

**ANALYSIS AND DETERMINATION OF THE UNDERLYING CAUSES OF
DEFORESTATION INCLUDING BACKGROUND INFORMATION ON PAST AND
CURRENT SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACT ON THE
RELATED ECOSYSTEM, AND MEASURES TO ADDRESS THEM**

Technical Report No. 2

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ABSTRACT

This Technical report is made available to satisfy the specific objective 1, output 1.1. activity 1.1.2 on analysis and determination of the underlying causes of deforestation including background information on past and current socio-economic and environmental impact on the related ecosystem, and measures to address them

Underlying causes of deforestation and information needed in relation to the past and current socio-economic and environment impacts on the ecosystem were addressed. There were two kinds of factor affecting deforestation, firstly, internal factor caused by repeated shifting cultivation and forest fire and the second due to intensive forest logging using heavy equipped logging machineries.

The first specific objective of the pre-project was to select and analyze the underlying causes of deforestation and define an overall strategy. This activity was thoroughly conducted not only in collecting information from discussion with local communities but also from observation of sample-site condition. In all locations visited the local communities were perceived the environmental impacts of forest degradation on their livelihood. Within the boundary of their villages there can no longer be found primary forest. Secondary forests and bare lands covered with alang-alang grasses in surroundings of the villages are primarily affected by continued logging in the past and shifting cultivation.

The villagers principally accepted the proposed forest rehabilitation project in their ecosystem since it will benefit to them. They agreed the use of endemic species for rehabilitation of degraded and secondary forests, however, they also proposed plantation of rubber tree on their community forest or "hutan adat" and even in the degraded forest. Their confidence with rubber trees is also supported by simple economic reason, especially today when the price of rubber has triple in ten years.

All proposed forest rehabilitation projects are located within the major watershed of West Kalimantan province. The six proposed locations from upstream to downstream areas were respectively discussed in the main text. Species mentioned by the villagers for all proposed forest rehabilitation projects can be summarized as follow : rubber; gaharu; tengkawang; ulin/belian; meranti; kapur; bengkirai, jelutung; damar; durian, kelampai, keranji and kemiri.

INTRODUCTION

To assess demands for the rehabilitation of tropical forest resources, it was considered past and present potential use of natural forest with primarily indigenous species, its maintenance and protection, and how much in terms of resources that communities are willing to commit for these activities. Data and information on how local communities perceive of the advantage and disadvantage of the degradation and rehabilitation of tropical forests were criticized on their desired options. Perception of

communities and other stakeholders (local assembly / unit committee members, district officials, etc) will be considered.

This survey was conducted by a team and destined to assess various factors needed to be considered in writing a proposal for a self-contained forest rehabilitation project implementation. Past and current socio-economic and environmental impacts were addressed. Several locations selected purposively primarily based on watershed approaches, the existing areas of degraded or secondary forest and the willingness of local communities to participate and collaborate in the project.

There were 6 potential sites within 5 (five) regencies selected including Mentajoi (Reg. of Sintang); (2) Merbang (Reg. of Sekadau); (3) Lintang Pelaman (Reg. of Sanggau); (4) Empirang Ujung (Reg. of Sanggau); (5) Manggang (Reg. of Landak) and (6) Bunbun (Regency of Pontianak). These sites were visited during the month of April and May 2006, and the information collected in each site is presented in the main text.

OBJECTIVE

The objective of this activity was to observe and analyse of the underlying causes of deforestation and degradation with measures to address them, including background information on past and current socio-economic and environmental impact on the related ecosystem. The strategy developed for the implementation of this rehabilitation program will give benefits to local communities both social-economically and ecologically by means of their participation.

METHODOLOGY

For the analysis and determination of the underlying causes of deforestation and background information on socio-economic and environmental impact on the ecosystem the activities were thoroughly conducted not only in collecting information from the discussion with local people in all sites but also from observation of the field condition.

Surveys were conducted by a team and destined to assess various factors

need to be considered in writing a proposal for a self-contained forest rehabilitation project implementation. Several criteria determined in this project, including:

- (1) Approach for selection of rehabilitation sites is geographically based on watershed principle.
- (2) The location should be a degraded or secondary forest within forest production area
- (3) The location is relatively near population settlement
- (4) Local population are willing to cooperate in development and maintenance of the rehabilitation plots
- (5) The size of the individual rehabilitation plots are between 50 to 400 hectare or less.

Based on those criteria, 6 potential sites were selected, from the upstream area, respectively: (1) Mentajoi (Regency of Sintang); (2) Merbang (Reg. of Sekadau); (3) Lintang Pelaman (Reg. of Sanggau); (4) Empirang Ujung (Reg. of Sanggau); (5) Manggang (Reg. of Landak) and (6) Bunbun (Regency of Pontianak), see Table 1.

Table 1: Site Selection In Upstream, Middle Stream And Down Stream of Mempawah and Kapuas Watershed Representing The Degraded Forest Conditions

NO.	REGENCY	SUB REGENCY	VILLAGE	TOTAL DEGRADED FOREST (HA)	PROPOSED SILVICULTURE SYSTEM
1.	Sintang	Serawai	Mentajoi	60	Enrichment and block planting
2.	Sekadau	Belitang Hilir	Merbang	50	Enrichment planting

3.	Sanggau	Kapuas	Lintang Pelaman	100	Enrichment and block planting
4.	Sanggau	Balai	Empirangujung	60	Enrichment and block planting
5.	Landak	Mandoor	Manggang	50	Block planting
6.	Pontianak	Sadaniang	Bunbun Amawang	50	Block planting

Source : Kapuas Watershed Management Unit (2004).

These site were visited during the month of April and May 2006, and the information collected in each site are presented in the following description.

In this Activity identification of socio-economic and cultural aspects related to the environmental problems were considerably included, such as:

- a) Physical environments to be affected
- b) Environmental factors, which will affect the project's sustainability, the demography, cultural and socio-economic aspects related to environmental impacts.
- c) The institutions and national laws involved in or related to the potential impacts and the requirements they pose for the design and operation of the project.

FINDING

The socio-economic, physical ecosystem and environmental factors identified in each location of the village can be described in the following paragraphs.

1. Mentajoi (Sintang Regency)

Mentajoi is a sub-village (dusun) within Buntut Ponte village (with 205 households, 1367 people), Serawai Sub-district, in the District or Regency of Sintang. To reach the place one has to travel a long distance to the upstream area of Melawi river. By road from Pontianak to Nanga Pinoh it takes about 10 hours. If we start from Nanga Pinoh, the seat of Melawi District by speedboat, we will arrive at log pond Tontang after 6 hours journey. Dusun Mentajoi is a settlement located approximately 15 km from the jetty of log pond Tontang, situated outside of the company Forest Concession area belonging to PT. Sari Bumi Kusuma (SBK) group.

Since the Forest Concession using heavy duty logging equipments in this Tontang camp is still waiting for extension of permit for logging operation in the area, which is still pending the company, is in an inactive state. When they do not work with

the logging company the community practice shifting cultivation, hunting for wild animal, and tapping rubber trees. Meanwhile, as part of government policy the community established a number of 100 Ha forest concessions in collaboration with SBK, but a number of those small concessions that have received permit from the government, have not been able to extract timber from their concession areas. Suddenly, the government policy took another turn, nullifying the yet unrealised permit.

This area has undulating to hilly topography with mostly consists of ultisol soils. The area has experienced intensive forest exploitation and shifting cultivation, hence from the asses road directing to the village of Mentajoi we can see grass lands, burned areas and secondary forests on the slopes. At present villagers acknowledges the needs of forest, they are now getting difficulty to find timber for their own house construction. Besides losses of biodiversity, in the dry season water source becomes shortage and in the rainy season flood always happen affecting the downstream area especially in Melawi river, so that the degraded forest waiting to be rehabilitated in this area.

When we ask them what they thought the most preferred species for forest rehabilitation, they mention the following: (1) Rubber; (2) Gaharu; (3) Tengawang; (4) Ulin; (5) Meranti; (6) Kapur; (7) Bengkirai (8) Jelutung; (9) Damar; (10); Durian and (11) Kemiri.

2. Merbang (Sekadau Regency)

Merbang Village is situated in Ketungau Hilir Sub-District of Sekadau Regency (District), West Kalimantan Province. This village is accessible by four-wheel vehicle in about 2 hours from Sanggau, through relatively good paved road. The village has 256 families consisted of 544 people mixed between local and long-time incoming people through transmigration project in the past. The majority of the population practice shifting cultivation combined with rubber tapping. Compared to the other village communities we have visited during this trip, this is one of the communities that claimed sufficient production of rice for their own consumption. They plant rice regularly once a year, and tap rubber when work in the rice field is completed.

This area has wavy to hilly topography with mostly consists of Ultisol soils. According to the villagers since timber boom in 1970s there has never been a logging company operating in this village. They basically depend to the forest not only for

source of timber for building material, but also other secondary forest products such as durian fruit, wild vegetable, rattan, wildlife, and water resource.

Environmental impacts on their livelihood were perceived. Within the boundary of this village we can no longer find primary forest. Continued logging in the past and shifting cultivation primarily affect the areas, which cover alang-alang grasses in the surroundings of the village. In addition, following oil palm and monoculture forest plantation using exotic species, water yield along the stream is reducing and micro climate (temperature) has changed compared with the condition in the past. It therefore local community suggested and supported forest rehabilitation using endemic species. Another environmental problem of the area is forest fire. Several attempts have been tried in the past to rehabilitate degraded area, but due to forest fire no trace of them still noticeable.

The areas, which cover alang-alang grasses found in, the surroundings of the village have to be rehabilitated. The main issue of among villagers that forest rehabilitation is welcome if people in the area are allowed to benefit from it. When they were asked to name several wood species they like to plant they mentioned the following: gaharu; rubber; tengkawang; meranti, kapur; belian; durian and kemiri.

3. Lintang Pelaman (Sanggau Regency)

Lintang Pelaman Village is situated in Sanggau Sub-District of Sanggau Regency of West Kalimantan Province. This village can be reached from Sanggau (seat of Sanggau District) using two methods of transportation: (1) speed boat, and (2) motorcycle. From Sanggau to the former PT. Erna Jetty the trip can be made by speed boat. From that point the trip can be made on the back seat of motorcycle. PT Erna abandoned logging activities in 1996, about 10 years ago, but some of its housing and office buildings are still standing, and the open space that was used to store log is still occasionally used for temporary store of wood coming from upstream area including Melawi river. Following forest exploitation the village that has 114 houses and a population of 832 people seems to experience environmental problems.

This area consists of primarily ultisol soils having undulating to hilly topography. As such condition following logging operation in the past it has affected serious problem on the environment. According to the villagers PT. Erna practice unselected cutting of species and cut beyond the limit of village forest reserve at the hilly area of mount Tunggal.

Environmental Impacts on their livelihood were perceived. The villagers reported that the extraction of timber from their environment left serious problem of erosion and contamination of stream waters. Alongside the road linking PT Erna's jetty and the village of Lintang Pelaman are found patches of abandoned rice farms. Those farms are no longer suitable for rice planting due to accumulation of silt transported by run-off from higher ground. The villagers said that solution is yet to be found so that those lands can be used for planting rice again.

The community also stated that "cukong" (logging bosses) commonly found in many communities, is not found in their area, so that tree cutting is done by members of the community strictly used for non-commercial local purposes. In their tradition they prohibit forest cutting along river course to protect river bank from sliding. Most preferred tree species to be used in rehabilitation of forest are in the following order: Rubber trees; Tengkawang; Meranti; Gaharu; and Kemiri. When the villagers were asked about their perception about forest they mentioned the following:

- a. Source of building material.
- b. Place to practice dry farming.
- c. Source of water.
- d. Source of life and living.

4. Empirang Ujung (Sanggau Regency)

Empirang Village is situated in Balai Batang Tarang Sub-District of Sanggau Regency or District, West Kalimantan Province. This village is accessible by four-wheel vehicle in about 30 minutes from Sosok, through relatively good paved road. The village has 114 families consisted of 364 people. The majority of the population practice shifting cultivation combined with rubber tapping. This village is located within the area having wavy to hilly topography dominated with ultisol soil type. Compared to the other communities we have visited during this trip, this is the second community that claimed sufficient production of rice for their own consumption. They plant rice regularly once a year, and also tap rubber when work in the rice field is completed.

This village seems to be developed gradually social and economically. The primary school established for this village seems to be running well with full student's attendance. For 6 classes (grade I though 6) there are 6 permanent teachers paid by the Central Government and 1 teacher on contract paid by the District Government.

The once a month a professionally trained midwife comes to this village, but when women give birth they are usually attended to their need by traditional midwives.

Even though there has never been a logging company operated in the area, forest fire primarily during the dry season when the time of land clearing for shifting cultivation which cannot be avoided is still in process an environmental problem usually occurs. The village or settlement itself seems to be environmentally sound. According to the villagers there has never been a rehabilitation project operating in this village, except rubber tree plantation. Within the boundary of this village we can no longer find primary forest. The secondary forest found here is scattered in small pockets of various sizes running from a few hectares to about 50 hectares in size. Among the secondary forests we can find standing-like forest abandone fruit trees (Tembawang) mostly of durian species either owned by individual or by the community. The vegetation structure in Tembawang area is dominated by much kind of fruit trees with the diameter from 20 to 120 cm. It means that Tembawang is the remaining forest, which is protected by the community laws.

They depend to the forest for source of timber for building material, durian fruit, wild vegetable, rattan, wildlife, and water source. The primary forest originally found in this area were gradually converted into rice field, and then in later stage turned into small-scale rubber plantation. Part of the remaining forest is reserved for community forest, and can only be cut if there is urgent need for building houses and other facilities.

The most preferred tree species for forest rehabilitation is rubber trees, and the most rejected species is oil palm trees. Other endemic tree species they prefer to be planted in the rehabilitation project, among others: meranti, kapur, gaharu, tengkawang, durian and ulin/belian. The villagers suggested that the government provide improved rubber seedling for forest and land rehabilitation, however if that is not possible local seedling also will be accepted. Simple economic also supports their confident with rubber trees, especially today when the price of rubber has triple in ten years. Here is how the figure this out:

- a. Average person can produce 4 kg of rubber slabs to be sold at Rp 7000 to Rp 8000 per kg = Rp 28000 to Rp 32000 per day.
- b. In a year they tap rubber for 10 months (two months are reserved for rice cultivation), and each month they tap rubber for only 15 days. The other 15 days

may be accounted for rainy days, illness, and other businesses that prevent them from tapping rubber. So, one person will earn from rubber tapping $10 \times 15 \times 4 \times \text{Rp } 7000 = \text{Rp } 16,800,000$ (sixteen million eight hundred thousand rupiah) or approximately = US \$ 1,866 a year.

- c. With the introduction of improved seed variety the outcome may be increased by 10 to 25%.

In principle the people welcome the idea of forest rehabilitation using Tembawang system.

5. Manggang (Landak Regency)

Manggang Village is situated in Mandor Sub-District of Landak Regency (District), in West Kalimantan Province. In the old day this village was called Malimo. The village head invited important people in the village to local school building where the team was given ample time to explain the purpose of our visit and recorded information about present condition, extraction, and conservation of the forest.

This village is located within the area having undulating topography dominated with spodosol-alluvial soils. Location of the production forest is only about 2 km away from the school where we had the meeting. From the discussion that followed by field investigation we manage to extract information people's dependence on forest around their settlement:

- a. In the past wood for housing was easily collected from the forest, but today good quality wood is difficult to find and people are forced to use low wood quality for building material.
- b. The price of wood material in the market is very high so that people cannot afford to buy them.

Uncontrolled forest exploitation in the past caused numerous environmental problems such as flooding, draught, etc. The existing surface mining activities in this area has increased serious problem to the environment. In principle the people welcome the idea of forest rehabilitation but several matters need to be clarified before they embrace the idea for implementation, such as:

- a. Is it true that the government really want to rehabilitate the forest found near their settlements?

- b. The people mentioned their experience with other government sponsored economic program in the past that forced the people to relinquish their land to the palm oil companies and receive only a small portion of oil palm plot in return.
- c. As a result the people became marginalized and become wage labours with low pay.
- d. The people here refuse oil palm plantation, but welcome development of small scale rubber plantation.

The villagers stated that forest rehabilitation is welcome in the area since they will obtain benefit from it. When they were asked to mention several wood species they like to plant, they mentioned the following: rubber (*Hevea brasiliensis*), tengkawang (*Shorea stenoptera*, *Shorea pinanga*), durian (*Durio zibethinus*), belian, kemiri (*Aleuritus mollucana*), gaharu (*Aquilaria malacensis*), keranji, and kelampai.

With spodosol soil type containing quartz sand in the surrounding areas, there could be found randomly surface mining activities and left over mining sites in certain locations. Therefore kinds of income sources in this area are more diverse compared with other villages visited, from collecting forest product, traditional agriculture, mining (gold and zircon), trading etc.

6. Bunbun (Pontianak Regency)

Bunbun is a settlement or section in Baweng Village situated in Toho Sub-District of Pontianak Regency (District), West Kalimantan Province. Most of the inhabitant of this village is Dayak (95%), and the rest are Malay, and other ethnic groups. The road accessing the village is always in poor condition although this village can be reached from Sungai Kunyit in the coast using motorcycle. Although the distance is not very far, electricity still has not reached this village.

Awareness of the impact of irrational forest exploitation taking place in past history of this area is responsible for the establishment of local organization aimed at conservation of the forest called *Lembaga Pembina Benua Talino (LBBT)*. The villagers suggested that to protect the remaining forest, every responsible party must find alternative income generating activities for the local population. Most people thought that such alternative is rejuvenation of old rubber trees using improved seeds and cultivation of other crop incorporating better management practices.

Current government policy indicates that in the community participation on rehabilitation of degraded forest is allowed the use of 60% wood species and up to 40% multi purpose tree species (MPTS). Recently the government introduce a new program entitled National Movement of Forest and Land Rehabilitation (*Gerakan Nasional Rehabilitasi Hutan dan Lahan* or *GERHAN*). The community in this area also receive its share in the movement by planting rubber trees, however due to difficulty in producing improved variety they have to resort to using local rubber variety. The government approves 3 varieties of rubber trees recommended for reforestation project i.e. NR 32, NR 35, and NR 39.

Environmental effects on their livelihood were perceived. As an effect left by irresponsible forest cutting in the past the community experience various environmental disturbances. In the past flooding was a rare event, but today it take place more often and leave more severe damage. The onset of rainy season and dry season can no longer be accurately predicted; therefore wet rice cultivation is more difficult and yields less rice compared to the past. Minor forest product such as rattan, wildlife, honey, fish that were abundant in the past are difficult to find nowadays.

More people now are competing for less and less resources and often culminated in territorial conflict. Conversion of forest for other uses also take place and carried out by the local community. The process proceed following these stages:

- a. Forests are cleared to make room for dry farming using the rotation methods.
- b. Rubber trees are planted on less productive rice plots.
- c. In low areas dry farming is transformed into wet farming using rain-fed irrigation method.
- d. In 1974 the government constructed a complete irrigation facility but due to lack of maintenance the facilities are ruined and no longer operational.

ANALYSIS

The government policy on permitting 100 ha forest concession on natural tropical forest has made insecure condition for sustainable forest management. The nullification of permit of this small forest concession was understood since its operation has had great impacts on the forest sustainability caused by uncontrollable natural forest harvesting or its silvicultural system. The changing policy creates friction with the existing and former forest concession, and the community urged company such as PT. SBK to honour and

acknowledge their permit, but the company would not dare to take the risk to stand up against the new policy.

Settlement nearby the Forest Concession that has received contribution from the forest company and experienced intensive program for forest-dwelling community so-called *Pembinaan Masyarakat Desa Hutan (PMDH)*, such as the village of Mentajoi in Regency of Sintang, it was supported in various aspects of Community Development Programs. The program primarily deals with agriculture-based economy which still in progress up to 2006, this year. Unfortunately this program did not deal with participation of local communities in forest rehabilitation. Therefore when the villagers were informed the proposed project they principally welcomed the rehabilitation of degraded forests in their ecosystem surroundings. Species selected for all proposed forest rehabilitation project can be summarized as follow : rubber; gaharu; tengkawang; ulin/belian; meranti; kapur; bengkirai, jelutung; damar; durian, kelampai, keranji and kemiri.

If forest rehabilitation will be done in the area through this project, several considerations must be taken into account: (1) That the area must not be too far from community settlement, so that the people involved or hired for the project will not waste much time for travelling; (2) The community should also be involved in protecting the area from bush fire, especially during the dry season; (3) The forest rehabilitation program should be combined with creating activities that can create immediate income for the community, one of those activities is animal husbandry. The open space at least partly can be used as animal grazing area. Animal husbandry, at least the natural method, is not new to the area. With the introduction of simple technology of artificial insemination the number of animal can be increased dramatically. It is also possible to introduce coffee and cocoa plantation as short term income generating methods, besides the existing rubber plantation.

The village, which has families, mixed between local and incoming people through transmigration project in the past, such as that in Merbang village in the Regency of Sekadau, generally degraded forest is more frequent due to forest conversion in the past. Primarily local migrants who wrongly considered that lands in their forested state are less useful than cleared lands for cultivation caused the threatened natural forest. The majority of the local villagers practice shifting cultivation combined with rubber tapping. Compared to the other villages we have visited during this trip, Merbang village is one of the communities that claimed sufficient production of rice for their own consumption. The

incoming villagers generally plant rice in swampy lands and also tap rubber when work in the rice field is completed.

Within the boundaries of the villages we can generally no longer find primary forest. The secondary forests were found scattered in small pockets of various sizes running from a few hectares to about 500 hectares in size. Between the secondary forests we can find abandoned fruit trees (tembawang) mostly of durian forests either owned by individual or by the community.

Degraded lands consisting along-alang grasses in the surroundings of the village are primarily affected by continued logging, forest conversion in the past and shifting cultivation including forest fire.. In addition, in the Regency of Sanggau following oil palm and monoculture forest plantation using exotic species, water yield along the stream is reducing and micro climate (temperature) has changed compared with the condition in the past. It therefore local community suggested and supported rehabilitation using endemic species on the degraded forests.

In Lintang Pelaman village where there was a forest concession operated, prior to forest logging operation the community found abundant flora and fauna in their environment, such as wildlife (Kelampiau, Kijang, Rusa) and fishes. During the operation most of those wildlife were gone. Now, they demand that their environment to be restored and the degraded forest to be rehabilitated. The local villagers in general welcome the proposed forest rehabilitation project, since their rights on land tenure are considered.

To sustain the right of land in surrounding the village, an NGO supporting the marginalized local communities conducted "village participative mapping". They explained that they could not rely on oil palm plantation as means of economic improvement for the villagers and land rehabilitation. Reasons dealing with social, economic and cultural aspects become areas of concern as mentioned in our discussion with the Villagers. Two areas of concern dealing with oil palm development were mentioned in our discussion with the villagers:

- 1). Redistribution of the plasma farmers of oil palm plantation did not take into account the original domicile of those farmers. Farmers from one village may be given palm trees in land belonging to another village, resulting in jealousy and resentment of the system;
- 2). The system of recruitment of personnel in the palm plantation that favours particular ethnic group (visiting people), and leave out the locals from competition. We heard similar claim somewhere else during this survey, although the truth must be verified

carefully. When we asked about their attitude toward palm plantation they outright refused to give up their land for that purpose.

In West Kalimantan forestland was first converted and turned into oil palm plantation done in Sanggau Regency about a decade ago where here oil palm is welcome in some areas. But the most preferred tree species for forest rehabilitation according to the villagers is rubber trees, and in general the most rejected species is palm trees. The villagers suggested that the government provide improved rubber seedling for forest rehabilitation, however if that is not possible good local seedling will also be accepted.

Certain villages such as Empirang Ujung village in the Sanggau Regency seems to be developed gradually social and economically. The primary school established in the village ran well with full student's attendance. Village health clinic was built and once a month a trained nurse come to this village, but when women give birth they are usually attended to their need by traditional midwives. Even though there has never been a logging company operated in the area, forest fire primarily during the dry season, or when the time of land clearing for shifting cultivation is still in process, environmental problems, which cannot be avoided usually, occurs. However, during our visit, the village or settlement itself seems to be environmentally sound even though there has never been a rehabilitation project operating in this village, except rubber tree plantation.

Even though it can no longer find primary forest in the village, the villagers still depend on the forest for source of timber for building material, durian fruit, wild vegetable, rattan, wildlife, and water source. The primary forest originally found in this area were gradually converted through traditional agriculture into rice field, then in later stage turned into small scale rubber plantation. Part of the remaining forest is reserved for community forest, and can only be cut if there is urgent need internally for building houses and other facilities.

The villagers suggested that the government provide improved rubber seedling for forest and land rehabilitation, however if that is not possible local seedling also will be accepted. Simple economic also supports their confidence with rubber trees, especially today when the price of rubber has triple in ten years. Here is how the figure this out:

1. Average person can produce 4 kg of rubber slabs to be sold at Rp 7000 to Rp 8000 per kg, so that every person will obtain cash flow income about Rp 28000 to Rp 32000 per day.

2. In a year they tap rubber for 10 months (two months are reserved for rice cultivation), and each month they tap rubber for only 15 days. The other 15 days may be accounted for rainy days, illness, and other businesses that prevent them from tapping rubber. So, one person will earn from rubber tapping $10 \times 15 \times 4 \times \text{Rp } 7000 = \text{Rp } 16,800,000$ (sixteen million eight hundred thousand rupiah) or approximately = US \$ 1,866 a year.
3. With the introduction of improved seed variety the outcome from rubber plantation may be increased by 10 to 25%.

The uncontrolled forest exploitation in the past has caused numerous environmental problems such as flooding, draught, etc. In Manggang village the existing surface mining activities in this area has increased serious problem to the environment. In principle the people welcome the idea of forest rehabilitation but several matters need to be clarified before they embrace the idea for implementation, such as:

1. Is it true that the government really want to rehabilitate the forest found near their settlements?
2. The people mentioned their experience with other government sponsored economic program in the past that forced the people to relinquish their land to the oil palm companies and receive only a small portion of oil palm plot in return.
3. As a result the people became marginalized and become wage labours with low pay.
4. In most project sites visited the local communities particularly the forest-dwelling people refuse oil palm plantation, but welcome development of small scale rubber plantation.

The villagers also wanted to know what kind of access they may have if endemic species besides rubber is chosen in forest rehabilitation project:

1. If rubber trees are planted in the production forest that will have the right to the rubber produced from those trees?
2. Who will do the work during the planting stage?
3. If the rehabilitation is done using other endemic species is it necessary to clear the land from existing vegetation?

To clarify this the team explained that rubber is not an endemic species, however it has already domestically planted, and the government program through Forest and Land

Rehabilitation Movement has also adopted rubber, one of the most favourable species among the multiple purpose tree species (MPTS), can be planted up to 30% of the total targeted plantation. Concerning the work local people principally welcome to collaborate in the rehabilitation project since they are allowed to benefit from it. Rehabilitation on the logged over and other secondary forests will silviculturally used endemic species for enrichment planting without clearing all existing vegetation, whereas on the bared or critical lands plantation will be done along the rows following contour.

In the village visited, with spodosol soil type containing quartz sand in the surrounding areas, there in Manggang village (Landak Regency) could be found scattered surface mining activities and left-over mining sites in certain locations. Therefore kinds of income sources in this area are more diverse compared with other villages visited, from collecting forest product, traditional agriculture, mining (gold and zircon), trading etc.

In the surroundings of the village of Bumbun (Pontianak Regency) in 1970s PT. Gelora Agung (forest concession) conducted intensive forest cutting in the dominated peat swamp forest area. Then various "*cukongs*" (logging bosses) continued the onslaught until the second *half of 1990s*. As a result for the last 10 years local community can no longer collect building material from their environment, instead they have to buy timber produced in other parts of the district. Sporadic forests are still found in remote and difficult to access locations. According to one of the informal leaders, Pak Nyalin, Ketua Adat (Tribute Leader) of Benua Sangking, more than 50% of forest trees are gone; primarily for belian/ulin or *Euxyderoxylon zwageri* tree the highest quality of construction wood, almost extinct. As such they are no longer viable and economical for commercial forest exploitation. Even so, *cukongs* from the town of Sungai Duri occasionally come to persuade local population to cut whatever is left of the forest. Today there is no more wood extraction for commercial purposes, except people cut timber from the left-over forest for their own use such as for building houses and other internal facilities.

More people now are competing for less and less resources and often culminated in territorial conflict. Conversion of forest for other uses also take place and carried out by the local community. The process proceed following these stages:

1. Forests are cleared to make room for dry farming using the rotation methods.
2. Rubber trees are planted on less productive rice plots.
3. In low areas dry farming is transformed into wet farming using rain-fed irrigation method.

4. In 1974 the government constructed a complete irrigation facilities but due to lack of maintenance the facilities is ruined and no longer operational.

Recently the government introduce a new program entitled Movement of Forest and Land Rehabilitation (*Gerakan Rehabilitasi Hutan dan Lahan* or *GERHAN*). The community in this area also receive its share in the movement by planting rubber trees, however due to difficulty in producing improved variety they have to resort to using local rubber variety. The government approve 3 varieties of rubber trees recommended for reforestation project i.e. NR 32, NR 35, and NR 39. For all proposed forest rehabilitation project, tree species including endemic species selected were mentioned: gaharu; tengkawang; ulin/belian; meranti; kapur; bengkirai, jelutung; damar; durian, kelampai, keranji, kemiri, and rubber.

CONCLUSIONS

All sites selected for the forest rehabilitation projects are within the prime watershed of West Kalimantan Province, dominated by degraded and secondary forests. Most of them are topographically undulating and hilly with ultisol soil types, besides alluvial and spodosol soil in the downstream areas. Alang-alang grasses and secondary forests found here are scattered in small pockets of various sizes running from a few hectares to about 500 hectares in size. Between the secondary forests we can find abandoned fruit trees (tembawang) mostly of durian species either owned by individual or by the community.

As an effect left by irresponsible forest cutting in the past the community experience various environmental disturbances. In the past flooding was a rare event, but today it takes place more often and leave more severe damage. Due to the unstable environment agricultural yields and minor forest product such as rattan, wildlife, honey, and even fish that were abundant in the past are decreasing and difficult to find nowadays. Forest degradation in their environment left serious problem of erosion and contamination of stream waters. Prior to forest depletion the community found abundant flora and fauna in their environment, such as wildlife (Kelampiau, Kijang, Rusa) and fishes. During the logging operation in the past most of those wildlife are gone.

Now, local communities demand that the environment to be restored and their forest to be rehabilitated. For all proposed forest rehabilitation project sites species selected included: rubber; gaharu; tengkawang; ulin/belian; meranti; kapur; bengkirai, jelutung; damar; durian, kelampai, keranji and kemiri. But the most preferred tree species for forest rehabilitation is rubber tree, and the most rejected species is oil palm. The

villagers suggested that the government provide improved rubber seedling for forest and land rehabilitation. Simple economic also supports their confidence with rubber trees, especially today when the price of rubber has triple in ten years. For example, one person will earn from rubber tapping up to approximately US \$ 1,800 a year.

Social economic condition of all villages selected where forest rehabilitation projects will be implemented are generally in subsistent state, except Merbang and Empirang Ujung where they have succeeded in terms of selves supporting to rice and income generation from their own local products mostly from rubber plantation. The villagers' perception about forest was mentioned the following: 1) Source of building material, 2) Place to practice dry farming, 3) Source of water, and 4) Source of life and living. At the present tree cutting is still done by members of the community strictly used for non-commercial local purposes, however there is a local knowledge that in their tradition they prohibit forest cutting along river course to protect river bank from sliding and its water.

RECOMMENDATIONS

Awareness of the impact of irrational forest exploitation and other degradation taking place in past history of their areas are responsible for the local movement and even establishment of local organization aimed at conservation of the forest. In the regency or district of Pontianak the communities developed local or public organization so-called *Lembaga Pembina Benua Talino (LBBT)*. As also suggested by the villagers that to protect the remaining forest, every responsible party must find alternative income generating activities for the local population, such as through animal husbandry, local estate plantation or cash crop development activities.

Subsistent livelihood and income generating activities of villagers of proposed rehabilitation projects are varied, except rubber tapping which are common in all places. Virgin forest in general can no longer be found in the surrounding of villages. The forest originally found in this area were gradually converted and cultivated for rice field, then in later stage turned into small-scale rubber plantation or currently oil palm plantation in some areas. The villagers suggested that the forest rehabilitation project can be initiated at least to prevent forestland conversion for oil palm plantation and they also suggested that the government or any sponsored project would provide improved rubber seedling to be included for forest rehabilitation.

Principally the villagers demand that their living ecosystem and environment must be restored and their forest are rehabilitated. For all proposed sites of forest rehabilitation project tree species to be planted depending on the species preferred in each location among others are: rubber; gaharu; tengkawang; ulin/belian; meranti; kapur; bengkirai, jelutung; damar; durian, kelampai, keranji and kemiri.

The local villagers in general welcome the proposed forest rehabilitation project, since their rights on land tenure are considered and they will be allowed to benefit from the project. A silvicultural system on the respective soil type and land tenure in each proposed village sites selected would be considered for the implementation of the forest rehabilitation project. Of course, for project sustainability, local perspective and the institutions and even national laws will be involved in the design and operation of the project.

Tabel 2. General Description of Seleted Project Location

No.	Location or Village	Regency or District (Kabupaten)	Sub District (Kecamatan)	Population (Jml Penduduk)	Accessibility (Perjalanan)	Watershed (DAS)	Dominant Soil (Tanah)	Topography (Kelerengan)
1.	Mentajoi	Sintang	Nanga Serawai	1367	Road-river	Kapuas-Melawi	Ultisol-Alluvial	Wavy-hilly
2.	Merbang	Sekadau	Belitang Hilir	644	Road	Kapuas-Ayak	Ultisol	Wavy-hilly
3.	Lintang Pelaman	Sanggau	Sanggau	832	River-road	Kapuas	Ultisol	Wavy-hilly
4.	Empirang Ujung	Sanggau	Sanggau	764	Road	Kapuas	Ultisol	Wavy-hilly
5.	Manggang	Landak	Mandor	748	Road	Kapuas	Spodosol-Alluvial	Wavy
6.	Bunbun	Pontianak	Toho	745	Road	Mempawah	Spodosol	Wavy

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