Working Paper

NTFPs as a Source of Livelihood Diversification for Local Communities in the Batang Toru Orangutan Conservation Program

Jusupta Tarigan, James Roshetko, Endri Martini and Andree Ekadinata

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About the authors

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Endri Martini is a forester with her research interest in multistakeholder perspectives and negotiation in balancing the trade offs between biodiversity conservation with livelihood enhancement. She was involved in the USAID Orangutan Sumatra conservation program in Batang Toru in collaboration between Conservation International Indonesia and World Agroforestry Center (ICRAF) in 2005 to 2007, as Agroforestry Tree Specialist.

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Abstract

Batang Toru, located in the northern part of Sumatran island, is one of the few remaining areas to support populations of the Sumatran orangutan (*Pongo abelii*). The existence of an orangutan population of 400 in the area was documented through a *Population and Habitat Viability Assessment (PHVA)* (Singleton *et. al*., 2004). Recent studies estimate that the population may be 380 at the current time. Although the Batang Toru orangutan population is smaller, its threat from habitat loss is relatively low (below 2% annually). This low rate of habitat loss is the result of topographic features that limit access and traditional indigenous forest management systems that are sustainable and value healthy environments. Besides orangutans, the Batang Toru forest is also rich with other endemic plant and animal species (e.g. Dipterocarpaceae species (*Shorea spp., Anisoptera spp., Dipterocarpus spp*.) and Sumatran tiger). To the present time the gradient of landuse systems practiced by local communities in Batang Toru have been compatible with conservation of the area's unique and globally important biodiversity. However, in the future, the expanding human population of Batang Toru may threat the forest and all of its components, if suitable livelihoods option are not identified and developed. In that context, we see a number of non-timber forest products (NTFPs) that are produced in Batang Toru forest systems (e.g. mixed tree gardens, agroforests, and forests) as having potential to diversify and secure viable livelihood options for the people of Batang Toru.

Keywords

Sumatran Orangutan, Batang Toru, NTFPS, Livelihoods, Agroforest, Landuse

Acknowledgements

Development of collaborative orangutan habitat protection in Batang Toru watershed, North Sumatra project was funded through USAID (United States Agency for International Development). The project is implemented by Conservation International Indonesia Program (CII), the World Agroforestry Centre (ICRAF), and Winrock International. Comments by Melissa Abdo, Jesus Fernandez, Sonya Dewi and Subekti Rahayu on earlier draft improved the manuscript.

Contents

Introduction

A re-emerging paradigm in forestry regards forest as a multi-purpose, multi-benefit resource system that should be managed to enhance the welfare of multi-stakeholders in local communities. This paradigm contends that non-timber forest products (NTFPs) have a high comparative advantage to address the needs of local communities both for household consumption and market sale to enhance family incomes. NTFPs provide a substantial proportion of income to rural households, particularly to meet seasonal needs. However, there is a shortage of information available regarding the sustainable management of these resources and the marketing of their products. Further, there are few proven means of effective information dissemination regarding sustainable management and product management.

Batang Toru, located in the northern part of Sumatran island of Indonesia, is one of the few remaining areas supporting the population of the Sumatran orangutan (*Pongo abelii*). The area is surrounded by roads, which separate it from the East Sarulla orangutan population/habitat. The Batang Toru area covers approximately 105,000 ha, with an elevation of 200-1500 masl and is dominated by primary rainforest (BPKH, 2006). The Batang Toru orangutan population was documented at 400 individuals through a *Population and Habitat Viability Assessment (PHVA*) (Singleton et. al., 2004), but more recent studies indicate the population may have decreased to about 380. Although the Batang Toru orangutan population is smaller, its threat from habitat loss is relatively low (below 2% habitat loss annually). This low rate of habitat loss could be attributed to topographic features of Batang Toru which limit access and the existing indigenous forest management systems that are sustainable and value healthy environments.

Besides orangutans, the Batang Toru forest is also rich with other endemic plant and animal species such as Dipterocarpaceae species (*Shorea* spp., *Anisoptera* spp., *Dipterocarpus* spp.) and the Sumatran tiger and tapir. The present gradient of land use systems practiced by local communities in Batang Toru are compatible with conservation of the area's unique and globally important biodiversity. However, the expanding human population of Batang Toru may threat the forest and all of its components in the future if suitable livelihoods option are not identified and developed. In this context, the number of NTFPs produced from Batang Toru forest systems (e.g. mixed tree gardens, agroforests, and forests) is seen as having potential to diversify and secure viable livelihood options for the people of Batang Toru. The production of these NTFPs can be managed in a way to protect environmental resources.

Most smallholder tree-based farming systems are proven to be compatible with the conservation of soil, water and biodiversity (Manurung et al, 2006). *Rubber Agroforestry Systems* (also called "Old Jungle Rubber") of Muara Bungo, Jambi are analogous to smallholder systems in Batang Toru. The Muara Bungo systems contain a total of 129 woody species/hectare compared to 148 woody species/hectare identified in adjacent natural forests (Rasnovi, 2006).

Many NTFP collectors/producers in the Batang Toru area have weak bargaining position with buyers; they are price takers. Results of a rapid market assessment indicate that the current

NTFP market system is of limited benefit to both producers and consumers (Kurniawan, 2006). NFTP collectors are highly dependent on cash loans from traders, preserving traders dominance in NTFP market chains. In Batang Toru area, the sale of NTFPs does not provide a large share for total household income, but the income from NTFPs often fills seasonal income needs or other cash flow gaps, and helps cover particular expenses including unexpected cash needs. This is why we assisted local communities to documentation the under-appreciated livelihood benefits NTFPs provide.

A process of facilitating local communities to conceptualize conservation-livelihoods enhancement strategies for the protection of orangutan habitat in Batang Toru area was implemented over a 1.5 year period through the USAID-funded (United States Agency for International Development) Development of collaborative orangutan habitat protection in Batang Toru watershed, North Sumatra Project. This was implemented by the Conservation International Indonesia, the World Agroforestry Centre (ICRAF), and Winrock International. ICRAF and Winrock worked with local communities and local government agencies to develop conservation-livelihood strategies that provide frameworks for: i) recognizing communities traditional role in conserving natural resources; ii) recognizing which local agricultural/forest livelihood systems are compatible with environmental conservation; and iii) strengthening communities/other stakeholders understanding/commitment to conservation as an approach to protect the environmental services (biodiversity, watersheds and carbon stocks). Strategies also identify/provide technical and marketing services/improvements that enable communities to enhance the productivity/profitability of NTFP in their agroforestry livelihood systems.

This paper shares insights and lessons learned on farmers' involvement in protecting and enhancing their local agroforestry livelihood systems through ICRAF's experiences in developing tree nursery facilities and conservation-livelihood strategies in three districts in Batang Toru.

Study Area Characteristics

The study area (Figure 1) is located in the province of North Sumatra, Indonesia and covers 91,400 ha. Within the area, there are a total of 251 villages located in parts of three different districts (Kabupaten), namely: North Tapanuli, Central Tapanuli, and South Tapanuli. The study recorded 133,971 people living in the sites constituting a total of 27,906 households. The three districts have large rural-based populations with densities varying from 126/km^2 in Central Tapanuli, to 69/km^2 in North Tapanuli, to 54/km^2 in South Tapanuli. The population is dominated by the indigenous Batak Toba, Batak Pesisir, and Batak Angkola-Mandailang ethnic groups with some transmigrant communities primarily of Javanese origin. Natural forest and agroforests are the primary land cover.

The local communities in all three districts, and specifically in the study area, have a long history of sustainable forest resource management through a gradient of land use intensities ranging from mixed tree gardens (*kebun campur*), natural forests, and agroforests. In mixed three gardens, species composition is largely controlled by farmers and management is intermediate. In natural forests, impact from human intervention is light with small quantities

of products harvested. On the other hand, agroforests (forest farming systems) are characterized by human management favoring plant species that provide useful/valuable products but management remains extensive rather than intensive.

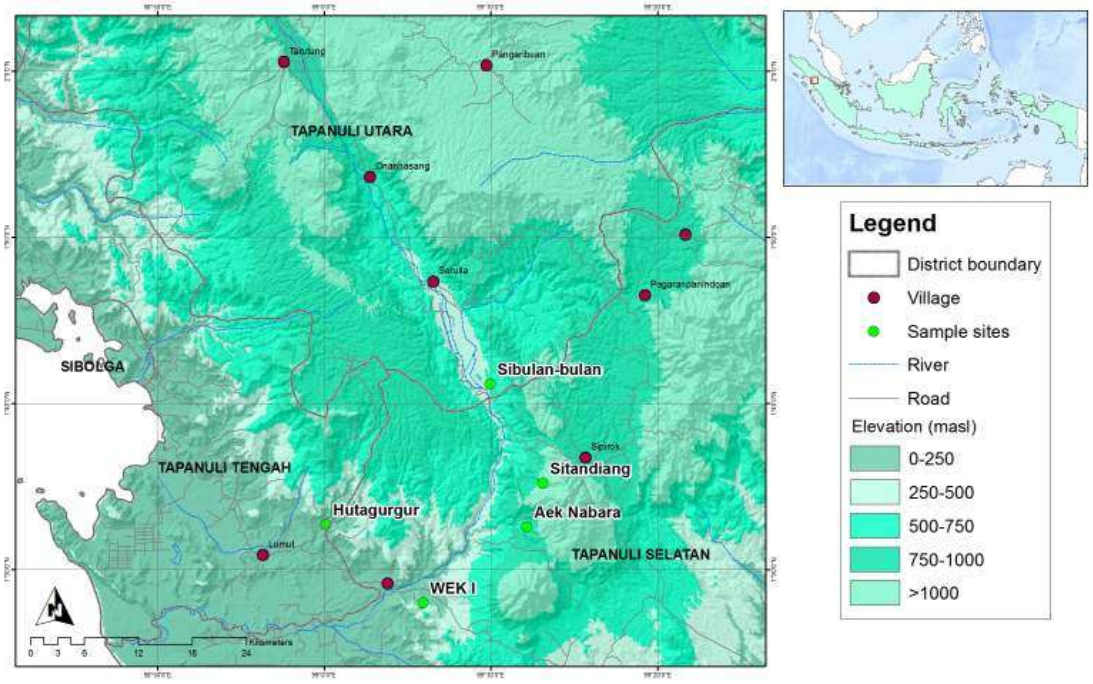


Figure 1. Coverage of study area and sample sites in Batang Toru, North Sumatra

The primary products from the mixed tree gardens of Batang Toru are rubber (*Hevea brasiliensis*), cacao (*Theobroma cacao*) and, in some villages, sugar palm (*Arenga pinnata*). These crops are the main source of on-farm family livelihood, either for subsistence and or through market sales. In the natural forests and agroforests native species that are important or hold potential include: gaharu (incense from *Aquillaria* sp. tree), benzoin (*Styrax benzoin*), durian (*Durio zibethinus*), petai (*Parkia speciosa*), nilam (*patchouli oil*), aren (*Arenga pinnata*) and flowers (orchids and Nepenthes). Those species can be considered domesticated or semi-domesticated. The products from those species are used for home consumption and sold in local/provincial markets.

Proper planning and management of the three tree-based landuse systems are inadequately practiced by the local communities. Observations indicate that improved management of species/crops and market linkages could enhance systems' productivity, profitability and sustainability. The predominant agricultural system in the districts is wetland rice production, which receive most of farmers' labour and other inputs. Tree-based systems receive minimal management and inputs.

Materials and Methods

The project conducted a preliminary field survey of the study sites in October 2005. The survey was designed to obtain detailed information about agroforestry system, socio-economic conditions, livelihoods activities, market systems, and orangutan habitat. The NTFPs income data was collected from key informants in each village. Information on the cash income was calculated in rupiah per month. Additional macroeconomic data was obtained from district governments. Data from the preliminary survey was used to select the key villages for the livelihood-conservation strategy documentation (Martini et al, 2008).

To further understand the land cover configuration and its dynamics in Batang Toru area, we conducted land cover change analysis using 1990-200-2005 time-series satellite images. Two types of land-cover change analysis were conducted: area-based change analysis and trajectories analysis. An area-based change is a simple analysis conducted by comparing total area of each land-use/cover class in each time period. Trajectories analysis is conducted to quantify and summarize the sequences of changes over the period of observation.

Results and Discussions

Land covers configuration in Batang Toru

Time series land cover map of Batang Toru in 1990, 2000, and 2005 is shown in figure 2. The accuracy of 2005 land cover map is 85%. The time series map clearly showed that Batang Toru areas are dominated by two land cover types: forest and mixed tree garden (*kebun campur*). Most of high altitude areas are still covered by forest in 2005. Mixed tree garden are dominating the area surrounding forest patches, especially in west forest block of Batang Toru.

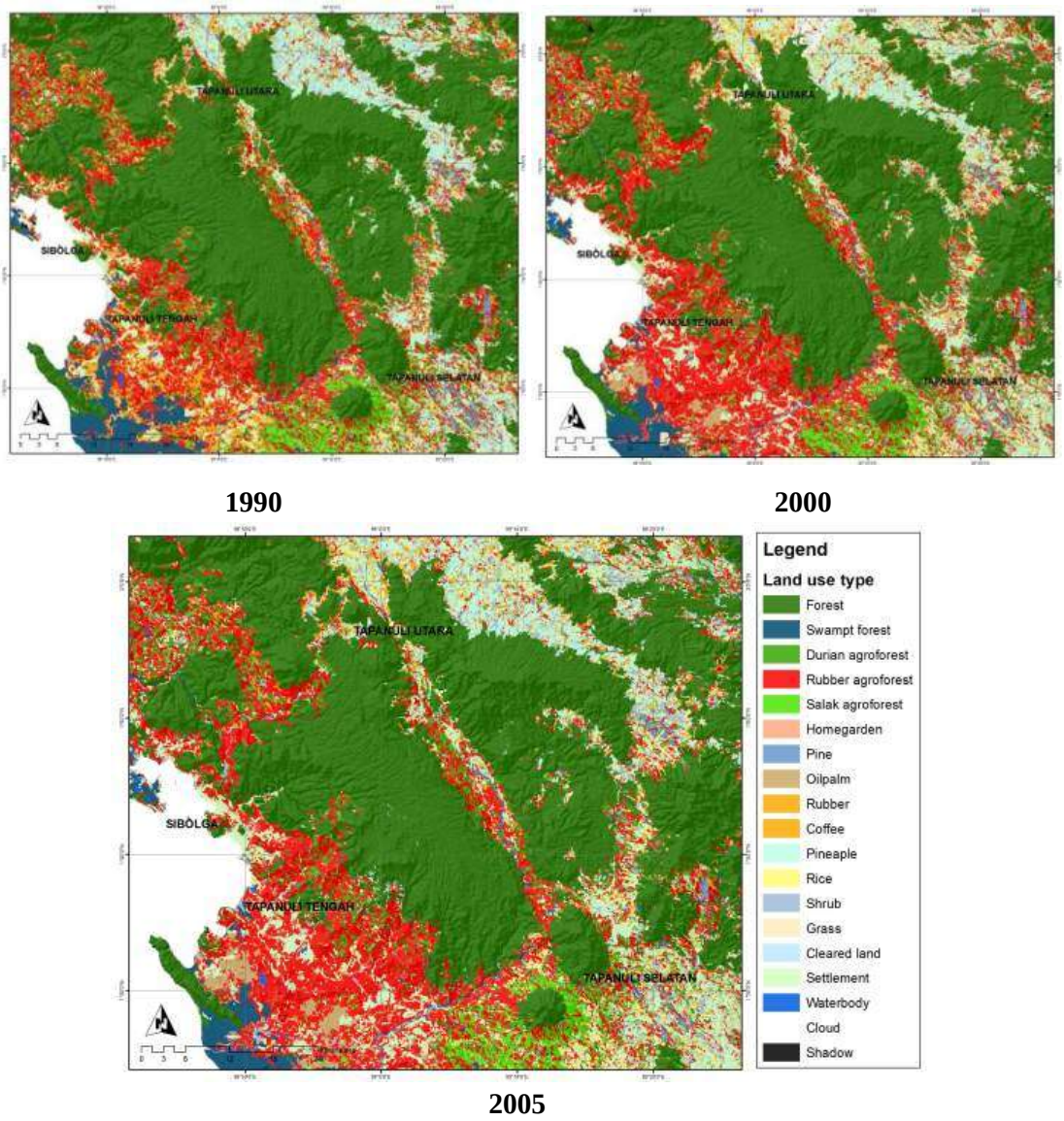


Figure 2. Time series land use maps of Batang Toru area

Several types of mixed tree garden were identified in the satellite images: rubber agroforest, durian agroforest, salak agroforest and home garden. *Rubber agroforest* can be seen in fairly large-continuous patches surrounding the eastern forest block. Durian agroforest are located near forest edges in smaller part, while salak agroforest are mostly located in the Southern

part of the forest blocks. These patches of mixed tree garden appeared to remain stable since 1990-2005.

In contrast to the western block, the eastern block of Batang Toru is dominated by agriculture land: pineapple, coffee and rice field. Mixed tree garden only appears in small patches in these areas. The eastern block seems to be more dynamics in term of land cover change compared to the western block. Declines of forest cover and increasing are of agriculture are two types of dominant changes in this part of Batang Toru.

Monoculture plantations are mostly located in the southern part of study area. Rubber plantation is the most dominant land cover types in this category. Small patches of oil palm are identified in this area from 2000 land cover maps, these patches of oil palm appear to be increase in 2005.

Table 1. Summary of land cover change in Batang Toru 1990-2005

No	Classname	1990		2000		2005	
		ha	%	ha	%	ha	%
1	Forest	336064.1	50%	319478.4	47%	316268	47%
2	Swampt forest	22459.41	3%	16838.1	3%	13938.3	2%
3	Durian agroforest	40441.5	6%	36494.55	5%	35642.61	5%
4	Rubber agroforest	98272.35	15%	96304.05	14%	95620.77	14%
5	Salak agroforest	17595.18	3%	16283.61	2%	15558.66	2%
6	Rubber	25308.54	4%	30782.34	5%	30123.99	4%
7	Oil palm		0%	4698.72	1%	7492.32	1%
8	Pine	8218.26	1%	6534.27	1%	6267.24	1%
9	Homegarden	5716.8	1%	3799.53	1%	1992.33	0%
10	Coffee	10602.63	2%	20047.32	3%	20860.11	3%
11	Pineaple	35577.9	5%	30936.87	5%	27288.27	4%
12	Shrub	13145.85	2%	11632.77	2%	15865.2	2%
13	Grass	973.35	0%	3068.46	0%	270.09	0%
14	Rice	12557.07	2%	15046.83	2%	14233.77	2%
15	Cleared land	2904.84	0%	164.52	0%	3673.8	1%
16	Settlement	38223.18	6%	52145.82	8%	63642.24	9%
17	Waterbody	3931.65	1%	3931.65	1%	3931.65	1%
18	Cloud and shadow	676.8	0%	4481.55	1%		0%
	Grand Total	672669.4		672669.4		672669.4	

Land cover dynamics and trajectories in Batang Toru

Area summary of land cover types in Batang Toru is shown in Table 1. Three types of dominant land cover changes can be summarized from the time series land cover maps: (1) decrease of forest cover, (2) decrease of mixed tree garden, (3) increase of monoculture plantation. Although forest is still a dominant land cover in Batang Toru, the area is continuously declined from 54% in 1990 to 50% in 2005. Sharpest decline of forest cover occurred in 1990-2000, where it decreased from 336064.1 ha in 1990 to 319478.4 in 2000.

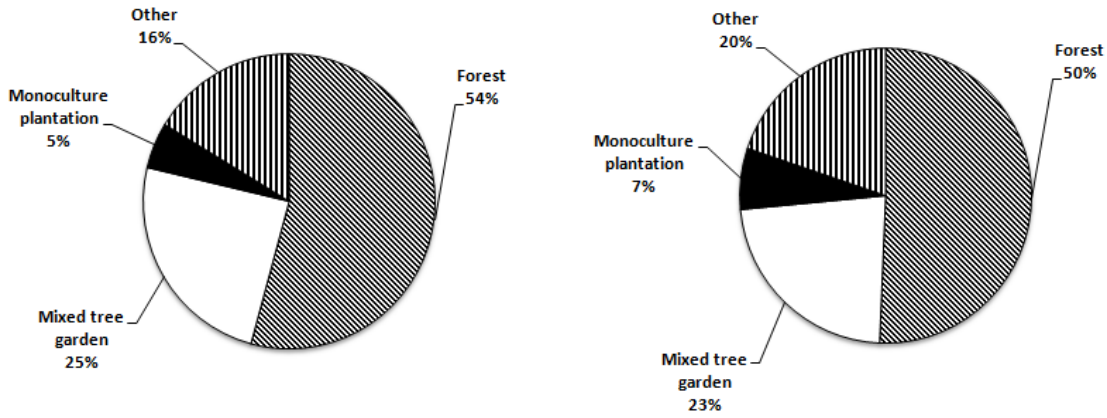


Figure 3. Dominant land cover change in Batang Toru

Conservation-Livelihood Strategy

The ICRAF and Winrock staff stationed at the site, with support from other specialists, were responsible to develop conservation-livelihood strategies for key Batang Toru villages. Four scientific keys and conservation concepts served as the basis for the formulation of the documentation strategies as follows:

- Recognition of communities traditional role in conserving natural resources;
- Recognition of local agricultural/forest livelihood systems that are compatible with environmental conservation;
- Strengthening of communities and stakeholders' understanding/commitment to conservation as an approach to sustain the environmental services (biodiversity, watersheds and carbon stocks); and
- Identification of technical assistance on management and marketing that enable communities to enhance the productivity/profitability of NTFPs in their agroforestry livelihood systems.

Stakeholders' socialization was an important first step towards developing livelihood-conservation strategies. Local communities were considered the main beneficiaries of the strategies. To help strengthen the stakeholders' understanding on the concept of livelihood-conservation strategy, the project developed and implemented an integrated training that matched the conservation and livelihood focus for the strategies.

Rapid Land Tenure Assessment

The project used the Rapid Land Tenure Assessment (RATA) developed by ICRAF to recognize the local community's traditional role in conserving natural resources. RATA is a method that documents historic land tenure, land use, related issues and policy options to resolve conflicts (Galudra et al, 2006).

Recently, some government agencies with support from international and local NGOs proposed the Batang Toru Watershed as a national park for the purpose of conserving and protecting the habitat of orangutan (Perbatakusuma, 2006). In the proposal, the urgent need for a national park in the area was justified due to the threat of deforestation. As of 2008, the North Sumatra Province has lost about 71,000 ha of its forested area. It is assumed that the Batang Toru Watershed area has experienced or is threatened by a similar loss of forest/habitat that would threaten local orangutan population (Wich and Geurts, 2002). However, site specific research in and surrounding Batang Toru shows that local communities help protect the forest and conservation areas if their traditional land tenure is recognized. This finding supports a dynamic policy option on the best way to conserve and protect the orangutan habitat i.e. through rewarding those stakeholders who demonstrate and respect the local practice of effective conservation.

Recognition of traditional tenure claims would be more effective than approving a proposal to establish a national park which was developed with limited transparency, and limited involvement of local communities or prioritization of communities' priorities and needs. Additionally, the legal status in the Batang Toru area remains uncertain.

Since 1936, only half of the Batang Toru Watershed has been gazetted as state forest land (Figure 4). Although the government claims the area as state forestland through Minister Decree No. 44/2006, local communities also have valid tenure claims under adat law as Batang Toru populations qualify as traditional communities which still practiced their cultures (ICRAF, 2006). Around 32,573 ha of the state forestland have been used by the local communities since 1930's and is acknowledged as agroforest garden. Over half of this area (17,392 ha), *customary land use rights* is legally recognized by the National Land Agency. However, forestry authorities refused to recognize either the communities' customary rights or acknowledge the National Land Agency's jurisdiction.

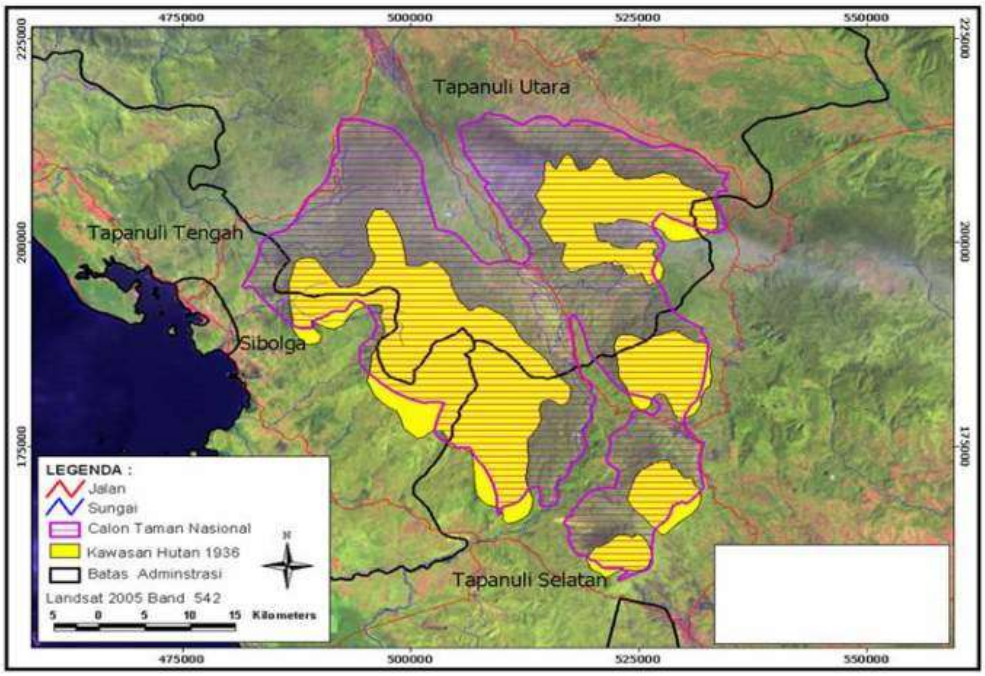


Figure 4. Delineation of forest status in 1936 (overlapping with landsat image 2005)

Current efforts to enhance orangutan conservation in the area need to consider the perspectives of the local stakeholders who are the *de facto* managers and protectors of the Batang Toru forested area. By ignoring valid local claims, particularly from communities who respect conservation, forestry authorities risk an escalation of tension and possible conflict that may make non-participatory, non-transparent conservation efforts counter-productive (Roshetko et al, 2007b).

Smallholder Tree Based Farming Systems

In Batang Toru, NTFP products are correlated with the smallholder tree-based farming systems (agroforestry) and the forest itself. Agroforestry is a collective name for land use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land management unit. The integration can be either in a spatial mixture or in a temporal sequence. There are normally both ecological and economic interactions between woody and non-woody components in agroforestry. These tree-based farming systems practiced in the study sites are usually characterized by limited proactive management and planning. They are being managed on a traditionally extractive basis and with few inputs (quality germplasm, fertilizers, labor, etc). Spacing is irregular and species components often primarily the result of chance. Harvesting products is often the most common management activity, with minimal weeding to control herbaceous and woody competition (Manurung *et al*., 2006). As a result, the quality and quantity of products may be far below the systems' potential. Farmers often occupy weak positions and are ill prepared to assume an active marketing role. Farmers generally: i) lack access to market information (product demand, specifications and prices); ii) lack understanding of market channels; iii) produce products of unreliable quality and quantity; and iv) rarely engage in grading or processing to improve product quality (and their profit-margin) (Roshetko et al, 2007a).

Farmers are usually interested in intensifying the management of their tree-based farming systems, but hesitate because they do not know where and how to focus their efforts (Roshetko et al, 2007a). Resource scarcity, absence of knowledge regarding propagation and management, and limited access of market and governments' policy disincentives/ambiguities are the limiting factors for farmers to intensify the management of their tree farming systems (Gintings, et al 1996; Potter and Lee, 1998). Under conditions of insecure land tenure and market access, smallholder farmers cannot and will not cultivate a wide range of tree species as a component of their efficient, integrated and risk-averse livelihood and land-use systems and will not effectively respond to the increased demand for wood products (van Noordwijk *et al.*, 2003).

Developing a replicable and efficient extension approach designed to reach motivated and innovative farmers can mobilize the self-strength of community-based forest management. These farmers are those who are committed to improve their incomes and environmental services by increasing the production and market access for their agroforestry products (Roshetko et al, 2007a). The extension approach requires the provision of a series of workshop trainings to farmer leaders and more intensive follow up assistances to farmer groups that these leaders have helped to organize agroforest productivity enhancement and marketing. Below are the NTFPs derived from agroforestry systems existing in Batang Toru.

Table 2. Types of NTFPs in the Batang Toru

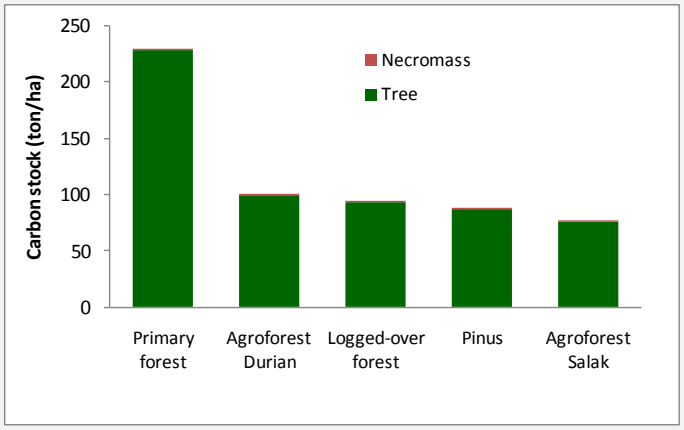
No	Plant species	Utilization		Remarks
		Marketable Products	Subsistence	
1	*Arenga pinnata* (aren)	Brown sugar, Thatch, kolang kaling	Tuak (alcoholic beverage)	Farmer produces brown sugar and directly sells it in local markets
2	*Hevea brasiliensis* (rubber)	Latex	Fuel wood	Farmer produce rubber and sell it weekly in local markets
3	*Coffee Robusta* (coffee)	Fruit	Fuel wood	Farmer produce coffee and directly sells it in local markets
4	*Durio zibethinus* (durian)	Fruit	Wood	Farmer produce durian in mixed gardens, agroforests, and forests, for sale in local markets
5	*Parkia speciosa* (petai)	Fruit	Fruit	Farmer produce petai in mixed forests, agroforests and forests for sale in local markets
6	*Styrax benzoin* (benzoin)	Resin	Fuel wood	Current production is low due to low market demand and price
7	*Cinnamomum burmanii* (cinnamon)	Bark	Fuel wood	Farmer produce cinnamon and sell it in local markets
8	*Lansium domesticum* (duku)	Fruit	Fruit	Farmer produce duku and sell it in local markets

Source: Interview with farmers in Batang Toru

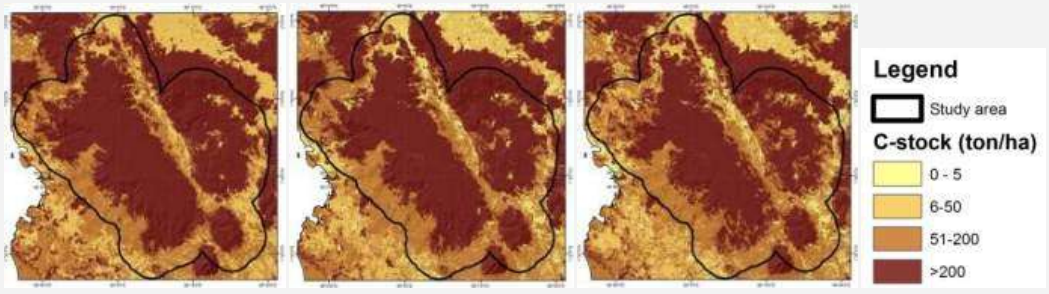
Box 1: Carbon Storage in Mixed Tree Garden of Batang Toru

Subekti Rahayu and Andree Ekadinata

As non-forest land use systems, sustainable mixed tree garden in Batang Toru has the potential to store carbon within a long period. Recent studies on carbon stock for every land use system in Batang Toru concludes that carbon stock of forest in Batang Toru is 243 ton ha^{-1}. While carbon stock of mixed tree garden such as durian and salak agroforest, ranged at about 90 – 100 ton carbon per hectare.



Carbon stock of tree and necromass component in Batang Toru



Carbon stock maps of Batang Toru

Improvement of Local Marketing Systems

Cash from sale of NTFPs can represent an important contribution to farmers' income. Effective and suitable marketing can help farmers optimize income from those products and maintain income stability. Effective marketing strategies can also reduce the risk of market over-supply, which drives down product prices. Batang Toru watershed provides many valuable NTFPs. Some of the NTFP products have economic value but are traded in small irregular quantities with low prices received by the farmer producer/collector.

In Indonesia, most smallholder farmers have poor market knowledge and linkages (Roshetko and Yulianti 2002), in Batang Toru this is illustrated by the case of palm sugar. Project surveys and interviews with farmers document that the demand for palm sugar exceeds supply, indicating palm sugar holds great potential for communities with established palm gardens. However, due to poor market intelligence farmers' products do not match market

specifications. The market prefers small-sized units (500 -1000 grams) of palm sugar, however farmers process palm sugar in larger-sized units (>10 kg). Color and packaging also influenced trader preference and price for palm sugar, but again most farmers do not consider those factors when processing their palm sugar.

Amongst of key NTFP products available in the Batang Toru area (as shown in Figure 5), rubber makes the biggest contribution to the household's income (40%) followed by durian (18%) and coffee (17%). Other crops providing additional income to the household are cacao (Theobroma cacao) (9%) and betel nut (Areca catechu) (7%). All five of those products are mainly harvested from tree based gardens/agroforests.

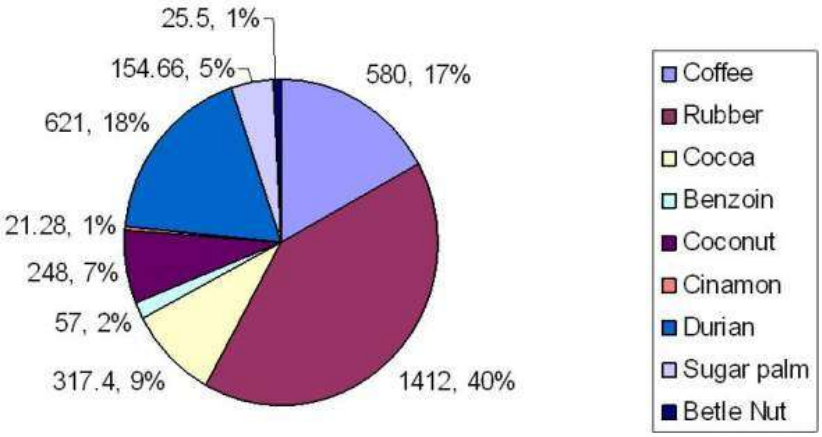


Figure 5. Average income percentage from NTFPs from households in the surrounding of Batang Toru watershed forest block.

Smallholder farmers in Indonesia have marketing constraints mainly related to a lack of market information regarding market demand and specification, price fluctuations, product quantity and quality, and market channel (Roshetko and Yulianti 2002). These constraints can be drastically reduced if farmers can access accurate market information to create marketing strategies. A good market information system will identify farmer-producers' opportunities and information on technology availability to support NTFP production that meet market demand and specification. Linking NFTP production with market information can help farmers to improve their natural resource management to generate greater cash incomes.

Conclusion

As a process, the development of NTFP strategy activities is dynamic and is developed based on community needs and environmental conditions. Based on our observations and experiences, the successful development of NTFPs strategies required communication between the community, local governments, and other relevant stakeholders by considering four issues as follows:

- Recognition of communities traditional role in conserving natural resources;
- Recognition of local agricultural/forest livelihood systems that are compatible with environmental conservation;
- Strengthen communities and stakeholders understanding/commitment to conservation as an approach to sustain the environmental services (biodiversity, watersheds and carbon stocks); and
- Identification of technical assistance on management and marketing that enable communities to enhance the productivity/profitability of NTFPs in their agroforestry livelihood systems.

The NTFPs strategies that recently developed by ICRAF in collaboration with Winrock International have put more emphasize on local capacity building as an approach to improve technical/marketing skills and at the same time enhance understanding on the importance to develop livelihoods and conservation strategies particularly at the village level. The main purposes of the approach were: i) to improve productivity/profitability of smallholder agroforest systems, and ii) to draw attention of Batang Toru farmers' long successful history of forest conservation making possible recognition and rewards for the valuable environmental services communities provide. Although new, these efforts were acknowledged as useful by local stakeholders, particularly farmers. Improved awareness by local people regarding the use ofbetter rubber germplasm and improved management of their agroforests garden could integrate livelihood with conservation issues.

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