

Balancing Economic and Environmental Concerns in the Uplands of Vietnam: A Continuing Challenge¹

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ABSTRACT

This paper presents results of a case study of the SANREM's research project and two other UAF case studies in the Central Highland of Vietnam. These studies used similar participatory research approach to generate empirical evidences to patterns of land use change as these are influenced by multidimensional factors. Environmental consequences associated with these land changes were also reported. The paper shows that changes in economic policies, institutions and market access led to a large transformation of forestland into agriculture. The rapid expansion and intensification of agricultural production, driven in part by expanding population, places high pressure on the natural resource base and causes high negative externalities in the uplands, particularly in marginal lands. In all case studies, rates of degradation of forests, soils, and water remain high and threaten agricultural sustainability. Recently, national and local government took some efforts to overcome negative environmental consequences of agricultural development in the uplands, but their impacts are still limited. Balancing agricultural development and environmental protection is currently a major challenge for upland development. For meeting this challenge, the paper emphasizes the need for setting enabling policies and institutional framework that better promote sustainable agriculture and natural resource management practices in the uplands.

INTRODUCTION

The series of institutional and policy reforms implemented since the early 80's when Vietnam shifted from a centrally planned to a market oriented economy ushered a dramatic increase in agricultural outputs, particularly in rice production. However the country continues to cope with both socioeconomic and environmental problems such as high rural poverty, increased income disparity between urban and rural population, high forest loss, and degradation of land and other natural resources, particularly in the uplands.

The upland areas are faced with high rate of deforestation as a result of war and subsequent reconstruction efforts over the last decades. More recently, large forest areas were converted to cash crops cultivation as part of the overall development of markets and exports. In many cases, recent economic development was achieved at the expense of environmental quality. Rates of depletion and degradation of forests, soils, and water remain high.

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The Government of Vietnam, cognizant of the need for watershed protection, adopted various policy measures to restore barren lands and protect vital forests but achieved mixed results. Managing critical watersheds continues to challenge resource managers and policy makers. Some parts of Vietnam's uplands suffer dry season water shortages and social tensions around water allocation, while others are subject to flooding, erosion and increased economic and environmental vulnerability of poor households. Balancing economic development and environmental protection is currently one of the major challenges in the upland areas of VN.

Using results of three case studies conducted in the Central Highland of Vietnam, this paper provide empirical evidences to a pattern of changes in land uses and the environmental consequences associated with these changes. It also evaluates efforts of national and local government to overcome negative environmental consequences of recent trends in agricultural development in the Central Highlands of Vietnam.

THE CASE STUDIES

All three case studies were conducted by the UAF research teams in the Central Highlands of Vietnam. One was conducted by the SANREM's research project in Dailao commune of Lamdong Province. The other two case studies were the Community-Based Natural Resource Management project in Kado commune of Lamdong Province and Managing Water Resource in a Dynamic Upland Environment conducted in Eal Tul catchment of Dak Lak province. The location of the study sites is presented in figure 1.

Similar participatory research approach was employed in these studies. In Kado commune, the Participatory Rural Appraisal (PRA) method was applied by a multidisciplinary research team to generate information on land use pattern and farmers' perspectives in natural resource management. In Dai Lao commune of Lamdong province, the research team employed the Participatory Landscape-Lifescape Appraisal (PLLA), a rapid, iterative and system-oriented approach (Espaldon and Magsino, 2001) to understand the agro-ecological and socio-economic conditions prevailing in this commune. To generate the needed information, the PLLA team employed a combination of techniques such as oral history that reconstructs historical events, use of secondary data, key informants interviews, farmers profiling, maps and map analysis and focus group discussions (Ha et al, 2001). For the study in Ea Tul catchment, the UAF team adopted a holistic, participatory approach and drew from existing experience of current and past projects as well as perspective of different stakeholders. By focusing on water resource use and management system in a catchment, the research identified, analyzed, and generated public discussions of major research and policy issues relating to an integrated approach of watershed management (Giang et. al. 2000).

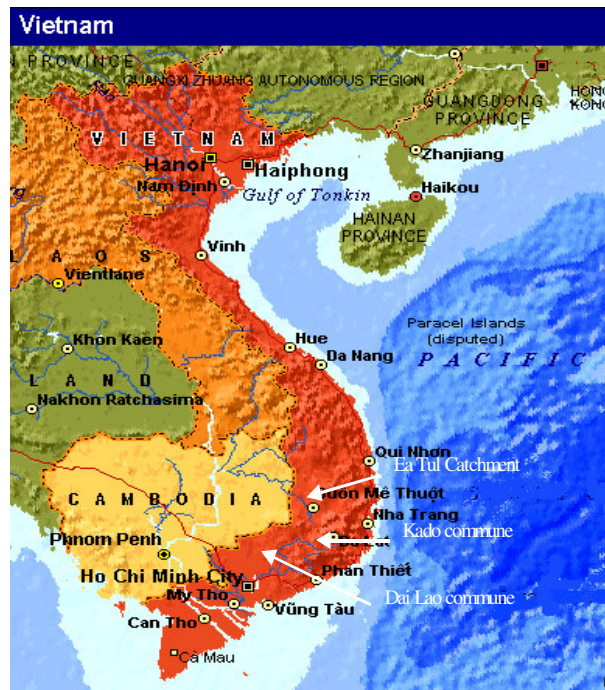


Figure 1. Location of the study sites.

In all studies, meetings and workshop with farmers and decision makers from the commune, district, and province levels were also organized to validate information and to generate an overview of farming systems and their major issues and constraints. The application of participatory research approach in these projects was not merely to generate data and information needed but also to enhance the participation of local villagers and other stakeholders in the identification of problems and issues related to sustainable agriculture and natural resource management systems and in the exploration of solutions to many concerns.

Dai Lao commune is an example of a village that underwent rapid changes as a result of multitude of factors. Over the past two decades, the landscape changed from dominantly natural forests to primarily agricultural areas for different crops such as rice, mulberry, tea and coffee. Recently, as coffee declines its profitability starting 1999, farmers of Dai Lao exhibits different coping mechanisms to adapt to the new market and environmental conditions. A rapid change from dominantly natural forests to primarily agricultural production, particularly coffee, was also observed in Ea Tul catchment of Dak Lak province. The expansion of coffee replaced large areas of forest and other annual crops, which led to the degradation of land and water resources. Kado represents a commune in transition from self-sufficiency towards cash crop production.

These study sites represent broadly socio-economic and ecological conditions in the Central Highlands of Vietnam. All of them are communities in transition, both in terms of the biophysical aspects as well as in terms of its socioeconomic contexts. They also display some common features of environmental stress and resource degradation associated with uncontrolled expansion and intensification of agricultural activities.

LAND USE CHANGE AND CAUSES

Like many upland areas in the country, these study sites are undergoing rapid economic growth and structural transformation since Vietnam shifted from a centrally planned to a market oriented economy. Rapid changes in land use and/or cropping pattern were reported in the communes under study.

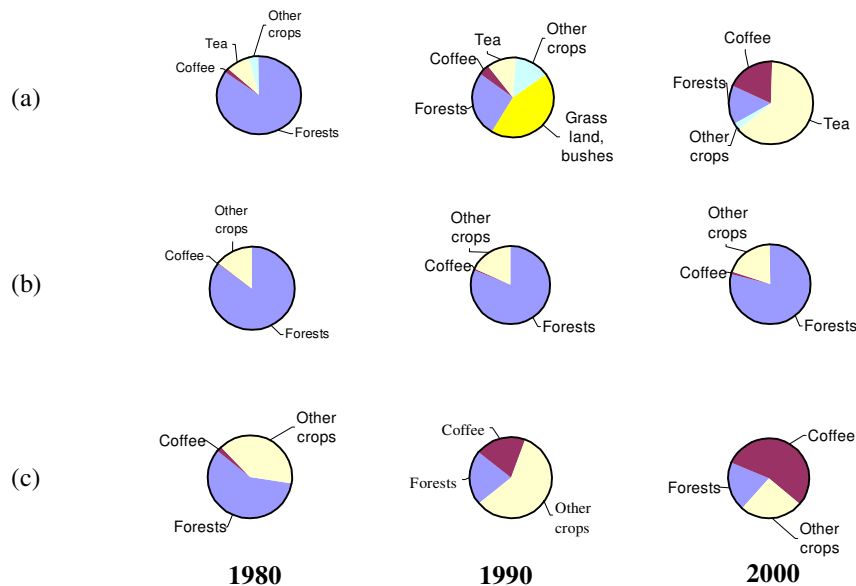


Figure 2. Land use changes in (a) Dailao commune, (b) Kado commune, and (c) Ea Tul catchment. (Source: Data collected during interviews of local officials, 2000).

Dai Lao Commune

Dailao commune experienced a rapid decline in forest resource over the last two decades. The forests covered about 85% of the total land in the commune in 1980 but reduced to about 45% in 1984 due to the increasing agricultural and timber harvesting activities. The remaining forest continued to decrease at a rate of about 5% per annum from 1985 to 1987. With the shift to the market economy since 1986 a high rate of deforestation caused by land clearing to accommodate spontaneous migrants occurred. In 1990, the forests remained only 27%. Until 1995, most of the forestland suitable for agricultural cultivation were cleared and cultivated. The remaining forest area of the commune was reduced to only less than 15% in the year 2000.

It was recorded that not only small farmers but also state farms and forest enterprises are stakeholders causing rapid deforestation in this area. While the operation of the state farms were planned, operated according to government program, and was subsidized, small farms were spontaneous and market driven.

In contrast to the reduction of the forests, agricultural land increased rapidly from 15% of the total land area in year 1980 to 83% in year 2000. The total area of major crops such as mulberry, tea, and coffee increased from 733 ha in year 1980 to 5584 ha in year 2000, an increase of about 76 times. The area expansion was highest for both coffee and tea. Even with strong support of the sericulture industry development program of the province, mulberry area reached a maximum of only 240 ha in 1995. It then declined due to the low price and irrigation water constraints.

With better market access and favorable prices, tea and coffee area expanded rapidly since 1994. This area expansion was achieved not only by the transformation from forests that were cleared before by

illegal logging but also by a shift from mulberry. Motivated by the high coffee price, a bandwagon effect in coffee planting was observed in this area. Many farmers have planted coffee even when they do not have experience in cultivating this crop or do not know about the variety and soil condition suitable for coffee. Many even planted coffee on very steep slopes where the soil and water conditions were not suitable for this crop. As a result, the yield was very low and caused high soil erosion.

Farmers in the commune shifted from crop after crop due to the fluctuation in market prices. Changes in prices have differential effects on land use by different groups of farmers. It was reported that due to the low price of coffee and a high price of mulberry in 1987-1988, some farmers cut down coffee to plant mulberry. As price of mulberry went down in 1994-1995, farmers again cut down mulberry for coffee or tea. Crop choice of farmers is usually based on current market value, that lend them to be more vulnerable to market changes, particularly the poor farmers. With the decrease in coffee price since 1998, the cultivation of coffee is no longer profitable. Large coffee farmers stopped intensive investment in coffee. Medium to small farmers even want to shift to tea if coffee price continues to decrease or remain at low level. When the price of mulberry went up, many farmers found an incentive to expand mulberry again. The shift from coffee to other crops is expected to occur not only because of price fluctuations but also due to degradation of the soil, poor soil, sloping land with high risk of soil erosion, and difficulty in water access. To cope with the fluctuation in market price, some local farmers diversify their farming activities by planting more than one crop and investing in other livelihood activities such as animal production. However, the level of diversification in farm activities among farmers is still limited to more innovative and more resource-rich farmers.

Kado Commune

The natural condition in Kado commune is characterized by a high diversity in topography, soil type, and water availability. The forest in the commune is a watershed that regulates water for the two important hydroelectric power plants. Compared to the situation in other two case studies, there was not a dramatic transformation from forests (only about 6%) to agricultural land over the same period. There was only a small expansion of agricultural land due to a strict enforcement of regulations on forest conservation, less favorable market access and less suitable land for high valued cash crops such as coffee and tea.

Despite the constraints, the commune is gradually shifting from self-subsistence mode of production to a more commercial cash crop production that also have some negative impacts on its natural resource base. Before 1986, the village concentrated on the production of food crops to satisfy the needs of the local people. Main food crops of the ethnic minority groups such as the Chil, K'ho, and Churu were wetland and upland rice, local traditional maize, beans, cassava and other root crops. The production of cash crops like vegetables, beans, and mulberry was not very intensive due to unfavorable market access. Most households of the ethnic minority groups in the community are very poor and maintain their traditional practice of shifting cultivation. Only less than 10% of their total farm production was channeled through the market. Wetland rice cultivation is the traditional agricultural system of the Churu group and some of the K'ho group. Shifting cultivation is their traditional cultivation practice of the Chil and K'ho people that continues until nowadays.

With better market access since 1986 there was a rapid change in cropping systems towards high valued crops. Many farmers intensified vegetable production and other cash crops. In year 2000, the proportion of market share increased significantly to about 60 percent and 94 percent of the total farm production for ethnic minority farmers and Kinh farmers, respectively. The computed man-land ratio suggests the increasing scarcity of agricultural land for cultivation among local residents. With only

limited land for agricultural cultivation (18.5% of the total commune land), this trend reflects the efforts of villagers to use scarce land resources more efficiently to increase income and food security. The production area for subsistence food crops decreased while commercial vegetable production and other cash crops like hybrid maize and coffee, expanded considerably.

Shifting cultivation is an important traditional agricultural system in the area. As this practice is considered as harmful for the environment by local authorities, they implemented a strict enforcement of forest protection and prohibited shifting cultivation practices. Shifting cultivated lands located on sloping areas were considered by the state as area to be planted with pine forests under the jurisdiction of the state forest farms. Poor ethnic farmers are now facing two major problems: decreasing productivity of the shifting cultivation system and institutional pressures against this system. Once a dominant and sustainable production system in this upland village, shifting cultivation system of ethnic minority farmers now has an uncertain future due to both internal and external factors. This policy limits the opportunities for ethnic minority farmers to practice shifting cultivation and reduces their ability to produce enough food.

Ea Tul Catchment

Over the last decades, the study area underwent remarkable changes in land use. Forest area was reduced from 58% in year 1980 to 20% in year 2000. Many forest areas were replaced first by annual food crops and then by coffee plantations. With very fertile balsatic land suitable for growing cash crops, especially coffee, the area is very attractive for migrants from other regions in the country to search for economic opportunities.

The first group of Kinh people from the northern provinces of Vietnam started to migrate to this area in 1954. After 1975, some new economic zones and state farms were established in the area to receive migrants from the crowded provinces in the northern and the central coastal region of the country. Besides the planned migration, spontaneous immigrants began to come to this area in the 80s. With high coffee price in the early 90's the number of migrants came in the area raised sharply. Data collected during the interviews in Eal Tul catchment shows that only 34% of the respondents came to this area before 1980. Majority of the respondents (66%) migrated to the area later. Until now, the spontaneous migration to this area is still going on which puts more pressure on the land, water and other resources in this area.

When farmers first came to the area, they cleared the forest to cultivate maize, beans and other food crops to satisfy their food demand. A large forest area was cleared for agricultural production. Before 1986, agricultural production was semi-commercial. With better market access since the early 80's, farmers' production became more oriented to cash crop production. The production of coffee, a highly profitable crop in terms of family labor and per cubic meter of water, replaced other less profitable annual crops. At the same time, farmers used high level of mechanization, fertilizer, pesticides and labor. Since 1994, there has been a large change in the cropping pattern in this area. As the price of coffee increased coffee area expanded rapidly. There was a large change from annual

crops and forests to coffee. Coffee production now contributes to the largest share of farm household income in this area. To date, agricultural production system in this area is highly monoculture, high input, high water consumption and market-oriented coffee production system.

The uncontrolled expansion of agricultural production, particularly coffee cultivation at the margin of the remaining forestland was reported in this area. Forest vegetation is perceived as a low economic

land use and benefit from forest influences including the regulation of water regime was not clearly taken into account.

The land use changes described in these case studies reflect the changes in policies, market conditions, biophysical condition and population. In the postwar period, the government pursued self-sufficiency in grains. The growth in food production in the Central Highlands has been due primarily to area expansion leading to large transformation of forests into agriculture. Policies implemented in the central highlands after 1975 include the establishment of new economic zones, state farms, and forest enterprises and population re-distribution program. The encroachment on forest areas driven primarily by commercial logging and planned conversion of forestland into agriculture by the state farm contributed to a large-scale deforestation. Commercial logging done by the state forest enterprises again facilitated agricultural expansion. These policies resulted in remarkable socio-economic and environmental transformations. This was well reflected in the case of Dai Lao and Ea Tul catchment where large deforestation was reported.

In the transition toward a market economy, the process of land use changes, especially the expansion of coffee in the Central Highlands reflects the government's policy for supporting export-oriented cash crop production and a rational judgement of farmers in coping with market situation. Under open access forest management regime due to poor implementation of regulation and rules, the price boom of coffee in the world and domestic markets attracted more people into the Central highlands. The process of migration to the Central highlands was either planned by government program, spontaneous in nature, or the product of a chain migration. This situation led to favorable environment for forest clearing and unsustainable patterns of land uses. Although population density in the Central Highlands is still relatively low as compared to lowland areas, the remaining forest can not be maintained without a strong supporting policy to stop free immigration. The situation is similar in other uplands areas of Vietnam as well as in other country in the Southeast Asia region like in the Philippines (Coxhead and Glady, 2001).

With better market access, farmers in the Central Highlands are increasingly integrated with national and global markets. Changes in prices have differential effects on land use by different groups of farmers. The rapid expansion of coffee over such a large area in the Central Highlands led to complicated social issues, including social stratification, resource tenurial changes, and resource degradation.

ENVIRONMENTAL CONSEQUENCES OF LAND USE CHANGE

Results of these case studies revealed that the increase in agricultural production and economic growth is achieved at the expense of natural ecosystem.

Dailao commune

With a high rainfall and large sloping land, Dailao commune is subject to high risk of soil erosion. The clearing of forest for the expansion of mulberry, tea and coffee planting, especially in sloping land usually meet the development goals in the short term, but increase the risks associated with soil erosion. Erosion rate was reported to be highest in the case of mulberry. With inappropriate farming practices, extremely high soil erosion rate (about 15 to 20 mm of soil loss per year) was recorded for mulberry planting on steep slopes (Du et. al., 2001).

A serious problem of soil erosion occurred during the period from 1987 to 1990 when the state farm cleared forests to expand mulberry plantation to the hills. Due to high erosion and loss of soil nutrients,

mulberry yield decreased rapidly after cultivating for about 3 years. Average yield of mulberry planted on the top of the hills was less than 2.5 tones of fresh mulberry leaves per hectare while the yield on flat land was from 7 to 10 tones per hectare. Plots with high soil loss yield even only less than 1 tones per hectare. The rapid reduction in mulberry yield due to high soil and nutrient loss forced the state farm to stop cultivating mulberry on sloping land. Currently, all mulberry plantation located on the hills were no longer existing.

Though tea and coffee cultivation caused lower soil erosion rate than mulberry, a high rate of soil erosion of 5-10 mm and even about 10-20mm per year on lands with slope of more than 25% were observed in both tea and coffee plantations (Du et. al., 2001). Some farmers reported that the rate of soil erosion is even visible as they could see on the base of tea or coffee plants. In many tea plantations, soil erosion is so high such that farmers have to replant tea each year. Due to soil erosion, tea and coffee planted on steep lands could only achieved a yield level of less than 50% of those planted on the on flat land.

Local authorities reported that lands with a slope of over 30 degrees have to be under forest cover and are not allowed for agricultural cultivation. But poor management of forest resources and weak enforcement of regulations resulted in illegally tea or coffee cultivation on these lands causing loss of remaining forest cover, high soil erosion, and poor harvest. The increasing intensive farming of coffee and tea in this commune also lead to the problem of high soil degradation and contamination of surface and ground water as a result of an inappropriate or mismanaged agricultural intensification, such as inefficient application of chemical fertilizers and overuse of pesticides.

It was revealed from farmer group discussion that most of the farmers are aware of the soil erosion problem and its impacts but few of them realized the actual levels of soil loss. Only few farmers reported or claimed to effectively manage or control soil erosion.

Kado commune

High population growth in this commune over the last decades due to both high natural growth of population and immigration caused a decline of cultivated land per capita. With better market access and increasing trend in cash crop production, better-off farmers within and from outside the village came to buy or rent land from ethnic minority people to develop commercial farming such as vegetables or coffee. The poor ethnic farmers practicing shifting cultivation are usually those who are losing land in this process. Their arable lands have been reduced significantly forcing them to modify their traditional shifting cultivation practices. The fallow period has been reduced significantly. Sometimes, they do not fallow the fields at all. The reduction in fallow period can lead to a higher soil erosion rate and losses in soil fertility. A steady decline in crop yields. For many ethnic minority farmers, the production of adequate amount of food crops on small land holdings, with ever declining farm productivity, seems to be impossible. They are particularly vulnerable to poverty. If this trend continues, one can expect that additional marginal lands will be brought into unsustainable use making the environmental degradation problem worst.

It was observed that the increased intensification of cash crop production on settled cropland has both positive and negative impacts on the local natural resources. On one side, it increased the farm income and the opportunity cost of family labor. This made forest-based livelihood activities and shifting cultivation on fields far away from farmer's house less attractive. Some farmers changed from cultivating labor-intensive but erosive annual crops such as upland rice and maize to less labor-intensive perennial crops such as fruit trees. This is expected to reduce the risk from soil erosion. On the other side, the increased cash crop production is accompanied with high input use. Some farmers now grow

hybrid maize with higher chemical and pesticides inputs on their sloping shifting cultivation land. This practice is expected to generate problems with water pollution if not properly regulated.

Ea Tul catchment

The large transformation of forestland to agriculture and the rapid expansion of coffee over such a large area resulted in the scarcity of water faced by farmers albeit unevenly, and the overall depletion of the resource-base in this area.

Similarly as in the other previous cases, the expansion of agricultural production, especially coffee, reduced forest area. Farmers noted that floods seem to be increasing in frequency and magnitude. The natural surface flow is also observed to be decreasing over the years and soil erosion is increasingly becoming a common occurrence. Ea Tul catchment has been heavily planted to coffee, with extensive stretches of over worked, exposed soil. Small dams and reservoirs, vital for sustainable agricultural production are silting up at alarming rates (Riddell, 1999).

The sources of irrigation water for coffee and other crops are mainly common-pool resources in nature such as reservoirs and dams, running water (streams, springs) and groundwater. Currently, the supplies water from irrigation system in the area cannot keep up with the rising demand for agricultural production, especially for coffee. Irrigation schemes suffered from quick degradation due to poor management and lack of capital for repair and dredging. For irrigating coffee, farmers use surface water from canals or streams as long as it is available. In cases where surface water doesn't suffice or dries out, farmers shift to use ground water from their own wells. With increased population pressure and increased coffee production, there is a greater competition and conflict over land and water resource. Some conflicts about the use of water during periods of water shortage have already emerged; particularly between irrigators for rice and coffee; between tail-end and top-end irrigators; and between upstream and down-stream communes.

The use of ground water for irrigating coffee on such a large scale as in the study area and in Daklak province is expected to seriously deplete the ground water resources. It was reported that more than 80% of coffee farmers are using ground water. On the average, farmers had to irrigate their coffee 4 times during the dry season with an average amount of about 500 liter per tree each times and about 1100 trees per hectare. This requires an extremely large amount of water to irrigate coffee during the dry season. Ground water is currently an open access resource that could soon result to overuse and severe depletion of the resource base.

A large number of wells were and are being spontaneously dug or deepened, especially during dry years, to maximize water extraction. Farmers reported that the ground water table is considerably very low during the dry season. To compensate for the draw down, many farmers are continually deepening and broadening their wells. All these activities will seriously deteriorate the ground water resource in this area.

Although ground water is being heavily used for coffee irrigation, water users are untrained in water management, i.e. exploitation of ground water resources is carried out without a well-defined regulation. Currently, local authorities are not able to manage the use of ground water for coffee irrigation. No farmers reported to register for digging their own well. There is still poor awareness of farmers regarding efficient use of water and in protecting water resources. The concern for the security of the water should be a high priority issue to sustain agricultural production.

On the whole, the situation in SANREM research site in Bao Loc and by other 2 study areas

demonstrate that promoting economic growth through agricultural commercialization have succeeded. However, social and environmental goals should equally be taken into serious considerations when planning for agricultural development. The evidences collected indicate that there is ongoing degradation of the natural resources that may threat the long-term sustainability of agricultural development in the Central Highlands of Vietnam.

Most of the resource degradation can be attributed directly or indirectly to the increased population pressures, unplanned and rapid expansion and increasing intensification of agricultural activities without the adoption of appropriate measures for the prevention of soil erosion, land quality deterioration, and degradation of water resources.

Particularly, the uncontrolled expansion of agricultural production into the fragile marginal land and the remaining forest poses a potential threat to the ecosystem with possibly serious consequences. These problems will be more serious as cultivated areas in the highland watersheds continue to expand. Furthermore the new land is increasingly marginal in terms of slope, fertility and water availability. This situation is similar to what are happening in other developing countries in the region such as in the Philippines.

EFFORT IN PROMOTING SANREM

The rapid changes in land use and the associated environmental problems in the uplands had made decision makers realized that achieving higher growth in agricultural production alone will not ensure a sustainable economic development.

At the national level

Sustainable agriculture and natural resource management have become an important issue in policy and economic development planning in the uplands of Vietnam in recent years. Response to these trends, Vietnam has adopted measures aimed at reversing deforestation trend and erosion. The Re-greening of the Barren Hills Program (Decision 327) was adopted in September 1991. In 1998, the government has promulgated the Decision 661 to reforest 5 million hectares by 2010 and the related Decree 2 on the allocation of forestland to households. These programs recognize the potential to develop, reforest and protect a natural resource system through sound and careful management involving local households.

Perhaps the most important policy change in rural Vietnam has been the recognition of land use right first in 1988 and then by Land Law in 1993. The government has also released the new Law on Water Resources in 1998. More attention has also been given to decentralization in environment and natural resource management. For instance, Decree No 29/1998/ND-CP (Government of Vietnam, 1998) clearly devolved general environmental responsibility to the grass roots. In the more specific context of water resources, the Law on Water Resources devolves, equally clearly, water resource management to the local communities or the masses. The Government of Vietnam's current support for the devolution process, greater decision-making and grassroots democracy at the commune level, and the growing role of Vietnamese Organizations in rural areas is expected to allow for creative and participatory planning processes that is beneficial for all actors, including vulnerable groups. The Government of Vietnam's new National Environmental Plan (2001-2010) pledges to support collaborative efforts with Vietnamese organizations towards cost-effective environmental education and awareness campaigns.

These evidence clearly show the increasing efforts of Vietnam government to achieve higher economic growth and at the same time to protect the environment and the natural resources. However despite many impressive achievements in economic growth, approximately 30 million people (37% of the

population) continue to live in poverty. Nearly 25 million people (60% of the work force) are either underemployed or unemployed, while each year, approximately 1 million new people join the workforce (World Bank 2000). Meanwhile environmental and resource degradation are still a common phenomenon observed in many parts of the country. These numbers and facts imply that the government needs to spend more efforts to promote sustainable and natural resource management.

At the local level

Local authorities have undertaken some efforts to protect and enrich the forest and water resources and to control soil erosion. However the results are mixed. Dailao commune for example has a program for allocating 300 ha of forestland to individual households for forest protection, reforestation, and agroforestry. However, the implementation of this program is still at the beginning stage and lacks the full participation of local people. Therefore, at present, its impacts are not readily apparent at the local level.

Some research institutions, universities, and NGO and local institutions have also supported farmers to control soil erosion more effectively. Demonstration plots were established to introduce soil erosion measures to farmers. Mulberry farmers were encouraged to plant *Mimosa invisa* in contour line in order to prevent soil erosion. However the number of farmers benefited from such support are still very small. Many farmers did not apply these soil erosion measures due to the high cost it imposed and high family labor requirements. The design of soil erosion control measure was done without a full participation of the farmers and therefore has a little chance of adoption (Du, et al. 2001). Other efforts of local authorities usually focused on strengthening enforcement in forest protection and preventing the conversion of forestland into agriculture.

Similar approaches to reduce the negative impacts of agricultural development were also evident in Kado village. For reducing shifting cultivation, local authorities have implemented resettlement program for ethnic farmer. Shifting cultivation were prohibited. Enforcement of forest protection and preventing the conversion of forestland into agriculture has been strengthened. However the forest resources management in the area focuses mainly on forestation and forest protection but pays less attention to the mutually beneficial linkage between forest development and poverty alleviation of local people (Ha, 2000). Methods applied for preserving the forest includes the setting of forest boundary and enforce exclusion, including patrol guards. As required by local authorities and the state farm, sloping land of the commune, specifically the traditional shifting cultivation area of ethnic minority farmers, have to be planted with forest species. Some new forest have been established on existing shifting cultivation land of local farmers that reduced their opportunity to produce enough food. The forest land allocation and reforestation program have also been implemented without a full participation of local farmers.

As can be derived from the previous section, a serious overexploitation of surface and ground water is taking place in Eal Tul watershed and it is not likely to be less in the near future. These problems are reflections of inefficient institutional guidelines regarding water and land use and weak enforcement, not only in Eal Tul watershed and Dak Lak province but also for many other upland areas of Vietnam.

Concerning the rapid land use changes and the environmental problem associated with it, the province has taken some efforts to address the issues. These include:

- Speeding up the process of providing land use right certificate to farmers.
- Encourage farmers to adopt more secure cropping systems and to grow less water consuming crops in the area, especially to substitute the Winter-Spring rice.

- Strengthen enforcement of rules related to water, land and resettlement.
- Participatory Irrigation Management (PIM) for surface water use in irrigation schemes were initiated. Water User Associations (WUA) were established in some communes.
- A steering committee of PIM was established to carry out planning and provide guidance of implementing PIM program in the province.

The effort of the province in speeding up the process of providing land use right certificate to individual farmers is an important step towards enhancing agricultural productivity and better natural resource management. However the proclamation of private property rights alone do not simply lead to sustainable land use. The short-sightedness, and the inability to bear the investment costs of conservation are reasons why most farmers in this area did not apply any soil and water conservation measures. The low incentives for reforestation do not encourage local farmers to invest in forest planting. The cultivation of coffee on the marginal land has also been encouraged by inefficient institutional arrangements with respect to forest, land, and water resources.

The provincial DARD encourages farmers to plan rubber and recently cocoa with the knowledge that these crops consume less water than coffee. However these species are not attractive to local farmers in terms of private profitability and accessibility to the market. There is also not enough incentive to encourage farmers to adopt more secure cropping systems and to grow less water consuming crops in the area, especially to substitute the low efficient and high water consuming Winter-Spring rice. To support farmers in adopting better use and management of the water resource, local extension and irrigation officers should play a facilitating and guiding role, as should have the Government with its investment and water policy.

The enforcement of the Water Law promulgated in 1998 created the need to assist local stakeholders to devise effective and efficient water resource management instruments, include an exploration of the applicability of market based instruments in combination with regulatory instruments. The Water Law clearly indicates the need to change from the situation of irrigation scheme focus based on subsidiary style of irrigation management companies to a more integrated approach of watershed management with the sharing of management responsibilities to local villagers. However the water resource management situation in Dak Lak province clearly show that there is still greater emphasis on irrigation schemes management and little attention is paid to integrated water resource management or integrated watershed management. In many cases farmers have not practically taken part in the irrigation management except paying for water fees. At the district and commune level, although there are regulations on mandate and responsibility, detailed regulations from the province are lacking concerning the co-operation between different district units as well as between district located in the same watershed.

The decentralization spirit of participatory irrigation management (PIM) has been initialized in the province. The most important impact of PIM initiatives was the adoption of this approach by Dak Lak People's Committee. The province decided to establish a Steering committee of PIM that will carry out planning and guidance of implementing PIM program in the province. This can provide an opportunity to scale up PIM initiative elaborated by the SWRM project. However, the process of scaling up of PIM is undergoing difficulties. Main constraints of decentralization observed in the water resource management sector in the study area are the fact that staff members of management institutions were not well prepared for a participatory management systems. Key informants interviews reveal that some staff may not fully comprehend what decentralization and administrative reform will entail or how to increase participation. Some officials are still reliant on top-down direction.

Even when there is a relatively clear policy at the national level, there is no clear and detailed policy and

legal framework guiding, supporting and creating an enabling environment for agriculture and irrigation sectors development and no comprehensive policy framework for an integrated water resource management at the local level.

At the provincial level, there is also a lack of detailed regulations to guide the relevant agencies in co-operating with one another to develop and protect water resources and irrigation schemes. Among the agencies, there is also a lack of integration in the direction of harmonising forest, land, water and population. For example, the regulations on management decentralisation as well as functions and tasks of irrigation scheme management are not well clarified. This leads to confusion in handling work. For an efficient use of the water resources, more efficient institutional and legal rules with respect to land and water and stronger enforcement are needed. These factors, together with a more efficient pricing system that reflects the scarcity value of water, will provide an environment under which farmers could make their own decisions regarding the use of the water resource in a sustainable manner.

The situation described in three case studies clearly show that local farmers and communities were not adequately involve in the management of local natural resources. Natural resource and environmental planning and management is still highly centralized at all levels. Little attention has been paid to capacity building for environmental and natural resource management at the community level. Currently, many villagers have only limited awareness on environmental and natural resource degradation caused by their unsustainable agricultural practices. Among decision-makers, there are also a general lack of information on the socioeconomic and environmental impacts of their decisions, especially at a watershed scale. There is a need to identify and use appropriate decision-support tools for policy makers and to engage in natural resource management and planning at both community and watershed scales.

CONCLUSIONS

Results of the case studies conducted in the Central Highlands indicate that the current agriculture and natural resource management system need to strike a balance between economic development, environmental integrity and social welfare. Experiences in Central Highlands show that top-down direction and enforcement of regulations are still the common approaches implemented by local authorities in resource management. However enforcement alone seldom worked. In recent years, the commune is becoming an increasingly important decision-making unit as the government push for greater decentralization and accountability at the local level. But implementation has presented complex challenges. Decentralization in natural resource management is uneven across areas. As sustainable agriculture and natural resource management deals with multiple inter-related aspects including socio-economic, biophysical, environmental and institutional aspects, a close inter-institutional collaboration is highly desirable. There is a need to create a sustainable framework for collaboration, which effectively engages local communities, government agencies, and other social organizations in natural resource management.

The rapid development of markets, since the country shifted towards a market economy, also poses additional challenges to local administrations as they have to change their perspectives and redefine their roles in relation to the changing economic and institutional conditions. The situation in the Central Highland, particularly as in the case of Kado commune, shows that there is also a need for changes in perception about upland and upland resource management. Rather than focusing only on watershed protection for the benefit of the lowland areas, policy makers also need to promote production systems that generate income for local farmers and at the same time compatible with the environmental objectives. The conservation of natural resources would have more chances of success if it reconciles with the social and economic needs of local people.

To achieve sustainable development in the upland watersheds of Vietnam better policies and plans that integrate environmental, economic and social goals are required. Access to information and decision-support tools is needed to support decision-makers and provide them with information on the potential impacts of policies on the economy and the environment at a watershed scale.

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