Nias Trip Report

NIAS AGROFORESTRY: HELPING THE POOR TO JUMP HIGHER

Gerhard E.S. Manurung, Jusupta Tarigan, James M. Roshetko

A. Introduction

In Nias culture, there is a “Lompat Batu” (jumping stone) atraction with using 2.25 m height of stone. Jumping stone attraction is a symbol for a man who achieved adult physiology and ready get to marriage. To height the stone should be jumped to high the ability of man on managing of new family. In this paper, the jumping stone attraction as a symbol for the tree based farming systems that managed traditionally by local community which needs improving on management and marketing for local community livelihood enhancement. To make clear understanding on landscapes, tree based farming systems, priority species, livelihoods, and marketing linkages; the assessment survey was conducted for 4 days (March 12-15, 2006) in three main transects as following: 1) Gunung Sitoli – Lahewa (northern part with coastal and hilly area), 2) Gunung Sitoli – Mandrehe (middle part to hilly), and 3) Gunung Sitoli – Teluk Dalam (southern part in along of coastal). The assessment survey used data collection method as following: 1) literature reviews, 2) field observations, 3) semi-structured interviews, and 4) farmer group discussions.

Picture 1. Nias Jumping Stone attraction

The Nias archipelago is comprised of the main island and several nearby smaller islands. The administration of the islands is divided between two districts, Nias to the north and Nias Selatan to the south. The two districts are further divided into 13 and 7 sub-districts respectively (excluding the smaller islands). The size of the main island is 4800 km2 and of all of the islands 5625 km2.

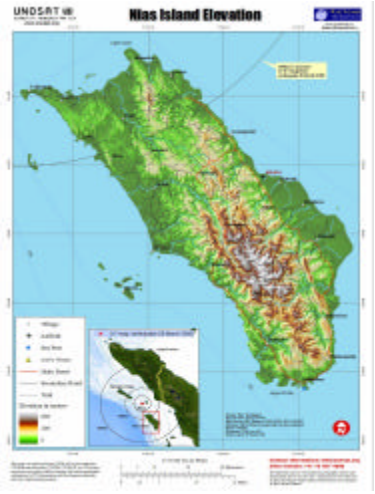
The official population of the island is given as 441,832 in Nias district and 270,243 in Nias Selatan district. About 95% of the populations are Christians of which about 80% are protestant and 20% catholic. Outside the main towns Bahasa Nias is most commonly spoken and many people do not speak Bahasa Indonesia (Biro of Statistical Centre, 2003).

Rainfall is very high on Nias, with over 3 meters falling annually and 270 rainy days per year. Relative humidity is 90% all the year round. Temperatures vary from 14-31C from January to June and 22-30C from July to December. The peak rainy season is between October and January bin terms of amount of rainfall and peoples description of the rainy season. July to September are considered mixed

months for rainfall, while February to June is considered the dry season (Nias Agricultural Agency, 2004).

B. Landscape and Tree Farming Systems

Landscape spread out from coastal to mountains areas with topographic flattens to steep slope hills are between 0 – 600 m above sea level (www.unosat.org). The landscape of Nias island consist of 3 zones as following: 1) coastal to low-land (24%), 2) low-land to hilly (28.8%), and 3) hilly to mountains (51.2%). The higher mountain areas are primarily in the southern portion of the island, in Nias Selatan, and this area is considered a sub-zone of the general hills and mountains livelihood zone.



Picture 2. Nias elevation map


Picture 3. Nias landscapes

This situation influence community established and developed a various land-use systems that dominated by tree based farming systems as following: 1) rubber agroforestry system, 2) coconut agroforestry, 3) cacao agroforestry system, 4) homegarden system, 5) teak monoculture, 6) nipah system, 7) banana monoculture, and 8) clove monoculture. Coconut agroforestry system spread out in around of coastal area, but logged forest system covered in mountains area. Rubber agroforestry system, cacao agroforestry system, coconut agroforestry system, and homegarden system are the most preferred by local community and dominated along of landscapes. Meanwhile, another tree based farming systems spread out in patches of the landscapes. Paddy systems divided with irrigation system and non-irrigation system. Land area of paddy non-irrigation system (sawah tadah hujan) dominated until to 3 times of paddy irrigation system (4,555 ha).

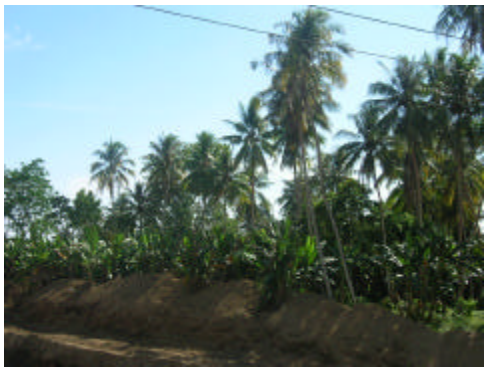
The tree based farming systems to be more various and transforming dynamics. Transforming dynamics of tree based farming systems was depending on the socioeconomic conditions and market opportunities facing a farmer, the allocation of a specific piece of land may shift between the tree based farming systems. This transformation occurs gradually over a number of years and affects the tree biodiversity and total number of trees in the system. A desire for tree products, market opportunities and household needs are the key factors that influence farmers' decision concerning which tree farming system develop (Manurung et al, 2005). Traditionally all tree based farming systems are managed on an extractive basis, few inputs (quality germplasm, fertilizers, labor, etc) are allocated to these systems. This management

approach is caused by: separate-remote island access, limited land tenure, small land size (0.5 to 2 ha/household), limited market access, and farmers' limited experience with intensive tree management.

Rubber (*Hevea brasiliensis*), cacao (*Theobroma cacao*), ubi jalar/sweet potato (*Ipomoea batatas*), and coconut (*Cocos nucifera*) are the main priority species for the farmer with high number of plants in the tree based farming systems. Fruit and timber species such as durian (*Durio zibethinus*), nangka/jackfruit (*Artocarpus heterophyllus*), pete/parkia (*Parkia speciosa*), pinang palm (*Areca catechu*), bananas (*Musa paradisiaca*), manggis/mangosteen (*Garcinia mangostana*), kweni (*Mangifera odorata*), sukun/breadfruit (*Artocarpus communis*), duku (*Lansium domesticum*), cengkeh (*Eugenia aromatica*), nipah palm (*Nypa fruticans*), teak (*Tectona grandis*), simalambao (indigenous timber), sengon (*Paraserianthes falcataria*), jati putih/gmelina (*Gmelina arborea*) are the second priority species to meet subsistence needs.

Rubber agroforestry system is a system which provides main income source for local community in rural areas with covering area 26,262 ha. Alasa subdistrict is the largest area of rubber agroforestry system (5,609 ha) with 3,286 households cultivated (Nias Agricultural Agency, 2004). The system looks like secondary forest with characteristic as following: 1) a various of fruit and timber species natural regenerated, 2) no uniform tree spacing, 3) rubber tree stand high density (could be achieved 900 trees/ha), and 4) dominated by unproductive rubber trees. Farmers are still using low quality tapping practices and usually tap on different diameter stands and age of the trees. This situation causes the rubber trees unproductive earlier. Weeding only in around of rubber trees at least once a year and only for easier accessing to tap the trees. Planting material is collected from other rubber agro-forests, from the best parental trees. Seedling have to have at least two whorls, with 50 cm in height and be young enough to avoid rood damage and to facilitate transport to the new location. Seed are also used for propagation as they can be easily stored for a longer period. Farmers collect seeds from old rubber agroforestry system and submerge them in water, discharging those that float.

Picture 4. Rubber agroforestry system



Picture 5. Coconut agroforestry system

Coconut agroforestry system spread out in 27,445 ha around of coastal areas. Lahewa subdistrict is the largest area of coconut agroforestry system (8,325 ha) with 2,629 households cultivated (Nias Agricultural Agency, 2004). Coconut fruits are the product from that system that provides the secondary income after rubber to the farmers who live in coastal areas. In the coconut agroforestry system, farmers have around 500 coconut trees/ha and the coconut trees usually mixed with some fruit species such as pinang palm, bananas, breadfruit, kapuk, mangos (kweni). Similar

with rubber agroforestry system, in coconut agroforestry system, almost all the coconut trees are old and unproductive trees with no uniform tree spacing. Beside of that, farmers lack access for information on high quality of coconut germplasm and tree-site matching for the coconut trees. High quality of coconut germplasm and tree-site matching are strong relationship to tree productivity. Farmers and coconut market agents known that the copra production of coconut trees in coastal area higher than in hilly area. But again, farmers no choice. They need to diversify their tree based farming products to meet their subsistence needs and market demand, although they lack access for information on tree propagation and tree management. Farmers weed the weeds in around of coconut trees only in fruiting season (four times harvesting per year). Low quality management of the coconut agroforest causes in last one year was founded *Brontispa sp* which damage the young leaves of coconut trees.

Cacao was introduced by Nias Agricultural Agency to local community in 1987. Since that year, price and market opportunities of cacao product increased. Farmers initiated to plant the cacao seedlings in around of old rubber trees and or in homegarden system. Transforming dynamics from rubber agroforestry system to cacao based farming system occurs gradually over a number of years. The allocation of a specific piece of land may shift between the tree based farming systems. A desire for cacao market opportunities and household incomes are the key factors that influence farmers to decide transforming unproductive rubber agroforestry system to cacao agroforestry system.

Cacao agroforestry system covered 3,610 ha and Tuhemberua subdistrict is the largest area of rubber agroforestry system (666 ha) with 676 households cultivated (Nias Agricultural Agency, 2004). In this system the number of cacao trees was higher than number of another tree species such as bananas, coconut, durian, pete, mangosteen, and pinang palm, etc. Sometimes this system is a part of homegarden system. Number of cacao trees was very dense (approximately 7000 trees/ha) without tree management practices such as spacing, branch pruning, thinning and fertilizing. Many tree species have been used by farmers as a tree shelter for cacao trees such as coconut, rubber, pinang palm, and bananas. But farmers used the tree shelters with high stand density to shade the mature cacao trees. Beside of that, farmers used the same method with rubber planting material supplying method for providing cacao planting material (wildlings and seeds).

Picture 6. Cacao agroforestry system

Picture 7. Homegarden system

Local community managed their homegarden system with intensively. They enriched in behind and beside part of homegarden system with fruit crops and timber species such as cacao, durian, duku, pinang palm, bananas, pete, coconut, sukun, kweni, manggis, kapuk, nangka, cengkeh, teak, gmelina, and simalambao. Except

cacao and ubi jalar products, fruit crops and timber products were used by farmers to meet subsistence needs primarily. But if the products have a good market opportunities then, farmers will change their decisions for selling the products firstly.

In front of their homegarden, farmers planted ubi jalar with management intensively. Most of farmers expand ubi jalar cultivating until to edge and along of road settlement. They used ubi jalar as the feed for their pig husbandry and or sell it to local (neighbouring) market, Gunung Sitoli and Teluk Dalam markets. According to farmers, each household has 5 pigs that was cultivated with traditionally management in behind of farmer's house. Farmers usually harvest ubi jalar in every week. Then they fertilize ubi jalar with urea fertilizers as soon as they harvested.

C. The Production to Marketing System

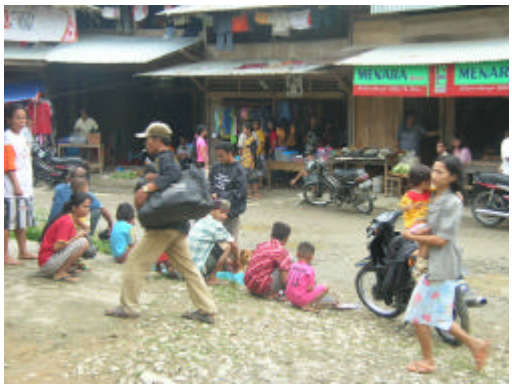
Based on Nias Agricultural Agency (2004), the rubber latex productivity achieved 9,610 kg/ha/year with 21,216 households who get income from latex product. According to the farmers, quantity of latex yield that they harvested in four workingdays in every week between 24 kg to 30 kg. The latex yield was collected from 300 to 400 rubber trees that farmers tapped every day. The latex yield was formed become slab that previously was coagulated with 'asam cuka' and mixed it with some substances (sands or soil and tapping bark) to increase slab weight. Then farmers only sell the slab with price Rp. 5,800.-/kg to local collector who attend in weekly local market (subdistrict market). Then the local collectors sell the slab to district traders in Gunung Sitoli and Teluk Dalam with price Rp. 6,200.-/kg. No choice for farmer to sell the latex slab to district traders, because high cost for transportation and long distance trips doesn't balance with product price. According to district traders who were interviewed mentioned that they sell the slab to rubber factories in Medan and Padang or Sibolga areas with price Rp. 12,000.- to Rp. 15,000.-/kg. As additional information, Save the Children (2005) in their Nias Livelihoods Assessment survey noted that latex price increased 70% to 80% in last twelve months.

Farmers in southern coastal area (Bawe ja'u village – Teluk Dalam subdistrict) can harvest average 250 coconut fruits in each three months. They sell the coconut fruit as the product to local colectors with price Rp. 1,200.-/fruit. The local collectors should increase the dry copra product price – because they conducted peeling and drying processes – when they sell the copra product with price Rp. 2,300.-/kg to district traders in Gunung Sitoli and Teluk Dalam. The district traders need to redry the dry copra product until 30% to 50% of water content, even local collectors have been drying the copra product. Then the district traders sell the dry copra product with price Rp. 4,000.-/kg to coconut oil factories in Medan and Padang areas.

Before tsunami and earthquake happened, some farmers and local collectors who live in northern part of Nias island sold the coconut fruits and dry copra product to a coconut oil factory in Lahewa subdistrict (in northern part of Nias island). But now this factory shortcoming on coconut fruits supply, because almost all of farmers changed their on-farm income becoming off-farm income. They work as a rehabilitation infrastructure worker for national and international NGOs.

Nias Agricultural Agency (2004) reported the coconut productivity achieved 12,229 kg/ha/year with 21,216 households who get income from the dry copra product. But according to farmers mentioned that in last one year the production of coconut trees becoming decreased until to 50% in southern part of Nias island. This

situation was influenced by *Brontispa sp* and unproductive coconut trees. Along of observations, the pest damage sprout leaf of coconut trees that happened in coastal areas dominantly.



Picture 8. Local weekly market activity

Picture 9. Latex slab production

Cacao beans productivity achieved 5,340 kg/ha/year with 4,164 households who get income from the product (Nias Agricultural Agency, 2004). In Lelehua village – Hiliserangkai subdistrict, farmers mentioned that the cacao production decreased until to 30% that damaged by a pest 'Penggerek Buah Kakao (PBK)' in last two year. Pak Sitoris Mendrofa, the farmer who has PBK problems in his cacao trees only harvested 30 kg/month in last two months, but two years ago he harvested 25 kg/week. In post-harvest processing, farmers still use traditional processing. They never used fermentation process for the cacao beans. In clear weather they dried the beans during 3 to 4 days, but in rainy season farmers use fumigation process to dry the cacao beans.

Marketing channel of cacao beans is same with other commodities. Farmers usually sell the cacao beans to local collector with range price Rp. 5,000.- to Rp. 8,000.-/kg. The cacao beans that sold by farmers still undried perfectly, so local collectors need to redry (reducing 30% of water content) and sorted the cacao beans then sell it to district traders in Gunung Sitoli with price Rp. 10,000.-/kg for high quality of beans (10% - 15% of water content). But sometimes the district traders need to redry again the cacao beans in bright weather to achieve 10% - 15% of water content. Then the district traders add Rp, 300.-/kg as transportation cost to regional traders in Medan and Padang areas.

Almost all households cultivate ubi jalar/sweet potato for harvesting the leaves only as the feeds for pig. The ubi jalar leaves was harvested every week. In the husbandry with 5 pigs, farmer have to provide at least 30 kg (2 bundles ubi jalar leaves) and mixed with 'dedak' (mixture of rice and bran) that will be used for 4 times feeding (6 days).

Market channel of ubi jalar leaves product shorter than other commodities. The market channel will end in Gunung Sitoli market. The distance of farmer's house to Gunung Sitoli market influences significantly on existing of local collector in between farmers and district traders. Farmers will sell the product to local collector if the distance to Gunung Sitoli to far. High cost for transportation and long distance trips doesn't balance with product price. In rainy season (November to January) when the ubi jalar leaves production decreased, so the price of product will increase around 2 times than the price in dry season. In rainy season farmers sell the product with price Rp. 5,500.-/bundle to local collectors in local market. Then local collectors sell the product to district traders (as a distributor, too) with adding the price Rp. 500.-

/bundle as a transportation cost. Finally, district traders sell (distribute) the product to consumers in around of Gunung Sitoli town with price Rp. 6,000.- to Rp. 7,000.-/bundle. The district trader will distribute at least 150 bundles of ubi jalar leaves product. Increasing of ubi jalar leaves product demand happened when the pigs have been mature and ready to sell in around of Christmas and New Year period. In that period, demand of mature pig increased to meet Nias community celebration needs. Each household sells 1 to 2 pigs every year.

Pinang product market channel is not different with rubber, cacao, and coconut commodities. According to local collector mentioned that every week he collected 50 kg to 200 kg of pinang fruit product from farmers who live in around of him. The local collector buy the product with price Rp. 3,200.-/kg from the farmers, then he adds Rp. 800.-/kg of the product to cover the drying process and transportation costs when he sell the product to district traders in Gunung Sitoli market. Local collector have to dry the pinang fruit product until to 30% of water content. But some times district traders need to redry the product to achieve product standard. The district traders sell the product to Medan and Padang areas with price Rp. 4,500.-/kg.

Picture 10. Ubi jalar production

Picture 11. Drying processing in local collector

Pisang keprok is banana variety that prefered by Sibolga and Gunung Sitoli communities for making fried banana. Most banana plants cultivated in southern part of Nias island with monoculture system, but sometimes farmers mixed banana plants with cacao and some fruit trees in homegarden system. Farmers sell the banana fruit product to local traders with price Rp. 3,000.-/bunch, then the local traders sell the product to district trader (distributor) in Gunung Sitoli with range price Rp. 3,500.- to Rp. 4,000.-/bunch. Finally, the district trader ships and distributes banana product to fried banana traders in Sibolga with price Rp. 6,000.- to Rp. 7,000.-/bunch. Distribution activity was conduct by district trader in Sibolga Harbour.

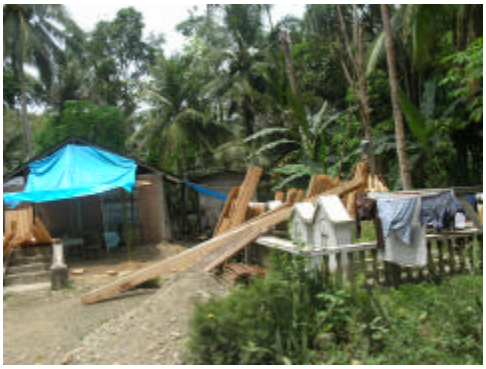
Low production of rubber, coconut, and cacao influenced by lack access of farmers on knowledge (information) and skill that related to high quality of germplasm, tree management implemented such as spacing, pruning, thinning, weeding and fertilizing, tapping and harvesting practices, and post-harvest handling. In harvest manner, farmers use simplify manner to harvest the product, for example almost all farmers are still using low quality tapping practices and usually tap on different diameter stands and age of the trees. Farmers don’t know yet how to achieve and to maintain high quality of product (product specifications) and product demand. Rubber, dry copra and cacao products usually mixed with dirt and still with high water content. Harvesting and post-harvest handling of farmers on tree based farming system products are still traditionally. This situation is caused by limited budget,

planning capacity, technical support and facilitation or extension from local government.

In marketing system, commodity products (rubber, cacao, coconut, etc) sold by individual manner, so quantity and quality of products indeterminate. Farmers don't have a working-group for developing marketing activity with traders. They lack access on market information and market channels, and then still using loan system without interest to meet daily needs. Meanwhile, traders have good access to information that related to daily commodity price, product specification, and supply-demand mechanism on regional and international market. Traders also don't have a working-group for collaborating marketing activity with farmers. This situation gives opportunities to the traders to determine the prices of commodity product.

D. Nias Livelihoods Activities

Earthquake disaster damaged a various of public infrastructures (roads-bridges, houses, schools, churchs and health centres directly. In some places there are localised landslides and flooding, but during several week in post-earthquake short-term foods price increases. Meanwhile, impact of earthquake on trees and annual crops for growing and production didn't influence significantly. But in rehabilitation programs, demand of durian timbers and other timber trees for rebuilding houses, schools, churchs, and health centres increased. To build a new house needs 3 to 4 m3 or 1 to 2 durian trees.



Picture 12. Rebuilding house with durian timber

Nias livelihoods are largely dependent on agriculture sector (90,07%) versus other occupations (service, trading, construction, mining, financial, transport-communication, electrical-gas-water, and industry) covered 9.93% only. Agriculture sector contribute 55.33% to RGDP (Real Gross Domestic Product) 2004 compare to other sectors that contribute 44.67% (Profile and Information of Nias District, 2004). In Hiliserangkai subdistrict (hilly part of Nias island), the contribution of rubber latex to household income can amount to as much as 90% of total income. Cacao beans and off-farm (making 'nipah roof', ojek, and warung) incomes contribute 10% of total income. Other fruit crops only meet subsistence needs. In southern part of Nias island (Bawe ja'u village – Teluk Dalam subdistrict), coconut and rubber contribute in each 40% of total income, and only 20% was contributed by 'sawah tadah hujan'. According to some farmers mentioned, local community who lives in northern part coastal of Gunung Sitoli get income from a various sources. Off-farm incomes (warung, labour, services) contribute 40% of total income. Coconut tree is the priority

species in that area only provide 25% of total income. Fishering contribute 20% and some commodities (cacao, pinang palm, and fruit crops) contribute 15% of total income.

Tree based farming systems exploitation is a male dominated activity (planting, weeding, tapping rubber and marketing latex slab, harvest and marketing coconut, cacao and pinang). But cultivating and harvesting ubi jalar was dominated by female. In the case of death of household head, the wife may get involved in male activity directly. Though women are not directly involved in the tree based farming systems exploitation, they have a very active role in managing the money provided by its marketing tree products and in some cases they get involved in marketing the tree products.

E. Community Development Based Agribusiness Linkages

Nias island is a separate and remote area of Sumatra island. This situation gives negative impacts on acceleration of agricultural and forestry developing, and finally local community keeps stay in poor livelihoods. The tree based farming systems in Nias island have potentials for conserving water, soil and biodiversity. The communities who owned of a various of tree based farming systems have played important roles to conserve water, soil and biodiversity, but in other hands the productivity of the tree based farming systems and community's livelihoods have not enhanced yet. In the meantime, almost all of the farmers have livelihoods that sourced by productivity of tree based farming systems. In general, tree based farming systems management is still extractive traditionally. Farmers used extractive traditional management to meet their daily income and food security. They do not know yet how and where they have to focus for improving their knowledge and skills on agribusiness linkages (Manurung, 2006). Generally, farmers lack access to market information (product demand, specifications and prices), lack understanding of market channels, produce products of unreliable quality and quantity, rarely engage in grading or processing to improve product quality, and sell their products as individuals (not through groups to achieve economies of scale) (Roshetko et al, 2006).

Market System Analysis. Nias agroforestry: helping the poor to jump higher preferable focused on agribusiness linkages through improving the livelihoods of tree based farming communities by providing technical assistance in sub-sectors where Nias island has long-term comparative advantages. The agribusiness linkages approach conducts a market system analysis that generally follows the tree products from the farmer to the final consumer identifying marketing chain and channels, the number and type of agents which include middleman, processors, and retailers. In a Smallholder Tree Farming System, market system it may be more advantageous to start on the demand side of the equation (market oriented vs. product oriented), identifying the final consumers' wants, needs, convictions, quality expectations, and current prices for different products which presently exist in the market place.

Farmer Group Extension. The farmer group extension approach seeks to empower motivated farmers to enhance and diversify the productivity/profitability of their tree based farming systems to seize market opportunities, both existing and developing. This approach can also be used with NGOs. Initial training is provided to farmer or NGO leaders that 1) analyze existing conditions and problems, 2) identify technical options, and 3) set work agendas. According to work agendas, more intensive follow up assistance is provided to farmer groups that these leaders have

helped to organize. The approach is flexible and dynamic, adjusting to the actual conditions of the target communities. It is also informal, practical, impact-oriented and focused on priorities identified by target communities. To avoid wasting resources and time, efforts are made to keep the structure and process of the farmer group approach simple and straightforward. Farmer leader training workshops focus on priority species, systems, problems, markets or other priorities. Common topics include seedling propagation and nursery management, tree and agroforestry system management, farmer–market linkages, and farmer-operated commercial enterprises (Roshetko et al, 2006).

Farmer Group Evolution Towards Farmer Enterprise Development. The implementation of *market system analysis* and the *farmer group extension* components build farmers' awareness of market conditions, enhance their technical skills, and strengthen/forms community-based farmer groups. The development of market awareness, technical skills and a group all facilitate the development of farmer-based enterprises. But what is an enterprise? An *enterprise* can be broadly defines as any *venture, project, endeavor, or activity*. We consider farmer-based enterprises as any activity that contributes to farmers' livelihoods or incomes (Roshetko et al, 2006).

Sites Selection for Regrin program. Implementing the Rebuilding Green Infrastructure with Trees People Wants project in Nias island needs some site selection criterias as following: 1) lack access information and skills on rubber and cacao nursery, tree farming management and marketing assistances, 2) tree-site matching, 3) collaborate with local NGO (church's NGO) who had experiences with establishing and developing of agroforestry extension and microfinance assistance programs in Nias.

Acknowledgements

The authors would like to thank the Asia ProEco IIB, EuropeAid Cooperation Office for the support to implement the assessment survey as part of the *Trees, Resilience and Livelihood Recovery in the Tsunami-affected Coastal Zone of Aceh and North Sumatra. Rebuilding Green Infrastructure with Trees People Wants* project. The authors also thank to Laxman Joshi for technical support during the implementation of the assessment survey.