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Economic Benefits of the A'Vuong Watershed in Vietnam to Indigenous Ka Tu People

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I. INTRODUCTION

This study has investigated the economic dependence of the Ka Tu people on the A'Vuong watershed in Vietnam. It is part of the Swiss-Re funded A'Vuong watershed project, which focuses on developing a comprehensive framework for the management of freshwater and forest resources by indigenous Ka Tu communities in the upland watershed areas of Quang Nam province, Central Vietnam.

The upland A'Vuong is one of the primary watershed systems that supports the Thu Bon river, with six other critical watershed forests contributing to its mighty flow. The area is highly valuable in terms of its biodiversity – dense rainforests cover most of the watershed. In 1993, the area became internationally famous for the discovery of a new species of mammal, the Saola. Since then, several other animal species have been discovered.

At the same time, the mountainous region of Quang Nam province in which the A'Vuong is located, is rated as one of the poorest in Vietnam. The Committee for Ethnic Minorities and Mountainous Areas (CEMMA) has ranked 60 communes in the six mountain districts as highest priority for poverty alleviation and development assistance, out of a total of 63 communes in the region. The population of these six districts is 87% ethnic minority, from 12 different ethnic groups. In the upper A'Vuong area, transport, market access, education, basic infrastructure, health care and social services are all minimal, whilst the effects of war are still present. 'Agent Orange' defoliant, carpet-bombing, unexploded ordinance, and massive social upheaval have ongoing repercussions on the stability and development of communities and local institutions in the area, 30 years after the conflict ended.



A Vuong river in Ta Lang Commune after building the Ho Chi Minh High way

(Photograph by Dang Thuy Nga)

The area has also seen the development of a major infrastructure project - the Ho Chi Minh Highway. The Ho Chi Minh Highway construction project began in 2000. In Quang Nam, the road is completed, apart from two bridges and escarpment stabilisation. The road transects the A'Vuong watershed and bridges the river three times. The environmental impacts of this road have been keenly felt by the locals as earth and aggregate from the construction has been dumped into the A'Vuong river. Furthermore, as the road is improved, more outsiders make regular trips to the A'Vuong watershed forest for illegal collection activities. Finally, although economic opportunities, due to better access will be provided by the road, to date it is only the Vietnamese traders who are benefiting

from exploiting local resources. The local Ka Tu people of the A'Vuong area still lack the skills, investment capital, loan collateral, and outside connections to take advantage of new market options.

Other infrastructure development is being planned in Quang Nam, most notably twelve small-to medium-scale hydro-electric dam projects. Of these twelve, the A'Vuong dam project is the most advanced to date, with detailed plans and a project management board. The small dam will be built in the mid-reaches of the A'Vuong river, with construction to begin tentatively in mid-2004.

A provincial logging-ban, aimed at an emergency re-assessment and moratorium on forest loss, has proved difficult to enforce, with the remoter watersheds such as the A'Vuong becoming a key target for illegal timber and rattan collection. Commercial hunting for the wildlife trade, including species such as the tiger and saola, is depleting essential forest resources and ecosystem functions that support local subsistence and culture.

It is clear that any work in the A'Vuong watershed requires a careful balancing of the needs of the local people with conservation of the valuable biodiversity. This study will contribute to that by building a better economic understanding of how local communities depend on the watershed. The goal of this study is to determine the economic values of the natural resources of the A'Vuong to local people, focusing on timber, non-timber forest products, water and agriculture. The outcomes of this study can be used as inputs in decision-making processes on the A'Vuong watershed, and must be taken into account in any future planning activities in the area.

II. The A’Vuong Watershed

1. The People of the A’Vuong

The upper A’Vuong watershed covers four communes (administrative units containing between 5 and 15 hamlets), namely A’Vuong; Bhalee; A’Nong; and A’Tieng. These communes are located in Tay Giang district. The indigenous population is Ka Tu, one of Vietnam’s 54 ethnic groups who traditionally live in the upper reaches of the Truong Son mountains and the Hai Van ridge, in Central Vietnam and Laos. In total, there are roughly 45,000 Ka Tu people in Vietnam. The four communes of the A’Vuong contain a total of 25 hamlets. Table 1 further illustrates the demographic situation in A’Vuong.



Ka Tu Woman

(Photograph by Kirsten Schuyt)

Table 1: Demography in the A’Vuong Watershed

Commune (hamlets)	Popn. 1995	Popn. 2000	Popn.2003 ¹	Popn. 2005	Percent Ka Tu
A’Vuong (8)	1,284	1,403	N/a	1,453	95%
Bhalee (8)	1,602	1,709	2095	N/a	90%
A’Nong (4)	879	917	650	N/a	100%
A’Tieng (5)	1,650	1,718	N/a	1,778	100%
Total: 25 hamlets	5,415	5,747			96%

The Ka Tu of Tay Giang traditionally practice shifting cultivation, based on a variety of highland crop cycles, centred upon hill rice. The Ka Tu have strong animistic beliefs in the spiritual essence of all things, and have a deeply ingrained knowledge and cultural appreciation of the forest and its offerings. Traditional clothing reflects rank, status and clan identity, with a wide range of natural motifs, colours and designs, although modern clothes are more often seen on a daily basis. Ka Tu society is based on clan and kinship, with social and geographic ties between clans and locations. Each village has a clan longhouse “*Guorrl*” for meetings and recreation. Traditional norms and laws govern the use of rivers, water and river resources, with detailed rituals and deliberation on irrigation and altering watercourses. Local navigation and land marks are all based on the streams, rapids, falls, gulleys and pools. Every stream has many names for the different sections and confluences, whereas often local mountains and more obvious landmarks have no set name. Cultural institutions also govern land use, land ownership and forest management, as well as tree tenure and rules for planting and managing trees in the forest.

2. Famous for Its Remarkable Biodiversity

In 1993 the Truong Son mountain forests, of which A’Vuong is the centre-pin, became internationally famous for a newly discovered species of mammal, the Saola (*Pseudoryx nghetinhensis*). Following this remarkable scientific discovery, a host of other species have been described, including the Truong Son Muntjac (*Muntiacus truongsonensis*), discovered in A’Vuong in 1997. The area has acted as a ‘refugia’, allowing specialised, endemic creatures to evolve. The distinctive biodiversity found in A’Vuong is attributed to the continuation of warm, wet conditions during the last ice age. Across most of Southeast Asia, habitat fluctuated between moist evergreen rainforest and more open dry forest, but the unusual

¹ Source: Village leaders and Tay Giang Border defending police.

conditions in the Truong Son mountains allowed rainforest to persist, giving its fauna and flora thousands of additional years to evolve. These conditions persist today due to the short dry season, created by the high ridge holding the easterly monsoons over the mountains, while areas surrounding the landscape suffer major climactic changes.



Dense forest in the A'Vuong watershed
(Photograph by Kirsten Schuyt)

3. Threats to Livelihoods in the A'Vuong Watershed

Hunger is a recurring theme for up to three months of the year in the majority of communes. Dependence on forest and river resources is high. The local people harvest timber for construction of their houses; non-timber forest products, such as medicine, rattan, honey, mushrooms and other vegetables; wild animals for food; freshwater for drinking, washing and cooking; and the land for agricultural production.

Deforestation, over-harvesting and the development of open-access forest areas are depleting essential natural resources, whilst soil fertility and productivity is decreasing due to exhausted agricultural areas and the adverse effects of seasonal drought, floods and erosion. The construction of the new 'Ho Chi Minh' highway, which transects A'Vuong commune, has opened up the area, yet so far provided only massive siltation and choking-up of the A'Vuong river, badly depleting river resources. The WWF Participatory rural Appraisal survey in 2002 discovered that 100% of respondents from A'Vuong raised the issue of a drastic loss of freshwater resources. The survey also showed that, provided with a new access route, 'outsiders' increasingly infringe on local resources in A'Vuong, polluting streams, reducing forest areas and decimating populations of key subsistence, cultural and economic species vital to local communities. Most hamlets lack representation and lack cohesion, whilst customs and traditional institutions have been eroded by poverty and ineffective local government administration which rarely caters for particular local needs.

The result of the despoiling of the A'Vuong (and other) watershed forests is drying up provincial revenues and causing ripple effects across lowland communities, as fish stocks plummet, pollution levels rise, floods are increasingly severe and periodic. The last major flood, in 1999, caused millions of US Dollars in immediate damage, caused loss of life, and cost millions more in reconstructing devastated livelihoods and infrastructure. Severe floods predicted for 2002 never appeared. In 2003, a year of drought has affected the province and increased incidence of forest fires. Widespread drilling of wells in Quang Nam and Da Nang city has caused water levels in the springs fall more than a dozen metres below the average levels, and most of the wells are being drilled with obsolete equipment, contaminating the water. The hotel industry has been identified as another culprit in the water shortage crisis. Every year, Hoi An attracts thousands of domestic and foreign tourists and a slew of hotels and restaurants have sprung up in response.

II. Economic Values of Natural Resources

Ecosystems provide a wide variety of benefits to both people and biodiversity. For example, freshwater ecosystems provide fish for food, water for drinking, irrigation, washing and cooking, the recycling of nutrients and human waste and flood control. The services provided by forest ecosystems have been classified as follows (Daily, 1997):

- Provisioning forest goods, such as timber, food, medicine
- Regulation of ecological processes, in particular watershed protection, carbon sequestration, biodiversity sequestration
- Cultural and enriching services, including spiritual and aesthetic values, scientific value

These services constitute values to humans. This total value consists of an ecological value, such as the maintenance of ecosystem stability and climatic stabilization; a socio-esthetical value, such as the role of ecosystems in cultural heritage; an intrinsic value, which is the value that resides in the environmental asset itself; and an economic value.

Economic values are monetary measures for benefits or costs of environmental change (Wills, 1997). They are based on estimates of people's willingness to pay for that environmental change or willingness to accept compensation for that change. Economic values will, however, always depend on the type of functions that are perceived as valuable to society – what people perceive as having of value to them (Turner et. al., 2000). Hence, not all functions have an economic value. Only functions that provide goods and services that satisfy human wants directly or indirectly have an economic value.

Economic values are usually distinguished as use and non-use values. Economic use values of ecosystems comprise the direct use of an ecosystem's goods, such as the consumption of fish for food, trees for fuel wood or as a building material, and water for drinking, cooking and washing. Use values also include the indirect use of an ecosystem's services, such as water retention capacity (including man-made for irrigation or energy production), carbon sequestration and nutrient recycling. Lastly, option value can be distinguished as a use value - this is defined as the value of a wetland to humans to preserve an environment as a potential benefit for themselves in the future. For example, some people would be willing to pay for the conservation of a tropical rainforest as a potential source of medicine against diseases like cancer and aids. The non-use value of a wetland refers to the non-instrumental value, not associated with use. This includes existence value - a recognition of the value of the very existence of wetlands. For example, some people may have sympathy with or concern for the welfare of certain animals - a desire that certain species should exist. These people would then be willing to pay for the conservation of this species. This study only focuses on use values of the A'Vuong watershed. The total economic value is therefore an underestimate.

Economic values can be quantified, a process that is called economic valuation of ecosystems. For those ecosystem goods and services that are traded in the market place and whose prices are not distorted, market prices can be used as indicators for economic values. Often, however, most goods and services do not have a market price and shadow pricing techniques can be applied to determine their economic values. Economic theory distinguishes several shadow valuation methods. For example, a well-known method is called Contingent Valuation, which directly obtains consumers' willingness to pay for a change in the level of an environmental good, based on a hypothetical market. Another example of a shadow pricing method is the Travel Cost method. This method relies on individual valuations of

environmental goods that are revealed in the travel costs made by consumers to obtain the environmental good, such as distance costs per kilometer traveled, time costs of the individual, and the entrance fee of the particular environmental good. The underlying study only focuses on use values that have a market price. Shadow Pricing techniques were not applied.

Although application of economic valuation must be done with care, it has an important added value. In general, one can say economic valuation of ecosystems has two benefits. First, economic valuation is important to highlight the relative importance of different economic activities of local people that depend on ecosystem functions. In this way, it can make important contributions to management plans of ecosystems like the A'Vuong, including the exploration of payments and compensation schemes by upstream stakeholders, the next steps in the Swiss-Re funded watershed project of which this study is part. Secondly, economic valuation may be useful in countering arguments on ecosystem conversion. Putting a monetary value on activities can highlight the significance of natural resources for people and thus provide strong arguments for the sustainable management of natural resources. The outcomes of this study can therefore be used in highlighting the importance of sustainably managing the A'Vuong watershed to the Vietnamese government.

III. Methodology

1. The Research Team

The research team members consisted of local Vietnamese researchers that were selected by Quang Nam Forest Protection Department. The researchers were local staffs from the Tay Giang district FPD, the Tay Giang Women association, the district Youth Union, the district economic department and the border defending police in Tay Giang district. All researchers were selected on their experience in carrying out studies such as Participatory Rural Appraisals and surveys and many had been involved in previous WWF-Indochina projects. They were also familiar with the customs of the local people, which ensured higher quality data.

2. Questionnaire Design

The data collection process on prices and quantities of natural resources was carried with household questionnaires. The questionnaire was divided into five main parts in order to get quantitative and qualitative data to assess the economic benefits of the watershed area to local people: (1) harvesting and using timber; (2) non-timber forest products; (3) agricultural products; (4) water products; and (5) other sources of income. After the questionnaire was designed, it was tested by the research team in one village. The research team then adjusted the questionnaire to better meet local circumstances.

3. Selection of the Study Area

The purpose of the study was to carry out an initial economic valuation of the A'Vuong watershed goods to local communities. Therefore, the places for the household survey were located in the upstream area of the A'vuong River where most villages are located. We used a map of the A'vuong area in Quang Nam province and the assistance from local expertise of the research team (people from Quang Nam FDP and Tay Giang FDP districts) to locate villages where the survey needed to be carried out. There are 25 villages in total, situated in 4 communes: A Nong, A Tieng, A Vuong and BhaLee. We carried out the survey in 24 villages (*see Annex I*).

4. Sample Selection of Households

The number of households in which we carried out the survey were selected based on the estimated number of households in each village. Budget and time available for the study further determined the amount of households ultimately surveyed. Each village has about 36 households on average, and the survey was carried out in 12 households per village. This encompasses about 33% of total households in per village.

We further sub-divided the 12 households in each village into three levels of living standards: rich, middle and poor. Each time, this selection was done by the village leader, who knows exactly the living standard details of the households in his village. For example, the selection of households was generally based on the type of house, the amount of luxury goods and income of households in the household. Generally, richer households own basic electric

appliances, such as radio; TV or motorbikes, and their houses are built by over 5 m³ of timber or by bricks. Middle households have just separated economy from their parents and been living in new timber houses. Poorer households have only houses with Neohouzeaua (a type of bamboo called *Schyzostachyum pseudolima*) walls and soil foundations. In some cases, however, the surveyors could not interview the selected households because they were working on the field. In those cases, the surveyors selected alternative households with a similar living standard based on their observation of available luxury goods, type of house and assessment of income.

The total number of surveyed households was 288, of which 99 constituted poor households, 109 middle income households, and 80 richer households. These numbers account for 33% of households in 24 villages.

5. Collection of Market Prices

Although economic values can be calculated in a number of ways, the approach in our study was using market prices and quantities of goods of the A'Vuong watershed. Obvious places to start are local markets. However, small markets where local goods are traded do not exist in the A'Vuong area. Instead, goods are informally traded between households and between villages. Each village has a small store selling groceries such as salt, glutamate run by the Kinh people who are from plain area These groceries also create a small market for the local people in the villages, and it is generally a place where forest products (mostly non-timber forest products) are sold or exchanged. The small stores also act as the connection between the village and the town. Therefore, we carried out a survey of market prices in each village through semi-structured interviews with the storeowners and with local people in the village engaged in trading goods. These questions were focused on goods that people in the village often sell and exchange.

6. Limitations of the Study

It is important to note this study only estimates the benefits of the A'Vuong watershed, and not of the whole A'Vuong river. Only upstream communities were interviewed. Downstream stakeholders must be included in any management plan and a study of the socioeconomic benefits and their distribution among upstream and downstream stakeholders are logical next steps. This study also had the following specific limitations:

1. Many goods are not traded in local markets, making it difficult to collect market prices for all goods. Hence, calculation of economic values for all goods in the A'Vuong was not possible. For those goods that did not have market prices, qualitative data was collected to describe the economic dependence of local people on these goods.
2. One village was excluded from the survey in the selection of the villages. The reason was a lack of information between the research team and people in Quang Nam FPD and local government staff on the other hand. Changes in administration systems in the local area had been made, which meant that some villages were merged while others were divided into two. The missed village is Zo Buop, belonging to the A Tieng commune. However, this accounts for only 4% of total potential collected data, therefore, it does not seriously affect the data collected.

3. Language barriers existed as the language spoken by the researchers was Vietnamese not all local people fluently speak Vietnamese. Instead, they speak the local dialect of the Ka Tu. Sometimes the research team members had to change proposed households because household members did not understand or speak Vietnamese. The language barrier might have influenced the data collected.

IV. Economic Values of the A'Vuong Watershed

1. Economic Value of Timber

Although eight timber species are preferred by local people, most of them have been using two main species: *Talauma michelia hypolamra* and *Parashorea chinensis*. Timber is not collected annually by households. Therefore, the data was collected only with households who harvested in the last 10 years. About 73% (equally 209 households) of the households surveyed harvested timber to build their houses and for furniture making purposes. The number of middle households with timber houses is the highest with 91 households (32% of total interviewed households), 18% for poorer households and 23% for rich households. The other poorer households often harvest small trees (with diameters smaller than 10cm) in the recovering forest for house frames only and house walls are neohouzeaua (a kind of bamboo)

Local people often transport timber from the forest back to their villages using four modes of transport: cows; carrying the timber themselves; using the river; and occasionally hiring trucks. Almost 84% of households which harvested timber carry timber by themselves, while 2% are able to hire trucks. Poorer households never use trucks. About 14% of households use the river to transport timber.

The price of timber is calculated using the average price for which local people buy the average type of timber. Seventeen households in total buy timber to build their houses and to make furniture. These 17 households bought over 46 m³ of timber over the last 10 years for an average price of VND1,376,000/m³. This price is used as the average price for all kinds of timber harvested by the local people. From this average price, the gross value is calculated (see Table 1).

Normally each household only harvests timber once in their life to build a family house. This is mostly for subsistence use. Due to the logging ban in Quang Nam province, the timber harvesting processes are controlled by the district FPD. All of interviewed people said they don't sell any timber for income. In general, people only harvest timber when they need to build a house or make furniture. At that time, the total harvested quantity is on average 988 m³. For obvious reasons, richer households have the highest quantity with 6.4m³/household and the poorer harvest an average quantity of about 3.9m³. Since this quantity is harvested once in a lifetime, there is a need to divide this quantity by the average lifetime of a person in A'Vuong..

The costs for timber, which will be deducted from these gross benefits, include the cost for sawing and transportation. Most local people chop down the timber by themselves and hire someone to saw the timber. They usually pay for a sawer's food during the time of sawing and their wages. In terms of transporting timber, only households which hired trucks had direct costs for transportation. Others often ask family members or their neighbors in the villages to help them carry the timber. People often exchange labors when they have big work loads such as transporting timber or neohouzeaua. Deducting the costs about VND 669,000 per household from gross benefits means timber can bring an economic net benefit of approximately VND 5,800,000 to each household in whole their lifetime. The average life expectancy in Vietnam is about 60 years. Therefore, each year one household can have net benefit from timber by over VND 97,249. By this benefit, each year whole A'Vuong watershed area can bring over VND 85million of net benefit to local people

Table 1: Comparison of benefit from timber among groups of households

	Total	Richer	Middle	Poorer
No of hhs harvested timber	209	66	91	52
%	73%	23%	32%	18%
Total harvested quantity (m ³)	988	396	404	188
Total gross value	1,359,336,178	544,690,706	555,694,559	258,590,537
Costs	139,828,000	54,365,000	62,433,000	23,030,000
Net benefit (VND)	1,219,508,178	490,325,706	493,261,559	235,560,537
Net benefit (VND)/year	20,325,136	8,172,095	8,221,026	3,926,009
Net benefit (USD)/year	77,676	31,231	31,418	15,004
Average harvested quantity/hh (m ³)	5	6	5	4
Gross value/hh	6,504,001	2,749,690	2,071,973	1,681,814
Costs/hh	669,033	823,712	686,077	442,885
Net benefit/hh	5,834,967	7,429,177	5,420,457	4,530,010
Net benefit/hh/year (VND)	97,249	123,820	90,341	75,500
Net benefit/hh/year (USD)	6	8	6	5

Note: * Exchange rate: 1 USD = 15700 VND

*hh: household

2. Economic Value of Non-Timber Forest Products (NTFPs)

a. Definition and Characteristics of NTFPs

There are about 48 different kinds of NTFPs harvested by the people in A'Vuong. These NTFPs are classified into 4 main groups: wild animals, wild vegetables, medical plants and fibre plants. Table 2 shows the dependencies of people on different NTFPs.

Table 2: Some main NTFPs harvested in A'Vuong area

NTFPs	Number of household		Dependence (nr. of people)	Dependence (% of people)
	household	%		
Mouse	101	35.07	678	36%
Common barking deer	39	13.54	274	14%
Bamboo rat	39	13.54	263	14%
Weasel	21	7.29	142	7%
Neohouzeaua	259	89.93	1,685	89%
Rattan	197	68.40	1,264	67%
Firewood	288	100.00	1,900	100%
Bamboo shoot	275	95.49	1,818	96%
Wild banana flower	72	25.00	470	25%
"Don" Vegetable	53	18.40	342	18%
Wild honey	22	7.64	151	8%
Pennywort	42	14.58	310	16%
Mushroom	22	7.64	110	6%

1. Wild animals

The highest quantities of wild animals trapped by local people accrues to mouse, squirrel, common barking deer, bamboo rat, wild pig, and weasel. Local people often put traps around their mountain rice in order to protect their crops from wild animals. Mice and bamboo rats are used in families as meat in their meals. The number of households that trap mice and bamboo rat are 101 (36%) and 39 (14%) respectively. Each household with an average of 5 members can eat 3 or more mice or bamboo rats per meal but they prefer to save mice as well as other wild meat for other meals. Squirrels are for selling for income in some households; others keep them as pets and yet others eat them in meals. Mice, bamboo rats and squirrels are mostly for household consumption.

Different from mice, bamboo rats and squirrels, the common barking deer, wild pigs and weasels are shared among households in the village. Common barking deer is hunted by 39 households (14% of total people). 7% of total households eat weasels. The least trapped wild animal is crow and field-mouse with only 1 household. Normally, crows are sold or feed as pet in family and field-mice are used in daily meals. (See Annex II)

Besides these animals, children collect termites as food after the rains. However, the household interviewees often do not mention this - children were seen by surveyors in the village when they were collecting termites on the ground in the village.

2. Bee products

Two main bee products are used by local people, namely pupa and honey. Over 8% of total households surveyed depended on harvesting wild honey. Honey is for subsistence or selling and pupa is for subsistence only as food. However, only 1 household recorded collect pupa in the forest. Getting honey or pupa is dangerous and it's difficult work. Sometimes they need to go back and forth to forest many times before they manage to get it. Only men in family do this.

3. Fiber plants

Fiber plants harvested by local people include neohouzeaua, bamboo and rattan. Neohouzeaua harvested by 259 households (equally 89% of total people) and is used for construction in poorer households - often by the children that have just separated from their parents - and for making fences. Rattan is also harvested from the forest by 68 households (about 68% of total people) and is used for selling, making baskets and fastening frames of houses. Rattan is one of the main income sources for households. However, it also depends on the number of labourers in a family: the more labour, the higher harvested quantity of rattan. Harvesting fiber plants is considered as hard work and done by men in the family. Only in some poorer households, with a lack of labour, the women are involved in these activities.



Flattening neohouzeaua for building a house

(Photograph by Dang Thuy Nga)

4. Firewood

Firewood is the essential need of all families (100%) because people don't have enough money to buy other types of fuel and they can get firewood for free. Also, they can earn money from firewood collection. Normally, children take firewood to the groceries, run by the Kinh people, to sell. The Kinh people use firewood for cooking including mash for pigs. Firewood can be collected by any member in family but normally by women and children. Most families gather 1 basket of firewood everyday. They also store firewood in their kitchen to use in rainy season.

5. Medical plants

People only harvest medical plant for stomach treatment - only when they need it. The households interviewed did not know the Vietnamese name of this plant. Only 7 households harvested these plants as medicine. These kinds of plants are collected by head of households or old man in the family.

6. Vegetable plants

Wild vegetables are the most diverse forest products harvested by local people with 21 species. The most popular vegetable is bamboo shoot with over 95% households depending on it for food. Furthermore, wild banana is harvested, including its fruit, trunk, root and flowers. Trunk and root of banana trees can be used as a kind vegetable or to cook with other vegetables. Wild banana flowers are more preferred and are consumed by 25% of total people surveyed. Only one household harvested banana root, trunk and fruits. "Don" and pennywort are 2 other kinds of vegetable consumed, with over 18% of total people using don in daily meals and 16% of pennywort. Mushroom is also harvested but at a lower rate – only 6% of total people depend on harvesting mushroom. Mushroom is also a source of income. In that case, mushrooms are dried in the sunlight and sold. Vegetable plants are often collected by women in the family only.

7. "Dot"

"Dot" is a type of grass that is harvested to make part of a broom. People can sell the grass to Kinh people or for their consumption. There are only 2 households harvesting this grass.

b. *Economic Values of NTFPs*

The economic value of NTFPs is the value either for direct consumption (subsistence), for exchange by barter, for sale, or in the production of other goods and services. The value of marketed NTFPs is calculated by multiplying harvested quantities with market prices of goods. Not all NTFPs have market prices because they are used for subsistence only. Therefore, the value estimated here is a low estimate compared to the "true" economic value of NTFPs. It became clear that only NTFPs that Kinh people consume have market prices - when local Ka Tu people sell or exchange NTFPs for Kinh people to get groceries or spices.

The market prices used to value NTFPs are averages of village market prices (*see Section III page 9: Methodology and Annex IV*). Some NTFPs, such as wild taro, are not sold by local people directly but exchanged to get foods such as cookies, rice, or spices. In that case, the value of the stuffs or spices are used to measure the value of those NTFPs. Furthermore, some NTFPs are not sold in the same unit as the unit in which it is harvested, therefore conversion

rates are used for specific NTFPs (*see AnnexIII*). These conversion rates were collected from local people and surveyors' observations.

To value meat from wild animals, total trapped animals whether marketed or not are multiplied the local market prices. Assumptions were made on wild animals' weight based on descriptions of trapped animals by the people (describing the length of the animals by span unit) in those cases where the market price unit is different from trapped units.

Value of medical plants are not included here because no details on harvested quantities were given by the people surveyed. Many people didn't know how much they use each time and they only use them when they have stomach ache.

In terms of costs, local people often do many types of work each time they go to forest to harvest NTFPs. For example, they commonly harvest NTFPs on the way to mountain rice fields. Therefore there is very little opportunity cost involved in harvesting NTFPs. Therefore, costs are negligible and will not be deducted from the gross economic value of NTFPs. The annual average value that NTFPs bring to each household is over VND 2,743,000. This is a very low estimate because many NTFPs do not have market prices and are therefore not included in this estimate.

The economic values of harvested NTFPs per income category are presented in Chart 1 and Table 3 below.

Chart 1: Value of marketed non-timber forest products

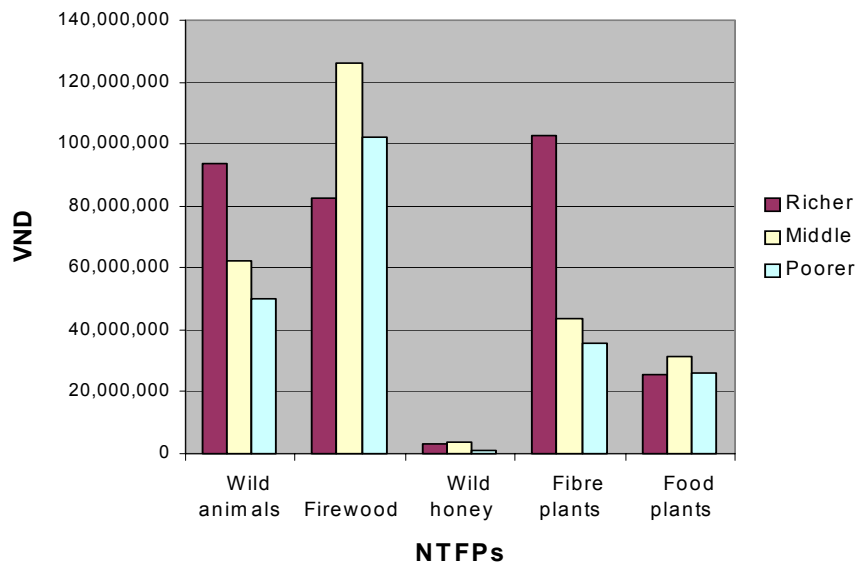


Table 3: Annual economic value per household of NTFPs in A’Vuong area

Items	Total	Richer	Middle	Poorer
	205,835,00			
Wild animals	0	93,707,500	62,237,500	49,890,000
	311,025,00			
Firewood	0	82,457,500	126,135,000	102,432,500
Wild honey	8,441,723	3,400,982	3,775,168	1,265,573
	182,096,57			
Fibre plants	6	102,783,589	43,885,075	35,427,911
Food plants	82,607,756	25,364,853	31,198,766	26,044,137
Medical plants	n/a	n/a	n/a	n/a
	790,006,05			
Total gross value (VND)		5 307,714,424	267,231,509	215,060,121
Total gross value (USD)		50,319	19,600	13,698
Gross value/hh/y				
Food plants	286,832	384,316	342,844	500,849
Wild honey	29,312	11,809	13,108	4,394
Fibre plants	632,280	1,557,327	482,254	681,306
Wild animals	714,705	1,419,811	683,929	959,423
Firewood	1,079,948	1,249,356	1,386,099	1,969,856
Total gross value/hh/y (VND)	2,743,077	4,622,619	2,908,233	4,115,828
Total gross value/hh/y (USD)	175	294	185	262

As we can see from the figure and table, the value of firewood is the highest with over 311 million VND per year. The value of wild meat is the second most valuable NTFP with 205 million VND per year. The richer income group benefits the most from wild animals (93 million of VND) and fiber plants (102million of VND). The middle income group benefit the most from firewood, wild honey and food plants (126 million VND, 191 million VND, 3.7 million VND and 31million VND respectively). The poorer group benefits the least from NTFPs (over 215 million of VND in total). An explanation for this is that richer and middle income groups have more experience in harvesting NTFPs than the poorer group; therefore, they could harvest much more NTFPs.

3. Economic Value of Fresh Water

Local people benefit from the river for transportation and irrigation, and on small streams (river branches) for drinking, cooking and washing.

a. Use of river water

1. Drinking, Cooking and Washing

Water from A’Vuong river and streams is the main source of water for people. 100% of people in the area use this water for their daily living such as drinking, washing and cooking. There are many ways that local people get water for their daily use. The most popular way is one which is funded by government programmes: the government supplies water pipes to

each village to direct the water from the stream to a water tank in the village. Each village has one such water tank. However, some households live too far from the water tank, in which case they have to buy extra pipes or cans to transport water to their houses. The poorer households prefer buying cans to transport this water as a water pipe has a higher price. Family members walk to the water tank to obtain the water and carry it back to the house by hand. Only a few heads of households are involved in carrying water - mostly this is a women's and children's job.

2. Irrigation

Only 2.7% of households use river water for irrigation. The reason that only few households have water-rice fields which use more water besides rain water than other crops. Other crops depend only on rain water the whole year.

3. Transportation

17% of the interviewed households had taken advantage of the river to transport forest products from the forest to their villages. River transported forest products include timber, rattan and neohouzeaua. Only one household uses the river to go to their mountain field on a bamboo raft.

b. Use of Aquatic Goods

Four main products are harvested from the river by local people: frog, snail, turtle and fish. Snail and fish are most popular. Only few fish are sold in the market - most are for household consumption (subsistence). Turtles are very few and were caught only by 1 household – the turtles are sold and not for subsistence purpose. About 81% of households have been depending on aquatic goods for their lives.

1. Harvesting methods

Local people collect snails by hands. Frogs are caught at night along rivers or streams - often a torch made of bamboo or flash-light is used to find frogs. Fishing activities are done by using casting nets, fishing nets, arrow-guns or hand nets. The casting net is the most expensive method but the equipment lasts longer than the other tools.

2. Changes of harvested aquaculture products

According to the local people, changes in quantities of aquatic products have taken place over the past 5 years in the A'Vuong area. 84.4% of total households said the aquatic products quantities are decreasing. 6.6% think this is due to the opening of the Ho Chi Minh highway in the area. This led to the depositing of soil in the river and streams; in other areas, the river is filled with soil to open the road. This results in the water becoming opaque so that fish, snails and other aquatic animals don't have enough oxygen for living. Some die and some move to other areas of the river. 3.7% of people who think aquatic products decrease said that the reason is an increase in the number of people harvesting. Another 1.4% of total households think the aquatic products are actually increasing now due to the abandonment of dynamite fishing. The same number of households thinks there is no change at all over the past 5 years and 0.4% of household said there were no longer and aquatic products in the river available. The reason they gave for this last opinion is the construction of the Ho Chi Minh highway. About 19% of households don't have any activities related to river and they know

nothing of the current situation of river or streams in their area. Most of those households are living far away from river/streams.

3. Adaptation with changes

There are many ways people cope with changes in quantities of aquatic products in the area. Some people (0.4%) prefer reducing their harvesting frequency. Most of them have been relying on agriculture products instead such as increasing cassava and maize consumption. 2.8% of households are harvesting more non-timber forest products to replace for low supply of aquatic products. Some people change from fishing to collecting snails when fish productivity reduces (0.4%). 17% people buy sea fish on the market instead. Lastly, 1.8% of the people are investing in fish ponds. These people usually live in lower land areas that are suitable for fish ponds.

4. Cost of harvesting

The main costs involved are the costs of buying tools such as fishing net, casting-net, flash light to catch frog etc. The annual cost for each household is calculated by dividing total cost of tools in each household by tools' duration of using (depreciation). The results show that each household will spend about VND31,399 per year on tools to harvest aquatic products.

5. Net value of river

The economic value calculated in this section does not include the value of the river as a mode of transportation or for irrigation because there is no market price available for this service of river. The economic value only includes the value attributed to harvesting aquatic goods. The gross economic value amounts to VND 530,000 per household. The net value of freshwater is VND 407,284 per year per household or over VND 442 million per year for whole people living in A'Vuong watershed area.

4. Economic Value of Agriculture

The A'Vuong watershed also offers fertile land for crop cultivation. Most foods used in families are agricultural products. Not any household plants crop on their land. Agricultural products are quite diversified, and include mainly cassava, mountain rice, water rice, corn, sugarcane, and loofah (*Luffa acutangula L.* (see Annex V). However, as was the case with NTFPs and aquatic products, many agricultural products are used for household consumption only (subsistence) and therefore in many cases market prices are not available. The agricultural products in this study include only the most common products for which market prices do exist - there are still many other products we do not value. Hence, the economic value of agriculture is under-estimated.



Carrying cassava home
(Photograph by Dang Thuy Nga)

The gross annual benefits per household from agricultural products is VND 5,000,000. Cost for agricultural activities are mostly investments to buy seedling. However most households do not have to buy seedling as they get it from their neighbors, relatives. Others store seedling from previous seasons. Most local people don't have habit use fertilizer for their crops. The government has program to encourage local people using chemical fertilizer by supplying them fertilizer but people here just use whole

the supported fertilizer because they don't have money to buy extra fertilizer for their crops. Normally supported fertilizer is very few and not enough for one season of the crops. Some other households use muck asked from Kinh people who don't have field or lands and use for their crops. And the fact shows that the crops of these people are higher than the others who don't use muck as fertilizer; however, they still keep their old habit. Therefore, there is no cost for fertilizer. For this reason, annual cost for seedling of each household is only about VND302.

Adaptation to crop loss

Agricultural activities are negatively affected by a variety of factors. 72% of the interviewed households have to face with crop loss every year. The main reasons given were drought (66%), floods (7%) and wind (7%). Crops of 52% of total households are destroyed by wild animals such as birds and mice. With those damages, every year each household will lose VND637, 000 in economic value of their crops.

Among those households that lose crop annually, 61% prefer to go to the forest to harvest NTFPs, especially wild vegetables for their daily meals. This is especially the case if people lose cassava as well as rice. The first preference when people lose rice is cassava but if they have no harvest from agriculture at all, they depend almost entirely on the forest for food.

Therefore, the annual damage costs must be deducted from the economic value of agricultural products estimated above. The annual net value is VND 4,376,876 for each household. By this calculation, each year the net benefit brought to local people in whole A'Vuong area by using land for agriculture is over VND 3,842,897,000.

5. Total Economic Value of the A'Vuong Watershed

The total economic value of the watershed area to local people is composed of use and non-use values. This study focused only on the use values - net benefits brought to local people when they use ecosystem goods such as harvesting forest products (both timber and non-timber forest products), using land for cultivation, and using river and streams for daily living, irrigation and stream products for household consumption. From Table 4 we can deduct that the highest economic value of ecosystem goods contributed to local people's lives is attributed to agricultural products with over VND 5 million for each household per year, or over VND 4 billion for the whole A'Vuong. The next highest economic value is non-timber forest products with over VND 2 billion for the A'Vuong watershed per year.

The total economic value of the A'Vuong watershed amounts to a gross value of VND 7,376 million per year. The cost to of these ecosystem goods for the whole A'Vuong area is about VND 597 million. Deducting this from the gross benefits leaves a net economic benefit of VND 6,779 million every year or USD 431,765 (based on exchange rate in 2004).

Table 4: Annual total economic value of the A'Vuong watershed

	Per household		Whole A'Vuong area		
	Gross value/y	Cost/y	Total value/y	Total cost/y	Total benefit/y
Timber	108,400	11,151	95,175,212	9,790,190	85,385,022
NTFP	2,743,077	0	2,408,421,238	0	2,408,421,238
Aquaculture	534,823	31,399	469,574,246	27,568,087	442,006,159
Agriculture	5,014,469	637,593	4,402,704,211	559,807,008	3,842,897,204

Total (VND)	8,400,769	680,143	7,375,874,908	597,165,285	6,778,709,623
Total (USD)	535	43	469,801	38,036	431,765

The economic value of the A’Vuong watershed seems low. The main reason is that many forest products have no market prices or they are not exchanged among households. Also, some products are underestimated because local people do not remember harvested quantities. Lastly, many non-timber forest products are harvested and used but no data on values is available - most of these are harvested when they are needed with no frequencies on harvesting times available. Therefore, the economic value as calculated in this study is a serious underestimate and the “true” economic value of the A’Vuong watershed is much higher. One should also remember that average incomes of people in this part of Vietnam are generally very low.

It must be noted, however, that in addition to the economic value of the A’Vuong watershed in Table 4, the A’Vuong watershed has many other economic values which benefit local people. However these values are not quantified in this study due to the lack of available data. These values are:

- Indirect use values: flood control, sediment retention, water purification, flow regulation, climate stabilization;
- Option value: potential future water use, future value of information about water;
- Non-use value : religious, cultural, scientific, legacy values

Further research should be carried out to estimate these values of the A’Vuong watershed.

The economic value calculated in Table 4, however, is the value that accrues to the communities in one year only. It is important that any alternative allocation of the A’Vuong’s water and lands must be weighed against the *Net Present Value* of the annual economic value – the discounted net benefits over a set time period.

6. Economic Dependence of Local People on the A’Vuong Watershed

In addition to the quantified economic values of the A’Vuong river, the economic dependence of the Ka Tu people on the watershed can also be clearly conveyed through dependence ratios. These ratios are presented in Table 5. The outcomes show that firewood and water for drinking, cooking and washing have the highest dependence ratios with 100%. Timber for constructing houses and furniture has a high dependency ratio with 73%, while bamboo shoots and fiber plants, such as *Neohouzeaua* and rattan, are important NTFPs for people, with 89% and 68% dependence ratios respectively. Agriculture is the most important source (100% of households depending on agriculture) for local food especially for remote areas where no market is available. Though living in watershed area, but not all local people (about 81%) take advantage from aquatic goods in water sources in the area.

Table 5 Dependence Ratios on Environmental Goods

Environmental Good	Dependence
Timber (houses and furniture)	73%
Wild animals	
Mice	36%
Bamboo Rat	14%
Common Barking Deer	14%
Weasels	7%
Wild honey	8%
Fiber plants	
Neohouzeaua	89%
Rattan	68%
Firewood	100%
Vegetable plants	
Bamboo shoot	95%
Wild banana flowers	25%
Don	18%
Pennywort	16%
Mushroom	6%
Water	
Drinking, cooking, washing	100%
Irrigation	2.7%
Transport	17%
Aquatic goods	81%
Agriculture	100%

V. Conclusions and Recommendations

About 5,268 Ka Tu indigenous people living in the A'Vuong watershed area depend for many activities almost entirely on natural resources. Most significantly, local communities depend on water for drinking, cooking and washing (100%); firewood (100%); bamboo shoots (95%); fiber plants such as *Neohouzeaua* (89%) and rattan (68%); and timber for the construction of houses and furniture (73%). Every year, the direct use value for these people of the A'Vuong watershed is at least VND 6.7 billion or US\$431,765. Therefore, threats to the A'Vuong watershed, including deforestation, over-harvesting, the development of open-access forest areas, and the development of the Ho Chi Minh Highway, are threats to the livelihoods of the Ka Tu people.

However, although the A'Vuong watershed is an important source for livelihoods to the Ka Tu, it cannot remain the sole source for livelihoods. The Ka Tu are one of the poorest communities in Vietnam and serious efforts must be directed towards improving their livelihoods and shifting their dependence from natural resources to alternative livelihoods strategies.

This study also underpins the need for integration of the economic values of the A'Vuong watershed into any management plans aimed to transform the A'Vuong watershed. Too many indigenous people depend on its goods and services. For example, the Quang Nam province has plans to build more hydro-electronic dams in the province including in the A'Vuong watershed area. Decision-makers should integrate the economic benefits and subsequent damage to the livelihoods of local people in decision making processes of these dams.

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VII. ANNEXES

Annex I: Interviewed communes and villages

Village	Household	Population	Male	Female
BhaLee Commune				
Adoc	35	248	129	119
Aung	65	388	98	190
Arung	68	419	195	224
Ro Cung	37	260	135	125
Ta Lang	33	244	112	108
Blooc	22	136	75	79
ATep1	36	225	117	105
Atep 2	31	175	86	89
A Vuong Commune				
Ap Lo II	21	n/a	N/a	n/a
Ap Lo I	52	n/a	N/a	n/a
Xa oi II	19	103	n/a	n/a
Apai	47	300	n/a	n/a
A Rec	53	324	n/a	n/a
Ta Ghe	30	177	n/a	n/a
Xa oi I	22	127	n/a	n/a
Xa oi III	19	98	n/a	n/a
A Nong commune				
A Rot	37	236	n/a	n/a
A Nonh	29	173	n/a	n/a
A Cap	24	139	N/a	n/a
A Xo	15	102	n/a	n/a
A Tieng commune				
A Hu	42			
Ta Vang	46			
Agrong	39			
A Ching	56			

Annex II: Harvesting preference of local people of NTFPs

Wild animals	No of hhs	%	Food plants	No of hhs	%
Mouse	101	35.07	Bamboo shoot	275	95.49
Squirrel	43	14.93	Wild banana flower	72	25.00
Common barking deer	39	13.54	"Don" Veg.	53	18.40
Bamboo rat	39	13.54	Pennywort	42	14.58
Wild pig	35	12.15	Mushroom	22	7.64
Weasel	21	7.29	Wild taro	13	4.51
Snake	9	3.13	"Lot" leaves	9	3.13
Deer	4	1.39	Amaranth	5	1.74
Python	4	1.39	Wild indian taro (body part)	2	0.69
Wild bird	4	1.39	Wild mulberry	2	0.69
Monkey	3	1.04	Wild banana root	1	0.35
Bear	2	0.69	Wild banana trunk	1	0.35
Chamois	2	0.69	Wild banana	1	0.35
Porcupine	2	0.69	Bamboo leaves	1	0.35
turtle	2	0.69	"Adoc" veg.	1	0.35
Wild chicken	2	0.69	"Mon thuc" Veg.	1	0.35
Crow	1	0.35	A Rui (Wild Veg.)	1	0.35
Field-mouse	1	0.35	Amomum	1	0.35
Fibre plants			Fern	1	0.35
Neohouzeaua	259	89.93	Uoi fruit	1	0.35
Rattan	197	68.40	Bee products		
Bamboo	1	0.35	Pupa	1	0.35
Medical plant	7	2.43	Wild honey	22	7.64
Firewood	288	100.00	"Dot" grass	2	0.69

Annex III: Conversion of NTFPs and Agricultural products

Quantity	Unit	Product	=	Quantity	unit	Product
1	basket	bamboo	=	2000	vnd	
7	animal	bamboo rat	=	3	meals	
8	basket	bamboo shoot	=	20	kg	Dried bamboo shoot
1	basket	bamboo shoot	=	10	kg	fresh bamboo shoot
1	basket	bamboo with 1-m length	=	5	trees	
6	trees	cassava	=	1	basket	cassava
4	kg	dried maize	=	1	handful	
1	basket	firewood	=	6	kg	
1	m ³	firewood	=	10	basket	firewood
1	trees	firewood	=	1	basket	firewood
1	basket	fresh bamboo shoot	=	10	kg	fresh bamboo shoot
10	kg	fresh bamboo shoot	=	6	kg	Dried bamboo shoot
2	basket	fresh cassava	=	1	basket	dried cassava
1	basket	fresh cassava	=	20	kg	fresh Cassava
3	kg	fresh cassava	=	1	kg	dried cassava
1	basket	fresh mushroom	=	10	kg	fresh mush room
3	kg	fresh mushroom	=	1	kg	Dried mush room
1	ang	maize	=	8	kg	
3	basket	maize	=	1	ang	
30	lon	maize	=	1	ang	maize
1	ha	moutain field	=	10	ang	seedling
1	ang	Moutain rice	=	6	kg	Mountain rice
1	bunch	neohouzeaua	=	40	trees	neohouzeaua
1	m ³	neohouzeaua	=	40	trees	neohouzeaua
1	basket	pennywort	=	5	kg	pennywort
1	basket	pineapple	=	20	fruit	
1	stem	rattan with length 15m	=	1	basket	
1	ang	rice	=	6	kg	rice
1	pack	rice	=	2	ang	
1	basket	snail	=	7	kg	snail
1	lon	snail	=	0.5	kg	snail
1	basket	sweet potato leave	=	10	kg	
1	ang	water rice	=	500-700	trees	cassava
1	basket	wild banana flower	=	10	kg	
1	animal	chamois	=	10	kg	
1	animal	deer	=	10	kg	
1	animal	frog	=	0.1	kg	
3	mice		=	1	meals	
1	basket	"lot" leaves	=	5	kg	"lot" leaves
1	meal	"lot" leaves	=	1	kg	"lot" leaves
	enough	bamboo shoot	=	5	kg	per year
1	meal	bamboo shoot	=	1	kg	bamboo shoot
1	animal	squirrel	=	0.3	kg	squirrel
1	basket	banana	=	1	bunch	banana
30	basket	maize	=	7	ang	of corn
1	ang	of corn	=	4.285714	basket	of corn
1	basket	of corn	=	0.25	ang	of corn
1	basket	loofah	=	10	fruit	loofah
1	basket	mustard greens	=	20	bunch	mustard greens

1 basket	sweet potato	=	20 kg	sweet potato
1 animal	mouse	=	0.3 kg	mouse

Annex IV: Conversion of NTFPs

Goods/Products	Unit	Average price (vnd)
"Dot"	kg	600
"Lot" leave	kg	3,500
Bamboo	tree	2,000
Bear	animal	6,000,000
Chamois	kg	20,000
Common barking deer	animal	400,000
Deer	kg	20,000
Dried bamboo shoot	kg	4,405
Dried mushroom	kg	5,000
Fresh mushroom	kg	1,667
Firewood	basket	2,500
Firewood	m3	25,000
Fresh bamboo shoot	kg	1,370
Mouse	animal	10,000
Neohouzeaua	basket	2,000
Neohouzeaua	kg	12,000
Neohouzeaua	tree	1,000
Pennywort	kg	2,000
Pennywort	basket	10,000
Rattan	stem	704
Squirrel	kg	25,000
Squirrel	animal	7,500
turtle	animal	150,000
Uoi fruit	kg	15,000
Wild bird	animal	40,000
Wild honey	liter	39,182
Wild honey	bottle	25,468
Wild pig	animal	350,000
Wild pig	kg	37,000
Wild taro	kg	500
Mouse	animal	30,000

Annex V: Agricultural products and market prices

Goods/Products	Unit	Average price (VND)
Amaranth		n/a
Banana	bunch	7,167
Banana	basket	7,167
Cassava		n/a
Cassava leaves		N/a
Cinnamon		n/a
Dried cassava	basket	6,083
Dried cassava	kg	562
Fresh cassava	basket	3,042
Dried maize	ang	8,133
Dried maize	kg	1,518
Eggplant		n/a
Maize	basket	8,625
Gourd	fruit ~0.5 kg	4,000
Gourd leaves		n/a
Green bean		n/a
Indian taro		n/a
Indian taro leaves	bunch	1,000
Jack fruit		n/a
Loofah	fruit	750
Melon		n/a
Mountain rice		n/a
Mustard greens	bunch	1,000
Orange	kg	n/a
Peanut		n/a
Pineapple	fruit	1,350
Pineapple	kg	2,133
Rice	ang	9,438
Rice	kg	2,807
Rice	lon	500
Salt		1,000
Sugar cane		n/a
Sweet potato leaves	basket	4,000
Sweet potato leaves	bunch	250
Sweet potato leaves	kg	175
Sweet potatoes	basket	4,000
Ta Ding*		n/a
Wax gourd	fruit ~0.5 kg	3,625
Sweet potato	kg	200

Note: Ta Ding is a kind of resin trees used to produce resin wine.

Annex VI: Questionnaire used in the survey

QUESTIONNAIRE FOR HOUSEHOLD INTERVIEW

Date: /06/2004

Introductory explanation to interviewee.

Hamlet:	Village:	Ethnic:	
Interviewers:			
<u>Interviewees</u>	<u>Position in family</u>	<u>Age</u>	VIII. SEX
Number of people in hh:			
Number of main labor:		Number of children:	

I. Harvest and Use forest resource:

TIMBER

1. Where do you often get the timber from?

- Don't harvest Old forest Natural forest Buy
 Village forest Plantation forest Other.....

2. How many times per year do you go to forest to harvest timber? _____times/year

3. How much timber do you collect per year? _____ logs/ or trees

4. How long does it take you to get there?.....hours or days

5. How do you transport timber to home?

- Buffalo Carry
 Stream Other.....

If by buffalo, how much do you pay for it?

6. How long does it take you return with logs?hours or days

7. What do you use it for?

- Selling Furniture Exchange
 Construction Tools Other _____

8. If exchange, what do you exchange for?

If exchange, how much of total timber collected in question 2 do you exchange per year?.....trees or logs

9. If selling, how much do you gain from selling timber per year?.....vnd

If selling, how many trees/logs of total timber collected in question 2 do you sell per year?.....trees or logs

10. Do you buy timber harvested from forest? Yes No

If yes, how many trees or logs do you buy per year?.....trees or logs

If yes, what is the price per tree/log did you buy?.....vnd/tree/log

If yes, How much do you spend on timber per year?.....vnd

11. Who go with you to help harvest the timber?

12. Do you hire anyone harvest timber? Yes No

If yes, how many people do you hire?

If yes, how much do you pay them per day?

13. If for other work, how much do they earn for a working day?

14. Has the timber quantity changed over the past years since Ho Chi Minh highway is built?

Increase

Decrease

15. Do you use replacement? Yes No

If yes, what kind?.....

16. Which species do you prefer?.....

NTFPs

1. Collected NTFPs

NTFPs	How often do you collect?	Collected quantity each time	Time go to forest to collect	Time to return with load	Used for*					Number of people involved **
					S	E	C	T	Sub	

* *S: Selling, E: exchange, C: construction, T: tools/equipment, Sub: subsistence*

** *State detail number people involve in harvesting NTFPs and number of family members*

6. Do you go with anyone else who helps you to harvest it?

7. Do you hire anyone else? Yes No

If yes, how much do you pay them per day?.....vnd

If yes, how many days do you often hire them?.....days

4. Sold NTFPs

NTFPs	Sold quantity	Unit	Selling price	Unit	Total income per year

5. Where do you sell NTFPs? How far is it?.....

6. Who do you sell to?.....

7. Exchanged NTFPs

NTFPs	What is exchanged for?	Unit	Exchange rate	Unit	Exchanged quantity per year

8. Where did you exchange them (distance from the house)?.....

9. Who do you exchange with?.....

10. Do you have to buy equipment/tools for harvesting? Yes No

Tools/equipment	Price (vnd)	Use time (years)

11. Do you do other things on the way to or from the forest? (for example you collect/harvest other NTFPs)

12. Do you share what you harvested/collected with other households in the village?

13. Has the productivity of NTFPs changed over the past years (eg. since 2001 when Ho Chi Minh highway is built)? Does it increase or decrease?

14. If decreasing, how do you adapt with this change?

15. Do you use replacement? what is it?

16. Where do you find them?

17. How do you think if there is no more forest in the area? What will you do?

II. Agriculture

18. How large agriculture land do you have?sao or ha

Water rice field:..... sao or ha

Mountain field:..... sao or ha

19. Kinds of crops

Crops	Seedling quantity Per season/per ha	Seedling price (vnd/unit)	Harvested quantity/year

20. Sold crops : Yes No

Crops	Sold quantity	Unit	Selling price	Total income per year

21. Do you use fertilizer for your crop? Yes No

If yes, how much fertilizer do you use per ha / season?

Where do you get fertilizer?

Supported by the local government Buy

If you bought, how much did you spend to buy fertilizer?.....vnd/per ha

22. Do you have any other costs –for example hire labor? Yes No

If yes, how much do you pay for a working day?vnd

If yes, how much do you spend per year for hiring labour?.....vnd

23. Do you exchange labour with others? Yes No

If yes, how do you do?

24. Do you have livestock? Yes No

Please list of livestock you have and their quantity,

Livestock	Amount spent for breeding	Unit	Quantity	Unit
Pigs				
Cow				
Buffalo				
Chickens				
Duck				
Dogs				

Do you have livestock for selling or for subsistence? Selling Subsistence

Livestock		Sold quantity	Unit	Selling price	Unit	Total income from selling
Chicken	Meat					
	Whole animal					
	Eggs					
Cow	Calf					
	Milk					
	Meat					
Buffalo	Calf					
	Meat					
Pigs	Meat					
	Piggy					
Duck	Meat					
	Whole animal					
	Eggs					

25. Do you have to spend on veterinary? Yes No

How much per year/month?.....vnd

26. Did you lost crops or livestock? Yes No

Reasons are:

- Drought Flood Epidemic
 Destroy by wild animals Other.....

27.

If yes, how much did you loose?.....

28. What do you count on when you lost crops?

III. Water resource

1. Where do you get water?	2. What do you use water for?	3. How much time do you spend to get water?	4. Amount spent to get water to house (vnd)	5. Who in your family collect water?
<input type="checkbox"/> Rain tank	<input type="checkbox"/> No use <input type="checkbox"/> washing <input type="checkbox"/> drinking <input type="checkbox"/> cooking <input type="checkbox"/> irrigation <input type="checkbox"/> other.....			
<input type="checkbox"/> Stream	<input type="checkbox"/> No use <input type="checkbox"/> washing <input type="checkbox"/> drinking <input type="checkbox"/> cooking <input type="checkbox"/> irrigation <input type="checkbox"/> Transportation <input type="checkbox"/> other.....			
<input type="checkbox"/> Bored well	<input type="checkbox"/> No use <input type="checkbox"/> washing <input type="checkbox"/> drinking <input type="checkbox"/> cooking <input type="checkbox"/> irrigation <input type="checkbox"/> other.....			
<input type="checkbox"/> Other.....	<input type="checkbox"/> No use <input type="checkbox"/> washing <input type="checkbox"/> drinking <input type="checkbox"/> cooking <input type="checkbox"/> irrigation <input type="checkbox"/> other.....			

If you use a pipe: do you use a pipe supplied by the government?

6. How often do you walk to get it?.....

7. Do you collect snails or fish or anything else from in the stream? Yes No

	Collected quantity each time	Number of collecting per week	Time for collecting	Total collected quantity per year
Fish				
Snails				
Turtles				

8. What do you use them for? Subsistence Selling

If for selling,

	Sold quantity	Unit	Selling price	Unit	Total sold value per year
Fish					
Snails					
turtle					

9. How do you catch them?the fish/snails or catch it for subsistence?

10. Do you need equipment or tools for collection (nets, boats, other) - which?

Tools/equipment	Price (vnd)	Use time (years)

11. When is the last time you bought tools for fishing and catching snails?.....

12. Do you go with someone else to collect fish or snails? Yes No

With whom?

13. Do you pay him/her? Yes No

If yes: how much?.....vnd/day

14. How do you share collected quantity among those people?

15. Have you ever use the stream as a transportation means? For example to transport timbers or other forest products?

When is the last time you do that?

Do you often do that?

What kind of products did you transport by this way?

16. Has the productivity of snails or fish changed over the past years (eg. since 2001 when Ho Chi Minh highway is built)?

Increase Decrease?

17. If decreasing, how do you adopt with this change?

18. Do you use other replacement foods? What are these foods?

19. Where do you find them?

IV. Income and loan

1. Do you have other income source? For example you work for others to earn money

Source 1: From whom:..... From activity:.....

Amount:vnd/week/month/year

Frequency:.....

Source 2: From whom:..... From activity:.....

Amount:vnd/week/month/year

Frequency:.....

Source 3: From whom:..... From activity:.....

Amount:vnd/week/month/year

Frequency:.....

2. Does your family have loan now? Yes No

Loan 1: Total loan Amount..... Interest rate:...../month

Paid amount:..... Time for loan:.....years

What do you use this loan for?.....

Loan 2: Total loan Amount..... Interest rate:...../month

Paid amount:..... Time for loan:.....years

What do you use this loan for?.....

Note: