



RESEARCH REPORT

NO. 2001-RR12

Forest Management Systems in the Mekong River Delta, Vietnam

Mai Van Nam, Nguyen Tan Nhan, Bui Van Trinh and Pham Le Thong
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This report assesses five approaches to forest management in Vietnam's Mekong River Delta. It investigates the main reasons for their success or failure. It finds that poverty, low education levels, lack of awareness of environmental issues, and a lack of incentives for forest protection are the main causes of forest destruction. A private ownership system that gives farmers the right to harvest mature trees was found to combine low rates of deforestation with high income levels. The report recommends that the logging ban in effect in the other systems be relaxed so that farmers will have an incentive to invest in and protect forests.

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December, 2001

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FOREST MANAGEMENT SYSTEMS IN THE MEKONG RIVER DELTA, VIETNAM

Mai Van Nam, Nguyen Tan Nhan, Bui Van Trinh, and Pham Le Thong

ABSTRACT

Poverty, low level of education, and lack of awareness on the importance of the forests, coupled with the lack of economic incentives for forest protection are the main causes of forest destruction in Vietnam. Despite various policy reforms, the deforestation problem has not been reduced, hence the logging ban policy in 1995. This policy, however, runs in conflict with existing management contracts in many parts of the forest areas where households or communities are engaged in forest management in anticipation of their being able to harvest the fruits of their labor from such efforts.

This study examined the socio-economic lives of the forest communities under four such types of forest management contracts or arrangements. It evaluated these management systems in terms of the community's role in forest protection, their economic dependence on the forests and how this varies across forest communities, and their performance in being able to protect and manage well the forests. The problems posed by the log ban policy on the forest communities were also analyzed.

The management systems evaluated consists of buffer zone management system, strict protection, joint venture, and family/household commercial management system in the Melaluaca Forests of Mekong River Delta. Household survey in the four study sites consisting of Song Trem (contract household and joint venture-JV), Tram Chim (buffer Zone), Vo Doi (strict protection) and Giong Rieng (family/household commercial farms) was undertaken.

The results of the study showed that forest products do not contribute much to the household income, especially in the light of the existing logging ban policy. The farmers had to rely mainly on rice farming, that is characterized by low yields, and on non-and off-farm activities such as hired labor that are highly seasonal and unstable. JV households are given very large land areas but earn less income from their forestlands. Harvesting of the forest is not allowed, which is potentially a big source of income for the JV households. Similarly, Buffer zone-contract households and those in the strict protection zone have not been able to benefit from their investment in forest management. There is therefore very little incentive to continue forest management activities for these households. The same cannot be

said for family/household commercial farms in forestland with about 50 years contract—where virtually “private ownership” exists. Income levels for this group are much higher, coming mostly from forestlands, with agriculture as the major land use system.

JV households generate most of their income from fishery and non-rice crop, especially bananas. Net income per household is VND20, 423,840 per farm or VND637, 260 per hectare per year. Areas devoted to forest, fishing, and banana crop significantly affect JV's net household income. Contract households have low income of VND 12,600, 000 per farm per year. The area devoted to non-rice crop (banana and vegetable) is the main factor affecting the net household income of contract households. Inclusion of non-rice crop will improve their income.

Families under the strict protection management system had the lowest farm net revenue (VND 11,089,480 per farm per year). Rice crop, non-rice crops and fishing are the main contributors to net household income. Rice farming is the main source of income but similar to contract farmers' case, rice yield is very low. The farmers depend greatly on employment in other farms to augment their cash income. In buffer zone management system, the result of the analysis indicates that rice, forest, and fishing are the main sources of farmers' income (VND 18,806,720 per farm per year). Moreover, farmers' net income at the buffer zone management system (VND 6,538,160 per hectare per year) is high compared with those of contract household management system (VND 1,074,440) and those in the strict protection management system (VND 1,626,180).

Farmers in family/household commercial farms management system had the highest income of VND 41,473,150 per farm per year. They obtain high profits from rice farming and forestry, partly owing to the favorable conditions for such activities.

Joint venture management seems to be the best alternative for state production forests. Strict protection forest management is better suited for reserved melaleuca forest, given some improvement in the economic status of community. Commercially managed forests are best for households with large farms; while rice and non-rice farmlands are more suited for households having small farms. An amended logging ban policy is needed to minimize, if not arrest, forest degradation. The amendment should allow those managing the forest to have limited access on the forest products therein, as specified in the forest management contracts. Better access to credit, extension services and training, more effective leadership, and higher participation in forest conservation would benefit the melaleuca forest reserve and would increase income from farming, thus reducing the need to rely heavily on forest products.

1.0 INTRODUCTION

Vietnam has not been spared from the problem of deforestation. At present it has about 26% natural forest cover, down from 67% in the mid-1940s. In the past 30 years, the total area of natural forests has declined at an estimated average rate of 350,000 ha annually. Of the nearly 19 million ha of forestland in 1990, only 8.7 million ha remain as natural forest cover (World Bank, 1995). The expansion of agricultural lands, weak enforcement of forest protection laws and lack of public awareness are among the most important contributors to this rapid decline.

With 4 million ha of natural forest and 2 million ha of agricultural lands, the Mekong River Delta (MKD) is currently the main food-producing region of Vietnam. MKD has a recent history. Reclamation of natural land for flooded rice cultivation started in early nineteenth century by digging an extensive irrigation-drainage canal system. Increasing population and rapid expansion of agricultural lands, mostly planted to modern rice varieties, have contributed to the fast disappearance of natural forestlands in the region.

The MKD is mainly composed of wetland mangrove and inland wetland melaleuca forests. Melaleuca trees flourish on inundated acid sulfate soil, occupying about 40% of the Mekong Delta, mostly in the provinces of Long An, Dong Thap, Bac Lieu, Ca Mau, Kien Giang and An Giang. Each province has from 10,000 to 30,000 ha of melaleuca forests. Up to 80% mangrove forest area are found in Bac Lieu and Ca Mau.

Growing pressure on forestland for firewood, construction material, rice cultivation and non-rice production have led to a rapid decline in melaleuca forest areas in the Mekong Delta (Khiem, 1995). In early 1970s, the natural area of melaleuca forests reached 241,000 ha but in 1984, this decreased to only 115,333 ha (Hien, 1987). Melaleuca forests are rich in non-timber forest products (NTFPs), fish, honeybees and several varieties of plant and animal species (more than 130 plant species, 147 bird species, and 268 aquatic species). In early 1970s, the biodiversity system of U Minh melaleuca forest was very rich (Ngan, 1990). This diversity has been seriously destroyed in terms of number and quantity of species. Some rare and economically valuable species may vanish unless there are appropriate policies on forest conservation. Melaleuca forests have another important function: regulating and containing the acidity of soil, thereby preventing it from being released into the water source.

1.1 Problem Definition

Re-planting of melaleuca forests by state forest enterprises and by land allocation and settlement projects has been initiated since the early 1980s. However, the lacks of incentives for protection, over-exploitation, and early cutting

and fire damage due to wanton harvest of NTFPs have affected large portions of the melaleuca areas. These valuable forestlands are under heavy pressure as local settlers harvest firewood and construction material, and clear the land for rice and non-rice cultivation. Also, fire destroys about 5% of melaleuca forest every year when NTFPs are harvested.

Policy makers, local authorities and environmental managers generally lack information on: (1) public awareness on the importance of forest; (2) community participation in melaleuca forest protection, and (3) effective incentive structures to formulate the best forest management system. There is no sustainable extraction rate of NTFPs and thus, no sustainable balance of conservation and conversion of melaleuca forests to crop production. Existing incentives as provided in the current land use are not clearly defined and not efficiently implemented. The present forest management system is not reducing deforestation rates and over-exploitation of NTFPs. Melaleuca timber continues to be illegally cut down, and NTFPs are extracted at non-sustainable rates.

1.2 Rationale and Significance of the Study

There are different causes of the rapid decline of melaleuca forests in the region in the last 30 years. Poverty, low education level and awareness of environment protection coupled with lack of economic incentives for forest protection are the main causes of forest destruction. Inadequate punishment partly explains also the increased cutting down of melaleuca tree species and the setting of fires to melaleuca forests. Moreover, many farmers recognize only the economic value of the forests since these bring them large cash revenues; the forests' environmental value remains unrecognized. Farmers' awareness level of the importance of forests is also quite low while the impacts of forest destruction are not well understood.

Several forest protection policies in Vietnam have already been developed and implemented such as the logging ban, strict forest conservation, long-term use right of forestland, and the shift from centrally-managed to people-managed forestry as contained in Resolution No. 10 of the Party in 1989. This last policy is quite significant because it recognizes the important role of forest communities in forestry protection and management. In particular, the policy was drawn to encourage and strengthen community participation on forest protection. To implement this policy, portion of the state production forestland was divided into small plots and allocated to poor farmers in 1990. In 1992, due to the need for investment in melaleuca forests, some of the state forest farms were awarded to farmers with sufficient financial capacity to invest in replanting melaleuca forests—under the Joint Venture scheme.

Despite the various policy reforms, the deforestation problem was not reduced, and even became more serious in many places, paving the way for the issuance of the logging ban policy in 1995. Since then neither the contract, joint venture nor household in buffer zone have been allowed to harvest and share in the income from the NTFPs as stipulated in their contracts. This has had a serious effect on the poor households, which now rely on small plots for rice cultivation, with very low yields. As a result, some residents in the area have resorted to stealing of wood from the melaleuca forests and illegal collection of NTFPs.

This study identified the incentive structures for forest management. It examined the leadership structure; extent and intensity of member's participation, rights and obligations associated with participation, effectiveness of control, and division of tasks in each of the alternative institutional management structures for Melaleuca forest conservation. The study also examined the socio-economic lives of the forest communities under the four forest management systems. The management systems evaluated consist of buffer zone management system, strict protection, joint venture, and family/household commercial farms in the Melaluca Forests of Mekong River Delta.

It is important to study and evaluate these management systems in terms of the community's roles in forest protection, their economic dependence on the forests and how these vary across forest communities, and their performance in being able to protect and manage well the forests. The study also aims to identify and evaluate the significance and effects of forest protection policies that have already been implemented at the study sites. It is the researchers' hope that the findings of the study can be used for:

- (1) To evaluate the effectiveness and weakness of the forest protection policies implemented at the study sites;
- (2) To identify and establish linkage of causes of problems of poverty - forest degradation;
- (3) To provide the alternative solutions that is the best recommendations to local and national governments for drafting policy reforms on forest conservation, and increasing farmers' income.

In addition to the primary data generated in this research, the study made use of the results of other studies conducted in the same sites. In particular, the data collected in the WB-funded Total Economic Valuation Study on melaleuca forests, conducted by the Global Environmental Consultant Ltd. (GEC) in two sites: Tram Chim Crane Reserve in Dong Thap province and Vo Doi Special Forest in Ca Mau province were used in this study.

1.3 Research Objectives

General Objective

To compare performance of forest communities under various forest management systems in terms of selected economic, environmental and institutional indicators.

Specific Objectives

1. To study the leadership structure, extent and intensity of members' participation, rights and obligations, effectiveness of control, and division of tasks associated with each of the institutional alternatives for forest management.
2. To assess the incentives to forest communities who entered into contract to manage the forestland.
3. To determine the factors affecting household income of forest- dependent communities.

2.0 THE FOREST MANAGEMENT SYSTEMS IN MELALAUCA FOREST

Under the Forest Conservation Law, forests are classified into three types: (1) strict reserved area or national park; (2) protection forest, and (3) commercial forest. Four forest management systems have been practiced for the planting and protection of melaleuca forests as follows:

- (1) "Buffer Zone" management system, which has been applied for the conservation of melaleuca forests in Kien Giang, Ca Mau (Upper U Minh and Lower U Minh reserved areas) and Dong Thap provinces.
- (2) "Strict Protection" management system, which is the scheme adopted in the core zone of protection forest.
- (3) "Joint-venture" between government agencies and the private sector or individual farmers to plant and exploit forest products. While the Buffer Zone and Strict Protection systems are designed to protect the reserved forests, the Joint venture is applied in areas zoned as production forests.
- (4) Family commercial forest farms with 30-40 ha of commercial melaleuca forests in Giong Rieng District of Kien Giang and Thu Thua District of Long An.

2.1 Buffer Zone Management System

Important land allocation projects have been designed to protect a large area of old growth native melaleuca forest in Tram Chim. Tram Chim in Tam Nong district was first demarcated in 1985 as a 5,200 ha reserve area by Dong Thap province. It was increased to 7,612 ha and declared as a national park through Decision 47 of the Prime Minister in 1994. Surrounded by 60 km of canals and dikes, Tram Chim faces pressure from the dense populations in nearby areas.

Under the buffer zone management system, farmers living in the surrounding areas are allocated plots of land, a portion of which, by contract with local government agency, should be preserved as forestland and the rest to be exploited as agricultural land. The ratio of area devoted to melaleuca and to rice cropping is 7:3. Lot size depends on household size. The cropping area is situated near the homestead and surrounds the protected forestland. The system aims to provide farmers with incentives in the form of income derived from allocated cropland and non-timber forest products (NTFPs) harvested from the melaleuca forests. It also aims to create a buffer zone to prevent illegal trespassing from outside the protected area. In turn the farmers have the responsibility to protect the melaleuca forest by preventing the indiscriminate cutting of trees and harvesting of NTFPs. The reward for this forest protection effort is the allocation of rice land surrounding the forest, and collection of NTFPs such as fish and honeybee at limited levels. Forest conservation is also monitored by government employees (about 100 ha per one person) stationed in the area.

This management system is based on the principle of “co-management” and farmers’ awareness of the forest’s value as a source of sustainable income. However, several issues about this current system should be addressed:

- (1) Forest conservation is not maintained for lack of information on the real value of NTFPs;
- (2) The sustainable harvest rate of NTFPs is not specified;
- (3) Land tenure of 20 years for “buffer zone” farmers is not long enough for them to make long-term investment; and
- (4) Cultivation of NTFPs is not encouraged.

2.2 Strict Protection Management System

Under this management system, a “forest protection team” stationed outside the areas strictly protects melaleuca forests. About 24 agents are responsible for about 2,800-ha of forest, supervising and monitoring the implementation of forest protection law. Their salary comes from government budget. In this system, entry to the protected forest is restricted and extraction of NTFPs is not permitted. This is an attempt to fully protect NTFPs and biodiversity in the protected forest’s core

area. Because of understaffing of the enforcement group and low salary, corruption is inevitable. Full conservation of the forest and maintenance of biodiversity are not attained.

The system therefore has the following problems: (1) it requires high monitoring costs and large number of enforcement staff; (2) farmers' income from the forest and NTFPs is not maintained; (3) NTFPs are not cultivated and extracted at a sustainable rate.

Another form of strict protection is the allocation of forest areas to state forest farms, local government bodies or military farms. These organizations are vested with the right to exploit the forest under their "ownership". Lack of awareness of the environmental and true economic values of the forests have led to over-exploitation of forest products. Most of the State forest farms are presently contracting local farmers to plant, protect, and harvest melaleuca trees and NTFPs. This arrangement is called "joint venture-alliance" between government institutions and farmers or private enterprises.

2.3 Contract Households and "Joint-venture" Arrangement

Reforestation of melaleuca and mangrove forests and planting of "production forests" in the Mekong Delta have been encouraged by local government through "joint-venture and alliance" arrangement. This arrangement applies to "production forest" where the government's contribution is in the form of forestland and infrastructure (canal and road construction). The private sector invests capital for planting and protection. Melaleuca timber products are harvested after 10-12 years. Private entrepreneurs are also allowed to harvest non-timber products. The state authority and the entrepreneurs share the income from the sale of poles and by-products at a proportion based on the value of their investment and the value of melaleuca stand at the beginning of the contract. This management system is usually associated with land allocation and settlement on projects. Forestlands are allocated to households with the condition to plant melaleuca on larger portions of the lots.

Song Trem Agro-Forestry-Fishery Farm in *Thoi Binh District*, Ca Mau province was among the first places where the model of people's participatory management of forest was applied. The State invested on canals in 4,000 ha of the farm. Starting early 1990, each household was allocated 10-15 ha with long-term land tenure and contract condition that 70% of the land should be planted to melaleuca. Harvest of melaleuca was shared between the State and the farmers based on the tree stand's age at the beginning of the contract. Farmers could grow and harvest other NTFPs like fish and honey bees except for some endangered species such as black skin gouramy.

Although not an environmental project, Kien-Tai is a new form of forest planting in the Mekong Delta. Established in 1992, Kien-Tai is a joint venture between Kien Giang province and a Taiwanese general company to establish 60,000 ha of eucalyptus in Ha Tien and Hon Dat Districts. Under this venture, the Taiwanese company is granted a 20-year land use right. In turn it will contribute US\$3 million to cover the cost of planting, protection and exploitation of eucalyptus products for export and for use as raw material by a paper pulp factory to be built in Kien Giang province. Although the environmental consequences of eucalyptus are not yet entirely known, farmers have expressed their concern. For example, it is believed that fish will not survive in irrigation ditches and canals with fallen eucalyptus leaves that pollute these waterways. Birds and bees, which flourish in melaleuca forests, are almost entirely absent in eucalyptus forests.

2.4 Family Commercial Forest Farm

There are 1,765 ha of family commercial forest farms in Giong Rieng District, Kien Giang province. The melaleuca forests have been planted on deep-water and inundated acid sulfate soil by land allocation and settlement projects initiated since 1989. Each family forest farm is about 30-40 ha. Melaleuca timber products are harvested after 7-9 years. The farmers are allowed to harvest and sell melaleuca timber products in the market after tax payment. High density planting has resulted in massive reforestation in the area. Also, good land and irrigation conditions ensure profitable rice yield compared to other regions. The farmers here are the most prosperous of all those studied.

Forestlands have been granted on a 50-year tenure. All melaleuca production forests in Giong Rieng are "privately owned" under household management. The existing production forests are naturally grown without government intervention. The government has not given much attention to planting of melaleuca forests. Meanwhile, farmers either establish more forests beside the naturally grown forests or they improve the natural forests for production purposes.

The farmers plant and harvest trees according to market conditions. Any increase or decrease in the forest area is a sign of the farmers' response to market demand rather than to government regulation. Nevertheless, the massive transformation of rice lands into forestlands has spurred the local government to limit the conversion to prevent the shortage of paddy rice area.

3.0 RESEARCH METHODS

3.1 Hypotheses

The following hypotheses were advanced for this research:

1. Weak enforcement of forest protection law and lack of public awareness on the importance of forest are among the most important causes of rapid depletion of melaleuca forests.
2. Increasing pressure on forestlands for firewood, construction material, rice cultivation and non-rice production have led to the rapid decline of melaleuca forests in the Mekong River Delta.
3. Lack of incentives to protect large portions of melaleuca planted area results in over-exploitation, early cutting, stealing, and fire damage due to wanton harvesting of NTFPs.
4. The best institutional alternative in forest management system provides farmers with sustainable income and conserves forest value. This alternative allows for:
 - a. Higher participation of members and local organizations in forest conservation;
 - b. Effective control of common property, and
 - c. Effective leadership and efficient division of tasks.
5. The best alternative management system also improves forest health with positive impact on environmental indicators and farm income.

3.2 Scope of the Study

This research was focused on melaleuca forest management in the Mekong River Delta in order to determine the factors that affected the performance of alternative forests management system. It required a comprehensive analysis that looks into the institutional arrangements with regards forest management, sharing of forest benefits, costs and benefits of land use systems in the forestlands, and determinants of household income, as this may be affected by the households' choice of the forest management system. The three study sites are Tram Chim, Vo Doi, Song Trem and Giong Rieng.

Tram Chim (Dong Thap province) and **Vo Doi** (Lower U Minh Special Use Forest) represent the sites for the institutional alternatives of core zone and buffer zone management system. These were also the sites of the World Bank study.

Song Trem Agro-Forestry-Fishery Farm in Thoi Binh District of Ca Mau province represents the model of contract farmers, joint venture, and state farm protection.

The **Giong Rieng** site in Kien Giang province serves as representative site for the commercial private forest farms.

3.3 Data Source

The primary data were derived from socio-economic surveys of 415 households in various study sites and distributed as follows: 114 households in Song Trem, 120 in Tram Chim, 65 in Vo Doi and 116 in Giong Rieng.

The elicited information was corroborated through participant observation and field interviews with farmers and local authorities; informal discussions with key informants; analysis of secondary data from the World Bank study and other sources and personal communication with knowledgeable individuals from government agencies, institutes and universities, among others.

3.4 Research Methodology

3.4.1 Variables or Factors Considered

The comparative analysis of forest management systems required a detailed economic and institutional study of the different sites' current land-use and institutions.

The following variables or subject matter were analyzed in this study:

1. Community participation,
2. Management aspects and incentive structures for participation to forest management systems,
3. Land tenure,
4. Leadership structure,
5. Extent and intensity of members' participation,
6. Rights and obligations,
7. Effectiveness of control,
8. Division of tasks, and
9. Costs, benefits and distribution of costs and benefits.

The main variables related to household income were rice area, banana area, vegetable area, fruit tree area, fishing area, melaleuca area, cost of rice production, cost of fishing, total investment of melaleuca, credit, cost of animal raising, cost of non-rice production, and kind of household.

3.4.2 Research Approach

The case study approach was used in this study. The institutional model and incentive structures at each study site were investigated and described in detail. Cost benefit analysis of the farming systems under the various management alternatives was carried out.

A household production function analysis was also undertaken to identify the contribution of forest management systems to household income.

Y_1 (Net Income/HH: mgt system model) = f (rice area, banana area, vegetable area, fruit tree area, fishing area, melaleuca area, cost of rice production, cost of fishing, total investment of melaleuca, credit, cost of animal raising, cost of non-rice production)

Y_2 (Net Income/HH: pooled data model) = f (rice area, banana area, vegetable area, fruit tree area, fishing area, melaleuca area, cost of rice production, cost of fishing, total investment of melaleuca, credit, cost of animal raising, cost of non-rice production, kinds of household (dummy))

4.0 LITERATURE REVIEW

4.1 Institutional Economics

4.1.1 The Evolution of Institutions for Collective Actions

Ostrom (1990) argued that individuals who do not have similar images of problems they face, who do not work out mechanisms to disaggregate complex problems into subparts, and who do not recognize the legitimacy of diverse interests are unlikely to solve their problems even when the institutional means to do so are available to them. He also indicated that without a fair, orderly and efficient method of allocating resource units, local appropriators have little motivation to contribute to the continued provision of the resource system. When multiple appropriators are dependent on a given common pool resource as a source of economic activity, they are jointly affected by almost everything they do. Otherwise, the appropriators act independently in relation to a common pool resource generating scarce resource units. The total net benefits they obtain will

usually be less than could have been achieved if they had coordinated their strategies in some way.

4.1.2 Property Rights

In his study on environmental problems in Southeast Asia, Bromley (1997) noted that all environmental problems are property right problems. In legal terms, to have a right is to have the capacity to call upon the collective power - some authority system - to protect one's interest in a particular situation or outcome. Bromley adds that rights only have content when there is an authority system that agrees to defend a right-holder's interest in a particular outcome. Property rights extend that legal force to the realm of objects and benefit streams. The degree of protection afforded by a particular structure of property rights is always relative to other social concerns and priorities. Rights can be thought of as factors of production (Coase, 1960).

Bromley (1997) mentioned four broad types of resource management regimes pertinent to environmental economics: (1) state-property regimes, (2) private-property regimes, (3) common-property regimes, and (4) non-property regimes (called open access). Resource degradation in state-property regimes arises when the administrative reach of the management agency is insufficient to control the behaviors of those authorized to use the resource. Where governments are weak and their legitimacy is easily undermined, there is a tendency for resource degradation to arise from the government's inability to confront powerful commercial interests exploiting the natural resources under state property regimes. The idea is that only an individual owner can make the proper management decisions and that when government regulations get in the way, the efficacy of private ownership is compromised. Resource degradation in common-property regimes usually arises for two reasons: (a) there is a breakdown in compliance with group rules by the members of the regimes, (b) the government holds common property in low esteem, that is, the state disregards the interests of those segments of the population largely dependent on common-property regimes.

Fisher (1989), in his research on indigenous systems of common property forest management in Nepal, argued that implementing local level forest management on a large scale requires "a step by step approach": step 1: recognize existing systems and leave them alone if they are effective; step 2: strengthen existing systems when they are inadequate, perhaps by attending to problems relating to legal tenure or by providing financial support; step 3: assist in establishing new institutions where necessary, but in doing so, pay close attention to existing use - rights. He concluded that the policy of handing over forest to local control has developed because centralized management has proved to be impossible. The most realistic government roles will be to create an environment

wherein indigenous initiatives can prosper and provide support through extension services.

Richards (1997), while studying common property resource (CPR) institutions and forest management in Latin America, found that community institutions are further weakened by intra- and inter-community conflicts over land rights especially where land tenure documentation is unclear, and by poverty pressure for subsistence farming, partly related to their loss of benefits from the forest. There is evidence that given the appropriate policy and institutional support, CPR institutions are more likely to achieve environmental and equity goals than alternative forms of tenure in the region. He concluded that an essential element of the success of forest management is the strength of the grassroots organization representing the forest users; where community rules and norms are developed, fences are built around forests and invasion by outsiders stop.

In a research on state and forest management in the Indian Himalaya, Haripriya (1997) contended that the distinction between property and control-form and function could provide a better understanding of the state's role in forest resource management. The analysis focuses on five factors influencing the ways by which state agencies exercise control over conservation, extraction and use of forest resources. These are: (1) broader political and economic processes that create pressures on forest resources; (2) competing perspectives and concerns regarding the importance of forests that shape the forms of state intervention; (3) legal, ecological and economic parameters that define the forms of resource extraction and conservation occurring in state forests; (4) instruments such as capital, labor exchange, concessions and entitlements used in controlling access to resource extraction; and (5) conflicts, disputes and negotiations that reshape the instruments and regimes of access, and redefine the nature of state control over forests. According to him, sustainable resource management requires a flexible array of access and management regimes. Forest conservation and management are shaped by the complex interplay of ecological, economic, social, political and cultural processes occurring at the local, regional, national and international levels. Different forest categories form, in effect, access and management regimes that function together as an ensemble, and are periodically reshaped through the complex interplay of social, economic, political and ecological factors. It remains to be seen whether this new approach will evolve towards more sustainable forms of resource use and management, and whether these emerging regimes allow forests to remain accessible for the livelihood and basic needs of poorer households and landless populations in these regions.

Haripriya also noted that increased market demand for timber and other forest commodities might lead private owners to overextract high-value timber. Privately owned forests may also suffer severe depletion in the event of a price collapse in forest commodities or when high rates of interest prevail in the credit

markets. Hence, given the volatility of commodity markets, sustainable resource management of forests under private ownership is possible only if the state intervenes to ensure such practices through a mix of financial subsidies and price supports. He believes that blanket prescriptions for privatization or transferal of state forest to “communities” is more likely to contribute to increased marginalization of poorer households, and also place the long-term sustainability of forest at immense risk. The study concluded that scholars and policy-makers seeking to promote sustainable management of forest resources need to direct their attention toward understanding the forms of access regimes and the balance of class forces in regions.

Furthermore, joint forest management is a strategy currently being implemented in parts of eastern and central India that does not transfer ownership of forests from the state to local communities. But attempts are being made to organize management in limited forest tracts by restructuring the forms of access and instruments of control to favor the needs of nearby villages (Ford Foundation, 1990; Poffenberger, 1990; Society for the Promotion of Wastelands Development, 1993).

4.1.3 Local Participation in Forest Conservation

May (1992) and others also point out the negative effects of enclosure on conservation and equity objectives. Many support a new relationship with indigenous people based on legal, scientific and financial support in exchange for a commitment to biodiversity conservation (Davis and Wali, 1993; Redford and Stearman, 1993).

Anderson (1990) recognized that the key to sustainable management is integrated, multiple, product management, and the broad livelihood base, which maintains forest societies. Geisler and Silberling (1992) agreed that local unions often play a key role in encouraging adherence to desirable management practices. Many argued that the underlying policy motive is to enable the elite groups to maintain their resource base (Silva, 1994; Utting, 1993). It is clear that the state, even with the support of international NGOs, cannot ‘create’ effective community management structures where local organization is weak and strong vested interests are present (Forster and Stansfield, 1993).

A study of 23 integrated conservation and development projects (ICDPs) in 18 protected areas in Asia, Latin America and Africa indicates that local participation is critical to the success of both conservation and development goals (Wells and Brandon, 1992). There has likewise been little thought as to who is participating, what is he participating in, and how he participates. Wells and Brandon (1992) identified five areas where local people can participate: information gathering, consultation, decision-making, initiating action, and

evaluation. As to how projects promote participation, Wells and Brandon (1992) identified two principal approaches: employing change agents and building local institutions. They mentioned that one of the most important lessons from rural development projects is that the intended beneficiaries cannot be expected to endorse and sustain projects that they have little or no involvement in identifying or designing. Finally, they concluded that despite considerable rhetoric in the country, most case study projects have treated local people as passive beneficiaries of project activities and have failed to involve them in the process of change and their own development. Thus far none of the ICDP case studies has convincingly shown that mechanisms of local participation can be established, which are capable of operating independently of the projects and/or conserving biological diversity in nearby parks and reserves.

In a study on local participation in conservation of the Ranomafana national park, Madagascar, Peters Jr (1997) defined 'local participants' as those engaged individually or collectively as research guides, wildlife guides, nature protection agents, or members of either non-formal or formal village organizations. The same should be said for conservation projects. While it is important to investigate and understand local participation once a project is underway, it is crucial to incorporate local participation in decision making before projects get implemented. Peters Jr. (1997) concluded that participation through institutions is likely to be more effective than through individuals.

4.2 Land Tenure Economics

Arnold and Campbell (1986) categorized forest control in terms of the types of rules imposed on: (1) harvesting only selected products and species, (2) harvesting according to condition of product, (3) limiting amount of product, and (4) using social means of protecting the area.

Owen (1990) indicated that not all forests are managed in the same way. The type of management depends on the main function of the forest or a combination of its functions. A forest manager will try to establish and maintain a unique stand with regard to species composition, species distribution, and age of trees. He must always consider the managerial, ecological social, and legal constraints under which he operates.

Stewart (1992) did a research on land-use options to encourage forest conservation on the Nagpana tribal reservation in the Philippines. Four models (current use model, forest conversion model, charcoal model, crop/charcoal model) were examined for their economic net present value (NPV). Each model represented a possible use of the land resource in Nagpana based on systems already being used and could be implemented under existing conditions. He concluded that high initial returns to illegal forest clearing create a great incentive for deforestation. An essential factor in the success of such systems is that the Ati

themselves recognize the environmental problems on their reservation and are actively seeking solutions to them.

Bann (1997), in an economic analysis of tropical forest land use options, in Ratanakiri province, Cambodia, found that villagers in Kancheung Village consider the clearance of forest for farmland as the most important environment threat to the area. They suggest ways to conserve the forest: look for flat land to plant rice; prohibit commercial forestry, and control forest clearance and promote forest regeneration. Meanwhile, villagers in Mas Village feel that the best way to manage the forest is for the government to support forest protection through legislation, and for outside villages to be prohibited from cutting trees and clearing the forest for farms. Inhabitants of the Koy and Tagaich Villages share the latter view. Local meetings have been suggested also to explain the importance of the forest to the local people.

Clearly, for a forest to be sustainable, harvesting must be confined to the accumulated growth since the last harvest and the stand must be left in a condition that can support the resumption of growth at least at the same rate, says Worth Bank (1996). She concluded that local communities have the motivation, capability, and knowledge to sustainably manage the forest themselves. She recommends that consultation with local people should be central to the committee's activities.

5.0 RESULTS AND DISCUSSION

5.1 The Study Sites

The study was conducted in Song Trem (Thoi Binh District, Ca Mau province), Tram Chim (Tam Nong District, Dong Thap province) Vo Doi (Tran Van Thoi district, Ca Mau province), and Giong Rieng (Giong Rieng District, Kien Giang province) representing contract households and joint venture households management system, buffer zone management system, strict protection management system, and commercial private management system, respectively.

5.1.1 Song Trem Agro-Forestry-Fishery Farm

Founded in 1982, Song Trem Agro-forestry-Fishery Farm (the State Forest Farm) was one of the first pioneers to call for people's participation in forest management. It covers an area of 10,094 ha, including 6,448 ha of forests, 1,464 ha of canal banks, 926 ha of agricultural land, 369 ha of homestead land and 85 ha of estate land for building infrastructure. Accounting for 65% of the area, forests are classified either as newly planted or middle aged. Newly planted forests have been established since 1989, and over 50% have potential for harvesting.

Song Trem presently operates under the contract household (CH) and joint venture (JV) forest management system. Since early 1991, the State Forest Farm has allocated 7,115 ha to 1,142 contract households or an average of 6.5 ha per household. In addition, the Farm has allocated 930 ha to form Joint Ventures (JV) with 37 partners and has cooperated with 6 partners on 324 ha to achieve efficient forest management and protection and high fishery yield. The State Forest Farm directly manages the remaining area.

All lands in the farm belong to the state. The Board of the Farm is assigned to protect the forest and apportion land to farmers living in the area. Starting 1986, the Board of the Farm has divided the total area into small plots for poor farmers to earn their livelihood. Since 1992, due to the need to invest in the melaleuca forests, the Board of the Farm has been allowed to allocate plots to farmers financially able to replant melaleuca or improve the land conditions for cultivating rice and non-rice crops. Said farmers are referred to as JV households in this paper.

The Contract Household Management System

Farmers are allocated both agricultural lands and forestlands lasting for 20 years. At the start of the contract, all farmers are given the same land size, i.e., 7 ha per household. Even if a contract is ongoing, farmers can overlap lands in the other contracts, depending on their financial capacity. After a certain period, the Board of the Farm will measure the contracted land and approve the actual area of each contract household on Land Use Right Contract. In 1990, the State Forest Farm for temporary land use granted individual households the “Green Land” contract, usually for 20 years. Farmers can grow and harvest non-timber products like fish, honey bees and others except some endangered species from their contracted land. The State Forest Farm takes charge of building boundary dikes, canals, land division and infrastructure to achieve the missions of administration, protection, settlement, transportation, etc. To improve their quality of life, farmers are allowed to convert part of their forestland into agricultural lands for rice or non-rice cropping but not exceeding 30% of the total contracted land. Contract farmers can also build boundary dikes around their lands but using only manual labor and simple mechanical tools. They shoulder entirely the construction costs. Such boundary dikes are often small and low, and can neither bar nor hold water for agricultural and forestlands. With the Board of the Farm's approval, farmers have the right to transfer their lands to others and continue the new contract after the first contract expires.

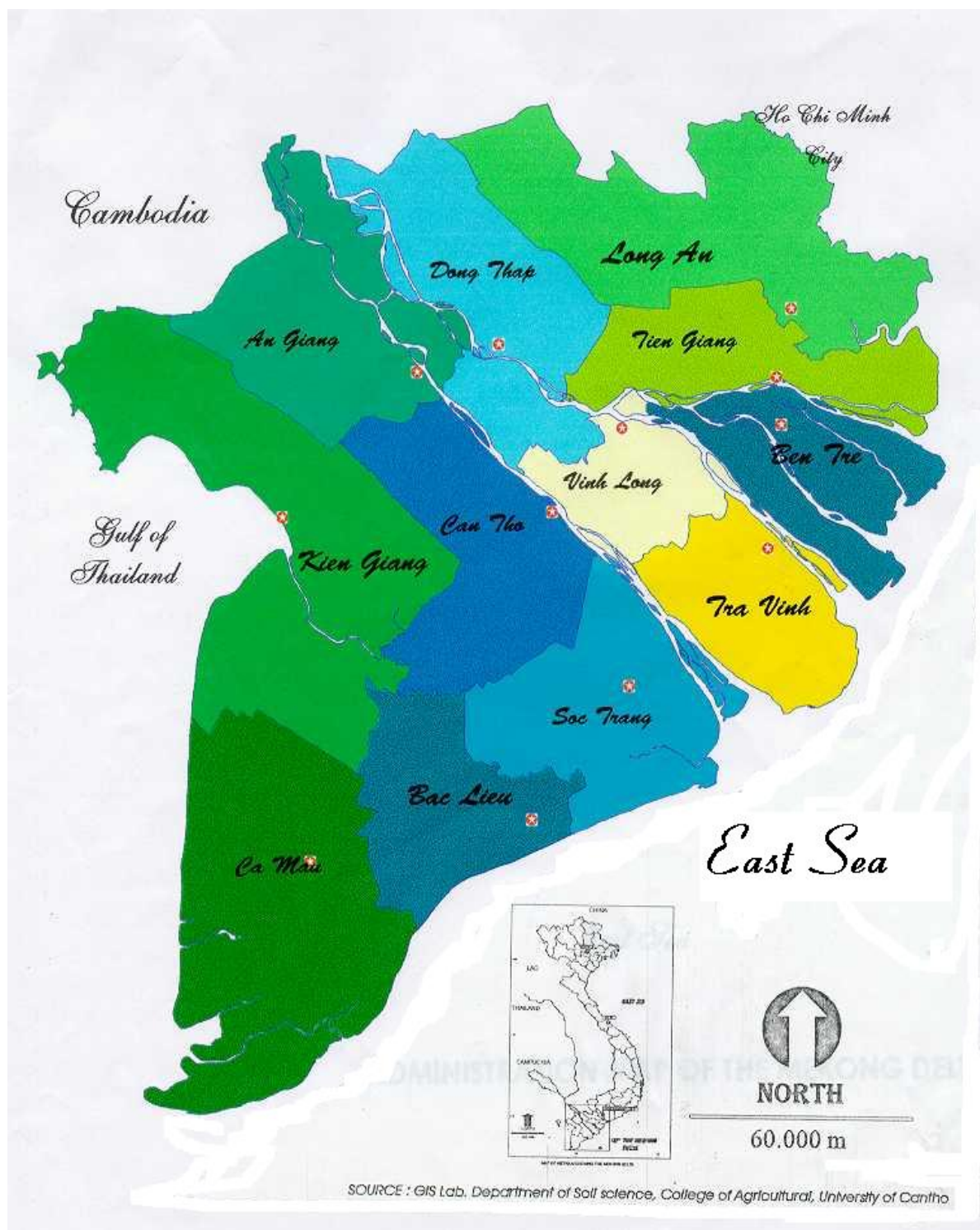


Figure 1. Map of Vietnam and location of the Mekong Delta.

Who can get contract land? People who are poor and landless can get the contracted land if confirmed as such by local authorities.

Benefits and obligations of the contracting parties. Farmers take charge of safeguarding the forests in their contracted lands and distributing the benefits from melaleuca forests to the State Forest Farm. The 10-year-old or more melaleuca trees are preferred for exploitation. The ratio of benefit distribution computed from the time farmers guard their contracted land, which is also the date of contract signing. The following sharing arrangements are observed: 8:2 (80% for the Farm and 20% for farmer) for more than 8-year-old melaleuca forest trees; 7:3 for 6-year-old trees and 6:4 for younger trees. The rate of 7:3 is the most common sharing arrangement.

In practice, the State Forest Farm has not allowed the exploitation of melaleuca forests since 1995. Up to now, the benefit distribution arrangements stated in the contract have not been implemented. Since farmers cannot reap the benefits from protecting the forests, they mainly live on rice or non-rice crops in their agricultural lands. With the poor conditions of the farmers, the Board of the Farm has to give them support such as granting of concessional loans for poverty alleviation and crop production and diversification.

Executive administration. The farmers take shelter in the contracted land and take responsibilities in protecting the melaleuca forests in their contracted land.

The Joint-venture Management System

The Board of the Farm allocates plots to farmers with financial capability to invest in planting melaleuca and in improving land conditions. There is no limit on the land size allocation (minimum area is 25 ha per JV household). Lands for JV contracts are often located in most in the State Forest Farm zone and depends on the recipients' reputation and financial capacity. The lands are either existing forestlands or lands without forests, which can be replanted with melaleuca. Since the areas in JV contract are large, JV households can hire big machines to build boundary dikes around their plots. This task often costs much, about VND 50 millions or more, indicating that JV households are often very rich. The Board of the Farm regulates the size of the dike at 10 meters wide and the channel is 8 meters. The farmers are allowed to cultivate along the dikes, with bananas and vegetables as the dominant crops. They have the right to transfer their allocated lands to other parties, upon the approval of the Board of the Farm; or continue a new contract after the first contract expires.

Who can avail of contracted land? Everybody can get the JV contract provided one has sufficient capital to build boundary dikes. No limit is set on how

much land can be availed of. The Board of the Farm would always select contractors and farm size allocable based on information gathered by their officers.

Benefits and obligations of the contracting parties. Most JV households enter into the contract hoping to get rich from the estimated high income from forestlands. The ratios of benefit distribution applied are the same as with the contract households. However, JV households must pay an extra fee if they cultivate along the dikes. The extra fee refers to a fixed contract amounting to 10 to 15 kgs of fish per ha per year, up to the location of the forestland and investment of JV households. A kilogram of fish is worth VND 12,000. If the JV households receive land and totally take charge of planting the forest, they will reap 80% of melaleuca's value after harvest; if they only take charge of forest protection, they will get 20% of the melaleuca's value after harvest. However, this type of contract has not been applied because of logging ban policy in 1995.

Farmers are also allowed to plant bananas along the dikes and raise fish in canals to improve their level of living, but not to clear forests for rice cropping. They receive all the benefits of their non-timber harvest. Because of large investment, farmers diligently take care of their lands, leading to good forest protection and economic output. A problem facing JVs is the too large plots that need much attention, thereby competing with the forest output.

Because of their wealth, JV households do not receive any favor from the government as well as the Board of the Farm. Similar to the contract farmers, JV households have not been allowed to exploit forests since 1995. Thus, their main sources of income are bananas and fishery, which are not enough to offset their investment in forestland preparation and others. The trend now is to transfer their contract lands to others and get out of the State Forest Farm.

Executive administration. The Board of the Farm does not require JV households to reside in the contract lands. Instead they can live outside the State Forest Farm and hire employees to take care of their lands and production.

The implementation of the contract and JV systems is an important step in veering away from centrally managed to community-managed forests. This not only creates common activities of both the state and non-state agencies in forest protection but also attracts investment from private partners to strengthen forestry resources and sustain the ecological environment.

Before 1995, farmers were allowed to exploit forests, thus, they could live on forest produce. There were also a few illegal forests harvesting because the contract farmers gave up their duty as forest guards.

But since 1995, the government has banned timber product harvesting in state-owned forests across the country so as to check over-exploitation of forest

resources. Song Trem has not been an exception; it continually experiences forest destruction.

The contract farmers, mainly living on forest produce, have become impoverished since their livelihood source from timber products has stopped. Households living in poverty account for 70% of the total number of households in the area. This is compounded by the fact that since 1992, the Board of the Farm has not provided farmers with credit for livelihood and production. Also most farmers are unable to finance the construction of boundary dikes for fish culture, another livelihood source.

As the contract farmers become poorer and lack incentives for forest protection, robbery and wanton harvest of melaleuca occur everywhere. In some areas of the State Forest Farm, an estimated 1,000-2,000 melaleuca trees worth about VND 10,000,000 are stolen every day especially near the Farm's boundary. The forest destroyers include both people inside and outside the Farm in cahoots with the traders, of which 30% are insiders. A thief earns an average of VND 200,000-300,000, but if arrested, he pays a penalty of VND 200,000. Inadequate punishment can partly explain the increase in robbery, and the understaffed protection force patrolling the entire area. Low salaries also dampen their eagerness to execute their responsibility.

Faced with these problems, the State Forest Farm introduced two actions to the provincial management. The first allows farmers to exploit forests on their allocated plots as specified in the contract to create employment and generate income. In the case of a closed forest, the government evaluates the benefit from the forest to obtain the base for compensation, thereby creating a fund for farmers to diversify crops and do agribusiness.

5.1.2 Tram Chim Wetland and Reservation

Tram Chim Wetland and Reservation uses the buffer zone forest management system (BZ). Internationally considered as a typical wetland of the Mekong River and South East Asia, Tram Chim was founded in 1995 and was operated as Tram Chim Agro-Forestry-Fishery Company.

In 1992, it was renamed the Tram Chim Centre of Crane and Natural Environment Protection under the People's Committee of Dong Thap province so as to strengthen protection of the red-necked crane and the area's ecology. On February 2, 1992, the Prime Minister issued Decision No 47/Ttg changing this site into "Tram Chim Wetland Reservation" with the status of strictly protected area of 7,612 ha surrounded by a 60-km-long boundary dike. The main functions of the Reservation are as follows:

- a) Re-establishment of the natural environment for wild animals, scarce aqua-birds, migrant birds, and preservation of the gene sources of original creatures.
- b) Research on land resource, living things and natural landscape of the ecology of wetland area.
- c) Development of the positive features of wetland ecology in protecting the natural environment and water source and restraining floods.

Tram Chim covers an area of 10,028 ha, including 7,612 ha of reserved area and 2,416 ha of buffer zones. Being in the lowland, it accommodates a big portion of melaleuca forest areas inhabited by wild creatures such as fishes, birds especially the red-necked crane, migrant birds, tortoise, snake, and others. The ecology of a wetland is a representative ecology of the Mekong River and South East Asia with lots of natural vestiges. Land and water conditions are characterized by heavy aluminum content, hence agricultural production is low.

Tram Chim Reservation accounts for 17% of Tam Nong District's total area. The population of five villages around the reservation stands at 31,229 compared with 76,206 of the District, or a difference of 39%. While the population density in the District is 171 persons/km² that in the Reservation is 410 persons/km² or nearly 2.5 times greater. The high population growth rate of 2.18% per year mainly results from both legal and illegal migration. A 1998 Cantho University survey of 135 households revealed that household heads over 35 years old and over 55 years old account for 75.5% and 23.7% of the total population, respectively. The average household size is 5.27 persons, and households with 7-8 persons make up 18.5%.

The reservation is bounded by some 60-km boundary dike system. There are 12 guard stations along the boundary, one of which is a patrol team. Each station has three members, but the patrol team has five members under a leader. These stations work 24 hours a day. They cooperate with the forest protection unit and local police in patrolling around the protected area to apprehend trespassers.

The Reservation area is divided into three sub-areas, namely: strictly protected area, nature restored area and administration-service-tourism area. The strictly protected area is 6,225 ha. This is the core of the reservation, protecting the landscape, natural environment of Dong Thap Muoi, residential places, wild animals and aquatic life forms.

The nature restored area totals 1,397 ha and is intended for the restoration of the natural landscape and ecological conditions for aquatic life forms. It is also designed to protect the cranes' habitat and those of other valuable but scarce aqua-birds. Residents of this area, can plant and harvest limited melaleuca, and raise some animals originating from Dong Thap Muoi. The administration and tourism area houses the offices and tourism services.

Surrounding the boundary dike are the buffer zones, which serve to stabilize farmers' lives and facilitate their participation in protecting the Reservation's natural resources. Farmers are allotted lands to cultivate and live in through which they are expected to create a protection boundary of the reserved area. However, the increase in population puts pressure on the land, resulting in increased indiscriminate exploitation of the resources in recent years. This is also true for other buffer zones all over the country.

5.1.3 Vo Doi Special Use Forest

Operated under the strictly protection forest management system, Vo Doi Special Use Forest (SUF) encompasses 3,688.6 ha of natural land.

Established through Decision No. 51 on June 9, 1983, the Forest Fire Protection team managed it; there were no inhabitants in Vo Doi forest at that time. The first Techno-Economic Proposal of Vo Doi Forest was implemented in 1984 by Team No. 11 of the Sub-Institute of Forest Investigation and Projection No. 2 (FIPI 2). Then, the Board of Management of Vo Doi forest was assigned in 1989. A dozen households from other places settled in the area. The second Techno-Economic proposed by Vo Doi Natural Reserve was completed in April 1990. In 1991, the Board of Management began distributing plots to contract households. Under the contract, each farmer received about 5 ha of land for agricultural production and planting of melaleuca trees. Each household also received a Green land certificate for temporary land use lasting 15 years.

The Vo Doi SUF was established for the following reasons:

- *Preservation of forest ecology and natural environment.* At present, the area around the reserve is agricultural land; the forest is completely exploited. Thus, building and protecting the Vo Doi forest are aimed at creating a forest landscape and maintaining the water resources for agricultural production and livelihood.
- *Creation and maintenance of good landscape and tourism.* The melaleuca forest is a special ecological environment in Southeast Asia. In Vietnam, it exists only in the Mekong River Delta, small in terms of area and with low forest quality. Maintaining the Vo Doi forest is aimed at creating and maintaining a forest landscape for tourism and field study.
- *Scientific research, preservation of gene resources and national security.*

In 1992 a dike and a canal system surrounding the protected area and cutting across the allocated plots were built. This shrank the distance from the dike to the protected area from 1,000 m to 500-600 m. At present, the area is divided equally into two: the outside zone devoted for agricultural production and the inner zone, for forest planting.

The canal system functions as source of water for both agricultural production and fire protection. The four frontside of Vo Doi forest border four canals:

1. North frontside bordering Canal T2, U Minh III Forest.
2. South frontside bordering Canal Minh Ha.
3. East frontside bordering Canal T19, U Minh III Forest.
4. West frontside bordering canal of experimental area.

In the middle area, Vo Doi SUF is equally divided into four main blocks by two main canals, Horizontal Canal and Vertical Canal, across the center of the forest area. Each block has a guard station.

Since 1993, the Forest Control Board of Vo Doi has been receiving financial assistance from the "327 Program" intended for activities in the protected area (excluding the area contracted to farmers).

Currently, 149 permanent households along the dike boundary have received contracted lands from the Board of Forest. The Board has stopped granting plots to farmers because land reserve has been used up. Contracted plots constitute two equal parts: agricultural land and forestland.

Vo Doi is characterized by tropical monsoon climate, warm-humid all year. It has two distinct seasons: dry from November to April and rainy from May to October. Forest fires often occur in dry season. The soil is acidic alluvium along the seashore extending to the Mekong river systems.

Contract lands serves as buffer zones around the strictly protected forest area. Farmers take charge of protecting the common forest area. Most of them have participated in fire prevention and fire fighting activities. They are not allowed to leave the region in dry season without permission from the Board of Management. Fires were frequent until 1994. The big one in 1994 completely destroy 500 ha and damaged an additional 500 ha of forest. Inner canals were thus built as safeguard against fire. Since then there has been no fire in the area; in the last two years, no illegal forest harvest has been reported as well.

In 1997-1998, farmers received seedlings from the Board to be planted in their forestlands. The ratio of benefit distribution between farmers and the SUF was set at 8:2 or 80% for the farmer and 20% for the SUF upon harvest in about 10 years. Other distribution rates were 7:3 and 6:4, depending on the age of forest at the time of allocation to farmers.

In agricultural production, farmers must pay taxes and fees in the form of 180 kg of paddy rice per ha per year harvested from their land. However, in the last

two years, farmers have been exempted from taxes because of bad harvest caused by heavy rains and floods.

Farmers obtain credit from the Bank for Agriculture and Rural Development (BARD) using their red land certificates as collateral. In 1997, credit per household amounted to VND 2 millions at an interest rate of 1.25% per month. In 1998, it increased to VND 3 millions at 1.2 % interest rate. Most farmers availed of this credit source and were able to repay on time.

The SUF has 22 officials and 8 contractors, of which 6 are members of the Board of Management and 24, belong to the forest protection guard team. Within the SUF area, five guard stations are positioned at the four corners of the boundary dikes. Each station has four bodyguards, except the central station located at the middle of the west front side on the dike of the experimental area canal.

Though the protection team is undermanned, its activities are well organized. This is because the team involves and mobilizes the residents in its activities. Farmers here show a very high level of awareness of forest protection unlike those in the other sites. They think that joining these activities is an obligation and beneficial to them. In addition, the guard forces constantly go on patrol, thus preventing any untoward incidence in the forests.

Criminals are forced to pay an administrative penalty of VND 50,000 - 2,000,000, depending on the severity of offense. Repeated offenders are forced heavy punishment based on the laws.

In 1998, the Farm replanted a total of 1,829.41 ha of forest area burnt in previous years. At present, there is almost no fallow at the region. Melaleuca density in the newly replanted forest is set at 20,000 trees/ha.

5.1.4 Giong Rieng Commercial Private Forest Farm

Giong Rieng Commercial Private Forest Farm (CP) measures 63,738 ha, with the melaleuca area accounting for 1,300 ha and rice area, 42,628 ha. The District includes 12 villages and 1 town. Three villages have large melaleuca forest areas representative of the District's production forest pattern, namely: Thanh Loc, Thanh Hung and Thanh Phuoc. The District's east side borders Vi Thanh District (Can Tho Province); the west, south and north sides border the other districts of Kien Giang, namely: Chau Thanh, Go Quao and Tan Hiep.

Like the other study sites, Giong Rieng has a tropical monsoon climate with distinct dry and wet seasons. Soil and water are slightly acidic. Exploitation of the land drastically started 30 years ago. Before the 1970s, Giong Rieng was a desolate, waterlogged area with acidic water. Up to now, a big part of Giong Rieng remains a

fallow area. An irrigation system built in 1982 ensures fresh water leading to the fields, effectively washing away the acidity that enhances agricultural production. The main crop is rice, and double-rice cropping is practiced. In Thanh Loc, Thanh Phuoc and Thanh Hung, the soil is fairly appropriate for growing melaleuca. Thus, the trend now is for the farmers to convert part of their rice lands into melaleuca forests owing to the higher benefits to be gained from the latter. Melaleuca's value is nearly triple that of paddy rice. Planting of melaleuca gained momentum 7-8 years ago when its market price began to go up. Before that period, melaleuca was naturally grown and farmers mainly relied on rice farming for their livelihood.

Melaleuca forest growing is concentrated in Thanh Loc, Thanh Hung and Thanh Phuoc, the survey sites in Giong Rieng. Each household owns a plot of 0.5 ha to hundreds of hectares. Households harvest the forests once or twice. Melaleuca is often sold by lump sum to middlemen, payable in cash. The price of melaleuca is calculated based on the area, i.e., VND 7 millions per cong (1 cong = 1,296 m²), a common unit used by the residents corresponding to 0.13 ha (VND 53.85 millions/ha). Variation in price depends on forest density and the quality of harvested poles for construction. The production cycle in the forest is only 5-7 years, shorter than in the other sites. At the beginning of the planting process, farmers often sow many melaleuca trees, about 6,000 trees/cong. They thin the planted areas after 2-3 years, thereby reducing the density of grown melaleuca to only 1,200-1,500 trees/cong, which are deemed saleable.

Taxation of the melaleuca forestlands has started in 1998. Farmers pay VND 25,000 per 1,000 m² of land, corresponding to VND 250,000 per ha per year.

Since all forestlands are household-managed, the role of local authority in protecting the areas is not emphasized much. According to the farmers, poor households without melaleuca forests to manage mainly commit forest robbery. They cut down a few trees for erecting their houses or trading. Often, it is the forest owners who warn the thieves against repeating their transgression rather than the local authority. Thus, robberies are rarely reported to the local. Forest destruction is also uncommon in the site.

5.2 Socio-economic Information

5.2.1 Population and Labor

The farm size of a household in Song Trem and Vo Doi seems to be bigger than in the other study sites (Table 1). But household size in the four survey sites approximates each other and rather high, except the JV households in Song Trem. The small size of the JV household is explained by the fact that the caretakers at the site are often the employees of the landowners in Giong Rieng. Hence, only few laborers remain in Song Trem to care for the land.

Table 1. Main Indicators of Population and Labor at the Survey Sites.

<i>Indicators</i>	<i>Unit</i>	<i>Contract HH</i>	<i>Joint venture</i>	<i>Buffer zone</i>	<i>Strict protection</i>	<i>Commercial private</i>	
						<i>w/ forest</i>	<i>w/o forest</i>
No. of sampled farms	HH	83.00	31.00	120.00	65.00	56.00	60.00
Farm size	Ha	7.79	32.05	2.39	4.90	6.82	1.99
Household size	Persons/HH	5.87	4.16	5.20	5.95	5.96	5.75
No. of main laborers	Persons/HH	3.08	2.32	3.00	3.15	3.54	3.28
Age of head	Years	44.83	42.90	46.2	45.38	49.68	47.67
Years of schooling of main laborers	Years	5.47	7.65	7.20	5.49	7.00	6.72

Source: From the 1999 survey.

Household size defines the number of main laborers in a farm, which are generally three. This is rather high compared with farm size allotted to them, thus leading to persistent labor surplus in the whole rural area.

The difference in age of heads is mainly due to migration characteristics. Districts inhabited by more native people have older heads, such as in Tram Chim and Giong Rieng where the heads are aged 46 and 49, respectively. But in Vo Doi and Song Trem the heads are younger because the residents consist mainly of migrants.

The educational level of farmers in Song Trem and Vo Doi appears to be lower than at the other sites (Table 1). This is probably due to poverty and difficult schooling conditions. Overall, the farmers of the two districts are the poorest among all farmers. They live in extremely remote areas that hamper their movement, schooling, training, and the flow of technology transfer, and information. Low educational level is firmly related to poverty. Farmers can hardly improve their living condition with low educational attainment.

5.2.2 Land Distribution and Investment

Depending on the institutional arrangements, land distribution varies across farmers in each site. In Song Trem, farms are state-owned and re-allocated to contract farmers for corporate management in order to increase the efficiency of forest planting and protection. The Board of the Farm regulates the farm size and so it somewhat varies across farms in the same state-owned farm. Farm size in Song Trem is the largest among the four sites. However, since soil and water conditions are highly acidic, the benefits from the land are very low compared with the other sites.

Rich households through land transfer among contract farmers practice accumulation of land. Farmers with large farms profit much from rice farming or forestry that they are enticed to amass more land. In these farms, the regulated

forest areas comprise the bigger share of the total area. At the same time, farmers conserve the allocated forests and do agricultural production for a living, forming a buffer-zone system surrounding the conserved area. Presently, the benefit distribution between farmers and the State Forest Farm in protecting the forest has not been implemented yet. This discourages the farmers from conserving the forest such that robbery has become rampant in Song Trem.

In Tram Chim and Giong Rieng, where farms are privately owned, farm size largely varies depending on financial capacity and ownership of farmers. As expected, the rich households have larger land areas and get richer from their land while the poor remains at the subsistence level. As a consequence, land accumulation is fiercely practiced in these sites.

Forests are important source of additional income for their owners/stewards. Households with forestlands often have higher income than those without. However, cash income from the forests is still less than from rice farming. The cultivated land constitutes the largest part of the total land area. Household-managed forests are more strictly protected than state-owned forests since forests are firmly tied to benefits for the farmers.

As to land investment, rich farmers invest much more than the others and privately owned lands are invested more into than state-owned lands (Table 2). The JV farmers in Song Trem incur the highest cost of investment per household. They spend much for construction of boundary dikes and canals and fire prevention since they manage very large areas (over 30 ha per household). They invest much with expectation of great returns. But due to the closed-forest regulation of the government, the benefits expected by JVs from forests are not coming. The JVs are losing much and now prefer to transfer their contracted lands to others. The second biggest investors are households with forests in Giong Rieng. They invest to improve land conditions and derive lots of benefits from the forests as well as from rice farming. In reality, they are rather rich households with strong financial capacity and own large farms. The other farmers do not invest considerably because of weak financial capacity and small land areas.

Table 2. Main Indicators on Land Distribution and Investment.

<i>Indicators</i>	<i>Unit</i>	<i>Contract HH</i>	<i>Joint venture</i>	<i>Buffer zone</i>	<i>Strict protection</i>	<i>Commercial private</i>	
						<i>w/ forest</i>	<i>w/o forest</i>
Forest area	Ha	6.03	30.05	0.612	2.560	3.241	0
Cultivated area	Ha	1.35	1.06	1.696	2.270	3.423	1.800
Fish pond	Ha	0.35	0.91	0.012	0.017	0.005	0.006
Homestead	Ha	0.06	0.03	0.065	0.053	0.155	0.179
Total area	Ha	7.79	32.05	2.385	4.900	6.824	1.985
Average amount of investment/ha/year	MVND	0.11	0.18	0.120	0.180	0.890	0.120

Source: From the 1999 survey

5.2.3 Household Property

The standard of living may be reflected in the housing conditions and household income. Most farmers in Giong Rieng live in houses and buildings that are rather well equipped for family life. Whereas, most of the contracted farmers in Song Trem and Vo Doi sites live in cottages with very simple amenities and lack the necessary conditions for basic living (Table 3).

Table 3. Housing Conditions of Farmers at Survey Sites

<i>Sites</i>	<i>Contract HH</i>	<i>Joint venture</i>	<i>Buffer zone</i>	<i>Strict protection</i>	<i>Commercial private</i>	
					<i>w/ forest</i>	<i>w/o forest</i>
% HH in cottages	88.51	-	49.17	83.08	23.21	45.00
% HH in housing	7.89	-	29.17	13.85	33.93	45.00
% HH in buildings	1.15	-	21.66	3.07	42.86	10.00
% HH in poverty*	55.52	-	30.00	55.39	12.50	23.33

Source: From the 1999 survey

* Based on the standard of the Ministry of Labor and Social Welfare of Vietnam

5.2.4 Credit

Farmers in Song Trem do not have access to formal credit system. Before 1995, the Song Trem State Forest Farm could get credit from the bank in the area for distribution to member farmers. In 1995, some Farm staff used the credit from the bank for their own business, but failed and hence could not repay the bank on time. Also, there were many bad loans by farmers. For these reasons the banks have stopped providing credit to the Farm. Up to now, the Farm has yet to source credit for its farmer-members. Thus, the latter are forced to borrow from private lenders, which is easier because no collateral is needed, but a very high interest rate (10% per month) is incurred (Table 4). Many farmers cannot repay the loans because of poverty and low production.

Table 4. Credit Situation at Survey Sites

<i>Indicators</i>	<i>Contract HH</i>	<i>Joint venture</i>	<i>Buffer zone</i>	<i>Strict protection</i>	<i>Commercial private</i>	
					<i>w/ forest</i>	<i>w/o forest</i>
Main source of credit	Private	None	Formal Institutions	Banking system	Banking system	Banking system
Prevailing interest rate	10%	None	1.2%	1.2%	1 – 2%	1 - 3%
Main purpose of loans	Production	None	Production	Production	Production	Production
Outstanding debt	Many	None	Many	Few	Very few	None

Source: From the 1999 survey

In contrast, the credit aid programs from Can Tho University and other institutes are provided in Tram Chim. Experience in the area is positive due to high rate of repayment.

Nowadays, the banking system, especially the bank for agriculture and rural development (BARD) provides most of the farmers' credit needs. Still, it was noted that the amount of loan grants is often insufficient for the farmers' requirements.

5.2.5 Community Participation

In general, community activities that are firmly beneficial to farmers will attract much participation such as road building, irrigation and canal construction, damming, and fire prevention. The participation of JVs seems to be weak since they do not receive benefits from doing so. Whereas in Vo Doi, most of the farmers take part in these activities due to the appeal from and promotion by the Board of the Farm (Table 5).

Except in Tram Chim, the participation of mass organizations (Farmers Union, Women Union, Veteran Association, Production Groups, Health Care Service Team) in the other sites, according to farmers themselves, does not bring particular benefits to them despite the relatively large number of members. Thus, attendance in organizational meetings is not given much importance (Table 5).

Table 5. The Community Participation Assessment in the Survey Sites.

<i>Indicators</i>	<i>Contract HH</i>	<i>Joint venture</i>	<i>Buffer zone</i>	<i>Strict protection</i>	<i>Commercial private</i>
% Participants in community activities	78.31	22.58	78.33	96.92	86.21
% Participants in mass organizations	56.63	9.68	88.33	86.15	38.79
% Participants in meetings	38.55	12.90	88.33	83.93	37.93

Source: From the 1999 survey

Forest protection is well implemented in state-owned forests, thereby encouraging most farmers to participate. However, forest destruction happens widely in Song Trem. Evidently, forest protection tasks are not firmly related to the farmers' benefits, and do not encourage responsibility among farmers.

In the case of privately owned forest, only farmers with forests take care of their forestlands. Household-managed system protects the forest better than state-owned forest.

5.3 Production and Income

The main sources of income of farmers in the study sites were rice crop, non-rice crop, animal husbandry, fishery and forestry, non-farm and off-farm activities.

Rice farming plays a dominant role in income generation of a farm in the survey sites, except in Song Trem where land and water conditions are unfavorable to it (Table 6). Generally, income from rice crop is very low. Farmers depend heavily on fishing and employment with richer farmers to improve their living conditions. Employment in agricultural production is the easiest means to augment farmers' income in the Mekong River Delta. Contract households are one of the two poorest sectors in the survey sites.

The JV households are not engaged in rice farming. They generate income from fishery and non-rice crop, especially bananas. Net income per household appears to be high, mainly coming from fishery, but their net income per hectare is low (Tables 6 and 7). This is because they operate very large areas and invest much on fishponds and boundary dikes. Moreover, their income from forests and their by-products such as branches and old dead trees is small due to the logging ban policy. The resultant income is not sufficient to offset their investment, they add.

Farmers at Giong Rieng appear to be the most prosperous as revealed by their very high income and low proportion of poor farmers. They obtain high profits from rice farming and forestry, partly owing to the favorable conditions for such activities (Tables 6 and 7). They pay very little attention to other income-creating activities such as fishery and animal husbandry unlike the Song Trem and Vo Doi farmers.

Vo Doi appears to be the poorest location among all the sites surveyed. It has the largest household size (5.95) and the lowest farm net revenue (VND 11,089,480 per farm per year). Rice farming is the main source of income but similar to Song Trem's case, rice yield is very low. The farmers depend greatly on employment in other farms to augment their cash income. They are also interested in non-rice crops, husbandry and fishery, but income from these sources is not significant (Table 6).

Farmers' net income per hectare at the buffer zone-core zone management system in Tram Chim is high (VND 6,538,160 per hectare per year) compared with those of contract household management system in Song Trem (VND 1,074,440 per hectare per year) and strict protection management system in Vo Doi (VND 1,626,180 per hectare per year). Sites have small farms that they have to generate sufficient income from rice (Table 7). Apparently, most farmers in the latter two non-rice farming activities including husbandry, fishery and others. In fact, the net

income per hectare in this case does not reflect correctly the efficiency of land use. The percentage of poor farmers in Tram Chim, according to the standard of the Ministry of Labor and Social Welfare, is 30% lower than that in Song Trem and Vo Doi (Table 3).

Table 6. Net Income per Farm per Year (Unit: 1000 VND)

Income Sources	Contract HH	Joint venture	Buffer zone	Strict protection	Commercial private	
					w/ forest	w/o forest
1. Rice	1,632.30	0.00	12,313.68	4,208.28	25,112.68	17,593.33
2. Non-rice	1,239.30	4,342.64	241.75	1,369.65	887.93	1,335.58
3. Husbandry	424.70	122.10	973.13	960.20	527.05	1,162.12
4. Fishery	3,867.20	11,894.00	1,743.46	1,280.31	442.29	869.25
5. Forestry	887.80	3,907.70	1,122.29	0.00	12,804.82	0.00
6. Non/off – farm activities	3,891.20	0.00	2,180.47	3,121.28	1,663.63	2,355.97
7. Others	656.70	157.40	231.94	149.77	34.76	129.00
Net income	12,600.00	20,423.84	18,806.72	11,089.48	41,473.15	23,445.24

Source: From the 1999 survey

Note: Figures are the average per respondent.

Table 7. Net Income per Hectare per Year (Unit: VND 1000)

Indicators	Contract HH	Joint venture	Buffer zone	Strict protection	Commercial private	
					w/ forest	w/o forest
1. Rice	209.54	0.00	5152.16	858.83	3,682.21	8,840.89
2. Non-rice	159.09	135.50	101.15	279.53	130.20	671.15
3. Husbandry	54.52	3.81	407.16	195.96	77.28	583.98
4. Fishery	496.44	371.11	311.07	261.29	64.85	436.81
5. Forestry	70.55	121.93	469.58	0.00	1877.53	0.00
6. Others	84.30	4.91	97.04	30.57	0.00	64.82
Net income	1,074.44	637.26	6,538.16	1,626.18	5,832.07	10,597.65

Source: From the 1999 survey

Note: Figures are the average per respondent.

5.4 Management of Melaleuca Forest

5.4.1 Melaleuca Reforestation and Protection

Song Trem has 31 contract households (37.35%) and all JVs participate in re-planting and protecting the melaleuca forests. But only 16 households (19.28%) actually do land preparation and 18 households (21.69%) grow melaleuca. JV households mainly take part in forest protection, particularly contributing labor to the guard team. Most contract households tap family labor to do their farm tasks and very few resort to exchanged and hired labor. Re-planting and protecting the forests mainly revolve around land preparation and melaleuca growing. Other tasks are rarely carried out. Each household contributes an average of 38.13 and 32.16 mandays to land preparation and growing melaleuca, respectively. Wage rate for

laborers averages VND 20,000 per day. Three households take care of melaleuca using very minimal labor input.

In Tram Chim, only households with private forestlands participate in replanting and forest protection because these are beneficial to them. There are 12 (10%) participants and they perform such activities as land preparation, seed preparation, breeding, planting, trimming and harvesting. However, the amount of their investment in reforestation is insignificant.

Since 1997 in Vo Doi site, the Farm has been replanting previously burnt forest areas. Most of the farmers in the site have been mobilized to participate in the activity. The Farm provides farmers with tree free seedlings while the farmers take charge of planting and protection. Land preparation and planting are done by a majority of the farmers (60%) under the management of the Farm.

In Giong Rieng, forestation is tied to the benefits gained by farmers of Group A from the forests. Unlike in the forests of Song Trem and Vo Doi, the production cycle of forests in Giong Rieng lasts for around 7 years since the land and water conditions are favorable to melaleuca growing. A big number of farmers planted melaleuca in the early 1990s and began exploiting the forests in 1996 and replanting after harvest. In 1997-1998 many farmers went into massive replanting of forests. In replanting a forest, a major part of costs goes to the purchase of tree seedlings. A seedling is priced about VND 30-40 and farmers often plant at a high density of 6,000 trees/cong. Land preparation is expensive since machinery is hired for land improvement. Also every year, farmers thin the forests to select the good trees, and thinning cost is also high.

Only households with forestlands participate in planting and protection, with Vo Doi registering the highest participation (Table 8). This results from the effective dissemination activity and the enthusiastic help by the Farm. In contrast, farmers in Song Trem spend little time with their forests since they have to devote themselves to other income-generating pursuits.

Melaleuca density in privately owned forests is lower than that in conserved areas (Table 8). But it does not reflect the state of forest depletion in the areas. This is because they are production forests where the farmers have to thin every year to select high quality trees for trade. The density of forest in state-owned Farm at Ca Mau is strictly regulated at a high level of 20,000 trees per ha for the purpose of environment conservation.

Table 8. Farmers' Participation in Melaleuca Forest Replanting and Protection.

<i>Indicators</i>	<i>Contract HH</i>	<i>Joint venture</i>	<i>Buffer zone</i>	<i>Strict protection</i>	<i>Commercial private</i>	
					<i>w/ forest</i>	<i>w/o forest</i>
a) % of participants	37.35	90.00	10.00	95.38	92.86	0
b) Forest density (1,000 trees/ha)						
- Buffer zone/HH level			3.06	10.45		
- Forest Farm	11.53	21.10	2.18	7.00	5.86	0
c) % of area planted to melaleuca (HH level)	75.65	93.76	25.52	52.24	47.51	0

Source: From the 1999 survey

5.4.2 Farmers' Point of View on Forest Protection

In Song Trem, 58 households (50.88%) state that the ecology of melaleuca forest is very important; 54 households (47.37%) say it is important, and the rest think it is not so. The frequently cited reasons for the importance of melaleuca forest are: 1) it is the source of livelihood of people in the area and stabilizes the balance of ecological environment (86.21%) and 2) it plays a key role in national security and protection of wild life (10.34%). Those who do not think it is important say that it is the origin of wild animals that destroy their crops (1.75 %).

About 36 households (31.58%) say that there is no need to improve the protection methods in the melaleuca ecology because efficient procedures are in place. Suggestions to improve the ecological environment mainly focus on raising the local residents' standard of living (56.34%). It is perceived that impoverishment drives farmers to commit wanton harvesting of melaleuca, crime and other unwanted acts. Farmers have indicated several ways to better their living conditions such as expanding agricultural extension services, clarifying and implementing the profit-sharing policy, and providing adequate credit to finance production. At least 15 households (13.16%) suggest more stringent fire prevention procedures by training and invoking the cooperation of local residents. The other 13 households (11.40%) recommend maintaining melaleuca forests separately from agricultural lands, establishing patrol teams, and implementing appropriate incentive policies.

However, 60 households (52.63%) do not support the cost of forest protection for several reasons such as poverty, no perceived benefits from these tasks, and because the task is the responsibility of the Farm. About 31 households (27.19%) are willing to support the cost of forestry protection but have yet to specify the amount, while 23 households (20.18%) agree to support in cash depending on their income and the forest area. Normally, most JV households accept the high fees because they own large areas and are wealthy.

The significance of forest conservation is universally recognized and it is now implemented around the world. The Tram Chim Reservation is no exception.

The Reservation is important, not only for the government's interest but also for the residents around the area. Thus, this study assessed the level of farmers' awareness of forest protection. About 32.5% of farmers perceive that forest protection is not important or have no idea about it. This is because they do not have forestlands, hence are not dependent on forest. In addition, the area devoted to conservation overlaps with part of the cultivated area, thereby reducing the land for crops. Farmers are also afraid of wildlife from the conserved area that can damage their crops. The environmental benefits are ambiguous to them. The results underscore the need to propagate awareness on forest protection so as to educate the residents.

However, the percentage of households positively aware of the significance of forest protection is rather high (67.5%). These farmers have forestlands or are well educated on forest protection courtesy of the local government or mass organizations. The reasons for the importance of forest ecology as stated by the farmers are: 1) forests are valuable natural resources that can improve their standard of living (27 HH); 2) forests stabilize the balance of ecosystem and influence national security (25 HH), and 3) forests have historical value and are good as tourism spots (5 HH). Some farmers complain about the wildlife from the forests that inflict damage to their crops (2 HH). Generally, the awareness of farmers about forest conservation is rather good. They are much concerned with the actual or visible benefits. To encourage farmers' participation in forest protection, the benefit of protection must be explained in relation to farmers' benefits and improvement of their standard of living.

Forty-two households (35%) say that there is no need to improve the forest ecological environment because it is already well implemented. About 23 households (19.17%) agree to support forest protection by an average amount of VND 74,000 per households/year. Around 36 households (30%) consent to contribute an average of 18.9 man-days per households per year. There are 14 households willing to support both labor and money. Households with forestlands show greater willingness to support the cost of forest protection than the others since their action is closely related to their benefits.

In Vo Doi, all the farmer-respondents participate in forest protection since the Farm often disseminates information about it and invites the farmers' participation. Thus, the farmers' awareness of the value of the forest is rather good compared to those from the other regions. Over 98% of households believe that forests are important to very important, indicating a good awareness level. This belief serves as the farmers' main motivation to taking part in forest protection.

When asked to support forest protection, 10 HHs are willing to contribute money at an average amount of VND 220,000 per household per year. There are 50 HHs willing to support it via family labor at an average of 57 mandays per household per year. All 65 HHs (100%) say that forest protection activities are

efficiently performed such that forest destruction rarely occurs in the region. Thus, there is no need to improve the current protection methods. Around 26 HHs (40%) have mentioned the occurrence of violation in forest protection regulations in the area, specifically wanton harvesting of melaleuca (24) and illegal hunting in the restricted area (2). Wanton forest destruction is attributed to poverty (18 HH) and low awareness level on forest protection.

In Giong Rieng site, the economic benefits from melaleuca forests are considerable. This motivates farmers to plant more forest to improve their living conditions. Thus, most farmers believe that forests are important to very important. Interest in forests also differs across farmer groups. Farmers in group A (with forestland) are very interested in the importance of the forest, in contrast to those in group B (without forestland).

More than half of the farmers in group B have no idea (58%) about the forests' importance, revealing their lack of care for the forests and perception that the forests do not have any relation in their lives. Most think that they do not gain economic benefits from forests. They fail to recognize the environmental impacts of forests due to low awareness level and these impacts are too far to be seen. There is a need to disseminate the impacts of forest to all people in the area so as motivate all residents to participate in the conservation activities. Among households in group A, many farmers recognize only the forests' economic value because of the large cash income derived from them. The environmental value of forests remains unrecognized by many respondents, however.

Only a few households know the impact of forest conservation on the environment such as protecting the wildlife and stabilizing the balance of ecosystem. Low awareness level induces farmers to wantonly harvest their production forests without regard for forest ecology. It is foreseen that once the economic value of melaleuca is greatly reduced, forest destruction will occur with a shift to cultivating other crops.

When asked to support forest protection, 33 households in group A (58.93%) and 22 households in group B (36.67%) show willingness to contribute money or labor. The amount of support largely varies across farms based on financial capacity of households and farm groups. There is a big gap in support to forest protection between two farmer groups, with group A contributing more than group B.

In state-owned forests like Song Trem and Vo Doi, farmers exhibit very high level of awareness of forest protection since they are frequently exposed to information on economic and environmental benefits from forests. However, due to difficulty in earning a living, they cannot devote much to forest protection, which does not bring them actual income. Thus, wanton harvesting of forests occur.

Otherwise, many farmers outside of state-owned forests remain unaware of forest conservation especially those without forestlands. They do not care about the forests' impacts on the environment since they are too far from the areas to recognize such. They are only interested in what can bring them cash income.

The percentage of farmer's group A at Giong Rieng with positive awareness is rather high. However, they tend to look more into the economic benefits of forests than their environmental benefits. Thus, if the economic value of melaleuca forest is badly reduced, forest destruction can happen.

The labor contribution of Vo Doi farmers to forest protection is the highest. They are well informed about forest protection and thus recognize their obligation to contribute.

Table 9. Indicators of Farmers' Attitudes Towards Forest Protection.

<i>Indicators</i>	<i>Contract HH</i>	<i>Joint venture</i>	<i>Buffer zone</i>	<i>Strict protection</i>	<i>Commercial private</i>	
					<i>w/ forest</i>	<i>w/o forest</i>
1. % participants	37.35	90.00	47.62	95.38	92.86	0
2. % HH with positive awareness on forest	97.60	100.00	67.50	98.46	94.64	41.76
3. % HH participated actively against illegal activities	43.37	22.58	9.17	100.00	30.36	-
4. % HH willing to pay for forest protection	42.17	70.97	53.33	84.62	58.93	36.67
5. Average money willing to be contributed to protection (1000 VND)	633.90	758.43	74.00	220.00	125.00	52.00
6. Average labor willing to be contributed to protection (man-days)	24.00	31.00	18.90	57.00	24.75	8.00

Source: From the 1999 survey

5.4.3 Action Plan of Farmers to Improve Melaleuca Forest Protection

Regarding current forest protection, 38 households (33.33%) in Song Trem, say that it is good but the rest say no. Although many have no idea (49.12%) on how to improve forest protection (Table 10), several actions are suggested:

Table 10. Action Plan of Farmers to Improve Melaleuca Forest Protection in Song Trem.

<i>Actions</i>	<i>No of households</i>	<i>Percentage (%)</i>
1. No idea	56	49.12
2. Suggestions	58	50.88
a) Provide credit for production	10	8.77
b) Change the cropping patterns	3	2.63

c) Treat strictly illegal behaviors	10	8.77
d) Upgrade farmers' knowledge on forest management	5	4.40
e) Grant land use right and adopt a clear distribution policy	6	5.26
f) Strengthen the protection team	6	5.26
g) Separate forest from agricultural land	4	3.51
h) Upgrade the river transport system	4	3.51

Source: From the 1999 survey

In Tram Chim, 31 households (25.83%) claim that the current methods are well implemented, hence forest destruction is strongly prevented. On the other hand, 50 households (41.67%) have no idea of forest protection. The remaining 39 households (32.5%) state that the current methods are badly carried out or not carried out perfectly (Table 11) and so they suggest the following actions to improve the situation:

Table 11. Action Plan of Farmers to Improve Melaleuca Forest Protection in Tram Chim.

<i>Actions</i>		<i>No of households</i>	<i>Percentage (%)</i>
1.	No idea	31	25.83
2.	Already well implemented	50	41.67
3.	Suggestions	39	32.5
a)	Improve people's life by employment, credit and subsidy	10	8.33
b)	Treat strictly illegal behaviors	6	5.00
c)	Upgrade knowledge on forest management of farmers	5	4.17
d)	Allocate plots to household-managed system	3	2.50
e)	Strengthen the protection team	10	8.33
f)	Implement stricter fire prevention	7	5.83

Source: From the 1999 survey

According to the farmer-respondents, 3 households (2.5%) have violated the forest protection regulation in recent years. Violations are in the forms of: i) cutting-down of melaleuca forest and ii) fishing and catching birds in the conserved area. Poverty drives them to violate the regulations in the conservation area.

In Vo Doi, 7 households (10.77%) say that there is no need to improve forest protection since it is already well implemented. However, other households recommend the need to improve fire prevention efforts, greater involvement of households in forest management, expansion of services provided to the people and planting of more forest trees (Table 12).

Table 12. Action Plan of Farmers to Improve Melaleuca Forest Protection in Vo Doi.

<i>Actions</i>	<i>Number of households</i>	<i>Percentage (%)</i>
1. No idea	7	10.77
2. Suggestions	58	89.23
a) Observe more strictly fire prevention	23	35.38
b) Train the households on forest management	13	20.00
c) Improve standard of living of residents	31	47.69
d) Assign land to household management	4	6.15
e) Plant more forest trees	2	3.07
f) Expand services provided to households activities	1	1.53
g) Involve residents in forest management	6	9.23

Source: From the 1999 survey

In Giong Rieng, forest protection is mainly based on household-management. Many farmers do not state their idea on improvement of forest protection. In farm with forest, 15 households (26.79%) say it is good, 6 households (10.71%) not good and the remaining 35 households (62.5%) had no idea. In farm without forest, only 5 households (8.33%) say that methods of protection are good while the remaining have no idea. To improve the current methods of protection, farmers suggested the following (Table 13): provision of credit for production to farmers; upgrading the transport system, stricter punishment for illegal behaviors, and more information dissemination to achieve greater awareness on the need to have more forest protection activities.

Table 13. Action Plan of Farmers to Improve Melaleuca Forest Protection in Giong Rieng.

<i>Actions</i>	<i>Number of households</i>	<i>Percentage (%)</i>
1. No idea	78	67.24
2. Already well implemented	20	17.24
3. Suggestions	18	15.52
a) Provide credit for production	2	1.72
b) Upgrade the transport system	1	0.86
c) Stricter punishment on illegal behavior	5	4.31
d) Strengthen the safeguard teams	5	4.31
e) Upgrade the awareness on forest protection	4	3.45
f) Expand extension of services to farmers	1	0.86
Total	116	100.00

Source: From the 1999 survey

When asked if there had been events of forest destruction in the past 5 years, 49 households (42.24%) said "yes" but the scale of destruction was insignificant. The culprits mainly cut down a few trees or caused small forest fires. The illegal activities mainly stemmed from poverty and laziness.

5.5 Factors Affecting Farm Profitability

This section discusses the factors that were found to have significant contribution to household income based on regression analysis. In general, it was reported by the farmers that they derived very little income from the forests, mainly because of the logging ban policy imposed by the government. The results of regression analysis showed that the farmers mainly rely on rice farming that is characterized by low yields and from non-and off-farm activities such as hired labor and services. In JV management system, forest, fishing, and banana are the most important sources of household income. The farmers increase their income by improving banana production and doing more fishing. Non-rice crop is one of the important potential sources of income improvement for the contract farmers. In buffer zone management system, rice, forest, and fishing are the main activities that can improve the farmers' income. In strict protection management system, rice crop, non-rice crops and fishing contributes more to household income. For family/household commercial farms, melaleuca forest is the most important source of the net income. This group of farmers have long-term lease over the forestlands.

5.5.1 Song Trem Site

Regression coefficients (elasticities) derived from the net income model of contract farmers were significant for banana area (13200859), vegetable area (95141645), cost of rice production (3.71) and cost of banana (39.40) (Table 14). It indicates the area devoted to non-rice crop (banana and vegetable) is a main factor affecting net household income.

Table 14. HH Production Function Analysis on Net Income/HH/Year of CF.

<i>Independent variables</i>	<i>Coefficients</i>
Intercept	5213748 **
Yield of winter-spring rice crop	-961210 ns
Yield of summer-autumn rice crop	1139645 ns
Yield of autumn-winter rice crop	-482511 ns
Area of rice production	-336938 ns
Area of banana	13200859 *
Area of vegetable	95141645 ***
Area of fish pond	377048.3 ns
Area of melaleuca forest	-51574 ns
Cost of rice production	3.71***
Cost of fishery	0.65 ns
Investment in melaleuca forest	0.19 ns
Cost of husbandry	0.70 ns
Cost of banana	39.40 ***

* Significant at 10% ** significant at 5% *** Significant at 1% ns: not significant

Likewise, the coefficients of banana area (13308063.19), fishing area (7566714.41), melaleuca area (491868.14), and cost of banana production (-4.87)

were found to be significant in the net income model of joint venture households (Table 15). It implies that forest, fishing, and banana are the most important factors affecting JV' s net household income. The farmers can increase their income by improving banana production cost and doing more fishing.

Moreover, the coefficients derived from the total model of net income were significant for banana area (6032730), vegetable area (34491969), fishing area (2464225), melaleuca area (647250.2), cost of rice production (3.63), and cost of fishing (0.58) (Table 16).

Table 15. HH Production Function Analysis on Net Income/HH/Year of JV.

<i>Independent variables</i>	<i>Coefficients</i>
Intercept	-18215933.55 ***
Area of banana	13308063.19 ***
Area of Vegetable	10069444.63 ns
Area of fruit tree	-21311669.18 ns
Area of fish pond	7566714.41 ***
Area of melaleuca forest	491868.14 **
Cost of fishery	-0.18 ns
Investment in forest	0.019 ns
Credit	0.99 ns
Cost of husbandry	0.83 ns
Cost of banana	-4.87 *

* Significant at 10% ** significant at 5% ***Significant at 1% ns: not significant

Table 16. HH Production Function Analysis on Net Income/HH/Year for Total Model.

<i>Independent variables</i>	<i>Coefficients</i>
Intercept	2977285 ns
Yield of winter-spring rice crop	-1310092 ns
Yield of summer-autumn rice crop	938201.5 ns
Yield of autumn-winter rice crop	-39670.2 ns
Area of rice production	249920.8 ns
Area of banana	6032730 *
Area of Vegetable	34491969 ***
Area of fish pond	2464225 *
Area of melaleuca forest	647250.2 ***
Costs of rice production	3.63 ***
Costs of fishery	0.58 **
Investment in melaleuca forest	-0.05 ns
Costs of husbandry	0.85 ns
Costs of banana	0.44 ns
JV	-2.6E+07 ***

* Significant at 10% ** significant at 5% ***Significant at 1% ns: not significant

5.5.2 Tram Chim Site

Elasticities derived from the net income model of the farmers were significant for yield of summer-autumn rice crop (2750.83), area of rice production (8496.47), cost of winter-spring rice crop (-0.57), cost of summer-autumn rice crop (-0.49), cost of fishing (0.41), and cost of melaleuca production (6.00) (Table 17). The result indicates that rice, forest, and fishing are the main sources that can improve the farmers' income.

Table 17. HH Production Function Analysis on Net Income/HH/year of Buffer Zone farmers at Tram Chim Site.

<i>Independent variables</i>	<i>Coefficients</i>
Intercept	1753.45 ns
Yield of winter-spring rice crop	-112.49 ns
Yield of summer-autumn rice crop	2750.83 ***
Area of rice production	8496.47 ***
Area of melaleuca forest	-746.95 ns
Area of fish pond	17838.75 ns
Cost of winter-spring rice crop	-0.57 *
Cost of summer-autumn rice crop	-0.49 *
Cost of non-rice crop	0.01 ns
Cost of animal raising	-0.24 ns
Cost of fishing	0.41 ***
Cost of melaleuca production	6.00 ***

* Significant at 10% ** significant at 5% *** Significant at 1% ns: not significant

5.5.3 Vo Doi Site

Elasticities derived from the net income model of the farmers were significant for yield of winter-spring rice crop (4254.01), yield of autumn-winter rice crop (1969.97), area of melaleuca forest (1927.57), area of fishpond (26788.33), and cost of non-rice crop (29.66) (Table 18). These factors significantly contribute to the net income of farmers at Vo Doi site. It indicates that area of rice crop, area of non-rice crops and fishing are the main contributors to net household income.

Table 18. HH Production Function Analysis for Net Income /HH/Year of the Contracted Farmers at Vo Doi Site

<i>Independent variables</i>	<i>Coefficients</i>
Intercept	-2368.5 ns
Yield of winter-spring rice crop	4254.01 *
Yield of summer-autumn rice crop	-614.57 ns
Yield of autumn-winter rice crop	1969.97 ***
Area of rice production	1169.98 ns
Area of banana	19883.55 ns
Area of melaleuca forest	1927.57 ***
Area of fish pond	26788.33 **
Cost of winter-spring rice crop	-0.83 ns
Cost of summer-autumn rice crop	0.99 ns
Cost of autumn-winter rice crop	-0.48 ns
Cost of banana	0.12 ns
Cost of non-rice crop	29.66 ***
Cost of animal raising	-0.33 ns
Cost of fishing	1.37 ns

* Significant at 10% ** significant at 5% ***Significant at 1% ns: not significant

5.5.4 Giong Rieng Site

Elasticities derived from the net income model HH with forest farm were significant for area of rice production (1733.62), area of melaleuca forest (5108.87), and cost of husbandry (7.38) (Table 19). The results indicate that melaleuca forest is the most important source of the net income of farmers with forest farms.

Table 19. HH Production Function Analysis on Net Income/HH/year of Farmers With Forests

<i>Independent variables</i>	<i>Coefficients</i>
Intercept	-15356.70 ns
Yield of winter-spring rice crop	4262.27 ns
Yield of summer-autumn rice crop	-4091.41 ns
Area of rice production	1733.62 *
Area of melaleuca forest	5108.87 ***
Cost of winter-spring rice crop	0.11 ns
Cost of summer-autumn rice crop	1.83 ns
Cost of fishery	8.14 ns
Cost of husbandry	7.38 ***
Cost of non-rice crop	1.71 ns

* Significant at 10% ** significant at 5% ***Significant at 1% ns: not significant

In the net income model of HH without forest farm, area of rice production (15891.38), cost of winter-spring rice crop (-5.99), cost of summer-autumn rice crop (4.36), cost of husbandry (2.68), and cost of non-rice crop (2.90) were found to be

significant (Table 20). It indicates that area for rice and non-rice crops are the main factors affecting the net income of household without forest farms.

Table 20. HH Production Function Analysis on Net Income/HH/Year of Farmers Without Forest.

<i>Independent variables</i>	<i>Coefficients</i>
Intercept	-2,0448.20 ***
Yield of winter-spring rice crop	1932.88 ns
Yield of summer-autumn rice crop	2698.36 ns
Yield of autumn-winter rice crop	3332.57 ns
Area of rice production	15891.38 ***
Cost of winter-spring rice crop	-5.99 **
Cost of summer-autumn rice crop	4.36 *
Cost of autumn-winter rice crop	0.01 ns
Cost of fishery	0.59 ns
Cost of husbandry	2.68 ***
Cost of non-rice crop	2.90 ***

* Significant at 10% ** significant at 5% ***Significant at 1% ns: not significant

Moreover, the coefficients derived from the total model of net income were significant for yield of winter-spring rice crop (3697.78), area of rice production (2053.78), area of melaleuca forest (5123.23), cost of husbandry (6.33), and cost of non-rice crop (1.66) (Table 21). The coefficient of kind of households, with and without forest farms, was insignificant. Apparently, there is indifferent in management systems of the two schemes.

Table 21. HH Production Function Analysis on Net Income/HH/Year for Total Model.

<i>Independent variables</i>	<i>Coefficients</i>
Intercept	-14446.80 *
Yield of winter-spring rice crop	3697.78 *
Yield of summer-autumn rice crop	-1807.87 ns
Yield of autumn-winter rice crop	5069.54 ns
Area of rice production	2053.78 ***
Area of melaleuca forest	5123.23 ***
Cost of winter-spring rice crop	0.08 ns
Cost of summer-autumn rice crop	1.60 ns
Cost of autumn-winter rice crop	-0.92 ns
Cost of fishery	2.88 ns
Cost of husbandry	6.33 ***
Cost of non-rice crop	1.66 *
Dummy	-2540.01 ns

* Significant at 10% ** significant at 5% ***Significant at 1% ns: not significant

5.5.5 Pooled Data Analysis: Analysis of Determinants of Household Net Income at the Study Sites in the Mekong River Delta

Effects of Forest Management Systems on Household Income

The pooled data regression results can tell more about the differences in net income of farmers under the different management systems. The JV dummy is statistically significant and the negative value implies that given the same farm and household characteristics, JV households earn lower income per household from farming than Family Enterprise in selected circumstances (Table 22). Note that JV households are given very large land areas but earn less income from their forestlands. Harvesting of the forest is not allowed, stopping a potentially big source of income. Thus, their income mainly comes from fish and vegetables, which are unstable and risky ventures. In fact, the net income per hectare derived from the allotted lands of JV is the lowest compared with the income level under the other management systems (Table 7). Low income from farming and forestry discourages them from investing in their land. The trend now is for JVs to withdraw from the contract with the enterprise and transfer their lands to others. However, it can be predicted that the income of JV households will improve significantly once the State revises or lifts the closed-forest regulation.

On the other hand, the coefficient of family commercial forest dummy variable was statistically significant at 1% and positive, indicating that the forestlands yield higher profit than the other management systems (Table 22). Being privately owned forests, these can be harvested by owners and become the main source of income for the owners. Farmers at Giong Rieng sell their timber products at an average price of VND 7 millions per cong (1 cong = 1,296 m²). Income from forests is quite high compared with other income sources. In fact, as CBA shows, farmers with forestlands are the most prosperous people in the study sites. Thus, the larger the area of forestland the farmers own, the higher the income earned by the household. This high income encourages farmers to convert their agricultural lands to forestlands. However, the local municipal authority currently prohibits this practice.

The case of JV management in Song Trem Enterprise appears to be the worst in terms of farmers' income compared with the Family Enterprise without forest. However, it is projected that the income of JV households will increase significantly once the State revises or lifts the closed-forest regulation. With larger forest areas, they can earn a big amount of money as the case in Giong Rieng district.

Table 22. HH Production Function Analysis on Net Income/HH/Year for Pooled Data.

<i>Independent variables</i>	<i>Coefficients</i>
Yield of winter-spring rice crop	1097.2 ns
Yield of summer-autumn rice crop	1203.7 ns
Yield of autumn-winter rice crop	1330.9 ns
Area of rice production	1934.2 ***
Area of melaleuca forest	1126.8 ***
Area of pond for fishing	-247.26 ns
Cost of winter-spring rice crop	0.72 **
Cost of summer-autumn rice crop	0.32 ns
Cost of autumn-winter rice crop	0.49 ns
Cost of melaleuca planting	0.29 ***
Cost of fishery	0.27 ns
Cost of husbandry	1.58 ***
Cost of non-rice crop	0.90 ***
Dummy variables	
• Buffer zone management system (BZ)	-1810.9 ns
• Joint venture management system (JV)	-38591.0 ***
• Contracted HH management system (CH)	-233.69 ns
• Strict protection management system (SP)	-2886.2 ns
• Family commercial forest management system with forest (FC)	10869.0 ***
• Family commercial forest management system without forest	base case

* Significant at 10% ** significant at 5% ***Significant at 1% ns: not significant

Insignificant dummy variables of the buffer-zone area in Tram Chim, contracted households in Song Trem and strictly protection area in Vo Doi reflect the insignificant contribution of forests to farmers' income (no differences in income between management systems compared with farmers without forest lands in Giong Rieng). In general, the farmers are poor and the forests almost do not contribute much to their total income. The farmers mainly rely on rice farming that is characterized by low yields and non- and off-farm activities such as hired labor and services that are highly seasonal and unstable.

Management Scheme Options in the Study Sites

The local and central government regulate the forest management schemes practiced in each study site. The details arrangements under the various systems are decided by the State.

Song Trem: In transferring forest management from the State to the individual household, the Song Trem State Enterprise re-allocated plots to contract farmers to improve the effectiveness of forest protection. The contract household (CH) system was established in 1986. The contract households were located at the outer edge of the enterprise for farmers to have easy access to transportation and

social services. After the plot allocation, there is still a large piece of unallocated land at the inner part of the Farm requiring a big amount of investment for land improvement and reforestation. Thus, the Enterprise has been encouraging people with large capital to invest in these lands, forming the JV system in Song Trem starting in 1992. The location of CHs and JVs is based on the historical development of the Enterprise rather than the intentional plan of the farm managers.

Tram Chim: Because of the need to conserve the red-necked cranes as clamored by international environmental organizations, bio-diversity and historical vestiges, the State decided to establish the Tram Chim Reservation in 1992. The conserved area is surrounded by a 60-km-long boundary dike system. Under the “New Economic Zone” program of the State in the early 1990s, migrants were allowed to settle along the dike, forming a buffer zone around the area. Its purpose was to stabilize and enhance the poor's living conditions.

Vo Doi: As part of ecology conservation, the provincial government selected one place in the Ca Mau province, Vo Doi SUF, as representative of the coastal wetland melaleuca forest ecology because of: 1) historical vestiges of the Vietnam war, and 2) presence of a lot of old trees and species diversity which are typical characteristics of melaleuca forest ecology.

Giong Rieng: The forestlands in this area belong to private individual households, hence these are under self-managed system rather than the State. The drastic development of commercial forests was initiated in the early 1990s due mainly to market factors such as price and demand rather than State planning. Farmers took the chance of earning profits from melaleuca planting by spontaneously planting the forest themselves. But the provincial government has yet to impose its management options for the area, thus the development of forest plantations in Giong Rieng has not been fully pursued.

5.6 Problems and Issues

5.6.1 Main Social, Economic and Environmental Indicators of Performance of Forest Management Schemes

The number of main laborers in a farm is defined by the household size. A household has three main laborers, which is rather high and leads to persistent labor surplus in the whole rural area. Unemployment is more serious during off-season agricultural production. The educational level of farmers in contract HHs (Song Trem) and Strict Protection HHs (Vo Doi) appears to be lower than those in the other sites. They live in extremely remote areas, which limits their movement, schooling, training, technology transfer and information flow. The farmers' low

educational level is firmly related to poverty. They can hardly improve their living conditions with low education.

As to land components, regulated forest areas constitute the biggest part in a site. Farmers conserve the allocated forests and do agricultural production for a living, forming a buffer-zone system surrounding the conserved area. The benefit distribution between farmers and the Farm in forest protection has not been implemented, thereby discouraging the farmers from conserving the forests, especially at the contracted household forest management system (Song Trem) wherein forest robberies happen everywhere. Otherwise, at the family commercial forest management system (Giong Rieng) on the privately-owned farm, the forest areas largely vary across farms depending on the farmers' financial capacity and ownership. Regarding investment in land, the rich farmers expectedly invest much more than the others and more on privately-owned land than on state-owned land. Among the sampled farmers, the family commercial forest HH at Giong Rieng incurs the largest cost of investment per hectare.

Contracted households (Song Trem) are the second poorest farmers among all forest management systems. The net income of JV households (Song Trem) seems to be higher, mainly coming from fishery and banana production. However, farmers in family commercial forest farm (Giong Rieng) appear to be the most prosperous (with very high income) and with low proportion of poor farmers. They obtain very high profits from rice farming and forestry. It partly results from the contribution of the appropriate management system. Revenue in strict protection forest management (Vo Doi) is the lowest, with rice farming as the farmers' main source of income. Similar to the case of Song Trem, rice yield is very low. Income per ha of farmers in the buffer zone-core zone management system (Tram Chim) is high compared with that in the contracted household management system (Song Trem) and strict protection management system (Vo Doi). Apparently, many farmers have small farms and they must generate sufficient income from non-rice farming activities such as husbandry, fishery and others.

Regarding credit, most farmers in contracted household forest management system (Song Trem) obtain loans from informal institutions at high interest rates. They encounter difficulties in accessing formal financial institutions for lack of collateral.

Participation in community activities among JV households seems to be weak because farmers do not receive benefits from these activities. In contrast, in strict protection forest management system (Vo Doi), most farmers take part in these activities due to a promotion of the Board of the Farm.

Except in Tram Chim, farmers as not bringing them significant benefits perceive the performance of mass organizations at the study sites.

Table 23. Summary of the Main Social, Economic and Environmental Indicators

Indicators	Contract HH	Joint venture	Buffer zone	Strict protection	Commercial private	
					w/ forest	w/o forest (base case)
1. Years in school	5.47	7.65	7.20	5.49	7.00	6.72
2. Household size (persons/HH)	5.87	4.16	5.20	5.95	5.96	5.75
3. No. of main laborers (persons/HH)	3.08	2.32	3.00	3.15	3.54	3.28
4. Farm size (ha)	7.79	32.05	2.39	4.90	6.82	1.99
5. Forest land area (ha)/HH	6.03	30.05	0.61	2.56	3.24	-
6. Cultivated area (ha)	1.35	1.06	1.70	2.27	3.42	1.80
7. % of area planted to melaleuca						
a. Buffer zone/HH level	75.65	93.76	25.52 27.24	52.24 57.46	47.51	-
b. Forest Farm:						
8. Total investment (MVND/ha/year)*	0.11	0.18	0.12	0.18	0.89	0.12
9. CBA for HH (w/o TFPs at state-owned farm) (MVND)						
a. Net income/HH	12.60	20.43	18.81	11.09	41.47	23.45
b. Net income/ha	1.12	0.64	6.54	1.63	5.83	10.60
10. % of poor farmers	55.52	-	30.00	55.39	12.50	23.33
11. Main source of credit	Private lender	None	Formal institution	Banking system	Banking system	Banking system
12. Prevailing interest rate	10%	None	1.2-3%	1.2%	1-2%	1-3%
13. % participants in community activities	78.31	22.58	78.33	96.92	86.21	86.20
14. % participants in mass organizations	56.63	9.68	88.33	86.15	38.79	38.80
15. % participants on forest protection	37.35	90	47.62	95.38	92.86	0
16. Positive awareness of forest protection (%)	97.60	100	67.50	98.46	94.64	41.76
17. WTP for forest protection (%)	42.17	70.97	53.33	84.62	58.93	36.67
18. Forest density (1,000 trees/ha)**						
a. Buffer zone/HH level	11.53	21.10	3.06 2.18	10.45 7.00	5.86	-
b. Forest Farm						
19. Regression analysis (dummy: pooled data)	-233.69 (ns)	-38,591 (***)	-1,810.9 (ns)	-2,886.2 (ns)	10,869.0 (***)	base case

* Average investment per hectare per year by annualized in base case 1998

** for farm size; 1USD = 12,700 VND (official exchange rate in 1998)

Participation in forest protection is weak in contracted household forest management system (Song Trem). Evidently, the division of tasks is not associated with benefits and thus discourages participation. However, forest protection in strict protection forest management system (Vo Doi) should be implemented. Farmers here are the poorest overall. According to them, forest destruction happens mainly because of poverty and unemployment. Therefore, long-term implementation of forest protection in Vo Doi cannot be guaranteed.

Melaleuca density in family commercial forest farms is lower than that in the conserved area. It does not indicate a forest destruction problem. Rather, the farmers have to thin every year to select high quality trees to sell. Whereas, the density in state-owned farms is strictly regulated at a high level, i.e., 20,000 trees per ha, for the purpose of environment conservation. Thus, it can be seen that forest destruction in contracted household forest farms (Song Trem) is severe.

The coefficient of dummy variable of JV management system was significant and should have a negative effect on the net income of households in the pooled data model. It means that the forest products' contribution to the net income of households in JV farms is less than that in family commercial forest farms. Farmers in JV forest management system do not get a share from timber products due to logging ban policy. However, the coefficient of kind of households in the family commercial forests, with forest farms, was significant and had a positive effect on the farmers' net income. Timber forest products and NTFPs in family commercial forest farm are the main sources of farmers' income.

5.6.2 Problems

Poverty coupled with lack of economic incentives for forest protection is the main cause of robbery and wanton harvesting of melaleuca forest in Song Trem. In some portion of the farm, especially near its boundary, stealing of trees is rampant. Inadequate punishment is also a good explanation for the increased robbery. In addition, the protection force or team of the Farm is thin and unable to defend the entire area. Moreover, low salaries do not motivate them to perform their responsibility.

In Tram Chim, farmers recognize the importance of conservation. However, serious illegal exploitation of natural resources frequently occurs. A hundred violations are reported every year particularly on catching fish by battery and other aqua-products, wanton cutting down of melaleuca forest, setting fire to melaleuca forests and others. The problem is blamed on poverty. A large number of people said that they do not wish to violate the regulations in the Reservation but are forced to do so to survive. Moreover, inadequate arrangement and regulations between the Reservation and buffer zone farmers and local people lead to illegal

exploitation and environmental degradation. Solving this conflict requires proper policies and regulations that clearly regulate the tasks and relationships.

In Vo Doi, poverty associated with low education level is the main cause in forest destruction. The reported number of illegal forest destructions in 1998 are as follows: cutting down of melaleuca (9 events/year), illegal fishing (9 events/year) and hunting such as trapping of pigs, bats, etc. (4 events/year).

In Giong Rieng, since all forests are household-managed, the role of local authority in protecting the areas is not much emphasized. According to farmers, the poor households without melaleuca forests are the main culprits in forest robbery. They cut down a few trees for house construction or trading. In response, the forest owners often warn the thieves against repeating the acts rather than report them to the local authorities. In reality, forest destruction is uncommon in the region. However, many farmers recognize only the forests' economic value since these bring them large cash revenues; the forests' environmental value remains unrecognized. Farmers' awareness of the importance of forests is quite low, while the impacts of the forests are not well recognized. Another constraint is that reforestation and forest control are not managed and planned by the local authorities. Generally, a well-managed and planned reforestation, and more dissemination on the impact of forests to the people of the region are indispensable to educate the people about the importance of forests.

5.6.3 What are the Causes of Poverty and Melaleuca Forest Degradation in the Study Sites?

Reason 1: Loss of forest income, low economic incentives and benefits to forest protectors, and low level of penalty imposed on violators.

- a. The income from the forest share by farmers was stopped due to implementation of the logging ban policy by the local government.*

The logging ban policy is a violation of the contract between the State forest farm and the households. As per the contract, the party involved is expecting to obtain a share of the income from the forest products. This has led to low and unstable income for the households involved in forest production and protection activities.

Before 1995, farmers were allowed to exploit production forests as stipulated in the contracts. Thus, farmers could live on income derived from forest production. There is only little illegal forest harvesting since contract farmers discharged their duties as forest guards. But since 1995, the situation has changed when the government has banned timber product harvesting in the state-owned production forest in the whole country to conserve forest resources from over-

exploitation. The farmers who are mainly relying on production forest have become impoverished because their income from timber product share has stopped. Households living in absolute poverty account for 55.52% in Song Trem, 30% in Tram Chim, 55.39% in Vo Doi, and 12.50% in group A and 23.33% in group B in Giong Rieng. Contract household farmers are getting poorer.

Low income leads to illegal cutting down of forest trees both by people engaged and not engaged in forest production activities. The farmers do not give much attention to forest protection and rehabilitation.

Lack of economic incentives for forest protection has led to robbery and wanton harvesting of melaleuca. It also leads to frequent occurrence of fire, with damage increasing from 2% to 5% before and after the logging ban policy, respectively.

This is evident in Song Trem site. In some areas trees are being stolen especially those planted near the farm boundary. As estimated by the farm staff, 1,000-2,000 melaleuca trees worth about VND 10,000,000 are stolen every day. Forest destroyers are identified to have come from inside and outside the farm in cahoots with the traders, 30% of whom are insiders.

b. Low benefits and economic incentives to forest protectors

The forest protectors are government officers whose main responsibility is protecting forest areas. They are presently receiving low economic incentives, in exchange for protecting the areas, or a monthly average salary of only VND 300,000 (less than \$25/month). This amount dampens their eagerness to execute their responsibility, aside from being insufficient for their sustenance, thereby leading to some collusion problems. Likewise, the farmers actively opposed the illegal cutting of trees and harvest of NTFPs are often not given any benefits or economic incentives by the state forest farm. Taken together, this is one serious cause of illegal harvesting of forest trees.

c. Low level of fine to violators

The fine imposed on the violators is too low so that people often ignore it. As a result, illegal cutting of forest trees persists. On the average, a thief earns VND 200,000-300,000 per harvest, but if arrested, he pays the fine of VND 200,000. The inadequate fine encourages increased robbery. In addition, the protection force of the farm is not enough to defend the entire farm.

Reason 2: Low level of agricultural intensification and diversification

Rice crop is one of the farmers' primary sources of income. However, rice yield is low because of low investment on irrigation and material input and the continued use of traditional varieties. Rice is mainly for home consumption rather than for trading. Farmers generally get small profits from growing rice. Thus, intensive farming is necessary to create a stable source of income for farmers.

Banana, a non-rice crop, should be a good alternative since it requires less production cost but has high yields. However, only a few farmers cultivate bananas and other non-rice crops. The rest are too poor and lack the money to build or rehabilitate the dikes to allow cultivation of non-rice crops.

Fishery income may be unsustainable due to over-fishing. Many households are engaged in both legal and illegal fishing. The only exception is the JV households in Song Trem where farmers do not fish due to the lack of capital investment.

Meanwhile, laborers earn more from non-farm and off-farm activities than from farming. Large households earn more income since they provide more labor. The problem right now is how the Farm can design and train labor to match the changes in economic structure.

Most credit comes from informal institutions. But farmers experience difficulties in accessing formal financial institutions due to lack of collateral. Most farmers own the temporary "Green Land Certificates" that are not accepted as collateral by the formal banking systems. Hence, farmers are forced to borrow from private moneylenders at a very high interest rate (10% per month). This is a big problem in Song Trem site.

As to extension services, only few households take part in the training course on extension services. Except in Tram Chim, extension services are generally perceived as poor in the study sites. This is the reason why the peasant farmers stick to traditional crop varieties and simple technologies, resulting in low crop and animal productivity.

Reason 3: Inadequate support policies of local government; inadequate leadership and neglect of the state farm; poor attitudes and actions of farmers

Most farmers say that local authorities have not given them due consideration. As stipulated in the contract, farmers get a share from the forest, which is one of their main sources of income. However, upon the imposition of the logging ban, the local government has not provided farmers' with adequate support

services such as technical and educational extension services, public credit agencies, storage and marketing facilities. These support services are needed in enhancing agricultural production and other sources of income.

Moreover, the state farm has not provided adequate leadership and initiative, especially on the credit problem. The farmers find difficulty in borrowing from the formal banking system with concessional interest rate.

On the other hand, farmers exhibit poor attitude in managing themselves and in changing their cropping patterns so as to increase yield and income. Such poor adaptation ability has led to decreased income when the logging ban was imposed.

5.6.3 Issues and Findings

a. The leadership structure, extent and intensity of participation of members, rights and obligations, effectiveness of control, and division of tasks associated with each of the institutional alternatives for forest management

- Household-managed forests are more strictly protected than State-owned forests since the former are firmly related to the farmers' benefits. Forest destruction pervades in Song Trem, evidence that managing the forests is not always related to farmers' benefits, thereby discouraging them from taking responsibility of the forests.
- Closed-forest regulation discourages investment in state-owned forests, making the residents' living conditions more difficult. State-owned lands receive less investment than private ones.
- Contract household management system in Song Trem state farm and small areas of forest and cultivated lands do not stabilize the poor's living conditions. They lack the capital to invest in production that can improve their life.
- Land-use certificates should be issued to farmers for them to avail of bank loans. The establishment of mass organizations is necessary to guarantee credit for each farmer-member and to get loans in bulk from the banks.
- Farmers only perform reforestation forest protection activities well when these bring them benefits, i.e., income generating. Therefore, forest destruction has become serious in contract household forest management system (Song Trem).
- Poverty accompanied by weak management scheme and community awareness can cause forest destruction as clearly seen in Song Trem.

b. The economic costs and benefits (CBA) of alternative land/farming systems in the study sites under varying management systems

- Farmers live mainly on agricultural production, that is, mono-rice farming, which is often unstable. Diversification of crops and services is hardly seen in the rural areas. Contract farmers in Song Trem and Vo Doi engage in rice farming and catching fish and rat, but pay little attention to other income-creating activities such as non-rice cropping, fishery, animal husbandry and others.
- Most farmers in State-owned farms in contracted household management system (Song Trem), and strict protection management (Vo Doi) are poor. In fact they are the poorest among the farmers due to unsustainable forest management brought about by the closed forests policy. They have low income and experience difficulty in getting extension services, schooling, training, technology transfer, information, transportation and health care.
- Poverty is accompanied by forest destruction as clearly seen in Song Trem. According to most farmers, forest destruction happens mainly because of poverty and unemployment. Hence, forest protection measures have not been strictly implemented for a long time where the income of farmers is low.
- There exists severe inequality in income distribution across forest management systems, as well as across farmers in the same management scheme.

c. Factors affecting household income of forest dependent communities

- Bananas (area, cost), vegetables (area), rice crop (cost) significantly affect the net income of contract farmers. Bananas (area, cost), fishing (area) and melaleuca (area) are found to be significant in the model of net income of joint venture households in Song Trem.
- Rice crop (area, cost, yield), fishing (cost) and melaleuca (cost) significantly affect the net income of farmers in Tram Chim.
- Rice crop (yield), melaleuca (area), fishing (area of pond) and non-rice crop (cost) have significant effect on the net income of farmers in Vo Doi.
- Rice crop (area), melaleuca (area) and husbandry raising (cost) significantly affect the net income of farmers with forest farms. Rice crop (area, cost), husbandry raising (cost) and non-rice crop (cost) also significantly contribute to the net income of households without forest farms in Giong Rieng.

d. *Socio-economic and environmental indicators associated with alternative management systems for melaleuca forests*

- Large household size leads to persistent unemployment at the survey sites as well as the rural areas.
- Land accumulation makes the rich richer and the poor poorer.
- Low education coupled with remote location opportunity of Song Trem and Vo Doi farmers limit the capacity of households to improve their living conditions.
- Investment in reforestation and protection by Song Trem farmers, especially the contract households, is not adequate hence forest destruction occurs everywhere.
- The farmers are not receptive to changing cropping patterns to increase their income when the logging ban policy has been imposed.
- The local government has no sufficient support policies such as extension services, technology transfer, credit programs and infrastructure improvement to help farmers increase their income.
- Many farmers outside forest farms illegally cut forest trees since the farms and the government impose low fines to violators, and do not provide adequate economic incentives for forest protection.

6.0 POLICY RECOMMENDATIONS

6.1 Defining the Alternative Solutions

The main question in this analysis is to determine the relative performance of several alternatives for *alleviating poverty, increasing farmers' income*, and enhancing the *efficient use and conservation of the melaleuca forests*.

As previously discussed, the problems of low income and decreasing melaleuca forest quality at the study sites are due to three important factors:

1. Implementation of the logging ban policy by the local government;
2. Low income from farming due to the absence of agricultural intensification and diversification;
3. Inadequate support services provided by the local government, poor management ability of the state farm, and poor attitude of the farmers.

Therefore, the solutions should be focused on these factors by addressing the appropriate alternatives.

6.1.1. The First Alternative

Totally revise the logging ban policy and apply the quota regulations for harvesting melaleuca forests (applied to production melaleuca forests). It is a comprehensive package approach to improve the households' income and melaleuca forest protection. It will provide long-term use of forestlands to every household. It involves many sectors or agencies such as local governments, leader of State farm, households and wood traders to reduce the negative impact of logging ban policy on household income and forest conservation as in the case of Song Trem. In this case, the farmers can focus on forest production and protection if they consider the forest serves as major income source

A. Action Agenda: To solve these problems, the following steps are needed:

A.1 Allocate forestland to contract households, allow them to produce, harvest and market the mature melaleuca in their contracted areas.

- a) The state-owned farm will allocate the total area of melaleucas forest to all households based on their financial capability and available labor. In effect, the households become the "owners" of the forestlands. The household will be responsible for planting, protecting and harvesting melaleuca trees in the area provided by the State Farm. The local government will provide the "Red Certificates of Long-term Land Use" for households based on optimum interval of melaleuca trees (i.e., the length of time in the Red Certificate equals the multiples of optimal interval of melaleuca trees).
- b) Sign the contract between the State-owned farm and the households. The contract indicates the percentage of land that the households can use for planting melaleuca and other cash crops; tasks and duties; responsibilities and benefits (i.e., proportion of income share) for both sides (i.e., the state-owned farm and the households).
- c) Every year, the households have the right to harvest by-products of melaleuca as part of their annual income from forest production (i.e., they can harvest dried or branches of melaleuca for domestic fuel consumption or selling in the market to generate income).
- d) The farmers have the right to harvest over mature melaleuca trees in their contracted areas. Farmers must seek the state farm's permission by informing the Board of the State Farm and both sides will schedule the harvesting. The State farm helps the farmers sell their products by contracting with the traders.
- e) After harvesting, the farmers and the state farm get their income share as indicated in the contract. The farmers will replant for another cycle.

A.2 *Set up the quotas for harvested melaleuca based on the biological harvesting decision of melaleuca forest, condition for maximizing the net benefit of present value from harvesting melaleuca (i.e., determining the optimal time for harvesting), and market demand for melaleuca timber products every year*

- a) Determine the supply capacity every year based on the biological growth of melaleuca over time and condition for maximizing the present value of net benefit.
- b) Determine the market demands for melaleuca timber products in general and for its particular products.
- c) Based on the volume of timber products (both supply and demand sides) every year, set up the quotas for harvesting and marketing.
- d) Based on the quotas in each period, the State Farm and the farmers will determine the areas and schedules for harvesting and contracting with logging companies in marketing the products.

A.3 *Legislative and institutional component activities*

- a) Establish rules to heavily penalize the people illegally cutting the trees and harvesting the wildlife, or trading these products without legal permission. First offense with a small volume of harvest will mean a fine. Second offense with a larger volume of harvest will mean prosecution in the court of justice.
- b) Re-organize the forest protection team of the State Farm. This means that the State Farm will dismiss or retire the people who fail to do their tasks well or connive with thieves to cut melaleuca or catch wildlife illegally.
- c) Provide high salary and other economic incentives to the members of the forest protection team. But they should be heavily penalized if they connive with the thieves to cut the melaleuca or catch wildlife illegally. This is to avoid corrupting them. First offense will mean a fine and the next offense will mean dismissal from the office.
- d) Enhance the relationship of the households and the Board of the State Farm with:
 - 1. The local government. The local government can help the farmers and the State Farm in solving difficulties in support policies related to production and marketing of timber products.
 - 2. Other agencies such as agro-forestry extension service, fire rescue, agricultural banks or banks for the poor, etc. that can provide technical and other logistic support.

A.4 Administrative and logistic support component activities

- a) Enhance the relationship between the Board of the Farm and the farmers. Organize monthly meetings to disseminate the events of the preceding month and the plans for the next month. In particular, the leader of the farm needs to share information on forest protection (i.e., the number of violators, who are they, etc.)
- b) Establish and enhance the relationship of the farm with branches of agricultural banks. The farm can serve as the witness between the farmers and the bank in times of borrowing.
- c) Provide a long-term credit program for the households. It will help the farmers obtain capital for planting, maintaining the planted forest and harvesting the timber. It will attempt to avoid or reduce problems associated with borrowing money from private lenders at very high interest rates.
- d) The farm will cooperate with the local government in providing health services, schooling for children, and fresh water supply.

6.1.2. The Second Alternative

Revise the total logging ban policy to partial logging ban and find other means (i.e., strengthening agricultural production activities) of improving household income. This means that the local government should allow the State farm to harvest only the area of over-mature melaleuca (in the buffer zone, not in the core zone). In this case the State Farm is the owner of the forests, and the households only take care of and protect the forests and get their share of income as payment for their protection activities. The State Farm plans all activities from planting, harvesting to marketing the products. The farmers earn income as share in forest protection as stated in the contract agreement and from the pursuit of agricultural production (i.e., major income comes from agricultural production).

B. Action Agenda: To solve these problems, the following steps must be done:

B.1 Allocate the buffer zone area of the State Farm to contract households for protection activities. This means that the State Farm will still be the owner of the forest, and every year they have to plan the production and harvest of over mature melaleuca areas in the buffer zone (do not allow farmers to go to the core zone).

- a) Allocate the buffer zone forest area to every household, whereby 70% of contracted land is to be used for planting melaleuca and the remaining

30% for other crops (cash crops) such as rice, bananas, fruit trees and vegetables. Part of the lowland will be used for fish raising. The households take responsibility for forest protection and get their income share along with the State Farm upon harvest of melaleuca.

- b) The government and the State Farm will not allow the households to harvest by-products of melaleuca (i.e., dried branches of melaleuca, bee honey). This is to avoid illegal cutting of trees and fire hazard.
- c) The government should allow the State Farm to harvest areas with over mature melaleuca (in the buffer zone, not in the core zone), i.e., partially removing the logging ban.
- d) Every year, based on the total area of over mature melaleuca, the State Farm owner should compute the total volume of melaleuca timber to be harvested and then network with the logging companies. The latter can organize the auction and award the contract for logging the melaleuca timber to the highest bidder. The following year they will rotate the harvesting in other areas and apply the same procedure previously described.
- e) After the harvest season, the state farms will then plant a new cycle of melaleuca and reallocate the area for each household to protect.
- f) Distribute the income from harvested melaleuca based on the income sharing arrangement indicated in the contract between the state farm and the households.

B.2 Strengthen agricultural production activities to alleviate poverty and improved the farmers' annual income. This is a very important strategy in combination with short-term and long-term benefits. It will not only raise the households' living standard but also increase their responsibilities in terms of cooperation in forest protection (i.e., the farmers will be attached for a long time with the State Farm as forest security guards).

- a) Investment for irrigation (as in fish raising) is needed.
- b) Increase the number of pigs raised alongside with the increase in rice production (the farmers use rice bran as the main pig feed).
- c) Increase fish raising production. At present, only some JV households raise fish because of lack of capital to invest in building dikes and ponds.
- d) Aside from the above activities, the farmers can generate annual income for livelihood by planting bananas along dikes encircling the fishpond.
- e) Establish a long-term credit program to help the farmers obtain enough capital for agricultural production activities. The state farm must

cooperate with the banking and/or informal credit systems (i.e., agricultural banks or banks for the poor people) to address this matter. If the farmers borrow money from moneylenders, they have to pay very high interest rates, which may reduce their real income. With long-term credit program the farmers have good opportunity to expand their production activities and generate more income for their livelihood.

B.3 Legislative and institutional component activity: as A3 in the First alternative

B.4 Administrative and logistic support component activity: as A4 in the First alternative

6.2 Recommendations

The discussion above provides a case study analysis of institutional alternative management systems that have been applied to protect and conserve melaleuca forests in the Mekong Delta, Viet Nam. The findings from the research clearly indicate that:

- **Joint venture forest management system (JVs) vs. contract household forest management system (CHs) for melaleuca forest production.**
 - (1) JVs have higher participation of members in forest protection and conservation.
 - (2) JVs have more effective leadership and efficient division of tasks.
 - (3) JVs are more effective in forest protection.
 - (4) JVs contribute more to income per household, but less to income per hectare

Recommendation: Joint venture forest management system is the better alternative system for state-owned melaleuca production forests. In particular, it is recommended that the logging ban policy be replaced by setting up the quota for harvested melaleuca following the contract agreement. This will allow the contract farmers to harvest mature forest trees and replant after harvesting. This is the main issue in developing the state-owned farm of melaleuca production forest in the study site (the first alternative).

- **Buffer zone forest management system (BZs) vs. strict protection forest management system (SFs): For conservation forest**

- (1) SFs have higher participation of members in forest protection and conservation.
- (2) SFs have more effective leadership and efficient division of tasks.
- (3) SFs have more effective in forest protection.
- (4) SFs contribute less to household income

Recommendation: Forest protection at Vo Doi is well implemented. Due to the good dissemination activities of the SUF Farm and the provision of credit from the banking system, farmers' appreciation of the forests' value and the need to undertake forest protection in Vo Doi is very high with all farmers motivated to participate in forest protection activities. All households are frequently engaged in forest protection, even though they are economically handicapped. According to the farmers themselves, in order to improve and motivate all farmers to participate in forest protection, the plans and programs should focus on improving farmers' income. It is projected that if farmers stay in poverty for too long, the wanton exploitation of forest resources will continue. Strict protection forest management system is recommended as possible alternative system for the management of reserved melaleuca forests, once households' income in the community improves. It is also recommended to partially revise the total logging ban policy to partial logging ban (partial logging ban for buffer zone and total logging ban for core zone) and to find other sources (i.e., strengthening agricultural production activities) to improve household income.

- **Commercial private forests: with forestland vs. without forestland**

Land sizes severely vary across farms. Forestland constitutes the largest part of a farm holding in the commercial private farm with forest. Rice land is the biggest area for small farms in a commercial private farm without forest, with farmers mainly dependent on rice farming for livelihood. These were a noted trend among rich farmers to accumulate land since large land areas bring in profits from the melaleuca forest. However, households with small land areas live on a subsistence level from rice crop and non-rice crop.

Recommendation: Commercially managed forests are best for households with large farms, and rice/non-rice crops are recommended for those with small farms.

To summarize, joint venture management seems to be the best alternative for state-owned farms of production forests. Strict protection forest management is a possible alternative for reserved melaleuca forests if the standard of living of households in the community will be improved. Commercially managed forests are

best for households with large farms; rice and non-rice crops are better for those with small farms.

A revised logging ban policy is needed to address poverty alleviation and forest degradation. This revised policy should allow production forest farms to harvest mature trees in state-owned melaleuca production forest site. Better access to credit, extension services and training, more effective leadership, and higher participation in forest conservation will benefit the melaleuca forest reserves, as would increased income from farming and better contracts for the tree farmers.

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