IMPROVING LAND USE TROUGH INDIGENOUS GROFORESTRY (*TINUNGGLU* AND *PUMONEAN*) IN SIBERUT

REPORTED TO

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Introduction:

With a total 403.300 ha, Siberut Island is the largest island of Mentawai Archipelago, located between 0°80' and 2°00' south latitude and 98°60' and 99°40' east longitude, the average distance is 155 km from the capital city of West Sumatra. However not far from the west coast of Sumatra, the island has been isolated from the mainland for approximately 500.000 years (*pleistocene)* and the island has biodiversity, ecological, and also cultural uniqueness.

Siberut Island is a relatively young island that has been developed from sedimentation process and separated from Sumatra (Sundaland) since the mid-Pleistocene epoch (ca. 1,000,000 to 500,000 years ago). The process of separation from the mainland of Sumatra that provides a 'Splendid isolation' in the process of evolution of flora and fauna. This situation makes the sea islands of Siberut is important during the Pleistocene to the present. The character of this island isolation caused changes in flora and fauna evolution of flora and fauna of Siberut in Sumatra. Siberut has a unique ecosystem with high biodiversity levels, including some species endemic.

From biogeography point of view, isolation with limited influence from the mainland led to the flora and fauna on Siberut Island has evolved and co-evolved separately from *Sundaland* evolutionary events. The process of isolation and lack colonization of flora and fauna of Sumatra, encourage the formation of a high level endemism with exceptional ecological uniqueness. This is evidenced by the form of Siberut island fauna is more primitive and ancient than Sumatra (McNelly 1979, WWF 1980). In this island, 65% mammal endemic, 58% of them endemic in the genus level, 15% endemic plants, and 10% endemic birds (WWF 1980). The fauna is best known is four primates are *Bilou* or *Siamang Kerdil* (Hylobates klossii), *Bookoi* or Siberut monkey (Macaca siberu), *Simakobu* or Pig Tail Macaque (Simias concolor), and *Joja* or monkey Mentawai (Presbytys potenziani). Only a few places in the world of a small island area has endemic primates with a high value unless Simeleu in Aceh and no island in the world that has a density of primates endemic unless Siberut. Its unique and endemic animals and plants contain make this island categorized as 'hotspots area' in the Greater Sunda region and therefore has an important aspect to science, education, and conservation.

Besides the uniqueness of its biological diversity, the interesting point from Siberut is culture of its community. This island is homeland for Mentawai ethnic, one of the few

traditional communities that still are remaining in South-East Asia. The geography isolation does not only influence the evolution of biological resources ecologically, but also made the Mentawai community, could conserve and maintain their special *Neolithic* cultural from the influences of big religions and the wave of the massive trade that happened in Indonesia (Schefold 1979, Ruddle et al.1992, Osseweijer, and Persoon 2002).

Traditionally Mentawai ethnic is divided on several the extended family or clan that is known by the name of *Uma*. *Uma* consist of several families that live in the small house along the river. The number of Uma's members varied, around 30-60 members, is divided into several families or *lalep*. The form of the traditional settlement spread along the river. *Uma* is the foundation of ownership of the land, the forest, and its contents.
Their culture reflects the unique relations with nature. Native community in Siberut has outlook that forest not only has economics sense to get food and the income. The forest relates with the religious system that is known with *arat sabulungan* belief. In this belief, each object in the world has the soul (*tai*), the spirit (*simagre*) and the power (*bajau*). It is very important for the community to maintain the harmony of every element. The harmony is maintained through ceremony (*lia, punen*). The implementation of the restriction on the behavior of the individual, and the taboo system (the prohibition) when going hunting, fished, collect forest crops, and raising (Schefold 1991, Persoon 2002)

The life of Mentawai people really depend on natural resources— especially forest and its crops. Forest and its contents play the important role that can be used as the economic commodity, including fruits and latex, the source of animal food, medicine plants, etc. Around 503 species from 109 families are used by the local community as traditional medicine. The staple food of Siberut community is sago (*Metroxylon sagu*), that grow spread in this island. Going hunting by using arch and bow and fishing is the activity that is carried out to get protein and additional food. The roots, bananas, and the fruits are planted in the field. Pig and chicken provide the main protein especially for the ceremony and ritual celebration. Most families fulfill their economic need in a subsistent manner and the aspect of the health as well as the cleanliness is still being very limited.

The special culture and biodiversity receive the acknowledgment internationally. Since 15 December 1981 UNESCO, the Indonesian government is supervised by *Man and Biosphere* (MAB) program designated Siberut as *Biosphere Reserves* and in 1993, half of the island was dominated became the National Park covering the area measuring 190,300 ha (UNESCO 1996).

Geography and Siberut Ecology

Siberut was formed in the *Pleistocene* period that was marked by the existence general float to the surface from the non-volcanic Western Sumatran islands routes. This is characterized by the existence of flat hills and the peak in Siberut. The rock (schist) and the kwarts land from the Pre-Miocene period; several limestones from the Miocene period, as well as the spread volcanic rock show his origin from the volcanic Sumatran situation from Miocene periode. The rock composition and its geological sedimentation show from the period Pliocene or Pleistocene. The origin (Proto-Siberut) just emerges in the period later Pleistocene and consists of the young sediment composition that non-resistant and is arranged. A large number of happen the erosion that cause the development the area spacious that is cut-piece and not level with many rivers and the water current as well as a

small hills that flat level. These hills increase steeply, almost without the transition from swift the big river and the high peaks are reduced to the steep peaks with the direction that almost completely is free from the geological composition (WWF 1980).

Therefore, Siberut is the island formed from the process of the sedimentation and is dominated by the chip of the stone, mud sediment, and clay calcifies with the age of the young relative layer. Geologically is formed by young sediment so quite high erosion (WWF 1980). The soft land condition and not contain the stones, as resulting from the erosion, the shape of the surface of the island put forward cracked with steeply sloping riverbank and the steep hill backs. There is a small river that is nuclear-warhead in the crowd gap the hill and flow towards the big river. This extreme situation cause most Siberut mainland is not really easy to be used for the productive land.
Cross the equator, Siberut climate is tropical wet. This climate is characterized by the height of the rainfall, humid, the sunlight is abundant, without being the season completely dry, low change in the seasonal temperature as well as the distribution of bimodal pattern rain. In general the rainfall that is recorded in the research station in the east coast is 3.250 mm and in the research station near the forest show the figure 3364 mm. Rain will experience the intensity in months that is crossed the north wind in April and in October. The relatively dry months are February and June.

The combination between the humid climate and hilly topography produce typical vegetation of tropical rain (McNeely 1979; WWF 1980). This tropical forest contains vegetations that provide the wood reserve in the global market. Although exploitation efforts had been begun since the beginning of the last century, the latest mapping results show the tropical forest ecosystem is still remaining. The tropical rainforest nature is still dominating the mainland ecosystem, although the reduction in the area of the forest for the last one decade happening.

Tropical biologists have classified two types of native tropical forest on the island of Siberut is divided into two major ecosystem types, namely lowland tropical rain forests (lowland tropical rain forest) and swamps mangrove forest. It consists of two types i.e.; Primary *Dipterocarpus*. Forest in hilly areas dominated by the types of major commercial timber in the global market namely from *Dipterocarpaceae* family especially of the *Dipterocarpus* genus); A mixture of primary forest on the slopes and low hills under the Primary Dipterocarp Forest. There is no dominant species and relative economic value is *Myristicaceae, Euphorbiaceae, Dilleniae, Dipterocarpaceae*; Forest Freshwater Brackish with limited and specific types of flora which is dominated *Terminalia phellocarpa*, feather palms, rattan, pandanus and araoids; Mangrove Forest along the eastern coastline near shallow sea and coral reefs are widely used as construction materials; Forest Sago, this forest are dominated by sago (*Metroxylon sagu*, and *Metroxylon rumphii*) that grow naturally in swamps. This forest is coming from domestic as sago seedlings planted vegetative by humans; coastal forest, this forest type is commonly found in the western islands. This forest is an association of plants of the Barringtonia, Pandanus, and Eugenia genus.

Supported by the history of complex geology, young and still in the process of the formation as well as the tropical climate of the island, Siberut show the characteristics of the typical small island ecosystem, widely 403.300 ha, Siberut can be categorized as the small island that has the measurement less than 10.000 km2 (Falkland 1991). Siberut

island also has the problem that is experiencing by the small islands namely the limitations of the fresh water, resources (land, fresh water, mineral and the source of energy) that is fast decreased, a complex geological system and hydrology, the biological diversity isolation, the sensitivity towards the natural disaster like the typhoon, the earthquake, and the tsunami but also the social problem took the form of the population's pressure and the economics sensitivity.

Briefly the physical condition of Siberut Island is very fragile. The landscape is not flat, basis geological construction of young mud sediment and the very high rainfall made this island sensitive to the erosion, the drought, the flood, and the impoverishment of the fertility of the land. The analysis of the land in Siberut show the land had the content of the poorer nutrient and the fertility rate that are lower compared to the land in the other tropical forest. This sensitivity is complicated with the area reduction of the mainland resulting from the coastal aberration and the rise in the surface of sea water.

On the other land that can be cultivated also very limited because of the hilly topographic feature and the danger of landslides. The land that could be cultivated for the agricultural land, the plantation and livestock breeding in Siberut not more than 48,000 ha or less than 5% of Siberut area. A study concerning the level of the sensitivity by LIPI in anonymous (1994) has categorized more than 45% of the Siberut Island as Sensitivity I, consist of 25% steeper castors. The land categorized as Sensitivity I marked by the availability of low water, and the sensitivity of extreme erosion and unproductive. From these conditions, LIPI suggest most Siberut land is not appropriate is used as the cultivation area.

Societal Life and Tenurial Land

The number of Siberut inhabitants is estimated by 35,000 people and show the density 7,5km. Since the last decade, Siberut population increases because of the change in the pattern of the settlement and the social condition and economics. In 1930, the number of inhabitants is estimated 9,000 (Nooy-Palm 1968). From 1960 up to at this time, this island population increases to 300 percent. The migrants (non-Mentawaian) living in Siberut around 3000 or 10 percent and come from the ethnics of Minang, Batak, Java, Nias, and several people came from Flores.

Since the last half century, Minang, Bugis, and from Benggala traders are reported periodically interact with Mentawai people since the last three centuries ago, but it did not have proof that they had lived for the long time period. These migrants are interested to visit Siberut to trade in agricultural crops. The first migrant living in Siberut was Minang people, was begun 1940s. The entry of formal religions (Protestant, Catholic, Islam, Bahai) in 1950s were followed also with missionaries especially is Javanese, Italia, and Batak people (Coronese 1981). The wave of the migrant is increasingly intensive since the 1970's that involved some ethnics like Nias, Ambon, and China. They lived in Siberut as the civil servant, the worker of the timber company, the disseminator of the religion, the social activist and conservation of nature and the trader (Coronese 1981, Skephi 1992).

Table 1. The number of Siberut citizen

Year	Amount	Source

1853	7,090	Rosenberg
1930	9,268	Census
1960	11,881	Census
1971	14,732	Census
1976	18,149	Agency for regional development of West Sumatra
1980	18,554	Census
1990	24,740	Census
1992	25,173	Agency for regional development of West Sumatra
2002	30,106	Mentawai Statistic Bureau
2006	34,352	Mentawai Statistic Bureau
2008	34,721	Mentawai Statistic Bureau

Source: Persoon (1995) for data 1853-1992 and Mentawai Statistic Bureau from 2002-2008

From table 1 above show that the escalation of the increase of population increases since the last 30 years. Population increase for a hundred years from the 1850s until the 1980s, the population of Siberut less than the increase that occurred since the last four decades. Indonesia does not recognize segregation based on ethnic origin in the statistical categories (Li 2002), so it is difficult to analyze the factors that have a major role in increasing of Siberut population based on categories of race or birth rate (Persoon 1995). Based on rough estimation of statistics at Muara Siberut and Muara Sikabaluan village offices, two coastal villages is the center of the Minangkabau ethnic settlement and also the other comers, it can be stated that the number of migrants in Siberut approximately 10% (compare with the experience of Persoon (1995) is divisible to Nias, Minangkabau, Batak, Java, Flores, Tionghoa ethnics. Increase number of Siberut population also reflects a lot of things, such as lifestyle changes, views of the family, improving health services and their interaction with the outside.

Ethnographers often said that the social organisation of Mentawai community in Siberut is the structure inheritance of egalitarian politics from *neolithic* period (Schefold 1991, Loeb 1972). Traditionally Mentawai ethnic group according to the line of the patrilineal descendants called *Uma*. *Uma* refers to the big house that is occupied by the group's member. Every *Uma* consist of 30-80 individuals who live in the small settlement along the river. Every *Uma*, usually consist of 5-10 monogamy families called *lalep*. The measurement and the number of populations each of *Uma* is stable in the long term period (Persoon 1995, 2002). In *Uma* took place the exogamy system in where the woman does not have the right to her descendants and nature resources. If her husband died, she again become her father's *Uma*, while her children became her husband *Uma* 's member.

Uma also is the ownership unit of the land. The implication, only *Uma*'s members who are relevant that had the full right to have and process *Uma*'s private property (Schefold 1991, Persoon 1995). All the resources in Siberut is divided by the extend families, based on the line of the descendants of the man (*Uma*). Only Mentawai people that had *Uma* is as the characteristics of the descendants's marker. This is widely acknowledged by the

immigrants but also its neighbouring ethnic groups. Therefore, only Mentawai people that legitimately claim all the resources in Siberut. The outsider (the country and the immigrants) do not have right to the land and the forests and all of his contents in Siberut. The manner and the history of ownership of resources are arranged by the Mentawai tradition. The utilisation of resources by the parties must ask Mentawai people permits.

Uma represents an egalitarian structure without political hierarchy or organized leadership pattern. In political, they have not formed the political unit. They develop the temporary alliance if having collective enemy and marriage reasons (Schefold 1991). Because of that not found the political trans-*Uma* leadership that can influence the other political decision's *Uma*. All of *Uma*'s members mature have the same right and equal in all the affairs related with *Uma*, with the member of *Uma* or another *Uma*. Autonomy of the politics made often trigger conflict between *Uma* members. The conflict usually is end with *Uma*'s dissension. If the conflict happened, some members took refuge in other valleys, establish new *Uma*, and proclaim the *Uma*'s name based on behalf of the location, like the valley, the river, the mountain, wood dominated their new residence (Schefold 1991, Persoon 1995, 2002).

The traditional settlement pattern place *Uma* is all along the main river ravine that could be sailed by canoe. The map of the river basin does not only give the illustration of the complexity of hydrology but also show the number as well as *Uma*'s location (especially big *Uma* (Schefold 1991, Persoon 1995). Siberut inhabitants follow animism belief that believes that everything has the soul. The belief is known as *Arat Sabulungan*. In the belief, all— human, plants, animals —have the spirits. The nature phenomenon such as the rainbow, the storm, rain, thunder also has the spirits. These spirits are assigned to protect forest (*taikaleleu*), keep sky by reducing rain and hot (*taikamanua*), the spirit of the earth that grow plants (*taikabaga*), or the river (*taikaoinan)*. This belief is tight related with nature and forest. The belief gives religious contain in almost all aspects of the natural resources utilization.

Mentawai animism belief gives human opportunity to interact with nature equally and harmoniously (WWF 1980). This harmony is maintained through standards, taboos, and the prohibition that is contained in the management of nature resources. For example the prohibition while a mother is pregnant. Her husband may not cut down the tree and pick up rattan, fished, work in the forest as well as is forbidden to eat primate meat and turtle (Schefold 1979.1991) Respect for the harmony of nature has the important implications to live in a balance with nature resources. For example, cut down the tree without organize the certain ceremony will disrupt souls's harmony. The cost and the complex of the ceremony cut down limit threat toward the forest (WWF 1980).

Resources Ownership

Historically, access towards resources (land, forest, river, etc) is managed through the *sibakkat laggai* or *sibakat polka* concept (the owner of the land). In the history, ownership of resources can be gained with many methods. The first is *polak teteu* land, the category refers to the land that is found the first time by certain *Uma*'s member before the others *Uma* 's member found. The land is also mentioned as *polak sinesei*. The claim of the land is stronger. *Polak sinesei* become the sign that is quite firm about the history of the origin, the spread, the dispute of big *Uma-Umas* dissension in Mentawai. If we refer to oral history, at the first time Mentawai people is one relative. They afterwards carried out the

trip explore Siberut island. They would claim places that just was encountered by them with signaled-sign discouraging of the twig and the certain plants leaves, if, before they came to the location there was a person who mark an area, they would continue the trip to the other places and did the same until all resources in Siberut has divided completely.

The second *Polak Sinaki*; this is referring to the area where the land owned by *Uma* because buying from the other. At the beginning, the land is *Polak Sinesei*. But the inventor and then sell it to the *Uma* or other relatives. The ownership exchange process is generally voluntary. The process involves the purchase of pigs, exchanges with other land, or by exchange of valuable objects. Third *Polak alak toga*, is the land and the area owned by a *Uma* because the process of marriage. The men give bride pride to the women. Land which is given as bride pride is very rarely reported there. If it is reported it means there are more complicated marital problems. *Polak pasailiat mone*; is the type of land because of farm ownership exchange process with other *Uma*. This generally occurs between *Uma* rising alliance with *Uma* and near field locations. *Polak Lulu*; this is the land owned *Uma* from the other as a result of life indemnity or beheading murder. This land type is most often a vast expanse of hills. *Polak tulou,* this is owned forest land or as a violation of customary agreement. If there's an *Uma* involved with conflicts with others, and convicted in a negotiation, they will pay for it with land. Private land, this land is owned by the individual results of the purchase, fines and barter paid personally. The process of transition to be private land is very rarely found. Ownership of personal land involves specific buying and selling concepts.

The ownership variety of this land indicates that the land and the forest are not permanent belonging to *Uma*. Even traditionally, the trade in the land is not forbidden and become practice everyday. Beside *sibakkat laggai* concept, in Mentawai also is known by *sipasijago* and *toi* concepts. *Sipasijago* is *Uma* that assign to keep the *Uma*'s resources land. It happens because not all owners land's *Uma* stay in their owned land locations. According to the oral story, after some of *Uma*s found the certain land, occasionally they did not reside in the land that is found by them. They roam to look for the new land or move to avoid the conflict. The land afterwards is sent to *Umas*. *Uma* is called *sipasijago*. *Sipasijago* generally got the right to use all the nature resources that is entrusted, except for selling it. As the compensation, if *Uma* (the owner of the land) sold the land, then *sipasijago* also got the right from the selling in where the amount is depend on owners negotiation (*sibakkat*) and *sipasijago*. The right can be in the form of land, other things, or cash money.

Toi is groups of migrants who stayed alive in the land of the *sibakkat laggai*. *Toi* does not have right to use and access to the land. If he lives, and using forests for farming, they must pay *pulajuk* to the owner, the amount is determined by negotiation between the owners and tenants. To get a more solid ground status, *toi* must go through the *pangumbek* process that is often burden to *toi*. *Toi* is the comers who are generally involved in the conflict and fled from the settlement or their village locations. *Toi* has the land but the location is not located where they now live in. *Toi* is very vulnerable position because it can be expelled by the owner whenever if there is conflicts with landowners or alliance that is built up between *Uma* who is the same location change.

To sign the land boundary between *Uma*, Siberut people sometimes plant certain plants such as *ngirip* (*Barringtonia racemosa*), *Bobolo* (*Cordilyne racemosa*), *Bekeu anitu*

(*Abelmoschus moschantus* spp.), *Sura* (*Codiaeum variegatum*) (Meyers, 2003). While with different *Uma*, the nature marker is usually used to mark the land boundary, like the river, the mountain, the swamp or the others. The sign is given not to restrict the person's other access to the certain land, but to facilitate the next generation to know their ancestors's land.

Various forms of the acquisition of the land above have created a complex tenurial system. The complexity can be complicated by the ownership system of available resources on the land. Mentawai people knew double ownership towards resources. Not all ownership of resources on the land (the river, the tree, scrub, the stones) are owned by the owner of the land (*sibakkat laggai*). Between the land and nature resources above often is owned by different *Uma*. Most trees that grew in the certain land is property of the nuclear family and not the extended family (*Uma*). But, the fruits that are harvested must be distributed fairly to all of Uma 's members.

According to the tradition, there is no empty land or the land that is owned by the government or the migrants (*sasareu*) in the Siberut island. Every land and the forest included plants above has had its owner. The ownership system of the current land is on behalf of *Uma* (schefold 1991, persoon 1995). Every *Uma*'s members (*sikauma*) know precisely the land territory and the forest that became property of their *Uma*. The knowledge is told orally from generation to generation. *Sikauma* had the right to nature resources to carry out efforts of the management of staple food, built the pigsty, cultivation, gather rattan, hunting, and cut down the wood. The decision of the land boundary and ownership is determined by each of *Uma* (Schefold 1991, Persoon 1995). The land could be bequeathed, is given as compensation, is traded or is bartered; a process that took place for hundreds of years and made complex land ownership of the land. The dispute concerning the land abandonment normally happens (WWF 1980).

The history of land ownership and the forest are bequeathed to their descendants through oral stories and the history of the descendants. Occasionally story between one *Uma* with the others has different version, not relate and overlap. With the whole reach *Uma* 's 500 with the region measuring 403,500 ha, really difficult to look for the stability and the assurance of ownership and using. If you had an opportunity to sit at the back of the bench in the church if the priests are preaching in prayer, certainly most inhabitants will discuss about the durian, the coconut, the names of the river, fields and the land limit as well as histories that follow—the marriage genealogy, the conflict in the past, the murder incident, and all the matters relating with the command and access towards resources. Based on the complexity of the right and access against the forest really is difficult to identify and determine the ownership land according to the official criteria government on the map.

Generally not all Mentawaian use and get benefit from their *Uma* natural resources. Because of the location of the land are far, partly gather food, built the pigsty, or hunting in the forest owned by the other *Uma*, the other *Uma* 's member that means to gather food, build the pigsty or hunting in the other's *Uma* land, must ask for permission and pay compensation on nature resources that are taken known as *pulajuk* or *pangumbek* (CII 2001). The process of land use and the others *Uma* 's forest often do not get the agreement fully. Stealing cases of nature resources often happened. The thieves who are arrested will be affected by the traditional fine (*tulou*), the amount is determined in the conference lead by *Uma*'s head (*Sikebbukat Uma*). If the agreement is not gotten relating fine and

authentication, usually will be carried out by oath of rattan (*tipu sasa*) that often end with the closed conflict causing the death to have a background of mystique. These kind conflicts cause the occurrence of revenge for long time periode (Schefold 1991, CII 2001).

Land Use and Man Made Ecosystem

The Siberut community more depend on their life from the results of the land management for generation to the generation. However in the island, Siberut inhabitants are not known as the competent or expert seaman that like to sail cross the ocean. They more land oriented. Mentawai people develop the adaptation power towards the extreme and limited geological condition.

Basically, symbolic and spiritual relations between human being and nature resources for Mentawai people give the influence on their practical methods in using the forest. They fulfil their daily life needs by using sago, tubers, and bananas and gather results of the forest. Meat consumption is obtained from hunting, especially the wild pig and deer as well as prawns, the small fish in the river that close to their settlement. They take rattan, wood, and plants as medicine for their daily life around their living. It can be said that the subsistent model, that rely on the forest products is dominant

But, the interaction of the Mentawai people not only with the forest. They know several ecosystems outside forest that have different functions. The ecosystem is man made ecosystem that becomes the foundation for the concept about the settlement, land as the place to produce food and also valuable cultural places. Man made ecosystem is very important is seen as the form of the Siberut community's engineering and give “mental map” culturally to live actively with nature. The man made ecosystem can be used to explain why the pressure toward forest decrease for a long time period for Mentawai people so show the strong impression that the Mentawai people have environmental wisdom.

Generally—with small variations—Siberut community divides island ecosystem into several micro-productive man made ecosystem:

Settlement (*barasi*). The term *barasi* not came from the Mentawai langguage but from the Minangkabau language *barasiah* means clean. The use of the name *barasi* also explains that the collective settlement is new. Before, they use words *pulaggajat* or *laggai* refers to the traditional settlement, but *barasi* more like because of emerging together with the government project since the colonial period that suggest the inhabitants live in their village. The use of the term *barasi* distinguish with the term *pulaggajat* because generally *pulaggajat* is not occupied by many *Uma*s, moreover the main characteristics *barasi* indicate that the settlement is a place in which the vegetation has been cleaned, different from *pulaggajat* that more often is overgrown by scrub. *Pulaggajat* that has been cleaned by several *Uma* could be mentioned as *barasi*. Here every family and *Uma* establish house to be lived in. In this ecosystem, there are vegetables, bananas, medicine plants, the coconuts, the fruits, the flowers for decoration and ceremony. In various places of this ecosystem also mix with the chicken coop, the duck, cattle and the goat.

Taro field (gette). Usually it is located around the settlement protected from the pig. The field of taro is unit with the small river that contains the frog and the freshwater fish as the

source of protein. In several juicy places, the taro field mixes with sago field. Taro (*gette*) is main food beside sago. Taro field of the taro is managed by women. Respectively the nuclear family generally had pieces of the sago field besides used as daily consumption, also could be used as the tool to pay fine, conflict resolution, and bride pride.

Sago field (*sagai*). This field is the main source of staple food. Perhaps this is the most important fields for the people of Siberut. These fields are in the swamp water or near a large river which sent floods and mud fertile. Sago is an important and special plants. All parts of this plant is useful: the trunk of the most important source of carbohydrates, the flour is used as a meal of chicken and pigs, sago leaves and bark as a roof and walls of houses; shoot stem used as a place to spawn a large beetle, *Rynchoporus ferrugineus*, which will produce larvae as a protein source most preferred; New Farm (*tinunggu*). Ownership of sago fields are mosaics because these fields become the main exchange equipment dowry, the cost of paying fines and dissension, and inherited from generation to generation. Almost every *Uma* has every sago field.

Forest field (*Tinugglu and Pumonean*). The field is the continuation of *tinungglu* or called as the old field. It contains the mixture of wood plants, brush, bamboo, and the herb dominated by fruits. All the daily needs – medicine source, food, handy craft —provided in this field, also with commercial crop kinds like the clove, nutmeg, and the coconut. Generally, these fields are on the hill back or gradient castors and relatively dry. Plants for the construction and handy craft as bamboo and rattan also are available. The chickens and the pigs are maintained in *tinungglu* and *pumonean*. This field is dominated by the durian crop, the stick called as *mone*, associating with the crop like mangos teens, yellow fruits, water rose-apple, forest rambutan, etc. This field is very important because it is be the main social tool for the conflict resolution, payment fine, the legacy, and as the social status for the owner as well as to the measurement of the wealth for the owner.

River and swamp (bat oinan). The ecosystem is often found around the settlement. Women are the most important role in the ecosystem. The ecosystem is allocated to get the shellfish, fish, worm, prawns, the frog. The river also had a function of preserving sago; every river owned by certain *Uma* however can be used by the other *Uma's* members.

Beach and small island (nusa). This region is in the east and south of Siberut island, including mangrove forest. The ecosystem is used to fish, hunting of turtle, and big fish like dugong, and seaweed. The coconuts are important plants in this ecosystem because of being valuable economical high; in some wide small islands, they also manage clove, patchouli, and also plants some commercial plants such as nutmeg.

Forest/Hill (leleu). The region is used for the hunting need, especially four primates, the wild pig, deer, the snake, birds and the bat. The timbers to make boat and built the house. The region is also important because of providing non-timber forest products like rattan, oil, and honeybee. Like stated before, the forest ecosystem had complex nuances because of having symbolic and practical nuances at the same time marked by relations ambiguity between human being with the forest.

Land Classification

The classification of the man made ecosystem really related to the land classification of

Mentawaian. The land classification of this land is connecting with the nature capacity to be cultivated. In Siberut, the people distinguish several characteristics of land, that is:

No	Vernaculat Classification	Physical Characteristics	Land Use	Location
1.	Posa	Yellow, reddish, tough	*Leleu, Tinungglu* and *pumonean*; durian, yellow fruits, *babaet*, clove, caladium, banana	Hilly
2.	Lolit	Black-yellow, a little bit loose (*magabbru*)	Yield, *Tinungglu dan pumonean*; rambutan, cacao, areca nut, coconut, and sugar cane	Edge hill, near the settlement
3.	Buggei	Sandy, white, and loose	Peanut farm, maize, coconut, jawa sweet potato	Near the river, near the settlement
4.	Onaja	Swamp-mud, black, and have water	Caladium, sago, and cacao fields	Near the river, have water mud land
5.	Titikup	Tough land, tough yellow, Tanah liat, waterproof	*Leleu*, fit to forest crops (*katuka, karai, kaboi,* etc)	The top hill

Onaja

Onaja is swamp ecosystem. Swamps in siberut have the variation areas and different depth level. Swamps area have not managed, dominated by palm species vegetables, rattan, and several timber species. For traditional community, *onaja* area with shallow depth level until middle level is land managed to development of sago (*Metroxylon sagu*). In Siberut, sago is suitable to be developed in this area. Sago is the source of the main carbohydrate in this island as the staple food for human being and raw sago is used as the food for livestock. It causes Siberut community also manage the flatland area located in the bank *onaja* as the place of the development of the livestock traditionally. Factors that became the element in the selection location of the livestock are the availability of the source of food (sago) and consideration of the distance with the settlement so that the livestock (the pig) not become pest for the crop of the inhabitants's agriculture. *Onaja* is the main element for man made ecosystem of sago or taro.

Titikup

Titikup is used to name yellow soil —reddish and tough texture. *Posa* can be found widely in the hills area dominated by primary and secondary forest vegetation, as well as the mix

forest that is in the hilly. The type of land is not fertile enough to be cultivated, except for hard crop like the durian, yellow fruit, or forest mangos teens. The land with this condition is managed by Siberut community for the development of traditional agriculture with the commodity of crop species that have deep root. The *titikup* land is identical to the *leleu* ecosystem

Posa

The *Posa* land is reddish clay land until very black chocolate. The texture *Posa* almost resembles *titikup* despite the land *posa* quite loose. The types of soil can be found around hilly castors as far as hills. Most hard crop cultivations are carried out in this land types. The soil is managed by inhabitants for the development of plant species having deep root like the durian, forest rambutan or the forest jackfruit. It is almost the whole *tinungglu* land and *pumonean* characterized by the *posa* land.

Buggei

Buggei in the Mentawai language mean sand. But the soil type is unlike coastal sand. The soil is demand the clay sand texture. Generally *buggei* is located in the settlement area close to the coast or close to rivers that flowed. The more specific, *Buggei* is the type of soil located near waters (bargain and sea) but tend not flooded. The location of the land is in the bank of the rivers and is the fertile land because nutrient sediment protracted during the flood. The land is called *buggei* normally is used by the inhabitants as agriculture area for cash crop and coconuts. Besides as cultivation area, Siberut community chooses *Buggei* land type as settling area.

Lolit

Lolit is the land type resembles *posa* and *onaja*. The texture tends tough but its characteristics are not dry and the color is red-blacknes. *Lolit* is the transition of the soil type between *posa* and *onaja*. Generally the location is not located in the swamp but also is not in hills. The soil type generally is used for the settlement or livestock breeding. The cash crops function is as the income generating such as pineapples, patchouli, are cultivated in this land.
The relations between Mentawai people and its nature resources give the influence on their practical methods in managing it. The way of Mentawai people formulate the relations with nature depend on their method of using it, change and how through the action they dug and change] knowledge on some part of nature. Vision or view of Mentawai people in Siberut toward their forest that always influence by two matters: the method to produce as well as the structure and the social organization.

The man made ecosystem explains to us in which valuable economical ecosystem (in subsistent step), whatever that is more valuable cultural and spiritual, and whatever that later more will be economical. The classification facilitate us to understand the ecosystem that is exploited, is maintained, the source of staple food, the source of protein, or the cultural source for the Mentawai community in Siberut. Every ecosystem can not be independent and be related to mutual other ecosystems. The factor that influences the connection is in the form of spiritual and material connection.

There is connection between land classifications with land use system of Mentawai people. For Mentawai people, every land is used and engineered to support certain man made ecosystem. The production of the man made ecosystem paid attention to the complexity between the power support the land, crop types that are cultivated, the location election, and the condition of the topography of the extreme Siberut island.

The man made ecosystem mutually relates and shows the existence of relations between the man made ecosystem, land use and the production method. The forest ecosystem has special relations because more have nuances spiritual for the Mentawai people. The interaction with the jungle is more limited and less intensive but this precisely mark the height the symbolic value. The forest opening is very limited in Siberut only for the execution or the production of the new agricultural field (*tinungglu*). It is tight relates with the classification of man made ecosystem in Siberut. The pressure against the forest is relatively small because having the other man made ecosystem that is easy and effective when being exploits namely the sago field (*sagai*) and the taro field (*gette*). Sago and taro are important plants in Siberut besides durian. Sago and taro field function as the producer of staple food. Sago grew all along the juicy swamp and the muddy river. Siberut community cultivate sago crop in vegetative manner with allow buds young grew from the stump of the tree is ready the harvest, chose qualified and young buds to be planted in the other sago cluster. Taro is cultivated in the yard (Schefold 1991, Persoon 2002, Meyers 2003).

Ecologically the dependence on sago and the taro reduce the needs for the field opening for the tubers crop and bananas. The vegetative bud taro can grow independently without needing the intensive maintenance. Sago produce flour that is relatively stable and potential as the food reserve. Sago flour with the dose of the carbohydrate and fiber is equal to the rice is needed by lower labor is needed (Whitten and Whitten 1981). *Tinungglu* and *pumonean* (with the main results of the durian) can be compared produce snack.

The production system that determinate by traditional land use is carried out by generation to generation. Up to now throughout Siberut, the system is still practiced for generations. It explains why the forest region in the Siberut island is still protected and show the characteristics of the native ecosystem without significant disturbance. Mentawai people land use made the maintenance of the balance of the ecosystem and the life of human being.

Man made ecosystem in Siberut reflects the adaptation of Mentawai people towards the extreme ecological and geography. The ecosystem also reflects complete and complicated relations between land management, geological condition, and small island ecosystem, soil structure, vegetation cutting selection, and practical rational reason upon the utilization of the field product. The ecosystem feature of small island like Siberut in where geologically the land is susceptible for the disturbance make the community adapt by cultivating in small plot “swidden plot” (Kristijono 1998). The land is in this island characterized by very thin layer humus, almost 82% of the total land in Siberut is sensitive upon disturbance and every land using must be very careful (PHKA 1995). The community doesn’t cultivate as nomadic like in Kalimantan and Sumatra. This condition apparently became the point to be considered the way to manage the land.

The form of the community adaptation to the ecological condition that ought to be high

appreciated is the agriculture model. Almost all shifting cultivation in South-East Asia uses the seedy crop as staple food or mix seedy crop and tubers. Burning is techniques to eliminate weeds, pest, as well as the illness. In Siberut, the staple food that is planted is tubers (taro, the taro, cassava, and the sweet potato) and bananas. Tubers and bananas seldom have the natural enemy, can compete with weeds, and do not need the intensive maintenance. Tubers also did not need labor and high input technology (Brookfield and Padoch 1994). The burning eliminates weeds and the natural enemy is not need for the Mentawai people.

Societal and Land Use Change

Although pretended still remain with the traditional feature, Mentawai community in Siberut island can not avoid from the societal change. Siberut has involved with economic market through the forest crop trade import various products from Sumatra, at least according to the official document since 18 century. The trade with the outside and the export of agricultural produce, especially rattan and the coconut sporadically has happened and begin to be intensive since the beginning of the age 20 centuries. Dutch tries to make the plantation at the end of 19 century despite less successful.

The important change in siberut was happened since 1960s when the state intervention and the trade of forest product was very intensive. Based on the official state policy, Mentawai community in Siberut island is categorized as isolated clans (Koenjaraningrat 1993, anonymous 1996, 1989). The term of isolated has negative meaning, humiliates, and refers to a set of conservative characteristic, primitive. The term isolated is chosen to show spatial and socio-cultural character of the community living far location geographically and the condition of their life is isolated from main cultural.

There ae special policies regarding group categorized as isolated group (Persoon et al 2004, Koentjaraningrat 1993). This community should be promptly brought to the Indonesian lifestyle 'normal' and 'modern'. Development of Isolated Community Welfare (PKMT) is a special program of the Ministry of Social Affairs to overcome the isolation. An explicitly stated goal of this program is to reduce the backwardness of physical, social, cultural of the isolated community in order they can achieve social prosperity and be able to participate in development (Anonymous 1996; 2). The core of this program is to build a re-settlement for people who generally live scattered it. These communities are removed from the traditional settlements into a new settlement formed by the government.

This policy changes the pattern of the Mentawai people production to be more commercial crop oriented. The traditional lifestyle according to Mentawai as hunting and breeding pig decline in PKMT and is replaced by new production pattern. PKMT project force (Coronese 1985). Re-settlement is considered illness appearing, change land use pattern, cause economic difficulty and took part in increasing the erosion of the lifestyle according to the tradition (Anonymous 1993). In the new place, the inhabitants is too far from the field and the source of food, cause the dependence with cash economic transaction, to increase government control, disrupt the authority of the local law and change the mechanism of the government according to the tradition (Barber, Afif, Purnomo 1997).

The state policy also does not appreciate Mentawai people natural resources management system. The practice of Mentawai people cultivation is regarded as primitive and is point

out as the practice of wild agriculture that will disrupt conservation of the tropical forest. The most adaptive and sustainable without using fire must be left and replaced by planting rice program like in low land together with the entry plan of the transmigration program from the densely-populated island. Government paradigm more support the forest management of Siberut by the outsider, this became the justification for the government to give forest concession rights by the timber company. The pressures from forced development —included large scale forest cutting policy and intensive plantation —bring traditional natural resources management change. Land use system and man made ecosystem also experience the very significant shift.

The formation of the tourism industry, the presence, the publication of the researchers, the modern educational institution, the monotheist's religions, and the trade supported by arranged regular transportation open access and increase the intensity of the Mentawai community's contact with the outside world. The introduction of the monetary system, the policy of the country, and the new needs in the new settlement (school, administration, and religion), and market economic system oriented urge Mentawai people to re-define the production pattern and must adopt unsustainable land management system. The shift from economic system become commercial natural resources management pattern oriented need exact adaptation and with control and the strong influence from the outsider like the authority of the country and the timber businessman. When traditional natural resources management pattern is based on a long term periode and generation to the generation, the new management method that is imported come without considering societal structure and local knowledge without considering the societal structure and local knowledge, changing socio-economic environment, evoked by outside influences and control mechanisms. It cause land using pattern not sustainable oriented but compete a moment economic profit.

The increase in the outside influence and state policy of the country that is not in accordance with Mentawai people's life will cause the scraping of knowledge and the practice of the traditional management of nature resources. The interrelated with commercial crop and new needs upon money cause community fast to shift their techniques and land management as well as land without paying attention to the power supports of the environment. Now, the younger generation is more easy to adopt the exploitative behavior, support the timber company and use clear cutting agricultural techniques to open the forest. The increase of new need for the younger generation and economic and capacity limitation, they more chose the fast way to manage forest by means of being unwise, as selling it to the timber company or open for the monoculture plantation.

Uncontrol development in natural resources use —especially sell well in market —have an impact for the uniqueness ecology and the high biological value of Siberut island. Moreover this is valid for small and vulnerable island ecologically. Besides not in accordance with the land management traditionally, the commercial felling, the conversion of the land for the plantation and the change of land use can reduce the diversity of the habitat type and the number of biomasses so can cause the destruction of the balance of the biological diversity but also the power support lands that are limited in Siberut to productive. In line with the habitat change in the habitat while the last decade resulting from the small scale commercial forest cutting, agricultural expansion and societal change, then areas that has the high value to be cultivated more limited.

The new district government that is already formed from the process of decentralization also made the policy that is not suitable with societal capital, knowledge, and the traditional practice of Mentawai people. With the reason to increase the original district income, Mentawai government makes the policy to give permit for the felling of the forest to make the monoculture plantation like palm oil and the coconut. Ecologically these crops are not suitable to be buried in the former area of the forest and very damaging traditional classification system concerning land order. Besides that the policy is very dangerous for Siberut island ecosystem. Forest conversion of low land forest for monoculture plantation will disrupt the cycle of Siberut island hydrology is very complicated. Siberut land is clay sand type, it also does not have the layer that can keep the water. Forest is the only provider of the fresh water and the guard for the balance of the hydrology cycle. Destruction of the forest and the loss wildlife are potential to destroy Siberut ecosystem permanently.

In the meantime, the pattern of the extractive new production is not balance with results of economics gotten and ecological risk for Siberut. Siberut people sell their natural crops in a raw manner so the price is cheap. Conversely they get the things from outside in the form of so built in so have high price. It causes the difference of the price from the Siberut island to outside is very low and from outside to Siberut is very high. The more economic margin, the most improve exploitation due to getting daily needs for Mentawai people must increase their sale of the agricultural produce. It will become the vicious circle. The bigger natural crop that left from Siberut island, the biggest exploitative improvement potency. The island position geographically that need transportation increase the trade cost. This cause the position of the Mentawai community became more marginal.

Ecological and ownership change and horizontal conflict

More exploitative

Societal changes take part in creating land use change of Mentawai people. The system of the management of Mentawai people is centered on the forest opening for the commercial crop plantation. They also begin to shift functioning to provide staple crop like *sagai* and *gettek* become monoculture agriculture. The conversion in the large scale is from the sago field to the cacao field. The conversion is considered is economical because the sago field does not have economic profit in the short time period. Transferring process cause man made ecosystem of the Siberut people only become one ecosystem namely monoculture agriculture. Since the 2000's, the Siberut inhabitant only focuses in commercial crop agriculture.

Monoculture agriculture (clove, sapphire and especially cacao) that now still is glow in Siberut cause land problems appearance. Many lands are swamp (*onaja*) is force to dry and is used as the agriculture land. The new forests that is in the high land has begun to be cut down, despite the characteristics of tough *posa* land is not fertile enough for the short age crop. The hydrology system that is stabilized with the existence of the forest and the sago field in the swamp also experience the disturbance. In fact in Muara Siberut, where the land is dominated by the peat swamp, the extensive land that is in the juicy swamp is burnt and dried to be made cacao field. The efforts experience total failure.

The conversion of the natural ecosystem forcibly then is carried out throughout the

ecosystem that traditionally is developed with sustainable principles. The poor low land forest of the nutrient cut down in a massif manner, the swamp forest is dried, and productive fields for staple food like the sago field. Taro is also converted for the dried field. The serious is small island *(nusa*) that is usual planted coconut now begins to be changed into monoculture agriculture. The conversion is risky because of Mentawai people personally does not have skills to open agriculture intensively, with the egalitarian social system, is really difficult to accumulate labor surplus to maximize the production of monoculture agriculture. They are also still foreign with exotic crops like cacao. New plants bring new diseases and also needs the management that is not controlled by them. They also have the difficulty in getting outside inputs (fertilizer, technology) due to limited capital and also skill. Most big conversions of their traditional ecosystem into agriculture are failure.

Changes also happen in the people's method of processing nature resources. The practices of the utilization of the forest or the opening *tinungglu* now ignore selected cutting system and use fire in drainage process. These new techniques tend more exploitative by leaving the traditional practices. Siberut inhabitants also start cut down the forest in the wide measurement although they experience the labor difficulty in the process of the processing. The forest opening often is not meant to change the plot of the forest into the field but is meant in order the buyer of the land is interested to buy the land that already half-finished. The Mentawai people also tend to ignore the cultivation of the food crops. Sago, taro, bananas do not priority of the crops species. They tend to give priority to the commercial crops and not combine with the needs for food endurance. The situation is very risky because some commercial crops are exotic species that come from outside of the Siberut island. Ecologically, these crops do not necessarily are appropriate to long term period for conservation of the land in Siberut.

Problems related technical agriculture skill for example is still limited in selecting more appropriate agriculture commodities species with Siberut land condition and also the weather. The land condition of Siberut land is sourer because of high pyrite substance (the fusion of iron with most protract oxygen in the land). Besides that the rainfall in Siberut is very swift. It is needed crops that resist toward both conditions. As far, the farmers only rely on the crop species that come from outside. Many farmers do not less care about crops compatibility. The election of the seed is very important regarding the quality of the production and the level of the maintenance.

Roughly, agriculture in Siberut is really opened. But not all the lands fit with the character of monoculture agriculture, a comparative data is really needed to know fit land for cacao, plantation can be only carried out in the dry land. But the land only is available in hills. Because of the reason the manpower difficulty in opening the forest, the Mentawai people use of the swamp areas. Most fields are just made from the former sago swamp. The steep hills and the land is clay (*posa*) are less. The gradient and low swamp forest is around 15% (60,000 ha) from the total of Siberut island. If around 5.000 families in Siberut open the field from year to year, land supplies in Siberut will decrease drastically in not long term again.

Besides ecological factor, land use appearance also stimulates the land conflict. The agriculture trend increases the land needs. For several owners of the land (*sibakkat laggai*), it is an opportunity gets cash money (capital) for efforts investment, the cost or valuable

things of children's school like television, the motor, or the machine from land selling. Basically the land disputes are not the new matter for Mentawai people in Siberut. Economic opportunity appearance from the commercial crop in recent times has become the trigger for excavation efforts of land history and gives gap for *Uma*s to propose the claim. The conflict often happens in regions that will be opened to the field.

The problem uproar of the land happens in the region starting commercial experience. One of factors of the emergence of the land conflict is caused by Siberut inhabitant's wish Siberut to have the land personally. It relates with the production system of monoculture agriculture. The monoculture plantation is more effective is done the nuclear family. The people who feel more hard and active working is difficult to collaborate with the others *Uma* not field oriented. Cultivate with *Uma* unit will be hold with societal obligation against the extended family (help buy pig when *Lia* ceremony, help the nephew to pay his/ her school, contribute in the uncle's medical treatment, etc.).

The Siberut inhabitants tend to strengthen ownership status through official certificate is acknowledged and guaranteed by country. Through personal ownership, someone can claim the land and its field through land certificate or trade letter that is acknowledged by state —at least village government. Personal land ownership can consolidate right guarantee and management. The wish to have personal land indicate the wider matter, namely that is shifting the function of the land to the commodity. The personal land can be easily become personal economics capital. Personal land change becomes investment. With this route, the land could be pawn to the other side to get credit or debt, can be offered as collateral in the bank, or be hired. The person who buy the land not only to plant cacao, but also is savings that can be used and will increase the selling point and give high profit in the future than when the lands are bought. It explains there is contradiction in the lands that is in the dispute. These lands is very interested by the rich person and has networking access to sell due to more catch buyers because of the cheap cost. This situation also became the weapon for the brave prospective buyers to take the risks of facing the contradictory claim mutually to press the price.

Land co-modification also explains the irony to a more stable land status, and free from dispute. Land types has higher selling point. Moreover, it is already clean, planted and obtains formal letters signed by official government. One of mood for land selling that have a valid claim is the owner of cacao plants in the edge street or place that is easily seen, make channel and cut down. It is done with the expectation of attracting buyers and implicitly describes the status of the land stability. This strategy will increase the price of land. Prospective buyers also more interest for the land without conflict even more expensive.

The method in getting the current land needs capital. In land changing matter into the commodity, the competition will be won by the person that has much capital. Capital to buy the land usually is owned by the immigrants (Batak, Flores, nias, Java or Minangkabau). They are the traders and the civil worker who set aside the profit and pawn the appointment letter of the official to the bank. Moreover with the social network and the connection, they can propose debt or credit. They see the cultivation opportunity, at first as additional efforts from their main job as the teachers, the religious figures, the small-scale traders or the civil servants. They begin to buy crowd lands (0,25-1 ha) have a cheap price. For the big businessmen, they buy the land measuring 50 ha with the not really high price,

then is sold again still became small pieces to relatives or his social network. These migrants, remains that their high investment instinct, drill the lands close to the village, market access or the side of the road. If we study in more detail, Mentawai family generally has status that enable to has enough capital like teachers, official head, big holders projects.

Ownership of the land as capital and the production factors begins the accumulation cycle. Almost all the land that is in the strategic places (close to the sub-district city, close to the main highway) has shift th owners. Most owned by the skill and successful person because of the capital support. For the immigrants, it is apparently the route that has the bright prospect. For the Mentawai people, it is similar with switch on light at the night when storm appear. Land capital for the migrants, immediately is combined with the financial security increase the intensity of the maintenance. Inputs from outside like fertilizer, good quality seeds quickly produce the field of high productive cacao. The high production of cacao will be faster return capital invested by them. For the local farmer personally, all is perhaps only done with its family's labor.

Because of the urgent needs (the school cost, *Lia*, or the medical treatment cost). Some Mentawai people will be more easy sell their field. It often happens before Christmas and the New Year. The accumulation capital cycle causes shifting of land owners from *sibakkat laggai*., Most move the hands to the immigrant. The process of the trading process through the principle likes to be willing. It is rarely the trade transaction involve forcing. It is not a process that is understood and often miss interpreted as the sasareu "colonization" to Mentawai people. In fact, in almost trade case, *sibakkat laggai* (the Mentawai people) that more previously offers the land on the various reasons. Now, the Mentawai people more cultivate in far fields. Some of their reasons are they does not have capital to buy the land near the road or the settlement. Another reasons, they cultivate previously in their owned land in where the location is far. The far distance of the location will increase the transport cost of harvest yield.

The owner of the field that has capital can spend their yield to buy the wider land, while, *sibakkat laggai* will be easy to lose the land ownership. It is more realized it is potential for Mentawai people work in fields not belonging to them. The switching process of the land from *sibakkat laggai* to the new cacao field owner and the daily worker's emergence trigger 'agraria differentiation'. It is a complicated, cumulative, and permanent process. The change process in different group, some of them outsiders — get profit from access towards its own resources or results of the other person's labor, based on the difference of the control on the land and production means, that often, despite not always, increase the imbalance of access against the land.

Land Use Recovery Efforts in Siberut

The occurrence of changes in natural resources management aspects in Siberut reflects the bigger change in the Mentawai community. These changes are determinated by the change in the production method of the Mentawai people. They are now more commercial crops oriented and the implications are a large number, both socially and ecologically. These changes gives the pressure towards the Siberut ecosystem, in the past time, with the tenurial system and traditional land use practiced by Mentawai people has proven guarantee the continuity of the utilization of nature resources. The rescue efforts of these

nature resources are difficult to be carried out because of the most rapid change flow and almost could be stated, like the wave motivating Siberut people to more exploitative and leave traditional practices.

Based on traditional knowledge, natural resources techniques, and the system of the management that is owned by them, there is still an expectation to carry out recovery efforts in line with increasing the utilization of nature resources in Siberut. It remains the orientation of the market that tend to become the only choice of Siberut people, improvement and recovery land use efforts also must pay attention to efforts of man made ecosystem management improvement that tend to be commercial oriented.

Based on the study of community around the forest, a lot of evidence reported capabilities and societal capital of communities around the forests to balance economic sufficiency and conservation needs. One of them is through local agroferstry system. Agroforestry is believed to be a middle bi-polar way of looking at the forest: the protection or exploitation. Now, a breakthrough for agroforestry practitioners is campaigned as a model of conservation for sustainable forest utilization. Knowledge of forest use by integrating logic agriculture and market are one of the best options for compromise conservation, maintaining biodiversity, and economic growth. Agroforestry system of communities around the forest has higher productivity values from monoculture farming system.

Tinungglu dan Pumonean as Local Agroforestry

The Mentawai people tradition in Siberut uses the integration concept of the forest crop, the agricultural crop, and the commercial crop through *tinungglu* and *pumonean*. *Tinungglu* and *pumonean* is man made ecosystem that mutually relates and equip to one another. The potency can be developed from land use of Mentawai people in Siberut. The classification of agriculture in the tropical forest, *tinungglu* and *pumonean* can be said as the variant of agroforestry. Agroforestry form in Siberut perhaps the most unique compared to the countryside community of wet tropical forest in South-East Asia or even the world that most cultivate by using fire as the drying factor (slash and burn) (Conklin 1967, Brookfield and Padoch 1994, Ruthenberg 1980).

The cultivation techniques of Siberut community are very much different from the shifting cultivation system in the tropical area. The most important point for cultivation activity in Siberut is fire is not important aspect from the process of the field opening (McNeely 1979, WWF 1980, Persoon 2002). In Siberut, the agriculture system uses the selected cutting model. The important plants are not in cut down. The plants that are cut down are allowed to rot without being burnt (slash and mulch) (Meyers 2003). So far, the main reason why the Mentawai community in Siberut do not use slash and mulch is the religious reason. Whoever cultivating by using fire will experience the danger, the accident, or serious sick. (Schefold 1991). The agriculture system without simple clear cutting and fire give the opportunity so that human being lives in relations that is more harmony with the forest (WWF 1980).

Despite *tinungglu* and *pumonean* is regarded as simpler by Mentawai community if compared by cultivation in Sumatran mainland. They regard the characteristics of crops planted in *pumonean* is unstructure (plant sibobo). The situation that is simple from outside need complicated process in the implementation because need special relations with the

taboo and the prohibition, the belief, and ceremonies.

Table 1. Steps vegatation forming in tinugglu land and pumonean in Siberut (After Darmanto 2006, Meyers 2003).

Steps	*Wild plants or planted plants*	*Spontan growth species*

*Primary forest (*leleu*)*	-
New field clearing (0-3 month)	Ficus *spp. , Dipterocarpaceae (Dipterocarpus spp, Shorea spp. Vatica spp), Beccaurea spp, Leea spp. dll*
New field, tinunggulu *(3-12)* The field harvest period and after harvest (1-4 years)	*Tubers[2]: caladium (Dioscorea alata),* taro *(Colocasia esculenta),* cassava *(Manihot esculenta),* sweet potato *(Ipomoea spp); bananas[2] (Musa spp),* patchouli[3] *(Pogostemon cablin);* nutmeg[3] *(Myristica fragrance),* areca nut[3] *(pinanga sp)* cacao[3] *(Theobroma cacao),* pineaple *(Ananas camosus)* and vegetables *(Cucurbitae* dan *Solanaceae)*: eggplant, cucumber. Re-plant bananas and tubers, cacao.
Transition field *(4-7* years*)*	Bananas, cassave, fruits: durian, its fruits, tree similar with jackfruits, rambutan, mango, sour condiment, mangosteen, *toktuk, Dipterocarpus, Shorea,* the rose apple
Ladang bera (dark red field (6-15 years)	Durian, its fruits, pineaple, tree similar with jackfruits, rambutan, manggo, sour condiment made from a fruits, *toktuk*, *Dipterocarpus, Shorea,* the rose apple
Old field (pumonean) (>20 years)	Durian, its fruits, *toktuk*, tree

[1] *Some* Ficus *spp. and cultural valued timber*
[2] *Carbohidrat (staple food)*
[3] *Income source (agricultural plants)*
[4] *Fruit plants*

Like agroforestry practices system in the other areas of the world, *tinugglu* and *pumonean* has opportunity to bring together ecological and economic interests in forest use. So far there are opinion tensions between development and conservation paradigm. From the exploitation side, conservation is considered does not provide financial benefits and contribute to the development. While in conservation side, forest conversion into big-scale plantations or large-scale commercial logging will lose out from ecological side (Angelsen and Kaimowitz 2004). *Tinungglu* and *pumonean* contain staple food (bananas, caladium, taro), fruits (rambutan, jackfruit, durian, yellow fruit), a source of firewood. Forest plant used as canoes and houses materials, as well as a source of protein from animals hunted. As agroforestry systems, *tinugglu* and *pumonean* is potential to give benefit for both, both ecologically and economically.

Tinungglu and *pumonean* is a method how to transform forests into cultivation area that has commercial value by maintaining the functionality and characteristics of the forest. This practice has an opportunity to increase the proportion of commercial plant species, maintain the proportion of the types for daily use and create patches of 'jungle' has cultural value and contains valuable commercial crops. In *tinungglu* and *pumonean* is often utilized as a place to raise chickens and pigs as a source of protein. *Tinungglu* and *pumonean* is a method to streamline the land. Although in the past time, *tinungglu* and *pumonean* were dominated by subsistent-oriented crops, does not mean the system is static. Its development was influenced by the trade in forest products in global markets. Commercial crops such as patchouli/*patokoilo* (*Pogostemon cablin*), rattan (*Calamus Manan*), areca nut (*Pinanga annata*), Clove (*Eugenia aromatica*), coffee (*Coffea* sp.), Petai (*Parkia speciosa*), nutmeg (*Myristica fragrance*), cocoa (*Theobroma cacao*), many have found, and are a source of income shows *tinugglu* and *pumonean* connected with the market.

Table 1. Staple foods species and seasonal crops planted on the staple foods planting phaase (*after* Darmanto 2006)

No.	**Local name**	**Scientific name**	**(Purpose)**
1	Bluik	Dioscorea bulbifera	Staple food
2	Daro	Capsicum spp.	Medicine, vegetable
3	Cengkeh	Eugeina carophyllum	Comercial
4	Gette’	Colocasia esculenta	Staple food
5	Gobi’	Ipomoea batatas	Staple food
6	Jahe	Zingiber sp.	Medicine
7	Rimau	Citrus spp.	Fruit, medicine
8	Kakao	Theobroma cacao	Comercial
9	Kiniu	Curcuma sp.	Medicine
10	Kopi	Coffea spp.	Comercial

11	Kulit manis	Cinnamomum zeylanium	Comercial
12	Laikket	Ipomoea sp.	Staple food
13	Luttik	Manihot utilisima	Staple food
14	Babeget	Calamus manan	Comercial
15	Mentimun	Cucumis sp.	Fruit, medicine
16	Asit	Ananas camosus	Fruit
17	Patokkoilo	Pogostemon cablin	Comercial
18	Pakku	Cucumis sativus	Vegetable
19	Pala	Myrstica fragrance	Comercial
20	Pepaya	Carica papaya	Fruit
21	Pinang	Pinanga acata	Comercial
22	Rimbang	Solanum sp.	Vegetable
23	Serai	Indet	Medicine
24	Siputetekket	Ipomoea batatas	Staple food
25	Kole	Sacharum officinarum	Medicine, fruit
26	Terong	Solanum melongena	Vegetabke
27	Tomat	Lycopersicum esculentum	Vegetable
28	Gette’	Dioscorea alata	Staple food
29	Cengkeh	Eugenia caryophylla	Comercial
30	Petai	Parkia speciosa	Comercial, vegetable
31	Turubilijo	Musa sp.	Staple food
32	Siboo	Musa sp	Staple food
33	Roijong	Musa sp	Staple food
34	Bikklu	Musa sp	Staple food
35	Kelakuggatai	Musa sp	Staple food
36	Takguili	Musa sp	Staple food
37	Kela ratangen	Musa sp	Staple food
38	Tasopo	Musa sp	Staple food
39	Magot sasareu	Musa sp	Staple food
40	Laga ugetu	Musa sp	Staple food
41	Tak bilijo	Musa sp	Staple food
42	Ngai Mang	Musa sp	Staple food
43	Pisang diri	Musa sp	Staple food
44	Jojoet	Musa sp	Staple food
45	Bambui	Musa sp	Staple food
46	Bobaga	Musa sp	Staple food
47	Sinatsat	Musa sp	Staple food
48	Lagot sikebbukat	Musa sp	Staple food
49	Puddi	Musa sp	Staple food
50	Pukpuk	Musa sp	Staple food
51	Boji	Musa sp	Staple food

Tinugglu and *pumonean* produce a mix domestication and or half of domestic as well as a meeting points of economic and cultural values. *Tinugglu* and *pumonean* have high biodiversity value. This fact can be opposition with monoculture farming. *Tinungglu* vertical structure and pumonean are not much different from the old secondary forest. The species used as medicines, woody plants, and fruit-cross resembles the old forest. *Tinugglu* and *pumonean* are also be seen as gene pools for plants that have the potential to breaded.

In the societal function, the contents of the crops in *tinungglu* and *pumonean* have a role as the conflict resolution, pay bride pride, pawning thing, and societal guarantee. Nevertheless, in fulfill subsistent needs, *tinungglu* and *pumonean* show the characteristics of the forest. Non commercial t*inungglu* and *pumonean* (for food and fruits) and half of the wild plants (medicine plants) increase the exchange and the donation. It develops the even distribution system and as the couple who equip the function of *tinungglu* and *pumonean* as the network of the trade through the commercial crops, and maintain the societal balance.

Tinungglu and *pumonean* become the effectiveness land method. The practice has an opportunity to increase the proportion of beneficial species, increase commercial species, maintain the proportion of wood for daily needs (*Dipterocarpus, Shorea, Sterculia, Hopea* etc.), create plot of the cultural valued forest and the fruits forest in the former field. The indicator of vegetation in *pumonean* gives the good reason for the domestication mixture (the cultivation crop) and or half of the domestication. *Pumonean* is be a meeting point of economics and cultural values and become the meeting zone between wild plants (the forest) and cultivation plants, high and high economic valued trees. The management of *pumonean* also has the implications towards the method of gazing forest for the Siberut community. The distinction between the mature forest, the secondary forest, fruit field, the forest of various stage sorts floristic, and the scrub land are as in the case of in classification of biology is difficult to be done. It is seen from the floristic structure, is difficult to make sure clear characteristics between *leleu* (forest) and old *pumonean*. The former of *pumonean* sometimes also is mentioned as *leleu* by the community. The available plants species in the forest are in *pumonean*, while some species in *pumonean* is found also in the forest (*leleu*). Vegetation in *pumonean* is not seen homogeneous but is the combination between forest vegetation, the field, and agriculture.

Tinungglu and *pumonean* are very potential to be developed into a typical agroforestry models in the Siberut island. *Tinungglu* and *pumonean* has potential to be developed become agroforestry, a way to crossed married 'the logic of agriculture' and 'forests' engineered by the scientist in the last three decades ago. *Tinugglu* and *pumonean* do not only make a combination between woody plants with *herbaceus*, *tinungglu* and *pumonean* plant species and potentially integrate the management of forest with logic agricultural and economic of household that is cultural dimension. In accordance with the report of the World Wide Fund for Nature (WWF) in 1980, the characteristics of vulnerable Siberut areas can not be exploited by intensive agriculture, so agroforetry is be the right option. Forest management system in Siberut, must contain the manipulation of forest ecosystems that contain a mixture of agriculture and forestry.

It need to be optimized in the system of agricultural fields is to intergrate logic into commercially oriented into *tinungglu* dan *pumonean* by developing plants species needed by the market in accordance with the ecological characteristics of Siberut island. Besides

that *tinungglu* dan *pumonean* can streamline with revitalize traditional management system combined with the introduction of advanced farming techniques. Agroforestry can be a breakthrough in formulating the traditional resource recovery strategy for the Siberut community economic. Agroforestry management can overcome the extractive and exploitative system of the forest until they run out. Therefore, it can contribute for preserving the fragile ecosystem of Siberut.

To improve land use of Mentawai people through *tinungglu* dan *pumonean,* a few things to note:

Traditional knowledge enrichment

Efforts are needed to renew *tinungglu* dan *pumonean* system by looking for input management techniques of forest management. Improvement of this system should be started from the practices that now exist and are obtained from community culture. Updates system of *tinungglu* dan *pumonean* are interpreted in the context of seeking the ways to convert forests and other land use that do not result in economic decline, not closing the economic potential and maintenance of biological diversity associated with forests. Conversely, looking for effective techniques of *tinungglu* dan *pumonean* is capable of restoring biodiversity in agroforestry. Community gets economic compensation for the present and future. Development of appropriate technologies, management techniques and *enrichment*/pengayaan of traditional knowledge into *tinungglu* dan *pumonean* management practices can be a strategy of agricultural intensification involved in setting the pattern of farming systems in addition to maintaining the land productive potency. The selection of appropriate commercial commodity with the ecology of Siberut will greatly help to preserve the traditional land use and ecosystem balance and provide significant economic benefits. Revitalization of local knowledge and combining with the knowledge of new natural resource management is an important aspect to enrich the existing traditional knowledge.

Land intensification

Siberut Island possesses limited cultivation area. LIPI research analysis tells us, from 403 000 hectares of Siberut, only 12-13% of eligible to be cultivated. This area is located in the lowlands which generally tend to get wet. This area is typically used for residential and sago gardens. The others are used to *tinungglu* dan *pumonean*. Cultivated areas mainly located along the river and near a residential population that is generally found in close to the important rivers. To optimize *tinungglu* dan *pumonean*, efforts should be done is to intensify the existing land. This business can be done by using intercropping techniques (which has traditionally been practiced) between commercially oriented crops with plant functions (medical, staple food, plants for the ceremony) in *tinungglu* or *pumonean*. In order not to disturb the ecosystem and hydrological cycle, conversion of sago swamp farm in swamp should be avoided. *tinungglu* dan *pumonean* lands residing in *lolit* and *posa* types can be maximized for the locations of the intensive new field. Although likely to fertile land, these lands often are sour because of stagnant water. Drying technique of ecologically-friendly land and the addition of external inputs such as fertilizer that can be produced alone by the community through processing of livestock manure is needed to improve *lolit* and *posa* land condition. Land intensification requires development of commodity species and improvement land processing.

Civil education

Agroforestry development can not be accomplished if the Siberut people who have knowledge treasury leave *tinungglu* dan *pumonean* practices and move to extractive and exploitative practices. Resource capacity building is urgently needed. This can be achieved when the cultivators can consolidate excess labor and traditional knowledge. This reinforcement can be achieved through the development of skills and skills of management. Ability to understand the market, household management skills are some important social skills that should be owned by the Mentawai people. Civic education for the community is very important. Mentawai people must also understand the consequences of changing production patterns. Changes of priduction methods do not only result for economic change, but also moral, societal, materials processes. Impacts do not only on the facts straight in the form of revenue and production but also the change of identity, aspirations, societal conflict and change in the relation between human and natural resources. Without process of improving human resources, conflict over land, damage to ecosystems and loss of food security is a risk that must be faced by Siberut people associated with changes in production.

Policy awareness

Appreciations of policy makers (governments, private sectors) to Mentawai people land use system are very bad. They never use the land use system of the Mentawai people as the basis for policy development in agriculture and plantations. Patterns of production and new techniques that endanger the ecosystem of Siberut actually come from government policy. The pattern of monoculture farming, forest clear-cutting system, the use of chemical fertilizers is chemical fertilizer is techniques of cultivation that was introduced officially by the government. This policy is endangering the sustainability of traditional land use ecosystems as well as Siberut island. It is required an effort to introduce more in-depth information and *tinungglu* dan *pumonean* system as a agroforestry model for policy makers. The expansion of information should be able to change the orientation of policy makers thinking easier to convert forests and the diversity of Siberut people land use through large scale plantation schemes that do not conform with the Mentawai people of labor capacity and capacity of natural resources support.