Results:

The groups of households obtained needed knowledge and skills on planting techniques, forest tending and protection and have planted forests with good results.

This activity was completed in August 2006 with a total budget of 26,800,000 VND.

Table 4: Locations and numbers of trainings and participants (planting)

No	Places of trainings	Number of trainings	Number of participants
1	Cam Thanh commune	02	60
2	Cam Nghia commune	03	90
	Total	05	150

4) *Seedling production*

Due to the short duration of the project (1 year), the project management board agreed with local communities and authorities to purchase seedlings of acacia and auquilaria from nurseries instead of creating nurseries at commune level. The project management board signed responsible for steering, monitoring and appraising seedlings for forest planting. The contract of providing seedlings of auquilaria was signed in May 2006 and the contract of providing seedlings of acacia was signed in July 2006 with the local seedling nurseries in Cam Lo district.

Results

- The total number of seedlings that met standards and was used for forest planting amounted to 328,180 seedlings of acacia and 13,390 seedlings of auquilaria.
- Budget: 142,168,600 VND.

5) *Forest planting activities*



Forest planting was carried out in the areas of bare land which have been technically designed for reforestation. The project management board signed contracts with village heads representing selected households (the poor and Agent Orange affected families) with specific terms on the labour cost for forest planting (clearing vegetation layers, fertilizing, planting, forest tending and protection). The ceiling labour cost for

local people was 4,725,000 VND/ha/person. Forest planting was carried out by the implementation groups of villages and communes under the management, steering and monitoring of the project management board. Labour force came from the selected households.

Results

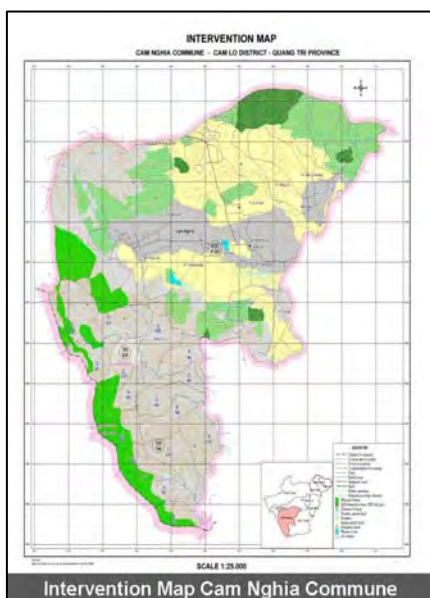
- The clearing of vegetation layer was finished in August 2006.
- Land preparation (hoeing, fertilizing and levelling holes) was done in September and October 2006.
- Provided fertilizers to households. Total amount: NPK= 6,086 kg; Lam Thao phosphate = 29,747 kg. Total cost: 77,752,000 VND. This activity was done in October 2006.
- Transported seedlings to the forestation sites in the villages. Total cost: 35,496,000 VND. This activity was done in November and December 2006.
- Planted forests in the total area of 190.3 ha (157.4 ha of acacia; 32.9 ha of acacia alternating with auquilaria). This activity was completed in December 2006.
- Implementing forest tending and protection. This activity was completed in February 2007.
- Carried out the appraisal and paid for labour cost of vegetal layer clearance, land preparation and forest planting for households. Total cost: 652,729,000 VND /190.3 ha



Table 5: Afforestation Results

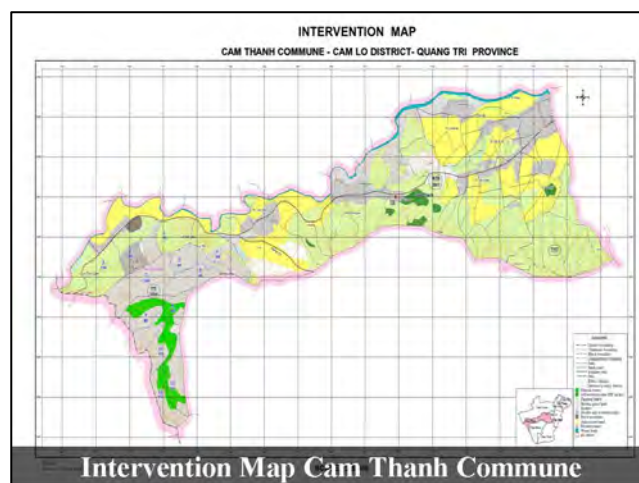
No.	Planting site	Compartment	Number of plots	Planting area (ha)	Kind of plant	Results	
						Survival rate	Growing status
I	Cam Thanh commune		10	37.3			
1	Phan Xa	I	02	9.8	Acacia	95%	Good
2	Tan Tuong	II	02	7.3	Acacia	95%	Good
3	Tan Xuan 2	II	05	18.8			
			02	8.4	Acacia	94%	Fairly good
			03	10.4	Acacia+ Auquilaria	95%	Good
4	Tan Xuan 1	III	01	1.4	Acacia	93%	Fairly good
II	Cam Nghia commune		39	153.0			
5	Dinh Son	I	03	9.3	Acacia	94%	Good
6	Nghia Phong		03	10.4	Acacia	93%	Fairly good
7	Tan Son	I	03	16.2	Acacia	95%	Good
8	Dong Lai	I	04	17.1	Acacia	94%	Good
9	Bang Son 1	I	05	19.4	Acacia		
			03	10.1	Acacia	94%	Good
			02	9.3	Acacia+ Auquilaria	93%	Fairly good
10	Bang Son 2	I	04	17.2	Acacia	94%	Good
11	Bang Son 3	I	07	31.9	Acacia	95%	Good
12	Cam Lo Phuong	II	04	13.2	Acacia+ Auquilaria	93%	Fairly good
13	Hoan Cat	III	01	3.8	Acacia	94%	Good
14	Quat Xa	III	01	2.6	Acacia	95%	Good
15	Thuong Nghia	III	01	2.5	Acacia	95%	Good
16	Phuong An 1	IV	01	3.4	Acacia	95%	Good
17	Phuong An 2	IV	01	3.0	Acacia	95%	Good
18	Cu Hoan	IV	01	3.0	Acacia	93%	Fairly good

3.3.2 Community-based forest management and development planning



The sustainable forest management and development plan has a timeframe of 5-10 years. The plan identifies the management regulations and objectives of forest resources for the commune development (see Annexes 14 a, 14 b, 15 and 16). Forest management planning can be understood as forest resource management policy at the commune and village levels, in which forest management regulations and solutions must be suitable with forest protection and development plan of the commune level, satisfy the demands of local people from forest benefits, have the participation of local people and relevant parties, receive active response and voluntary involvement from local people, and ensure the stable, long-term and sustainable utilization of forests.

Such comprehensive planning has neither been implemented in the two projected communes nor in other communes in Quang Tri province. Hence, the project piloted the planning exercise also as an example for expansion in the future, which is also to be seen in the context of the National Pilot Program for Community Forestry and ADB's GMS-BCI program, which are both active in Quang Tri province



1) Activities carried out for forest management and development planning

- Collect and process data on socio-economic and natural conditions and forest resources in the two projected communes.
- Provide survey trainings for forest management and development planning.
- Carry out the planning steps from the village level.
- Work out the forest development and management plan and the digital map of the communes.
- Organize trainings on planning at the commune level with approval of the commune people's council.
- Set up village community based forest development and protection regulations.

2) Preparatory Training

- Trainings on surveying and planning for community based forest management and development were organized in the two projected communes. Facilitators specialized in forestry compiled training materials and provided theoretical and practical facilitation to members of the project management board and commune and village people.

Results

The trainees have gained necessary knowledge, skills, contents and methods of survey and assessment of forest resources.

- Completed in September 2006.
- Budget: 10,660,000 VND

Table 6: Locations and number of trainings and participants (planning)

No.	Training Place	Classes	Number of Participants
1	Cam Thanh commune	01	30
2	Cam Nghia commune	01	30
	Total	02	60

3) Participatory survey and forest resources assessment

Objective:

To know forest resources, forest owners and identify management objectives and forestry technical solutions for each forest plot.

Content and methods of survey and assessment:

The community forest resources were surveyed and assessed using the map of current forest situation (scale: 1/10,000) and GPS for site survey, updating the assessment on forest resources of each village as follows:

- Description of the forest plots (areas of forests, types of forests, years of planting, forest owners, management objectives, forestry technical solutions.)
- Dividing borders of forests in the villages on sites and on the map and handing over to the village community for their management, protection and development.

The survey team:

Staff members of the project management board, Cam Lo Forest Protection Station, communes, villages and key persons of the villages.

Results:

The survey team has carried out site inspection visits to the villages and identified the current situation of managing and using forest resources in the two projected communes as follows:

- a. Cam Thanh commune: The commune has a natural area of 4,431.6 ha, including 1,683.4 ha of forestlands (natural forest: 114.4 ha; planted forest: 1,569 ha).

Table 7: Forest areas according to forest owners (Cam Thanh commune)

Forest owners	Area (ha)
Supported by programs/projects	415.7
Households (self-invested)	393.5
Highway 9 Plantation	475.5 (Planted forest: 361.1; Natural Forest: 114.4)
Tam Lam High School	3.0
Commune Veteran's Association	8.0
Nam Thanh Co-operative, Cam Lo Township	40.0
Military Units	340.7
Public Security Department of Cam Lo district	5.0
Traffic Department	2.0

- b. Cam Nghia commune: The commune has the natural area of 5,548.9 ha, including 1,333.1 ha of forestlands (natural forests: 437.3 ha; planted forests: 895.8 ha)

Table 8: Forest areas according to forest owners (Cam Nghia commune)

Forest owners	Area (ha)
Assisted by programs/projects	590.3
Households (self-invested)	58.0
Ancestry	24.0
Commune people's committee	157.0 (Natural forest)
Highway 9 Plantation	280.3 (Natural forest)
Hoan Cat Re-education Centre	130.5
District Military Division	12.0
Tan Lam Farm	8.0
Villagers of Cam Thanh commune	73.0

Border division of forest resource management for each village:

The villages and communes have agreed to divide the border of forest development, protection and management based on forest areas and forest owners identified on site and on the map after survey.

Results:

The borders of forest management and development in the two villages are shown on the forestry map and in the plan (14 villages in Cam Nghia commune and 12 villages in Cam Thanh commune). A list of forest owners, who are local households, has been made and attached to the plan.

4) Needs assessment on villages' forest products

Identification methods:

- Need in firewood: Taking survey to three types of households (crowded, moderate and few members) for their need in firewood per day in order to specify the average firewood (Ster) per month per household.
- Need in breeding facilities: Taking survey to households who breed different livestock (crowded, moderate and few) for wood to make sheds in order to specify the average wood quantity of cubic meters for one shed (pillars, beams, surrounding fences).
- Discussing with key persons and staffs of communes and villages.

Results of needs assessment

- Need in firewood: the average rate of one household is 0.9 Ster/ month.
- Need in making sheds: 0.7 cubic meters for a shed with the using duration of 2-3 years. One shed can be used for 3-4 animals.

5) *Plan preparation*

Objective:

The five-year forest management plan (from 2006-2010) is made based on the results of survey and assessment of forest resources, the need of community in forest products and the output capacity of the forests. Forest plots need to be planned the five-year operation, including management solutions of planted forests, natural forests and bare land areas planned for forestry development. The plan is made based on the situation of forest plots, the needs, management objectives, forestry technical methods as well as the available resources of the households and community.

Contents of planning:

- Land allocation plan
- Identification of management objectives and development of management regulations and forestry technical methods for each forest plot/section.
- Villages' needs in forest products.
- Forestation and exploitation plan.

Results:

- The project management board has provided technical and financial support to the commune people's committees and the villages to compile the 5-year forest management and development plans of the two communes. The contents are described in details in the plans.
- Two forest management and development paper maps for two communes. These maps have been digitalized and processed in computer so that each commune can keep track of forest and forestland statuses for the coming years.
- Budget: 99,613,000 VND.

6) *Planning workshop*

On the basis of planning, the project management board has provided technical and financial support to help two commune people's committees and the villages make the 5-year (2006-2010) forest management and development plans and organize planning workshops in January and February of 2007 in the two communes.

Results:

- The plan has received the active response from the local authorities and people. They have recognized the benefits and importance of forest management, protection and development, which has helped the local authorities to realize their responsibilities in forest and forestland management.
- The forest management, protection and development has been approved by the two commune people's councils and organized for implementation by the commune people's committees.
- Budget: 12 million VND.

7) *Developing village community regulations on forest protection and development*

The development of village community regulations on forest protection and development is based on Circular numbered 56/1999/TT-BNN-KL issued on 30th March 1999 by the Ministry of Agriculture and Rural Development about “guiding the development of regulations on forest protection and development at the village communities”. Contents of the socio-economic development plan, land use plan and forest protection and development plan are clear, easy to understand and feasible and uphold good customs of the locality.

After surveys to specify forest areas and forest owners and divide borders of forest management between the villages, the project management board coordinated with Cam Lo District Forest Protection Station and people’s committees of two communes to organize workshops on formulating forest protection and development regulations in the villages.

Results:

Forest protection and development regulations have been formulated for 26 villages of the two projected communes (12 villages of Cam Thanh and 14 villages of Cam Nghia). These regulations have been revised by the people’s committees of the two communes and approved by the district people’s committee. This activity was carried out in December 2006 and January 2007 with a budget of 26,000,000 VND.

Contents of the regulations:

- Chapter I: General regulations (2 articles).
- Chapter II: Specific regulations on forest protection and development of the villages (11 articles).
 - General regulations on exploitation, trading and transportation of forest products;
 - Regulations on cattle grazing;
 - Regulations on wild animal hunting and trapping;
 - Regulations on forest development;
 - Regulations on water source protection;
 - Regulations on establishment and use of the village community forest protection and development funds;
 - Regulations on penalties and compensations;
 - Regulations on commendations and rewards;
 - Regulations on responsibilities and rights of the village heads.
- Chapter III: Regulations on ways of implementation and validity of execution (one article).

Development steps of the Regulations:

- Aggregating data collected from the surveys on forest management and development planning and the socio-economic conditions of the villages;
- Formulating a draft regulations with the participation of villagers in selected villages and the facilitation by staffs in charge of forest protection in the two communes;

- Organizing village meetings to present and discuss the forest protection and development regulations with villagers (the rate of households' participation had to be 70% at least).
- Reaching a final consensus on the regulations and submit them to the people's councils and people's committees of the two communes for revision and then to the district people's committee for approval;
- Disseminating the approved regulations to all the villagers for implementation, monitoring and evaluation.

3.4 Water Resource Investments

Based on the information obtained from the base line survey, water resource management investments in the 2 project communes were carried out.

3.4.1 Setting up water and sediment quality GIS database

Surface water quality monitoring was conducted from June to November 2006 (once a month) at 11 selected sites in the catchment areas of different forest types: 5 sites in Cam Thanh, 4 sites in Cam Nghia and 2 sites in Gio Linh (lake Ha Thanh and lake Truc Kinh) considered as reference sites located in the area of forest plantations supported by the ADB Forestry Sector Project (Loan 1515-VN). Sediment samples were collected for detection of organochlorine pesticides (pesticide DDTs; herbicides 2,4-D and 2,4,5-T) at the same sites as surface water sampling.

Well water quality was monitored from June to November 2006 (once a month) at 63 selected wells (33 wells in 10 villages of Cam Thanh commune and 30 wells in the 8 villages of Cam Nghia commune).

Water sample collection, storage and measurement/analysis procedures were carried out according to guidelines of Standard Methods for Examination of Water and Wastewater (APHA, 1995) and applicable Vietnamese standards.

Information of the sampling sites/wells and water quality data were listed in tables (Annexes 19-22) and also put into local 1:5000 GIS map so that it is easy to access, share and update data. Water and sediment quality GIS database have been used for the communities as well as Cam Lo district administration and provincial MONRE.

1) Surface water quality

Generally, surface water quality at 11 water bodies under study met the Vietnamese standards applied to the surface water using for source of domestic water supply with appropriated treatment (TCVN5942-1995 issued by MONRE in 2002) and Vietnamese standards for drinking water hygienic (TCVN 2002 issued by Ministry of Health in 2002) in the terms of:

- *major constituent*: temperature, pH, turbidity (TUR), electric conductivity (EC), salinity (SAL) or total dissolved solids (TDS), dissolved oxygen (DO), biochemical oxygen demand (BOD₅), chemical oxygen demand (COD), total dissolved iron (Fe^{II,III}), hardness;
- *nutrients*: nitrate (NO₃), ammonia (NH₄/NH₃), total soluble phosphate (PO₄);

- *toxic constituents*: heavy metals (CdII, PbII, CuII, ZnII); DDTs; 2,4-D and 2,4,5-T
- *bacteria*: total coliform.

Water quality assessment in the 2 communes shows that concentration of total DDTs was low, but concentration of herbicides (2,4-D and 2,4,5-T) rather high:

- in Cam Thanh commune, 2,4-D: min – max = < 1 – 24 ppb, mean \pm SD = 8.3 ppb \pm 6.9 (n = 10); 2,4,5-T: min – max = <1 – 3.1 ppb, mean \pm SD = 1.5 \pm 0.8 ppb (n = 10) ;
- in Cam Nghia commune: 2,4-D: min – max = 5.2 – 11 ppb, mean \pm SD = 7.9 \pm 2.1 ppb (n = 9); 2,4,5-T: min – max = <1 – 6.6 ppb, mean \pm SD = 2.8 \pm 2.5 ppb (n = 9).

These levels were higher than those in Gio Linh (< 1 ppb 2,4-D and < 1 ppb 2,4,5-T in lake Ha Thanh) and than Canadian Environmental Quality Guidelines (EQGs, 2002) for freshwater aquatic life (< 4 ppb phenoxy herbicides). This was an evidence to prove erosion and runoff of herbicides (or Agent Orange) from different forests into the watersheds.

Fecal bacteria pollution occurred in all water bodies under study (concentration of fecal coliform in most of samples in the range of 4 – 240 MPN/100 mL). In addition, level of ammonia and COD in several samples were higher than TCVN5942-1995. The main reason for that was discharge of untreated wastes (liquids and solids) directly into the water sources. The concentration of PO₄ in most of water bodies (\geq 0.1 ppm) was potential to cause eutrophication.

2) *Organochlorine pesticides residue in sediments*

Total DDTs residues in the sediment samples were < 0.5 – 4.3 ppb dry wt.(n = 7) in Cam Thanh and < 0.5 – 2.9 ppb (n = 6) in Cam Nghia, higher than those in Gio Linh (0.26 ppb in Ha Thanh lake), but lower than EQGs for freshwater sediment (Interim Sediment Quality Guideline and Probable Effect Level for total DDTs: 6.2 ppb and 20.0 ppb) . Herbicides residues in several sediment samples at the 2 communes were rather high:

- In Cam Thanh, 2,4-D: min – max = < 0.5 – 75 ppb ; mean \pm SD = 13.9 \pm 23.6 ppb (n = 11); 2,4,5-T: < 0.5 – 22 ppb; mean 5.1 \pm 8.1 ppb (n = 11);
- In Cam Nghia, 2,4-D: min – max = < 0.5 – 201 ppb , mean \pm SD = 37.5 \pm 62.7 ppb (n = 10); 2,4,5-T: min – max = < 0.5 – 17 ppb; mean \pm SD = 2.2 \pm 5.2 ppb (n = 10).

The organochlorine pesticides residues in the sediment samples were higher than those in Gio Linh (0.26 ppb total DDTs; < 10 ppb 2,4-D and < 10 ppb 2,4,5-T). These gave again more evidence on erosion and runoff of herbicides (or Agent Orange) from different forest types into the watersheds (no EQGs for herbicides in sediment).

3) *Well water quality*

Generally, major constituents, NO₃, ammonia and toxic metals in well waters at the 2 communes met TCVN 2002. Well water quality concerns were as follows:

Cam Thanh commune:

- Hardness of well waters at 4 villages (Thuong Lam, Tan Tuong, Tan Trang and Ngo Dong) was rather high (150 – 330 mg/L), while the hardness at 6 other villages was between soft (< 50 mg/L) and moderate hardness (100 – 150 mg/L).
- Fecal coliform concentrations in most of well waters (about 90%) were much higher than TCVN 2002. Turbidity was high in rainy season (about 50% wells). pH of well waters at Quat Xa village were rather low, 4 – 5 and did not meet TCVN 2002.

Cam Nghia commune:

- pH in most of well waters was below 6.5, especially about 50% well waters with pH between 4 and 5. Fecal coliform pollution in the well waters was the same as in Cam Thanh. Because of low pH, toxic metals dissolved into well waters easier than the case of higher pH in Cam Thanh commune. Concentration of Pb^{II} and Cd^{II} in some well water samples was higher than TCVN 2002 standards.
- Five wells at Agent Orange affected families were selected for detection of organochlorine pesticides in water. The results obtained show that total DDTs and 2,4-D presented in 3 wells with the level lower than TCVN 2002; 2,4,5-T occurred in 2 wells (11-17 ppb) at level higher than TCVN 2002 (< 9 ppb). For comparison, one well (sample GcdND) in an AGENT ORANGE affected family in Cam Thanh commune was also done in the same way. In this well, 2,4,5-T was not detected, but the detected concentration of total DDTs and 2,4-D was lower than TCVN 2002. Clearly, sand filters need to be used for treatment of well waters in order to improve water quality and decrease health risk in the communities in Cam Nghia.

Information and data obtained from the above water and sediment quality monitoring were fundamental for targeted investments in water quality improvement, in establishment of water quality monitoring program for the coming time and water resource management planning in the 2 communes.

3.4.2 Installing family-scaled well water treatment equipment

Small-scaled well water treatment systems were designed and installed for water supply improvement in the selected families at the 2 communes: 13 systems in Cam Thanh and 7 systems in Cam Nghia with priority given to AGENT ORANGE affected families. The systems are simple, stable and easy to be operated and maintained by households. Materials and equipment to produce the system are available on the market in Vietnam, and technical works to install the system can be carried out by technicians in Quang Tri and/or Hue city. One system can serve 5-7 families with average investment costs of 40 US-\$ per family, which includes the purchase of some parts from Ho Chi Minh City. If these parts of the system could be produced in Quang Tri province, average investment costs per family would decrease to about 30 US-\$.

1) Well water treatment system in Cam Nghia commune (see Annex 23)

Each well water treatment system consists of a sand filter tank to reduce suspended solids and organochlorine pesticides (if any) and a column containing calcium-carbonate hard pieces (or material) to raise water pH. After running the column, water pH increases to 7.5 – 8.0 (this met TCVN 2002: pH = 6.5 – 8.5), while water hardness raises insignificantly (< 50 mg/L). After every 2 – 3 years, addition of 1 kg material into the column should be done. Lifetime of such a column is over ten years.

Well water systems have been installed in 7 Agent Orange affected families.

Training of the communities in water treatment system operation, regeneration and maintenance, and rapid checking of water quality was conducted in the 2 communes (each class at a commune; 20 persons/class, day).

2) Well water treatment system in Cam Thanh commune (see Annex 24)



A well water treatment system with the price of 3,300,000 VND comprises a sand filter tank to reduce suspended solids (or turbidity) and an ion exchange column to remove hardness. When well water with high hardness runs through the column containing ion exchange resin (Na^+ - form), metal ions (mainly Ca^{II} and Mg^{II}) are retained in the column due to ion exchange. Once metal ion absorption of the column is saturated (about 30 days), regeneration (or reproducibility) of

the column is easily carried out by running sodium chloride (sea salt) through the column (regeneration time 2 – 3 hours). By doing that, the Na^+ - form of the resin in the column will be regenerated and then the column can function again. Lifetime of such a column is about ten years.

Well water treatment systems have been installed at 4 kindergartens, one medical station of the commune, one Agent Orange affected family and 7 other poor families.

3.4.3 Supplying water quality checkers and hardness test kits

By using water quality checkers and test kits, local communities can participate in water quality monitoring program in Community-based Water Resources Management Plan recommended in the frame of the project.

1) Supply of water quality checkers

For routine monitoring of water quality in terms of major constituents, 2 water quality checkers (TOA, Japan) were given to the 2 communes and one to the sub-department of provincial DONRE. The checkers can be used easily for measurement of 6 water quality parameters: temperature, pH, TUR, EC, SAL or TDS, and DO.

Training of the communities in operation and maintenance of the checkers, and interpretation of water quality with the above parameters was done in the same day of water treatment training in the 2 communes.

2) *Supply of water hardness test kits*

15 kits for testing water hardness (100 tests per kit) were given to the local partners (7 to Cam Thanh commune, 2 to Cam Nghia commune, and 6 to the sub-department of provincial DONRE). Five kits for testing total dissolved iron in water were given to the sub-department of provincial DONRE. These kits can be simply used by household for testing water hardness. In addition, two pH indicator boxes were given to Cam Nghia for testing water pH. This is also simply used by people for testing pH.

Training of the communities in use of the test kits for checking water quality was done in the same day of water treatment training in the 2 communes. When the test kits of water hardness are used up, they can be supplied easily and cheaply by Chemistry Department of Hue College of Sciences.

3.4.4 Community-based water resource management planning

Pilot Water Resource Management Plan consisting of organization, functions and regulations were proposed to and discussed in the 2 communes, and then endorsed by the commune administrations (see Annexes 17-18). Members of villages and representatives of the commune, Cam Lo district, the sub-department of provincial DONRE and Chemistry Department of Hue College of Sciences were involved in the preparation of the plan.

Training of the communities to enhance understanding of water environment protection was conducted in the 2 communes (two classes at each commune; 60 persons/class and day).

3.5 Results

The forestry activities in this project aimed to pilot community-based rehabilitation of Agent Orange affected forestlands and initiate sustainable forest management and development systems at the commune level. The project has brought the following specific results:

- Contributing to increasing the coverage of forests in the locality.
- Rehabilitating an area of Agent Orange affected forestlands.
- Transferring technology and techniques on forest planting, tending and protection to local people.
- The community based forest management, protection and development planning has helped the commune authorities to realize their responsibilities in forest and forestland management. However, this approach is new to the locality and the project has been carried out in short time duration. In addition, the staffs involved in the project have not yet had much experience. Although they have contributed their best in expertise and time to meet requirements and objectives, there are still shortcomings in technical aspects. Therefore, it is necessary to improve their capacity to have better plans.

- Supporting the village community in formulating the forest protection and development regulations which received active response by all the villagers.
- Generating jobs for the local villagers to increase their income, contributing to poverty reduction and environment protection. Through the project, village forestry funds have been set up with initial contributions of the forest owners.

Investments into water resources management unit in the project resulted in the following impacts on communities and involved institutions:

- At investments of 40 US-\$ per family, the project demonstrated an affordable technical approach to improving water quality with technical designs tailored to ensure operation and maintenance by local communities.
- Local beneficiaries and partners (the 2 commune administrations, village leaders, and people of the 2 communes, as well as involved authorities of Cam Lo district and Quang Tri province) can understand the present status of water resources quality supplied for specific uses (domestic, agricultural, industrial, aquaculture and aquatic life conservation) and assess future needs. In addition, the communities have become aware of the close relationship between forest cover, water resources and water pollution.
- Water quality for domestic use has been improved in part of the communities. This represents a meaningful contribution to reducing health risks in the communities.
- The communities are set to unite in voluntary activities of water resources protection and water pollution control with the aim of mitigating health risks and supporting sustainable development.

4 LESSONS LEARNED

- The project has been prepared with clear objectives, targets, criteria, benefits as well as budget allocation for each component. This clarity has helped the different stakeholders to get pro-actively involved in project implementation, particularly the farmers in the project communes.
- The combination of forestry and water components in the project has significantly demonstrated the relationship and the benefits of integrating these two fields, and has helped local authorities at different levels to more clearly recognize the benefits of implementing those related activities in a cross-sectoral approach.
- The constructive and transparent collaboration between project management unit (which involved the Departments for Forest Protection and the Department of Natural Resources and Environment), villagers, local authorities at commune and district level, and Universities has been crucial for the success of the project.
- Local level democracy could be further strengthened through participatory approaches during the field survey, project planning, project implementation, monitoring/check for acceptance, as well as initial establishment of village forest funds.
- With the forest and water resource development and management plans, the project has provided an important basis for the sustainable use and further development of important local resources.

5 CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations are drawn from reports and papers presented during the final workshop, and subsequent discussions.

5.1 Conclusions on Forestry Investments

- The inclusion of high-value tree species in reforestation measures has been very much appreciated by local communities and has resulted in higher awareness of protection.
- It is necessary to continue keeping track of the village community based forest planting model (such as model of Phan Xa village) with the mobilization of available resources of the community combined with the support of the project to bring about very promising forest planting and protection methods.
- The preparation of forest development and management plans for all villages in the



communes has helped to clarify rights and obligations of all involved parties and is a strong basis for adherence of local communities to the forest and water resource protection regulations. However, this approach is new to the locality and the project has been carried out in short time duration. In addition, the staffs involved in the project have not yet had much experience. Although they

have contributed their best in expertise and time to meet requirements and objectives, there are still shortcomings in technical aspects. Therefore, it is necessary to improve their capacity to have better plans.

- It is necessary to continue supporting the projected communes in implementing the forest management and development plans, especially in using and updating the digital maps to create a base for amendments and adaptations of the plans when needed. The forest protection staffs in charge need to keep supporting the villages in implementing the forest protection and development regulations and in managing and using the village forestry funds.

5.2 Conclusions on Water Resource Management Investments

- The water situation is in large parts of Quang Tri province not yet good. With average investments of 40 US Dollar per family the small-scale water treatment plants are affordable. This price might decrease to about 30 US Dollar if parts of the filtering system could be produced locally (which needs a larger local market).

- More funds should be allocated to provide more water treatment systems in term of different scales (small and/or larger group of households and/or villages) and modalities (project and farmer joint-investment, by farmers only). Funds for water resource protection at the commune level which include contributions of beneficiaries should be piloted, including the development of the management mechanism for this fund.
- Local authorities should work together with involved sector agencies to develop a communication system in the commune and villages to provide and update forestry and water information to the people.
- Financial and technique assistance to carry out Water Environment Monitoring Program following the Water Resources Management Plan recommended should be done by the provincial DONRE.

5.3 Recommendations for Follow-Up

5.3.1 PPC Quang Tri

- Based on the lessons learned in this Project and other projects and programmes, PPC Quang Tri should develop local guidelines for grassroot-based integrated forest and water resource management and development. In this the issues of bottom-up planning, land allocation, and community organisations should receive particular attention.
- PPC should direct DPI, horizontal sector agencies, and relevant donor projects to properly coordinate public and private sector investments in forestry and water resource management through clear sequencing and conditionalities of investments.

5.3.2 District and Communes

- The local authorities (people's committees of district and commune levels) and especially the communities in the project area should continue to implement, monitor and evaluate activities in line with the forest management and development plans and the water resource management plans which includes compliance with the regulations on forest protection, environment protection and water source management
- The involved parties (the district forest protection station, the centre of environmental measurement and technology of Quang Tri) and the commune health stations should continue to help the local authorities to manage the forests, keep track of the situation of forests and forestlands, comply with the forest protection convention, and to manage and measure the quality of water sources

5.3.3 Quang Tri Rural Development Programme (Vietnam-Finland)

- Clarify sequencing of and conditionalities for investments into forestry and water resources management not in a sectoral, but cross-sectoral approach (e.g. no investments into water resources unless protection of local natural/forest resources is secured, and vice-versa)

- Utilize and further develop the „blueprint“ for forestry and water resource development and management plans, and investment packages on commune/village level developed under the Project, and contribute to their further improvement in view of assisting PPC Quang Tri in developing province guidelines
- Coordinate particularly forest development and management planning approaches with the National Community Forestry Pilot Program (DARD) and the ADB – financed Biocorridor Initiative (Sub-Department for Forest Protection)

5.3.4 Community Forestry Pilot Program (MARD/DARD)

- Utilize and further develop the „blueprint“ for forestry development and management plans, and contribute to their further improvement in view of assisting PPC Quang Tri in developing province guidelines
- Utilize the design of the small-scale water treatment plants as one option for using the investment funds made available under the CFM Pilot Program (about 5,000 US-\$ per commune)

5.3.5 BCI-GMS (ADB)

- Utilize and further develop the „blueprint“ for forestry and water resource development and management plans, and investment packages on commune/village level developed under the Project, and contribute to their further improvement in view of assisting PPC Quang Tri in developing province guidelines
- Coordinate forest development and management planning approaches with the National Community Forestry Pilot Program (DARD)