

Part 7

Human Dimensions

Role of Peat Forest in the Banjarese Traditional Land Management (BTLM) System

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Abstract

The role of peat forest on the paddy fields within the Banjarese Traditional Land Management system was studied in Karya Tani Village, Pulau Petak, South Kalimantan. Field observation and some laboratory analyses were done in order to understand the soil, including peat layers and water characteristics.

In the Banjarese Traditional Land Management system peat swamp forests in the upstream were conserved while paddy fields were established in the downstream. Converting the area with potential acid sulphate soils, such as peat swamp forests, into agriculture land by development of canal system would induce pyrite oxidation and cause the soils into extremely acid condition.

Soils of peat swamp forest are porous and retain water in very high amount; hence the peat swamp forests may act as water reservoir. The water from the peat swamp forest in the upstream may flush out the hazardous substances (produced by pyrite oxidation) in the paddy fields established at the down stream.

Introduction

Indonesia has about 20 million ha of peat land spread over Sumatra (41.1%), Kalimantan (22.8%), Irian Jaya (23.8%), Sulawesi (1.6%), Halmahera and Ceram (0.5%). During the last 25 years, Indonesia has converted the peat lands in relatively very large area for some purposes (for agriculture land, energy, etc.), especially in Sumatra and Kalimantan. However all these efforts have less success due to lack or ignoring the knowledge of the characteristics of peat swamp forest of the tropical region and its eco-relationship with surrounding ecosystem.

Long time before the Indonesian government open the peat land in a very large scale, the Banjarese people of South Kalimantan have converted the wetland area, including peat land area into agricultural land in traditional manner. In land management system, they always consider the peat forest upstream as source of relatively fresher water for their agriculture land established in downstream. This paper intend to study the role of peat swamp forest on the paddy fields within the BTLM system

Material and Methods

The study was conducted in Karya Tani village, Barito Kuala district, South Kalimantan (Fig. 1). The land management system that related to the agriculture practices was described based on the field observation and the history of the area development was recuperated by discussion with H. Anang, known as Kepala Parit. He was the group leader of the village establishment pioneers. Based on the description of land management system, a land-use cycle was set up.

Soil observation was carried out by augering the soil using a peat auger made by Eijlkamp up to more than 2 m depth. If possible soil pits were made to observe the

morphology of soil and the morphological characteristics were described in the field. Some soil samples were taken and packed with half PVC pipe and wrapped with plastic film. In addition the water samples were also taken for chemical analyses. Soil and water chemical analyses included pH, EC, K, Na, Ca, Mg, Fe and S.

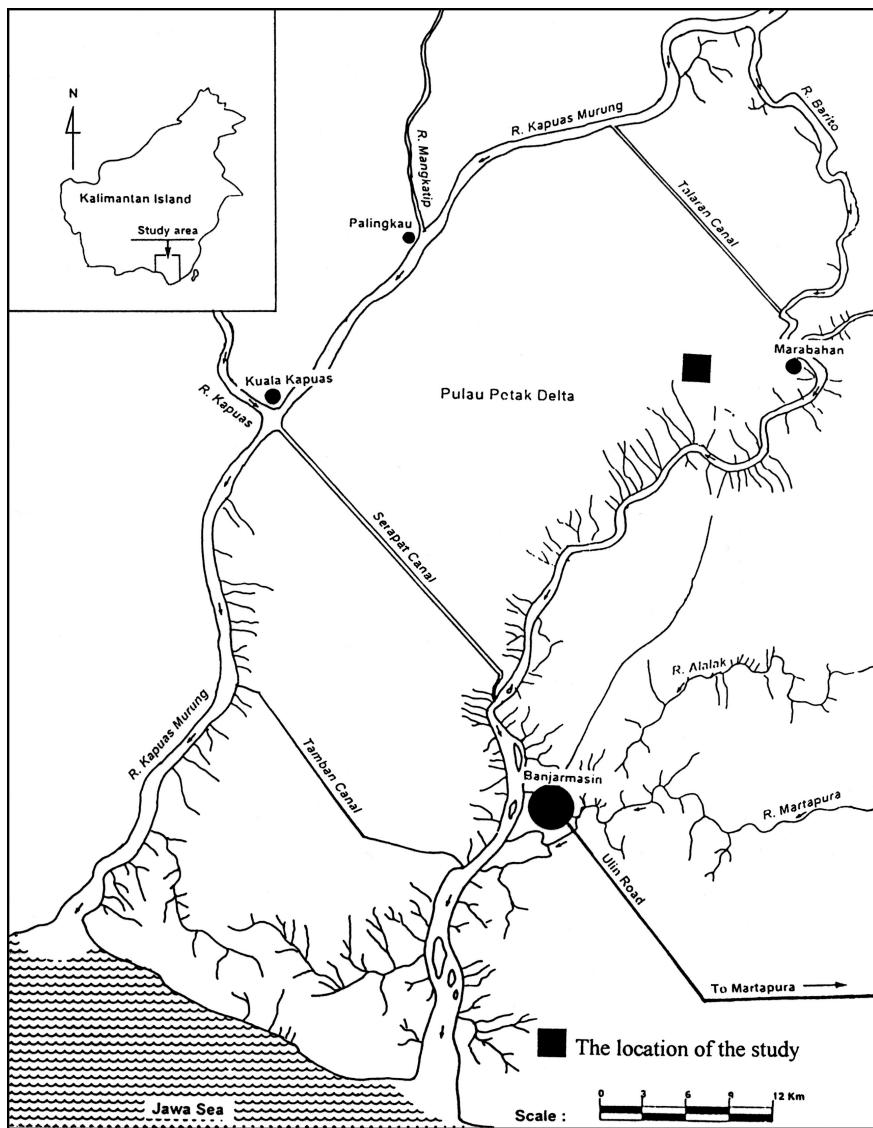


Fig. 1. The location of study area.

Results and Discussion

The Banjarese Traditional Land Management (BTLM)

Initially the Karya Tani area was covered by peat swamp forest as indicated by the pollen analyses of sediments taken from this area (Sumawinata, 1998). Due to shifting cultivation the primary swamp forests were gradually converted into secondary swamp forests dominated by *Gelam* (*Melaleuca* sp.).

The drainage system in this area includes narrow ditches (dug with hand called *handils*) as secondary canals set perpendicular to, and in the left and right directions of the primary canal (Fig 2). The distances between secondary canals are 27 depa (1 depa = 1.70 m). The lands between the secondary canals are divided into kavelings, called *kepings*. Dimensions of *kepings* are 33×150 depa² and 33×135 depa² for the *kepings* facing to the primary and secondary canals respectively. In about 1985 the secondary canals were 8 rows, while at present have increased into 14 rows, means the expansion of the agriculture land is naturally in progress in expense of the *Gelam* forests (Mulyanto *et al.*, 1998).

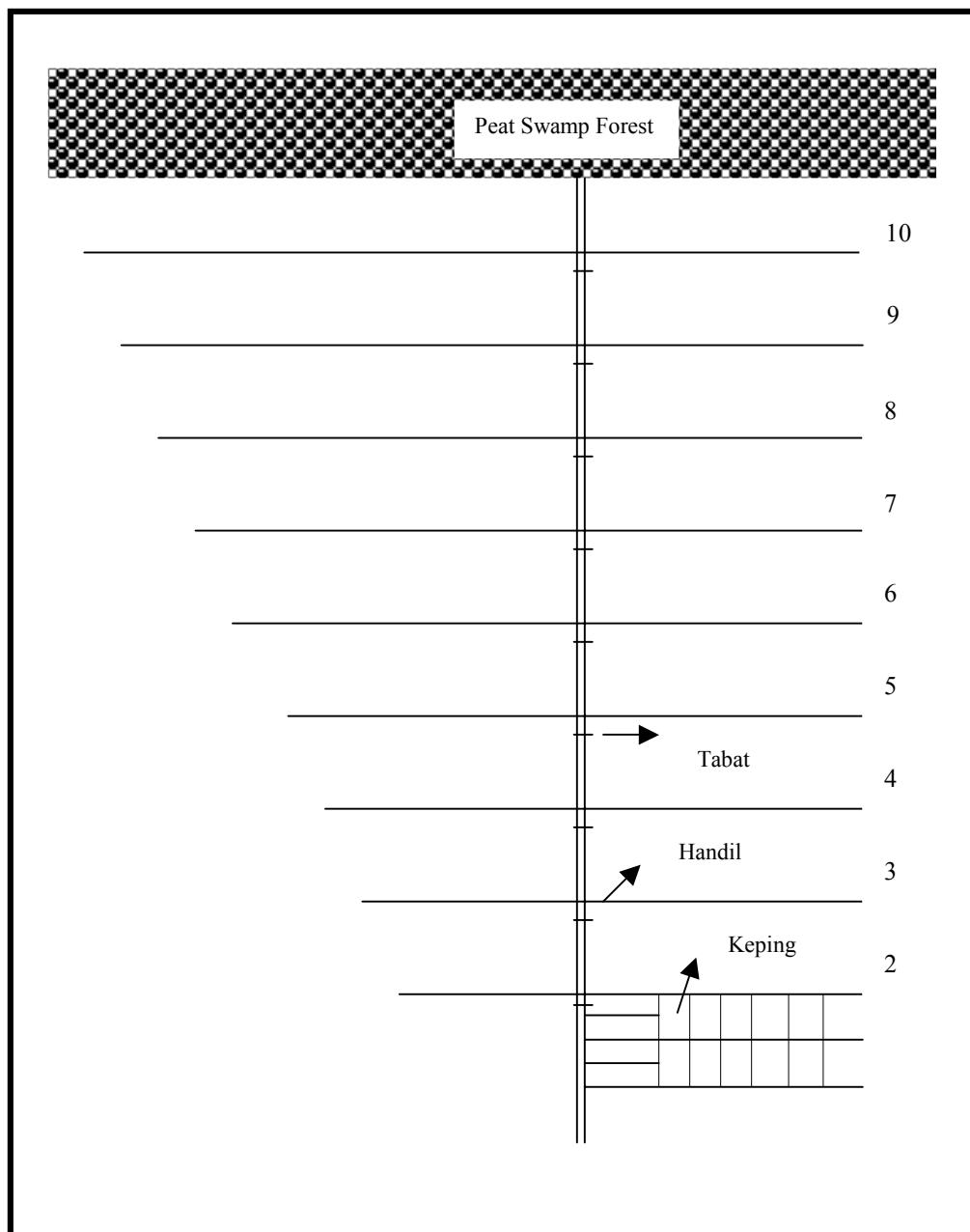


Fig. 2. The drainage system of the BTLM in the study area.

Canals drained out and control the water level for rice planting. The water level in the kavelings is controlled by *tabats* (simple water gates) either in the primary canal or in the secondary canals. In early November, when the rainy season starts, the water gates are kept open to leach out the acid substances produced in the rice fields during the dry period from the kavelings, and drained off through the primary canal. In the late of December the simple water gates are closed, the black water draining from the *Gelam* forest as well as the rainwater filled up the rice fields; further transplanting of the plant is started.

Land preparation of rice field in the peat land of BTLM is significantly different with the land preparation of the rice field in mineral soils. BTLM systems do not plow the soil but the Banjarese people prepared the land with very limited disturbance to the soil. The land preparation for the second seedbeds (*ampakan*) is carried out by cutting the grasses with *tajak* or *parang*, and allows grass litters to decompose. In that way, the soil is not disturbed because either *tajak* or *parang* cut the grasses about 1-2 cm above the soil surface. Further the land preparation is done step-by-step, and only as needed related to transplanting *ampakan* seedlings to the *lacakan*.

About 25 years after the Karya Tani Village establishment, the surrounding village has extended into a mosaic of several land covers. Present land covers of the areas were included: *Gelam* forest, a mixture of rice field and *Gelam* forest in the forest margin (row number 11 and 12), pure rice field (row number 8, 9, 10), a mixture of rice field and abandoned lands (row number 5, 6, 7) and abandoned lands (1, 2, 3, 4). This mosaic is an expression the sequences of land use cycle in a swampy area. The sequences of the land use cycle include a) forest and paddy field stage, b) climax paddy field stage, c) transition land use stage, d) abandoned stage. After the area is abandoned, the area will becomes secondary forest, mostly *Gelam* forest through natural succession. The stages of the land use cycle seem related to the change of soil characteristics as indicated by the difference of the vegetation composition. The abandoned area is mostly occupied by *Porum kudung* (*Eleocharis* sp.) grass. The change of soil characteristics is probably caused by the change of water table fluctuation in the soil, due to establishment of drainage system.

Characteristics of Peat Swamp Forests Forest

According to Van Wijk (1951) the studied area was covered by peat swamp forest. At present, the peat swamp forest in the studied area was replaced by secondary forest, dominated by gelam (*Melaleuca cajuputi*). Sumawinata (1998) reported that the peat swamp forest shrinkage significantly after about 50 years. This is due to conversion of forest into agriculture land by shifting cultivation. Abandoned agricultural land was then successively replaced by grasses, shrubs and secondary forests dominated by gelam.

The nearest primary peat swamp forest was found in Saka Lagun areas. According to Klepper *et al.* (1992) the peat swamp forests in Saka Lagun were consisted of 20 tree species, without any gelam (Table 1), completely difference with the secondary forest around Karya Tani Village. The peat layer in Saka Lagun (1.5-2 m) is deeper than of in Karya Tani (0.5-0.75 m). The existing of the peat forest is very significantly important for the agriculture system in surrounding such as the BTLM.

Table 1. Vegetation composition in the Saka Lagun areas (after Klepper *et al.*, 1992).

No	Local name	Latin name
1	Mangkurangan (dominant species)	-
2	Basan	<i>Pandanus helicopus</i>
3	Tampuluh tuku	-
4	Papung	<i>Sandoricum</i>
5	Kacapuri	<i>Diospyros korsthalsiana</i>
6	Banitan	<i>Polyalthia sp</i>
7	Salumar	<i>Jackia ornata</i>
8	Lampatitung	-
9	Tumulinah	-
10	Pak borong	-
11	Tangkolopo	<i>Eugenia spec.</i>
12	Walak	-
13	Ayau	<i>Cryptocarya ferrea</i>
14	Kalumpang	<i>Artocarpus sp.</i>
15	Kandrih	<i>Semecarpus spec.</i>
16	Ompah	<i>Semecarpus sp.</i>
17	Kamurah	<i>Mastixia sp.</i>
18	Kulur hutan	-
19	Unsit	-
20	Otak Udang	-

Soil

The thickness of peat layer in pulau Petak was about 1-2 m in the year 1930, and the age of the peat is about 1420-2000 years (Furukawa, 1994). The thickness of peat layer in Karya Tani varies in between 0-75 cm. In the area of paddy field the peat layer is 0-20 cm, while the peat in gelam forest is about (0.5-0.75 cm) (Fig 3).

Peat under gelam forest in the study area is black and at fibric-hemic ripening level. The peat contain organic fragment of various sizes. In several centimeter upper peat layers, the peat is hemic without wood fragments. The coarse fragments are mostly live roots of gelam tree. At layer below 20-cm depth the peat is fibric, contains some coarse wood and root fragments. Morphologically, peat is porous; consequently peat layer could retain water at enormous amount (200-500 %). Based on this condition, the peat forest in the upstream may act as water reservoir for the agriculture lands at the downstream.

Underlying peat layer is soil developed from mangrove swamp sediment, and contains pyrites (FeS_2) in significant amount. The present of pyrite in the underlying peat layer has to be considered in the conversion of land use, because oxidation of pyrite can produce acid that causes deterioration of the soil environment.

Chemical characteristics of gelam forest and paddy field (Table 2) indicate that the c-organic content of the upper layer is higher than that of the paddy field due to decomposition of peat when the land use was changed from forest to rice field about ten years ago. This fact is parallel with the data of soil morphology. The iron content of the paddy field soil is relatively higher than that of peat forest. It caused by pyrite oxidation when the land was drained (Mulyanto *et al.*, 1999).

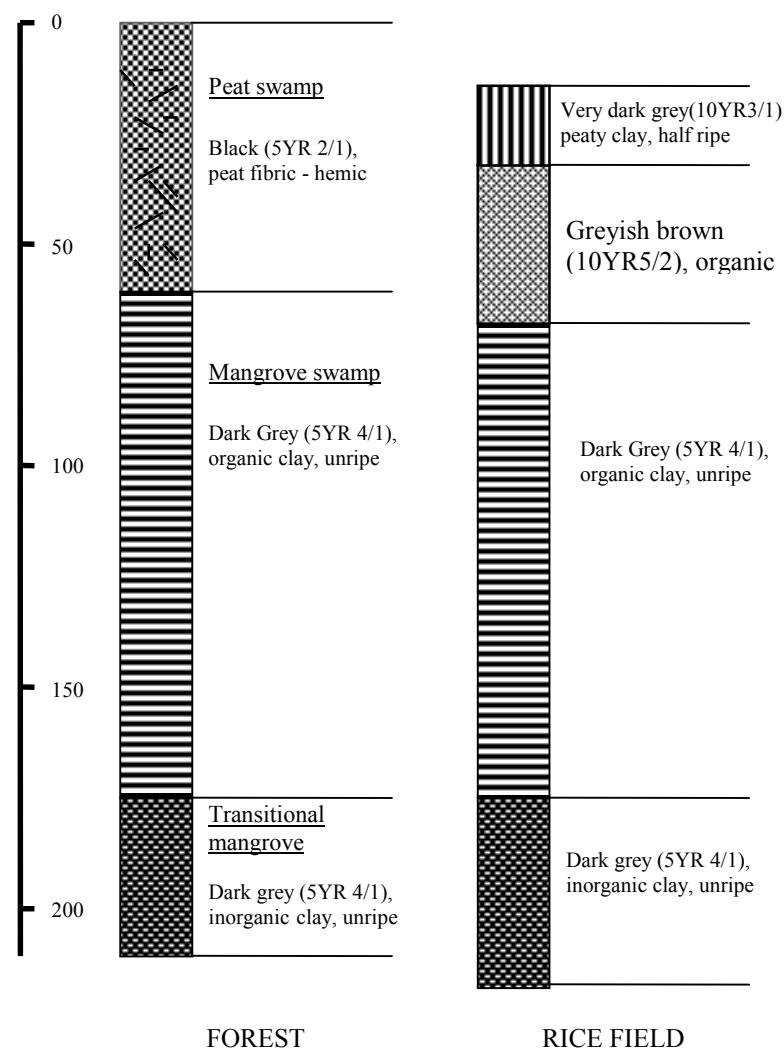


Fig. 3. Soil profiles of forest and rice field in the study area.

Table 2. Chemical data of soil in the study area.

Depth cm	pH H ₂ O	EC μS/cm	C-org %	Ca	Mg	Na	K	Total	CEC	Fe ppm
me/100g										
Forest										
0-25	4.64	32.6	42.27	9.17	15.21	0.52	0.41	25.31	32.5	166.16
25-50	4.95	42.1	-	-	-	-	-	-	-	-
50-75	5.65	121.1	10.42	8.20	15.50	0.43	0.21	24.43	18.8	178.17
75-100	5.95	194.5	-	-	-	-	-	-	-	-
Rice Field										
0-25	4.43	104.8	13.30	9.41	29.22	0.49	1.39	40.51	23.36	341.36
25-50	4.56	124.2	-	-	-	-	-	-	-	-
50-75	5.34	143.6	4.92	8.82	19.42	0.43	1.48	30.16	25.35	350.20
75-100	5.16	115.0	-	-	-	-	-	-	-	-

Water

Characteristics of water of the peat forest and the paddy field are strongly different due to development of canal system in the BTLM (Table 3). The pH of water of the paddy field is much lower than that of peat forest. The low pH of the paddy field is related to the pyrite oxidation during water table at the lower level in the dry season. The pyrite oxidation causes the amount of Fe and S increase significantly leading to the formation of iron oxides and other minerals as expressed by red color of the canal wall. Besides low pH, the content of Mg and Na of the paddy field water is relatively higher than that of peat forest. It is probably related to the influence of the tidal activity, especially in dry season when the tidal water strongly influences the paddy field area.

Table 3. Chemical data of water in the study area

Parameter	Rainy season		Dry season	
	Forest	Rice field	Forest	Rice field
pH	5.4	2.9	-	-
Mg (mg/l)	0.96	2.28	4.35	14.50
Ca (mg/l)	0.20	0.20	0.18	1.18
Na (mg/l)	5.06	18.90	12.00	30.00
K (mg/l)	1.56	4.29	4.50	4.50
Fe (mg/l)	0.56	2.80	3.25	5.29
S (mg/l)	1.92	14.70	-	-

Impact of Peat Forest to Paddy Fields

Converting gelam forest into paddy field by opening up drainage system causes decomposition of peat as indicated by the lost of peat layer and formation of dark peaty clay /organic clay in the rice field. In addition, draining the fields would decrease ground water table and in turn induced oxidation of pyrites in mangrove swamp sediment. Pyrite oxidation produces acid as indicated by low pH and high EC both of soil and water and may decrease the productivity of paddy field.

In the BTLM system, the peat forest in the upstream may supply relatively fresher water (with higher pH and lower EC) into paddy fields. Since the peat forest in the upstream is still remain in sufficient wide, supply of fresher water for washing out the hazardous substances in water and soil the of rice fields at the downstream can be managed. According to the Kepala Parit (H. Anang), in the end of 1970, number of handils is only 8, and the rice production was about 2 tons per ha without fertilizer input. However, since the main canal has extended and the number of canals have increased up to 14 in the expense of peat forest, the production of paddy fields in handils no 1 - 4 were decreased and ultimately abandoned. This fact indicates that expanding the agriculture area in the expense of the peat forest will decrease the fresh water supply, and in turn decreased the rice field productivity. In that sense, the productivity of paddy field can only be maintained in the areas closer to the peat forest.

Conclusions

In the Banjarese Traditional Land Management system, the peat forest is always conserved in the upstream area, whereas the paddy fields are established in the downstream. Converting the area with potential acid sulphate soils into an agriculture

land by canal system development will induced pyrite oxidation, causes the agriculture land became extremely acid condition and dangerous to the crops, including rice.

Peat under forest such as gelam forest, with porous structure can retain water in very high amount; therefore the peat under the forests can act as water reservoir. The water from the peat swamp forest is essential to flush out the hazardous substances produced by pyrite oxidation. When the peat swamp forest in the upstream was conserved such as in the BTLM system, the rice productivity of peat soil fields established in the downstream may sustained relatively high even with only minimum fertilizer input.

Acknowledgement

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References

- Furukawa, H. 1994. *Coastal Wetlands of Indonesia: Environment, Subsistence and Exploitation*. Kyoto University Press. Japan. 219 pp.
- Klepper, O., Chairuddin, G., and Hatta, G. H. 1992. *Ecological Aspect of the Development of Acid sulphate Soils in the Humid Tropic*. AARD & LAWOO. 100 pp.
- Mulyanto, B., Sumawinata, B., Djajakirana, G. and Suwardi. 1999. Micromorphological characteristics of (potential) acid sulphate soils under Banjarese Traditional Land Management System. International Seminar on Toward Sustainable Agriculture Facing the 21 Century, 26-28 September, Lampung Indonesia.
- Sumawinata, B. 1998. Sediment of lower Barito basin in South Kalimantan: Fossil pollen composition. *Tonan Ajia Kenkyu*, 36(3): 1-24.
- Van Wijk, C. L. 1951. Soil survey of tidal swamp of South Borneo in connection with the agriculture possibilities. Contr. Gen. Res. Sta. No 123.

The Massive Exploitation of Peat Swamp Forest Potentiality has not Successfully Increased the Local People's Prosperity in Central Kalimantan

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Introduction

The total area of forest in Central Kalimantan is approximately 15,356,400 ha (or 90% of the total area of Central Kalimantan). 2,651,724 ha, or 17,27% of the area above is still covered by peat soil, and also as the habitat of various forests which are having high economic values. Some of them are Ramin (*Gonystylus bancanus* Kurtz), Jelutung (*Dyera costulata*), Meranti Rawa (*Shorea* spp), and Gemor (*Alseodaphne* spp).

It is true that timber is the leading commodity of Central Kalimantan within the last three decades, as it has contributed the largest portion of Indonesian foreign exchange after oil and gas. The management of forest potentiality has been carried out by the owners of forest concession, which is legally arranged under the law of forestry along with its implementation guidelines. The decree of minister of Forestry number 485 /KPTS – II/ 1989, stated that the management of productive forest can be worked out by silviculture system, as known by "Tebang Pilih Tanam Indonesia (TPTI), selective cutting system. This method must be executed by every forest concession owner, which is clearly stated in **the "Rencana Karya Lima Tahun" (RKLT)** the five years work planning as well as in **the "Rencana Karya Tahunan (RKT)**, the annual work planning. The formulation of RKLT and the RKT is based on the survey finding in the field is aimed at regulating the cutting cycle within every forest concession. In this way, it is hoped that within a certain period of time (cutting cycle 35 years), the tree will have reached cutting criteria and could be exploited.

The establishment of various acts as well as their guidelines is aimed at maintaining sustainable production of forest. However, the application of those acts in the field seems to be inconsistent. The inconsistency of the law mentioned above is clearly proven. In many cases, the forest concession owners have broken the law as they exceeded the cutting limit as stated in the effective forest acts.

The condition of forest management as mentioned above has been going on for a long time and it will be going on and on in the future. This is due to the vested interest of the decision-makers. Consequently, illegal logging has proliferated all over Indonesia. Although illegal logging activities have been tolerated as what is going on up to the present, it is proven that illegal logging activities have not been successfully increased the prosperity of the local people.

Peat Swamp Forest Potentiality

To describe the potentiality of peat swamp forest in Central Kalimantan, in the following parts the inventory findings done by the forest concession of PT Inhutani III (Ex PT. Sumber Alam Ramin) within the area of 600 ha in Kapuas Regency of Central Kalimantan (Table 1).

Table 1. The total number of tree (N, stem) and volume (V, m³) of some types of wood within peat swamp forest area of 600 ha in Kapuas Regency, Central Kalimantan

Type of wood	Diametre class (cm)										
	20 - 29		30 - 39		40 - 49		50 - up		Total		
	N	V	N	V	N	V	N	V	N	V	
2	3	4	5	6	7	8	9	10	11	12	
A. Protected wood 1.Jelutung				37	36.42	48	77.69	15	41.84	100	155.95
Total A			37	36.42	48	77.69	15	41.84	100	155.95	
B. Wood type allowed for cutting 1.Meranti types a. Meranti Rawa b. Gerunggang c. Alau	104	40.26	185	133,64	310	521.11	99	280.60	698	975,61	
	67	24.45	170	123,23	281	451.19	89	242.95	607	841,82	
	115	6.50	22	22,53	59	94.37	19	50.82	115	174,22	
Total B1	186	71.21	377	279.40	650	1,066.67	207	574.37	1,420	1,991.65	
2. Miscellaneous a. Mentibu b. Terentang c. Kapur Naga d. Ketiau e. Tanah-tanah	155	58.14	281	215,20	619	836.07	200	450.19	1.255	1,559.60	
	67	24.97	163	121,75	270	433.84	86	233.60	586	814.116	
	37	12.85	74	60,37	127	204.64	40	110.19	278	388.41	
	15	6.50	37	30,51	87	139.78	28	75.27	167	252.06	
	37	13.30	81	66,71	117	187.92	37	101.19	272	369.12	
Jumlah B2	311	115.76	636	494,90	1,220	1,802.25	391	970.44	2,558	3,383.35	
3. Exclusive type a. Ramin	1,079	641.84	2,527	1,689.48	3,609	6,957.96	1,173	3,746.59	8,388	13,035.87	
Total B3	1,079	641.84	2,527	1,689.48	3,609	6,957.96	1,173	3,746.59	8,388	13,035.87	
Total B1, B2, B3	1,576	828.81	3,540	2,463.78	5,479	9,826.88	1,771	5,291.40	12,366	18,410.87	
Total (A + B)	1,576	828.81	3,577	2,500.20	5,527	9,904.57	1,786	5,333.24	12,466	18,566.82	
Average/ha	3	1.38	6	4.17	9	16.51	3	8.89	21	30.94	
Ramin volume (%)		4.92		12.96		53.38		28.74		100	
Total Ramin stem (%)	12.86		30.13		43.03		13.98				

Source: Data PT. Inhutani III (ex. HPH PT. Sumber Alam Ramin)

Based on the data in the above table, Ramin type was found out to be more dominant, i.e., 13,035.87 m³ or 70.21% of the volume of all type of wood (total 18,566.82 m³). From the above volume, it was known that 4.92% of trees having 20-29 cm, 12.96% of trees having 30-39 cm diameter, 53.38% of trees having 40-49 cm diameter and 28.74% of trees having > 50 cm. If the harvesting of Ramin is limited to those of having ≥ 40 cm in diameter, log production from the area of about 600 ha is approximately 10,704.55 m³ (82.12%) or 4782 trees (57.01%).

Forest Exploitation

Historical background and forest concession programmes

The exploitation of natural forest for production is carried out by providing the legal forest concession, which has been clearly stated in the government regulation, no: 21/1970. Silvicultural system being used is TPTI. This system is developed from the TPI, the selective cutting system (the Decree of Directorate General of Forestry Exploitation, No: 35/KPTS/DD/I/1972), which has been revised in 1980, and then later revised and being changed to the TPTI (according to the Decree of Minister of Forestry, No: 485/KPTS-II/1989). This was again revised in 1993 (according to the Decree of the Directorate General of Forest Exploitation, No: 151/KPTS/IV-BPHH/1993) about the guidelines for TPTI.

The system of TPTI is effectively used up to present. Every forest concession which has been provided operational right are designated to manage their forest concession based on the “Rencana Karaya Pengusahaan Hutan” (RKPH). Moreover every forest concession should make five year planning as well as annual work planning as the guidelines in executing their activities in the field.

Forest right which has been provided to the forest concession owners is aimed at gaining the socio-economic of forest, covering: a) the development of forest productivity, processing and marketing of forest product (in the effort of developing the domestic income, state foreign exchange, as well as meeting the need of the society: sufficient, and reasonable price), b) job expansion, even distribution of job opportunity, as well as business opportunity, c) enhancement of the prosperity of the people both within and surround the forest, d) development of energy supply by developing biomass energy generated from forest product.

Addressing ourselves to forest degradation caused by the malfunction forest concession, so that Indonesian Government through the decree of Minister of Forestry, No: 523/KPTS-II/1997, designated every forest concession owners to be more concern in forest conservation by involving the local community to hand in hand in managing the forest and enhancing the prosperity of the local people. This policy is widely known as the development of rural society surrounding the forest (PMDH).

Forest concession contribution for the local communities

The presence of a forest concession, however, often brings about difficult problems to the local society. In many cases as reported that the forest concessions have carried out their obligations and task, through forest concession for villages development programmes, which was considered to be fruitful to the development of the local communities. In fact, the forest concession's contribution up to the present to the development of the local communities is meaningless if it is compared to the profit gained by the forest concession owners from the forest exploitation from time to time. It is true that there is a forest concession contributed the development of villages, by for examples: providing educational facilities, such as school building, religious facilities such as mosque and church, establishing “Village Cooperation Unit” (KUD), as well as the provision of school teaching staff. But those programmes were not managed in a sustainable manner. Therefore, there have been many of those facilities are not effective.

The establishment of inland road, which was at first promoted to be useful for breaking the isolation of remote areas, however, now is not effective. This is due to the characteristics of the roads developed. Inland roads in many cases were developed for the need of the company only. The assumption that the opening of market center by the presence of the forest concessions has not come to reality, and even those markets which have been available long before the presence of forest concession, could not be developed. A clear fact on this case is that the **“City of Pulang Pisau”**. Pulang Pisau was a place where 75% of timber production of Central Kalimantan produced. Now, this city has been a dead city.

With regard to the manpower employment, most of the forest concession owners recruited employees from outside Central Kalimantan, or they were supplied from the area where the owners of forest concession come from. If there were employees from the local communities, they were not able to stay for a long time. This was due to the lower wages paid. Besides, the Dayak people are not used to work as labors. The

management structure and personnel of the companies are used to pre-established long before they are operational in Central Kalimantan.

The description of the forest product of Central Kalimantan done by one of the forest concessions can be presented in the following table:

Tabel 2. Forest production within three years RKT

Activities	Five Years Work Plan (RKL II)			Total RKL II	Average (m ³ /ha)
	RKT 1995/1996	RKT 1996/1997	RKT 1997/1998		
Width (ha)	350	350	500	1.200	
Production in m ³	11.447,90	13.145,01	17.897,00	42.489,91	35,41
Meranti rawa	2.195,35	1.102,97	3.520,21	6.818,53	5,682
Nyatoh	196,80	783,86	1.767,02	2.747,68	2,289
Geronggang	272,96	965,48	2.448,56	3.687,00	3,073
Kapur naga	299,09	447,47	2.185,04	2.904,60	2,421
Perupuk	166,83	1.421,63	-	1.588,46	1,324
Jelutung	-	111,06	-	111,06	0,093
Terentang	-	1.540,47	-	1.540,47	1,284
Keruing	-	1.704,39	2.263,66	3.968,05	3,307
Pulai	124,97	-	-	124,97	0,104
Mentibu	274,76	2.045,83	2.440,87	4.761,46	3,967
Ramin	7.917,14	3.021,85	3.298,64	14.237,63	11,86

Source: Data HPH PT. Gajah Seno Sakti

From Table 2 above, it is clear that forest product is dominated by Ramin species. It is the leading forest product of peat swamp forest in Central Kalimantan. If peat swamp forest in Central Kalimantan with the total area of approximately 2.7 million ha (which is mostly exploited) has been managed professionally, the whole area of peat swamp forest of Central Kalimantan would produce million cubic of wood. For example, especially Ramin based on the price about US\$ 150.00/m³, we could easily predict how much profit can be gained. However, so far the profit has been dominated by the forest concession owners, "the cukong", financial backer, or the illegal logging guarantors as well as the governmental personnel who keep protecting the companies. Whereas, casual logging workers, and illegal loggers were usually underpaid, this condition was indicated when there was a transaction between them. It is proven in many cases, that the casual logging workers or the illegal loggers were trapped in debt to the financial backers.

With regard to the number of HPH BINA DESA, in their form as HTI TRANS or HTI MURNi in Central Kalimantan, i.e. around 15 unit altogether, and the number of saw mill or band saw is about 128 units with their felling capacity is about 892,290 m³/year, 6 units of plywood industries with felling capacity licenses about 477,680 m³/year, 9 units of moulding/dowel with their felling capacity licenses about 137,800 m³/year, 315 units of wood processing industries, and plus 46 units of other active HPH, so that the presence of those facilities and companies should be able to support the local community to live sufficiently as well as the successful development of the local government. In contrast, with regard to the target of wood production of Central Kalimantan, which is stated formally 4 million m³ per year, excluding the illegal

logging which might be more than that, in fact this amount of production has not significantly contributed the development of local communities as well as the local provincial government.

To give a clear description of the injustice in terms of timber trading up to present, for example within Sabangau river, Central Kalimantan, the price of timber, especially of Ramin or meranti species, the casual logging workers were paid Rp. 270,000/m³. These types of wood then was sold to the middlemen on the price not less than Rp. 1 million/m³, and in Surabaya, the price would reach Rp. 2 million/m³. From those figures, it is clear that there is a significant difference in price. The casual loggers could only gain gross profit as much as 13.5-27 %. Where as financial backers could gain 73-86.5%, with out hard working. This practice of wood trading, even if there is an increase in the timber production, it will remain unable to enhance the prosperity of the casual loggers, except to a certain group of society, the government personnel who keeping guard the forest concession owners or the HPH.

The reactions from the local communities surrounding the forest concession

Any effort done by the HPH to enhance the condition of local communities has not satisfied the need of the local communities. With respect to the concept that should have been worked out by the HPH, there would not be any poor local communities around the forest every forest concession. Therefore, Indonesian government through the governmental act, No: 41/1999, chapter 10, section 68, article 1, on the forestry. It is stated that the local communities dwelling around the HPH, have the right to live in safely within the well-preserved environment. In fact, this was not paid to the local communities. In practice, the right was not gained by the local communities because forest is remain belongs to the central authority (the authorized government personnel as well businessmen).

To this condition, there have been disappointments within the local communities. These disappointments among others have been firmly expressed in the National workshop on 12th April 1999 in Palangka Raya, which produced **Tambun Bungai and Sabangau Declaration**. This national workshop provided good opportunity for the local communities to express their ideas and opinions about the HPH where they lived. Through this workshop the local communities stated that those who lived around the HPH did not gain any meaningful advantages from the HPH (forest concessions). In contrast, if the local communities were caught cutting the forest around their villages, they were charged of illegal logging or at least threatened to be charged of legal action. This situation, as well the behavior of some authorities as mention above has made the local communities feel that they do not own the surrounding environment any more, although in fact they have for generation keep guarding the forest as their main livelihood.

The establishment of inland roads by the HPH, as one of the effort to break the remote areas isolation was only useful for the activities of the HPH. After all of the HPH have finished their project, there were many inland roads were made dysfunctional, so that the local communities could not use them for any purposes. This condition is very ironic because the government has formally established policies on development of local communities. However, what had happened was something very contradicted.

Since the implementation of government act in the field did not satisfied the condition needed, peat swamp forest will become a very promising business for the

illegal loggers as well as for the businessmen. For this reason, peat swamp forest could not provide fresh air but as the best area for competition for forest felling by using various tools, such as axe, chainsaw, and even the best gambling area. This condition was not taken into account by the local communities because in fact the life of illegal loggers was not developed but gradually went down to the deep poverty.

For example, there were immigrants in Kalampangan, Bereng Bengkel told that they have been involved in illegal logging. Having involved in the illegal logging activities for about five months, however, they could not support their family needs. But even, in many cases, the financial backers did not pay their wages. Furthermore, they were trapped in debt. The local communities also stated that if they work as casual logging workers in the HPH, there is not any clear guarantee to support their family life. This is due to the low wages gained compared to the risk resulted from the work. Therefore, in enhancing the economic status of marginal communities, local price of any commodity including timber should be managed and increased, as well as wages. Some facts showed that local communities who have ever been involved and successfully as casual logging workers in 1975–1980, now realize that casual logging activities would not be dependable activities if they did and said in every thing honestly.

The presence of HPH has about negative impact more than positive impact. In this case Directorate General of Productive Forest, (Waskito Suryodibroto) stated that forest degradation within the HPH areas has reached 16.57 million ha out of 52 million productive forest. Thirty-two percent of this figure has been deforested during this last decade. This means that 3.24% or 4.5 million ha of forest destroyed every year. (Realitas, 1999). Other negative impact of deforestation on the socio-cultural aspect of the local communities, Alqadrie in Hasanuddin, 1996), stated that there have been much more negative impact of exploitation. In terms of negative impact with regard to socio-cultural life, it was begun by the recruitment of casual workers of the HPH from various areas. In this context, there have been much fighting, gambling, prostitution both openly and disguised practiced, the oppression of traditional law, and making the local communities as the main cause of deforestation.

Hasanuddin reported research finding by Wahana Lingkungan Hidup Indonesia (WALHI), that one of the main causes of the productive forest destruction was the low price of wood in the level of casual loggers. The low price of wood did not reflect the presence of opportunity costs and scarcity values of logs. The low price of wood in this case, has hampered the efficiency both in the logging areas (only 60%) and in the logging industries (only 50%). This also encouraged over investment in logging industries, and increased effective demand on natural wood. Consequently, there has been a wide gap with regard to the log supply. Based on the data from the Secretariat of Forest conservation collaboration (SKEPHI), it is known that fixed capacity of wood industry in Indonesia up to present has reached 40,000 million m³/year, where as log production has only reached 33 million m³/year, generated from the HPH (forest concession), IPK, (Wood utilization Licenses) HTI, (Industrial Forest Plantation) and “Hutan Rakyat” (Forest for people). Therefore, there has been a deficit of wood supply as much as 7 million m³/year. This gap has occurred due to the mismanagement of principle licenses for wood industries (Pulp paper and plywood), and wood processing industries (saw mill), carried out by the Department of Forestry and Plantation. In this case, there has not any certain regulation on the fixed capacity of wood industries. Consequently, if HPH is dominated by a certain department and particular companies,

those companies will have a wide freedom in forest felling, especially within the areas which are functionally changed for non-forestry. (Realitas, 1999).

Conclusion

1. Peat Swamp Forest is an important habitat for various type of forest having high economic values. Some of them Ramin (*Gonystylus bancanus*), Jelutung (*Dyera costulata*), Meranti Rawa (*Shorea* spp), and Gemor (*Alseodaphne* spp). Ramin species are dominant, i.e. 70.21% of the total volume of all type of wood, or with average production as much as 30.94 m³/ha.
2. The proliferation of illegal logging from year to year, both those are organized by the HPH or individually practiced, peat swamp forest sustainability has been seriously threatened. As the logical consequence of mismanagement of forest in Indonesia up to present, the need for wood in the future could not be met by domestic supply, but imported from overseas countries.
3. Illegal logging which has been long practiced by the local communities is proven to be not promising income generation. In fact, within those community involving in both legal and illegal logging, there was much development.
4. Legal logging practiced by the HPH even if it has been regulated by various acts and practical guidelines, the implementation of those acts in the field has been very much contradicted to the local communities needs. Therefore, the presence of the HPH in Central Kalimantan has not brought about much contribution to the local communities surrounding the HPH, as well as to the acceleration of the development of Central Kalimantan.
5. The pattern of forest management which was practiced since 30 years ago is actually the main cause of deforestation and environmental degradation.
6. With regard to the useless of the HPH to the local communities or the unbalance contribution resulted from the forest exploitation returned back to the local government, it is worth considering the concept of selling the wood without cutting the tree and the same time to implement credit carbon programmes.

References

- Departement Kehutanan dan Perkebunan Kantor Wilayah Propinsi Kalimantan Tengah Palangka Raya. 1999. Laporan Tahunan Tahun 1998–1999 (Annual report of Forestry and Plantation Department of Central Kalimantan)
- Departemen Kehutanan dan Perkebunan Kantor wilayah Propinsi Kalimantan Tengah. Target dan Realisasi Rencana Karya Tahunan Pengusahaan Hutan Tahun 1999/2000 Propinsi Kalimantan Tengah sampai bulan September. 1999. (Target and the achievement of annual work plan of forest concessions in Central Kalimantan)
- Gajah Seno Sakti. 1999. Rencana Karya Lima Tahun Pengusahaan Hutan III (Tahun 2000–2005). PT. Gajah Seno Sakti Propinsi Kalimantan Tengah. (Five years work plan of Pengsaahan Hutan III, Central Kalimantan)
- Hasanuddin. 1996. Sistem Pengelolaan Hutan Produksi Lestari dalam Pengelolaan Hutan Lestari di Indonesia. Konsep Permasalahan dan Strategi menuju era ekolabel di hutan produksi, Jakarta.
- Realitas Media Indonesia (Daily Newspaper). 1999.

Rehabilitation of Devastated Peat Lands and Establishment of Sustainable Agro-systems through Buffer Zone Planning in Central Kalimantan

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Abstract

Tropical peat swamp areas have been considering as the key ecosystem for not only reserving bioresources and biodiversity, but also reducing carbon efflux owing to degradation of peat, stocking of carbon in forests, or controlling water balance. However, now, the peat swamp and wetland in tropical area face to the crisis of disappearance due to human impact, which is accelerated by recent abnormal and unusual global climate changes.

In Central Kalimantan (surrounding Palangka Raya), the native peat swamp forest locate between Sebangau River and Katingan River (Sebangau-Katingan Watershed), the abandoned, destroyed, and fire-damaged area locate between Sebangau River and Kahayan River (Sebangau-Kahayan Watershed), and intensive agriculture area locate between Kahayan River and Barito River (Kahayan-Barito Watershed). Recently we started the project on rehabilitation of devastated peat lands and establishment of sustainable agro-systems through buffer zone planning in Sebangau-Katingan Watershed. The following area are proposed as research belt zones:

1. Belt Zone Kalampangan (Inland peat area with sandy material sublayer) lies between both rivers of 10 km long, 10 km wide.
2. Belt Zone Pangkoh (Transitional peat with clay material sublayer) lies between both rivers of 30 km long, 10 km wide.

Instead of sustainable development of peat swamp, it is proposed that principal concept of this project are 1) to conserve the native peat swamp forests, 2) to rehabilitate and protect the destroyed, abandoned, and fire-damaged area in surrounding area of native forest, and 3) to reduce the human impact to surrounding area, to minimize the introduction of civil engineering works, and to establish the sustainable production system. Idea and strategy on this project will be presented in this symposium.

Introduction

The lowland wetland area of Central Kalimantan shows extremely complicated and diversified ecological system. But with careful observation, it can be pointed out that the area seems to have gradient in many criteria such as soil type and distribution, vegetation, hydrological condition, and the land use that is the reflection of history of human activity in this area. Obviously, this tropical wetland area is the one and the only

of such an ecological system that can be found in the world. Such gradient is most apparent to be observed along a transect passing through an area from the large river stream to the interior part of peat swamp forest. For instance, the lower reach of the main river stream is highly effected by seawater, but the salinity declines with distance from the main stream. Soil distribution along the riverbank is mainly covered by alluvial soil forming a levee through deposition of silt contained in the river water. But, apart from the riverbank, the formation of peat soil is established where the thickness of peat increases toward the boundary of watershed. Prior to the development of the peat, however, the weathering, formation, and development processes of the underlying soil has long been occurring resulted in a sandy sublayer of the inland peatsoils and marine clay sediment sublayer of the coastal peatsoils. In some places, a pyretic sublayer in which an acid sulfate soil can be formed if the layer is oxidized accompanies the latter. As a resultant of all of these processes, the coastal and near river stream area is occupied by nutrient rich topogenous peatsoils and the inland area, which is dominant in Central Kalimantan, occupied by relatively poorer nutrient containing ombrogenous peatsoils.

In most tropical woody deep peat soils, it is well-known that micronutrient deficiencies are one of the major growth-limiting factors for crop cultivation (Tadano, 1985). Among the micronutrients, Cu, B and Zn appear to be the most deficient elements for crop growth in some tropical peat soils (Joseph *et al.*, 1970; Ng and Tan, 1974; Chew *et al.*, 1979; Nilnond *et al.*, 1987). Frequently, sterility becomes a serious problem in rice grown in deep peat soils and it was suggested that sterility was due to the lack of Cu or toxicity of phenolic compounds or the combined effect of both factors (Driessen, 1978). In peat soils, the growth of maize and tomato is extremely retarded and the yield is very low, and the sterility of barley and rice occurs in the no Cu application or B application (in only barley) (Ambak *et al.*, 1991).

In acid sulfate soil, nutritional factors limiting crop growth are considered to be as follows; (a) the extremely low pH condition of the soil, such as pH3.2, associated with a high Al concentration in the soil solution, is an important factor limiting crop growth before liming. Iron toxicity may be another important factor for low land rice under flooding, and (b) after liming, a low K level in the soil may be the primary limiting factor followed by low P and low N (van Breemen and Pons, 1978; Takai and Vijarnsorn, 1987).

Outline of JSPS Core University Program in Agronomy Group

The latitude of human activity also shows a gradient along the transect from the river bank to the interior peat swamp forest. People first inhabited the bank of large river because of its accessibility and soil fertility reasons. They gradually moved toward inland through and by making anjirs and handils for logging and starting permanently agricultural activities. Since then, population is growing and some more areas are needed as well. Nowadays, the frontier seems to move toward west direction, over-going into the watershed of Sungai Kahayan and Sungai Sebangau that are still relatively covered with forest.

In the JSPS Core University Program entitled "Environmental Management of Wetlands Ecosystems in Southeast Asia", the agricultural sciences group declared its research concept as follows:

- (1) to conserve the native peat swamp forests (subject I, conservation area),

- (2) to rehabilitate and protect the destroyed, abandoned, and fire-damaged area in surrounding area of native forest (subject II, protection area), and
- (3) to reduce the human impact to surrounding area, to minimize the introduction of civil engineering works, and to establish the sustainable production (subject III, sustainable production area). And from these points of view, it is requested to choose appropriate study area for this study.

It would be the best if the study area can cover the whole one watershed of relatively large river system and designate it as the research area, because such watershed seems to contain both extremely diversified ecosystem and agrosystem. However, to be realistic, it is quite difficult to set such large area as a research object because of implicated human activities that already established in the area, and also of difficulty in conserving the appropriate condition of research environments necessitated for the research study project.

By establishing the research area as belt zones connecting two large rivers, the Sungai Kahayan and the Sungai Sebangau, the above requirement of the research concept can be easily satisfied. And, it is scientifically justified that these belt zones should cover both the coastal and the inland peatland area. Since some places of these areas have long been established and cultivated for various agricultural commodities and other activities with various degree of success, the belt zones should cover those inhabited areas.

Based on the above-mentioned justifications, the following areas are proposed as research belt zones:

Belt Zone A

Covering an area lies between Sungai Kahayan and Sungai Sebangau of 10 km wide that passes through the formerly transmigration area Pangkoh, this belt zone is to represent the coastal peatland area with clay material sublayer.

Belt Zone B

Covering an area lies between Sungai Kahayan and Sungai Sebangau of 10 km wide that passes through the formerly transmigration area Kalampangan, this belt zone is to represent the inland peat area with sandy material sublayer.

Once these zones are established, meaning that the area is preserved and protected as a tropical peatland conservation area, the following phases of the research programs are proposed:

1. Phase I – the Baseline Study

Year 1 to 2

The results of this study will be used as a basic consideration in establishing the detail research programs and activities and their required experimental plots.

2. Phase II – the Implementation of the Detail Research Programs and Activities

Year 3 to 7

During this phase, the detail research programs integrating all related aspects are implemented. The goal of this phase is to establish a management practice that results in a better land functions and productivity as a sustainable ecological system of bio-production in Central Kalimantan's Peatlands. As a basic criterion, the management practice that will be chosen and established should results in a better

prosperity of the people with a minimum environment disturbances or even without any of them as far as possible. This will be achieved through a series of research activities that will be implemented based on a yearly basis of evaluation.

3. Phase III – the Implementation of the Action Research Programs

Year 8 to 10

In this phase, the land management and practices established in the Phase II will be applied and improved accordingly to the research program area in a kind of participatory programs involving all the stakeholders, including farmers, extension workers, government officers, experts, etc. Based on the results of this phase, the establishment of a regional, national, and international networking on Sustainability of Ecological System of Bio-production in Tropical Wetlands will be proposed.

References

- Ambak, K., Abu Bakar, Z. and Tadano, T. 1991. Effect of limiting and micronutrient application on the growth and occurrence of sterility in maize and tomato plants in Malaysian deep peat soil. *Soil Sci. Plant Nutr.*, 37: 689-698.
- van Breemen, N. and Pons, L. J. 1978. Acid sulfate soils and rice, In: *Soils and Rice*, IRRI Publication, IRRI, Los Banos, pp. 739-761.
- Chew, W.Y., Joseph, K.T. and Ramli, K. 1979. Influence of applied copper and other micronutrients on groundnuts (*Arachis hypogaea*) and sorghum (*Sorghum bicolor*) on Malaysian oligotrophic peat. *Trop. Agric.*, 56: 25-32.
- Driessen, P. M. 1978 : Peat soils. In: *Soils and Rice*, IRRI, Manila, pp. 763-779.
- Joseph, K.T., Hussein, S. and Williams, C.N. 1970. Assessing the nutrient status of a peat soil from the Klang area. *Malays. Agric. J.*, 47: 338-345.
- Ng, S.K. and Tan, Y.P. 1974. Nutritional complexes of oil palms planted on peat in Malaysia. I. Foliar symptoms, nutrient composition and yield. *Oleagineaux*, 29: 1-14.
- Nilnond, C., Pantanahiran, W. and Tadano, T. 1987. Evaluation of copper deficiency among micronutrients as a nutritional factor limiting crop growth in peat soil. In: Takai, Y. *et al.* (eds.), *Coastal and Inland Salt-Affected Soils in Thailand-Their Characteristics and Improvement*, Nodai Research Institute, Tokyo University of Agriculture, Tokyo.
- Tadano, T. 1985. Nutritional factors limiting crop growth in problem soils and crop tolerance to them. In: *Proceedings of International Seminar on Environmental Factors in Agricultural Production*, Thailand, pp. 329-345
- Takai, Y. and Vijarnsorn, P. 1987. In: Takai, Y. *et al.* (eds.), *Coastal and Salt-Affected Soils in Thailand. - Their Characteristics and Improvement*, Nodai Research Institute, Tokyo University of Agriculture, Tokyo, pp. 258-267.

Livelihood Role of Inland Floodplain Ecosystem for Local Community Related to Fisheries Commodity: A Review

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Abstract

In Central Kalimantan the livelihood role of the inland floodplain ecosystem can be defined both economically and ecologically. Economically, this provides fish to the local community due to its role as a fish habitat, so it serves as a cheap nutrition sources to their life. Ecologically on the other hand it does not only act as sink for carbon through utilization of nutrient in the system by both aquatic and terrestrial plants but also plays a considerable role in the self-cleaning function of the system.

One of the methods applied by local fishermen to catch and culture the fish in the flooding area is called "beje". This is a kind of traditional method, which is constructed during dry season by digging small ponds or canals in area of flooding which follows the natural feature of the area.

The result of government policy for the development of area for agriculture and human settlements has clearly changed the nature of the system, which has severe effect on the fish biodiversity. The effects destabilize fish populations with a loss of species and a fall in productivity. The recent example is the failure of 1 Million-Hectare Mega Rice Project in which its implementation has destroyed the nature of the flooding area due to alteration of flood regime in the area. As a consequence severe effects have been occurred to the local people due to loss on their source of traditional livelihood including beje operation.

There is now a immediate requirement to identify more friendly way of utilization of the ecosystem without neglecting its function to the both local community and its related ecological system. To do so a wise use of the floodplain ecosystem by appreciating the traditional wisdom of the local people should be taken into consideration.

Keywords: Livelihood role, inland floodplain, local community, fisheries commodity

Introduction

Floodplain ecosystem in Central Kalimantan is a part of large river system in which according to Welcomme (1994), the ecology of the system depends on the flood regime, which by seasonally inundating the floodplain, increases the food and space available to fish. During flooding time that usually takes 2 to 3 months, the water rises to overflow its river's bank and slowly extends over the floodplain to produce a massive increase in aquatic habitat. This condition, according to Bayley (1991), has accelerated recycling of nutrients as they enter solution and a burst of primary productivity follows with bloom of phytoplankton.

During drought time on the other hand, some area is completely dried but some low parts of the areas are remain in pools which are entirely disconnected with the main river. The former condition gives opportunity to the terrestrial plants to develop well through utilization of trapped nutrients in the soil that was formed during

flooding time. It supports the growth rate of terrestrial plant. The later condition on the other hand, due to limited water area, high temperature and dense of fish population are cause an extreme condition for the fish. Only certain fish species can stand on this condition like swamp fish which have developed some adaptation strategies (Welcomme, 1979).

As a natural ecosystem which has a function for increasing the aquatic habitat and enrich the aquatic system with the nutrients, the role of its system is very important to support the existence of the fish. Both functions provides more opportunity of fish to develop properly since it acts as a sheltered habitat used by fish for spawning, as nursery areas for fry and as habitat for adults (Page, 1999). In addition, most of fish species time their reproductive cycle and associated migrations to place the juveniles on the floodplain at this time of maximum food availability and shelter, and have developed a wide variety of breeding strategies to achieve this end. This role obviously has put a greater contribution to the capture fisheries on open inland water surface in which most of fish caught consumed by the local people.

The dependency of the local community on the aquatic resources in Central Kalimantan is considered high since these resources fulfills almost all of their daily life need. The water for instance has been utilized for drinking water and other activities like washing and bathing. Other importance is in term of yielding fish commodity, which are caught out from rivers, lakes and swamps areas of the Central Kalimantan province. Since this is considered as an important sources of nutrition for local community then it is very demanded due to cheap price of it compare to others commodity like cereal, beef, poultry, and again the fish can be easily caught out of the aquatic system using simple method. Table 1 indicates the fish is in a comparative list of average per capita consumption of calories and protein by commodity group 1993.

The importance of the fish as a nutrition source is also indicated by the number of fish consumed by the local people each year. In 1994 about 61,885.46 ton of the fish had been consumed by 1,501,326 people and this value had increased in 1995 become 64,630.10 ton which were consumed by 1,547,134 people, and 67,700.15 ton in 1998 which were consumed by 1,671,621 (note: The number of population in Central Kalimantan in 1997 were 1,685,535, Anonymous, 1998d.). Based on this figure the fish consumption in the Central Kalimantan tends to increase by 3.05% per year (Anonymous, 1998c).

Table 1. Comparative list of average per capita consumption of calories and protein by commodity group, 1993.

Commodity group	National		Central Kalimantan	
	Calorie	Protein	Calories	Protein
Cereals	1210.42	23.26	1335.96	25.28
Tubers	93.70	0.81	64.34	0.62
Fish	40.14	7.26	73.13	13.82
Meat	20.19	1.40	36.31	1.74
Eggs and Milk	27.79	1.67	26.83	1.54
Fruits	37.83	0.43	43.25	0.53

Source: Adapted after Anonymous, 1998.

Some problems have occurred in relation to the development of the area, which are mainly resulted from human activities like gold mining, logging activities and swamp reclamation for agriculture. Those activities have brought about devastation on the aquatic resources which in turn have led this negative implication to lowering the fisheries production in the area. This indication can be seen from number of fish production of inland open water that tends to decrease each year by 3.09% (Anonymous, 1998c). The cause of this trend has also resulted from fishing activity using dangerous method such as using poisoning chemical substances and electricity power that threatened the existence of fish population. An urgent action then should be formulated to measure the extent of effect, so a remedial action could be taken for better utilization of the floodplain ecosystem and its functions to the human being (local people).

This paper is aimed to highlight the important role of floodplain ecosystem as a main source of fish for local community and to provides a review of the characteristics of floodplain ecosystem including its contribution to the existence and development of fish biodiversity in Central Kalimantan.

Status of Floodplain Ecosystem in Central Kalimantan

Type of Floodplain

Unlike low-land floodplains, in which most of the water level condition are affected by the tidal regime, inland floodplain ecosystem in Central Kalimantan on the other hand is dependent mainly in run-off from the rainfall over the river. Based on this, the classification of the floodplain in the region falls into up-land floodplain where the flood regime is uninfluenced by the tidal regime, and the drainage time goes on 24 hours (Chandrawidjaya, 1994).

The classification of the floodplain in Central Kalimantan ecosystem can also be defined according to MacKinnon *et al.* (1996) who defined that the swamp area which mostly flooded during rainy season is divided into two types, first rain-fed peat swamp forest and the second river fed freshwater swamp forest. Based on this type, the rain that feed peat swamp forest are nutrient poor due to lack on nutrient which are derived from rainfall and are caused by low soil pH and contain high pyrite substances. The river fed swamp forest in contrary is very rich with nutrient due to receive dissolved mineral nutrient from rivers flood waters (MacKinnon *et al.*, 1996). However their classification of peat swamp forest into first category seems not applicable to all peat-swamp forest since not all of the peat swamp areas are rain-fed sources but some of them are also exposed by the influences of the river's flood regime.

Distribution and Extent

In Indonesia, marshy flood area founds in Sumatra, Kalimantan and West Irian. These are located on the flat coastal alluvial plains and submerged and drained by numerous small rivers (Welcomme, 1979). Inland floodplains ecosystem in Central Kalimantan which consists of Freshwater swamp and peat swamp are widespread over alluvial soils that are flooded for long periods with freshwater (MacKinnon *et al.*, 1996). In Central Kalimantan alone the area covered is 1,812,000 ha of the total wetland area in Kalimantan. This is the largest part of total wetlands habitat (1,932,000 ha) of the area (Table 2). They are also associated with coastal swamps, inland lakes and huge

low-lying river basins, such as those of the Seruyan and Kahayan (MacKinnon *et al.*, 1996).

Table 2. Wetland habitats in Central Kalimantan

Type of wetlands	Original area (ha)	Remaining area (ha)
Freshwater swamp	1,880,000	940,000
Peat swamp	996,000	872,000
Mangrove forest	120,000	100,000
Freshwater lakes	20,000	20,000
Total	3,016,000	1,932,000

Source: Adapted from MacKinnon *et al.* (1996).

The distribution and location of the floodplains ecosystem are mainly related with the existence of flooded area. In Central Kalimantan most of the flooded area are part or connected to the main river. Generally the areas are a low part of the region so they are most vulnerable to the flooding. There are 14 flooded areas in Central Kalimantan which cover an area of 58,647 ha. Upstream of Muara Teweh and Buntok have the largest area followed by upstream of Pangkuh, upstream of Palangka Raya and upstream of Kuala Kurun (Table 3). Those lowland areas such as Kuala Kapuas, upstream of Pangkuh and the Jelai River are flooded by the combination of high tide and river flood (Anonymous, 1998b).

Table 3. Location and extent of flooded area in Central Kalimantan, 1995

Location	Flooded area (ha)
Muara Teweh upstream, Buntok	12,800
Kuala Kapuas	6,128
Pangkuh upstream, Palangkaraya upstream,	11,200
Kuala Kurun	
Kasongan	10,700
Sampit	6,400
Telaga Pulang	5,746
Arut River upstream	2,685
Kotawaringin upstream	2,388
Jelai River	600
Total	58,647

Source: Anonymous (1998).

The Livelihood Role

The life of dayak people in Central Kalimantan have been much influenced by existing natural resources. By this reason high appreciation had been put to the natural resources by their ancient since they had realized that the consequences have to be bear if their natural resources are destroyed due to their own activities. In this perspective, they had exploited the natural resources carefully and in a limited number; it was done only to fulfill their daily life. This wise utilization of natural resources seems to be an important aspect of natural conservation.

Other than planting, fishing is one of their way that have been done to fulfill the need on food. Whilst animal husbandry is only done as a subsistence activity rather than commercial one. It is no wonder then the role of aquatic resources for supporting their life is very dominant. Fishing has been done intensively simply just because both the nature has provided it abundantly, and due to other alternative to provide protein to their family is difficult to find. Again, the fishing gear to catch the fish is simple and easy to operate.

Economic Role Related to Fisheries Commodity

Economically, the livelihood role of floodplain ecosystem to the fisheries aspect can be distinguished both direct and indirectly. Directly, as the area of main fish producer, the fishing activity that is carried out commercially by the fishermen will affect the income contribution domestically to the region in term Gross Product Regional Domestic (GDRP). In 1997 the contribution from fishing activity in inland open water including floodplain area to the GDRP was amounted Rp 246,768,85 (about \$ 37) (Anonymous, 1998c). Although this contribution was not quiet significant, but if we assess the contribution indirectly which are related to the protein provision for the poor people, it will show how significant is the importance of this aspect. Fishing activity in this respective is mainly done as a subsistence activity, so they do not need to buy fish, and in turn reduces their expenditure on food. The capture fisheries in floodplain area of Dadahup village using beje for example had generated income amounted of Rp 2,000,000 per 17 m × 2 m area of beje (Epriyeni, 1997).

Number of Fisheries Household

In the one hand the number of local people who works as part-timer fishermen is difficult to be defined. It is because their number always changes. This situation is understandable that since some of them are not permanently work as a fishermen. On the other side, in 1993 the number of full-timer fishermen who were categorized into fisheries household was 9,186. This number tend to decrease in 1995 become 4,373. But in 1997 the number was increase significantly to 9,867 (Anonymous, 1998c). The dynamic of fisheries household in Central Kalimantan can be seen from Table 3.

Aquaculture is now considered as an alternative method for producing fish. As shown in Table 4, the number of household that is engaged in this activity has significantly increased. "Karamba" (cage) are widely used to rear the fish which are situated along the Kahayan River adjacent to Palangka Raya city. This activity has

Table 4. The number of fisheries household in 1993-1997

No.	Year	Fisheries household			Number
		Marine fisheries	Inland open water fisheries	Aquaculture	
1.	1993	4,044	9,186	3,101	16,331
2.	1994	4,063	8,628	3,655	16,346
3.	1995	4,373	4,373	6,221	14,967
4.	1996	4,340	7,781	8,772	20,893
5.	1997	4,476	9,867	8,272	22,615
Average increase		2.62%	12.34%	30.84%	9.87%

Source: Dinas Perikanan Tk. I Kalteng, 1998.

strongly supported by the local government since it is realized as an excellent alternative for generating income and food for the community.

Fisheries Yields

Fish species

The fish caught out of floodplain area consists of both riverine species (white fish) and swamp species (black fishes). The former usually are caught at the beginning of the rainy season and at mid of the dry season where the water level begins to decrease. The latter, however are mostly caught at the end of the dry season.

The fishing activity at the beginning of the rainy season is carried out during migration of the riverine species in relation to their sense in fulfilling their life cycle in the floodplain area for breeding activity. Whilst in the mid of the season, due to decrease in water level and change in water quality, the fish cannot stand on bad condition migrated back to the river.

During the drawdown, when the water in the system is confined to the floodplains pools and the main river channels, severe condition of low dissolved oxygen, high temperature, crowding and reduced food availability prevail. In this condition only the fish which have developed adaptation strategies such as climbing perch (*Anabas testudineus*), snake head (*Chana striatus*), catfish (*Clarias* sp.) will remain. The condition in which only limited space and water available in the pools makes the fish vulnerable caught by fishermen.

Fish production

The fish commodity in Central Kalimantan is mainly resulted from marine and inland fisheries. Marine fish commodity is solely contributed from capture fisheries with production of 46,900.9 ton in 1994 and it had been increased become 50,027.1 ton in 1997 (Anonymous, 1998). The average increase was 3.78% per year. The fish's contribution of inland fisheries on the other hand resulted from various aquatic ecosystem such as river, lake and floodplain area, and are also comes from aquaculture. From inland capture fisheries, in 1994 the fish production was reached 42,253.2 ton in 1994 and this value had decreased to 39,444.9 in 1998 (Anonymous, 1998). The average decrease was 3.09 per year.

The fish caught from the floodplain area during dry season according to Sastrosoedaryo, 1981, are dominated by the swamp species such as snake head (*Chana striatus*) 33.9%; Climbing perch (*Anabas testudineus*) 14.3%; Sepat siam (*Trichogaster pectoralis*) 13.3%; Sepat rawa (*Trichogaster* sp.) 13.2%; Kapar (*Polyacanthus hasseltii*) 8.5%; Toman (*Channa micropeltes*) 7.9%; and Tambakan (*Helostoma teminckii*) 1.9%. The number of fish produced from floodplain ecosystem varied accordingly. Data observed by Muslim, 1997 in the floodplain area of Bakung Merang Village showed that the fish production were ranged between 20 – 300 kg per month during the fishing season, the fishing season in the flooding area is usually take place for 2 – 3 months period.

Capture Method

Fishing activity in Floodplain area of Central Kalimantan can be defined as the traditional method since the equipment used are usually constructed using local

material such as bamboo and rattan plaited. Generally, they are passive in nature and in form of fishing traps which are adjusted to the floodplain characteristic. Most of them are aimed to catch the fish during their migration. The list of fishing gear used in floodplain ecosystem in Central Kalimantan can be seen in Table 5.

Table 5. Fishing gear used in Floodplain of Central Kalimantan

Local Name/function	Common name
Tempirai	Vertical slit trap
Bubu/lukah	Cylindrical trap
Penggilar	-
Serok	Scoop net
Rawai	Long line
Rengge	Gill net
Pancing	Hook line
Jala/lunta	Cash net
Hancau	Lift net
Tangguk	Scoop
Beje	-

One of traditional method applied by local fishermen to catch the fish is called “beje”. This method is applied by concerning the nature of fish behavior in response to the floodplain characteristic as explain before. A beje can cover about 2–5 ha of the floodplain area which is named as “Tatah Beje” by the local people.

According to Fatimah, 1995 beje is considered as a fishing apparatus which it is like fish pond in shape. The beje is constructed purposely in the area of floodplain in order to make easy the fishermen in catching and collecting the fish that are assemble in small area of the beje when the water level extremely decrease during dry season. While Hamid (1981) defined the beje as a ditch that is constructed in order to make a connection between the main river and the swamp areas. The size of the ditch is 1 to 2 m in width while the depth varies between 1 to 2 m. The main function of the beje according to Hamid 1981 is a trapping for the fish that are entering the beje during raining season when the water level rise. But different definition comes from Mangalik and Arifin (1994) who stated that the beje is not merely used as a method of catching the fish but also for culture facility. According to them, the fish culture can be carried out in the beje because the water is available whole year thus its amount is enough for one period of fish culture. And as a consequence, the fish will live and growth properly which in turn give an opportunity to breed and multiply in the beje area. Moreover, a certain method of fish culture by giving the fish either supplemented or artificial feed can be applied so that high rate of growth attained. Moreover Mangalik and Arifin (1994) confirmed that stocking fish seed into the beje can be carried out if it has been estimated that the remain of fish population in the beje is already lowered.

Traditionally beje only useful during dry season so that there is no special management apply on it. However if the beje is aimed to yield more fish continuously then development of a management system is a must. Of course, there should be a special attention given in order to run the management of the beje so much time must be consumed by the owner of the beje.

Ecological Role

The ecological role of floodplain ecosystem related to fisheries aspect can be defined as an area for food sources for the fish. In this way, the role of higher vegetation as a sink mechanism of nutrient by locking up nutrients during the flood phase and returning them to the soil during dry season is very important. About 55% of allochthonous minerals (C, N and P) are trapped in the marshy area of floodplain in the form of biomass, debris and detritus (Rast and Ryding, 1989). Another important role of floodplain ecosystem is the function of self cleaning in terms of biotic nutrient filter. In this way, the rate of N and P absorbed by the higher plants amounted to 9.48 and 0.15 kg/(ha year), respectively (Richardson *et al.*, 1982). It is clear that the ecological function of the floodplain ecosystem will give a significant contribution to the aquatic productivity, therefore to the fish productivity of the floodplain area.

Some Problems Facing for Future Development

At this time, the tension on the fisheries resources as a consequence of human activities is going on heavily. Logging activities, gold mining, land reclamation for agriculture, utilization of pesticide for wood preservation for instance have been and will continuously be sources for quality degradation of the aquatic ecosystem. It is realized that along with the increase in human population those activities will become stronger in the future, which implies that more basic need will be demanded. For this reason, there should be an effort formulated not only merely to overcome the negative impact of human activities in one side but also to fulfill the need of people without causing a negative implication on the environment on the other side.

Logging Activity

The activity related to logging activities whether illegal or not are common conducted in Central Kalimantan. Although there is data on it available but it is certainly that the effect of its can be directly or indirectly affected the fish's habitat and to the fish themselves. Directly, it affects the fish biodiversity and its related aquatic component when the water temperature rise due to no tree's canopy remains to shade the aquatic system. This has also cause increase in penetration of the sunlight in to the water (higher light intensity occurs) which have caused negative effect on the existence of phytoplankton including its abundance, distribution and diversity. The logging and related activities in adjacent areas of forested watersheds can adversely affect aquatic life (McCool *et al.*, 1986). This has destroyed the riparian vegetation which shades stream and provide bank stability, overhead cover, food for fishes (by insect drift) and allochthonous input to support the aquatic system (Moring *et al.*, 1994). On the other side, it has indirectly affected the fish biodiversity by increasing in the soil abrasion which have led increase in water turbidity. This high turbidity can cause the decrease in penetration of the light into the water and also can cause clogging to the fish larvae.

The sediment loading during flooding time will change bed structure of floodplain which in turn change on ecostructure of benthos fauna. This also cause change on flow regime which will affect the ecology function of floodplain ecosystem including the migration pattern of fish. Alteration of flood regime is also tending to block the main river channel, disconnect the floodplain and reduce ecosystem diversity. In this case, the fish production tends to decrease due to reduction in the aquatic area and drop in the water level due to shallow process.

Pesticides are also widely utilized for log/wood preservation. After used the waste of this activity are directly discarded to the river, as a result the pesticide will enter and be accumulated into sediment and due to microorganism activity they are engaged into food web including the fish. Thus, it might have a negative effect to human health if the fish already contaminated by the pesticides are eaten.

Peat Swamp Reclamation

One of the projects in Central Kalimantan called 1 Million-Hectare Mega Rice Project has been well known to cause negative effect to the environment including to the aquatic resources. In this case the construction of the canal by digging and cutting enormous peat forest have changed not only terrestrial habitat but also the peat swamp function as a fish habitat. Soil leaching from the open acid soil has lowered the water pH between 2.84–3.32 (Anonymous, 1999). Its effect was that no fish could stand on this aquatic condition. Another important effect of this project was that fisheries commodity was lost of the traditional beje operation. Seemingly, the canals construction which cross over the area has cut the connection between beje and the main river, so that water from the river during flooding time could no more inundate the floodplain where the beje existed (Epriyeni, 1998).

Gold Mining

On the one hand, bad condition of Indonesian economic combined with falling in the exchange rate of Indonesian Rupiah to the American dollar have led increasing in gold prices. Both aspects seem to act as a trigger factor for some people in Central Kalimantan turn their work into the gold mining. They are not only mining the gold on the land but also in almost all the catchment areas of 11 main rivers. According to Tim PPLH Unpar (1997), along the Kahayan River alone there had been ± 5,838 gold miners who had engaged in this activity. Unfortunately, in carrying out of their activities, they do not take into consideration of its negative effect on the aquatic environment. In order to separate the gold from other substances mercury is used. At the end of this process the waste mercury is simply discarded into the river. This obviously have cause water pollution of the heavy metal. Based on the research by Tim PPLH Unpar (1997), the mercury was found from the water sample in some area of the Kahayan River ranging from 0.001–0.081 mg/l. This value is above the level permitted for drinking water, i.e. 0.001 mg/l.

In aquatic environment, inorganic mercury (Hg) can be converted by microorganism into *methyl mercury* that is considered to be dangerous and this form of mercury is easy absorbed by the human body. Some 95% of the methyl mercury is absorbed by the gut, and most of it retained and accumulated in the body, and less than 1% can be excreted. In the food web the mercury concentration tends to increase due to accumulation process. In higher tropic level the concentration is higher than the lower tropic level (Mason, 1993). But even a low level mercury concentration can have dangerous effect on the human being. The dangerous effect of mercury can be clinically observed on blood of adult people on level of 0.2–0.5 µg/ml and mercury concentration in the human body as much as 0.5–0.8 mg/kg (WHO, 1976). But for the people who eat fish from the aquatic system contaminated by mercury, the level mentioned above could be possibly exceeded (Mason, 1993). The poisonous effect of mercury is dominated by neurological disturbances (Mason, 1993).

Conclusion

The natural resources of floodplain ecosystem in Central Kalimantan is considered as a huge potency for the local people. Other than its high economic value as an area that produces the fish for the local people, but also its important ecological role on keeping balance between the terrestrial and aquatic ecosystems.

The contribution of floodplain ecosystem to the existence of fisheries activity is very significant through its ecological role as a nutrient trap, nursery ground for small or adult fishes and fish breeding ground: all of those role are in turn enriching the fish biodiversity whether in the floodplain area itself or in the connected river. As a consequence, it is also increasing the fish yield by the fishermen.

Regarding the traditional fishing activity in the floodplain area, there should be an effort done to the improvement of fishing ability while taking into consideration the carrying capacity of the existence of the aquatic ecosystem. The beje fisheries as an wise alternative might be developed in the area by modifying beje, so it is not only acting as a fish trap but also as a culture facility. But in its operation, the modified beje should be constructed by following the nature of floodplain ecosystem. It also should be avoided to clear the land by cutting the tress and other plants in the area during its construction.

There have been heavy tensions on the fisheries resources in the floodplain area and its related rivers as a result of human activities. The activities in the future certainly will be continued and will act as main sources for fisheries degradation in the area. It is no wonder then the fisheries resources will be extinct in the future along with the degradation of the floodplain ecosystem and other related aquatic ecosystems. An immediate action then is necessary to be done to avoid this prediction coming true in the future.

References

- Anonymous. 1998a. The Development Study on Comprehensive Regional Development Plan For The Western Part of Kalimantan (SCRDP-Kaltengbar). Draft Final Report. Pacific Consultants International. International Development Center of Japan. Sector Plan 2. Vol. 5.
- Anonymous. 1998b. The Development Study on Comprehensive Regional Development Plan For The Western Part of Kalimantan (SCRDP-Kaltengbar). Draft Final Report. Pacific Consultants International. International Development Center of Japan. Sector Plan 1. Vol. 4.
- Anonymous. 1998c. Potensi Daerah Dan Kebijaksanaan Pembangunan di Kalimantan Tengah. Pemerintah Daerah Tingkat I Kalimantan Tengah. 58 pp.
- Anonymous. 1998d. Evaluasi Pembangunan Lima Tahun (PELITA) VI Sub Sektor Perikanan Kalimantan Tengah Tahun 1994/1995 – 1998/1999. Pemerintah Daerah Tingkat I Kalimantan Tengah. Dinas Perikanan, 45 halaman.
- Anonymous. 1999. Laporan Antara Studi Implementasi RKL-RPL Proyek Pengembangan Lahan Gambut Kalimantan Tengah Anggaran 1999/2000. Departemen Pendidikan dan Kebudayaan Universitas Palangka Raya. Lembaga Penelitian Pusat Penelitian Lingkungan Hidup.
- Burrows, I.G. and Whitton, B.A. 1983. Heavy metals in water, sediments and invertebrates from a metal-contaminated river free of organic pollution. *Hydrobiologia*, 106: 263-273.

- Bayley, P.B. 1991. The food pulse advantage and the restoration of river floodplain systems. *Regul. Rivers*, 6 (2): 75-86.
- Conner, W. H. and Day, J.W., Jr. 1982. The ecology of forested wetlands in the south eastern United States. In: Gopal, B. *et al.* (eds.), *Wetlands. Ecology and Management*. National Ins. Ecol. and Inter. Sci. Publ. New Delhi. pp. 69-88.
- Chandrawidjaya, R., 1994. Karakteristik Dan Pola Perilaku Perairan Rawa di Kalimantan Selatan
- Fatimah, S. 1995. Beje Sebagai Alat Tangkap. Harian Banjarmasin Post.
- Hamid, A., 1981. Tatah Beje. Prosiding Seminar Perikanan Perairan Umum. Pusat Penelitian dan Pengembangan Perikanan. Jakarta.
- Kazantzis, G., 1980. Mercury. In: Waldron, H.A. (ed.), *Metals in the Environment*, Academic Press, London, pp. 221-261.
- MacKinnon, K., Hatta, G., Halim, H. and Mangalik, A., 1996. *The Ecology of Kalimantan. The ecology of Indonesia Series. 3rd Volume*. Periplus Edition, 681 pp.
- Mangalik, A. and Arifin., S, 1994. Pengembangan Budidaya Ikan Di rawa Sungai Buluh, Kabupaten Hulu Sungai Utara. Pusat Penelitian Unlam Banjarbaru. 11 pp.
- Mason, C.F., 1993. *Biology of Freshwater Pollution*, 2nd edn. Longman Scientific & Technical. Copublished in the United States with John Wiley & Sons, Inc., New York. 339 pp.
- McCool, S. F., Benson, R. E., and Ashor, J. L. 1986. how the public perceives the visual effect of timber harvesting: an evaluation of interest group preferences. *Env. Manage.*, 10: 385-391.
- Moring., J. R., Garmon, G. C. and Mullen, D. M. 1994. Effects of logging practices on fishes in streams and techniques for protection: a review of four studies in the United States. In: Cowx, I.G. (ed.), *Rehabilitation of Freshwater Fisheries*, Hull International Fisheries Institute, University of Hull, U.K., Fishing News Books, pp. 194-206.
- Muslim. 1997. Pengelolaan dan Pemanfaatan Perairan Rawa Melalui Tehnik Beje di Desa Bakung Merang Kelurahan Panarung Kotamadya Palangkaraya. Departemen Pendidikan Dan Kebudayaan, Universitas Palangkaraya, Fakultas Pertanian, Jurusan Perikanan, Program Studi Manajemen Sumberdaya Perairan. 29 pp.
- Piotrowski, J.K. and INSKIP, M.J. 1981. *Health Effects of Mercury*. MARC Report 24. Chelsea College, London.
- Page, S.E. 1999. *The Natural Resource Functions of Tropical Peatlands*. Department of Biology, University of Leicester, Leicester.
- Richardson, C. J., Tilton, D. T., Kadlec, J.A., Chamie, J. P. M and Wentz, W. A. 1978. Nutrient dynamics of northern wetlands ecosystem In: Good *et al.* (eds.), *Freshwater Wetlands*. Academic Press. New York. pp. 217-242.
- Sudjana, M. A., 1984. Metode Statistika. tarsito, Bandung. 487 pp.
- Tim Peneliti Universitas Palangka Raya. 1993. Laporan Akhir Studi Program Pengembangan Wilayah Terpadu Bagi daerah Kritis, Minus Dan Terpencil DiKecamatan Kamipang, Kabupaten Kotawaringin Timur, Kalimantan Tengah. Kerjasama Antara Universitas Palangka Raya Dengan Bappeda Propinsi Daerah Tingkat I, Kalimantan Tengah.

Tim Studi PPLH Unpar. 1997. Laporan Hasil Studi Identifikasi Dampak Lingkungan Penambangan Emas Tanpa Ijin (PETI) Pada DAS Kahayan Yang Meliputi Kecamatan Kahayan Tengah, Banama Tingan, Sepang, Kurun, Tewah, Dan Kahayan Hulu Utara Kabupaten Daerah Tingkat II Kapuas. Kerjasama Antara Proyek Pembinaan, Pengembangan Dan Penyuluhan Usaha Pertambangan Tersebar di Enam Kabupaten/Kotamadya Daerah Tingkat II dengan Pusat Penelitian Lingkungan Hidup (PPLH) Universitas palangkaraya.

Welcomme, R.L., 1979. *Fisheries Ecology of Floodplain Rivers*. Longman, London and New York. 313 pp.

Welcomme., R.L. 1994. The status of large river habitats. In: Cowx, I.G. (ed.), *Rehabilitation of Freshwater Fisheries*. Hull International Fisheries Institute, University of Hull, U.K. Fishing News Books, pp. 11-20.

Socio-Economic Values of Wetlands for Dayak Community in Central Kalimantan

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Abstract

Central Kalimantan Province has not only been covered by primary and secondary thick freshwater but also by tropical peat swamp forests. The soil of Central Kalimantan is poor. It is only 8% of the Central Kalimantan soil is alluvial where mostly traditional rice cultivation have been long practiced. This degradation is believed as the effect of excessive forest felling through government programs, which have been implemented since the beginning of 1970. This condition has been made worse and intensified by the 1 Million hectares rice project (PLG) in 1996, and also the newest but controversial forest policies: "Forest for people", and legal forest felling licenses (IPK).

The largest Dayak groups include the Iban and the Ngaju of Central Kalimantan, lived along the river banks (a part of wetland ecosystems) and earned their life from the traditional rice shifting cultivation, "berladang" as their main subsistence for generations.

Central Kalimantan is dominated by natural wetlands. They are covering more than 19.61% of the total Central Kalimantan area. The main wetlands habitats in Central Kalimantan are fresh-water swamp, peat swamp, mangrove forest, beach vegetation and freshwater lakes. The values of wetlands to the indigenous people of Central Kalimantan, the Dayak cannot be underestimated as they have been the main source of their livelihood, especially for traditional rice shifting cultivation, secondary forest and non-forest product and traditional fisheries.

As the result of the extensive natural resources exploitation in Central Kalimantan, including the conversion of wetlands for agriculture, the local Dayak Community, have been facing many complicated socio-economic problems: job opportunity, scarcity of natural resources as their main livelihood, the humiliation and ignorance of their traditional right.

Reacting to these problems, the local traditional leaders of Dayak seek for the best solution. They have declared that they strongly support any effort in natural conservation where by the main livelihoods of the indigenous people can be maintained and developed in the future.

Introduction

Centralt Kalimantan province is the third largest province in Indonesia; 15,380,000 ha, or more or less as large as one and a half time of Java and Madura islands. This part of Borneo island has been well-known by its tropical rain forest, which is up to 1993, 84% of this area was still covered by both primary and secondary forest which mainly freshwater and peat swamp forests, around the rivers of Kahayan, Seruyan, Sebangau, Mentaya (Rampai, 1993). But now the percentage of these forest areas is of course substantially reduced mainly because of the extensive forest cutting and land clearing by both legal and illegal logging for new transmigration program and the implementation of the 1 Million hectare Mega Rice Project in January 1996 and new forestry policies: "**Forest for people**" by providing more legal licensees (IPK), for

forest felling, i.e. 777,180 ha. Now in Central Kalimantan, there has not any conversion forest left, and the deficit of conversion forest is about 777,000 ha (Tim Realitas, 1999).

In terms of soil type, the result of research conducted by JICA 1998: D12-2, shows that Kalimantan's soils including Central Kalimantan are poor. It is only 8% of the Central Kalimantan soil is alluvial soil where mostly traditional rice cultivation was practiced. This might be true as the result of extensive and unplanned forest and other natural resources exploitation. This fact is very discouraging because Central Kalimantan used to be very rich in terms of its Natural Resources as reflected in this quotation (Kusni and Rukiah, 1999):

Central Kalimantan was characterized by thick, green tropical rain forest, impenetrable by the sunlight; big and small rivers with abundant freshwater fish; fertile soil where even wooden stick could grow easily became a tree, and the sky above it was crowded by various birds from early morning until night. Its natural resource was so rich that it could provide every thing for the people.

Therefore, 500 years ago the largest Dayak groups include the Iban and the Ngaju of Central Kalimantan, who mostly lived along the riverbanks, have been very knowledgeable in utilizing wetland ecosystem as a part of the main resources of their livelihood. Dayak swidden farmers have accumulated knowledge and skills of land and forest management (Sasaki, 1998). Dayak people are mainly traditional shifting cultivators of hill rice, within the areas, where they could find out mineral soil and alluvial plains along the main rivers of Kahayan, Kapuas, Barito, Katingan, and Sebangau rivers, with a short cropping regime and a longer fallow (5-20 years) to allow fertility to recover. (MacKinnon *et al.*, 1996). In many ways including in cultivating the soil (berladang), they were very much dependent on the natural systems and signs. For example, they could tell when there would be rainy or dry seasons (common indicators in shifting rice cultivation) by looking at the position of the moon ("bulan bunter", "bulan monos"), the stars ("bintang patendu"), winds and other natural signs, such as thunder storms, the sound of animals, etc. (see also Sellato, 1989b and Harrisson, 1960 in MacKinnon *et al.*, 1996). So that hundreds years ago and up to 1970s natural phenomena were predictable. With regard to the wetlands utilization, they have learnt that what they call "LUWAU", the peat land "NAPU", the ever-wet land areas have never been good for rice cultivation. So that they had neither cultivated nor exploited peat land in the inland areas for rice planting. However, they very well understand that this has been the characteristic of the soil in Central Kalimantan, and as well as they understand that this type of soil provides much livelihood either in terms of forest or water resources. Therefore, at the same time, they have been very much dependent on those natural resources: water and peat swamp forest and non-forest resources. For this reason, they have their own concepts on living harmoniously with the natural resources: "***Rewan Penyang Hinje Simpei, Rewan Tingang Kampungan Renteng, Rewan Lamiang Tusukan Samben***". (Declaration of Bumi Tambun Bungai 1999) This can simply be translated as: We are the Dayak, who live and earn life in Bumi Tambun Bungai, Central Kalimantan as the owner of the abundant natural resources will always think and act wisely in utilizing it so as the life will go along harmoniously with the nature." It is true because the natural resources of Central Kalimantan have provided the needs of Dayak to live happily and prosperous. This culture of Dayak has been very effective until the beginning of 1970. Up to the late 1970s, even if Dayak people lived in the remote areas in the upstream of the Kahayan River, for example, they had never

suffered from hunger. This was due to at this time almost every Dayak family had their own “LOSOK PAREI”, barn of rice, where they stored rice supply enough for more than two years resulted from once rice harvesting. At that time every Dayak family undertaking traditional shifting cultivation with only once a year harvesting time. However, when the sectoral government programs including, **land clearing for big scale plantation, transmigration, logging concessions and other government jumping projects such as livestocks, and fisheries** were executed by the beginning of 1970, forest and other natural resources were extensively exploited. This resulted in significant decrease in local people’s subsistence areas and great ecological problems. Therefore, everything including the weather: dry and rainy seasons and flood were unpredictable, and at the same time traditional shifting cultivation of Dayak society in lowland and wetland ecosystems hardly ever harvested successfully. It has been even worse because the above government programs have never contributed revenues to raise the welfare of the indigenous community. Therefore, the whole life style and the culture of Dayak in Central Kalimantan have accordingly changed very much. The changes viewed from many aspects, have been very fatal, not only to the Dayak community (not limited to those group who are traditional shifting cultivators but also to those who are civil servants) within Central Kalimantan but also to the whole world since they mostly affected the ways people earn their lives and as well as the ways perceive the natural resources where their livelihood generated. Since traditional shifting cultivation is no longer effective, most of traditional shifting cultivators of Dayak community have changed their ways of earning life i.e., by illegal logging, and traditional gold mining, etc. These two sectors have been very intensive, as they are very promising. In fact they are fully aware that these natural exploitation are hazardous to the whole ecosystems including their lives, but they act indifferently as they have learnt that the “outsiders” have been greedily exploited their livelihood through the legal logging concessions, why could not they? So that they have to compete with them in any ways they could.

Now since the ecosystems have been very much exploited, that the traditional farmers of Dayak have nothing in their barns. This group of communities now has lost their livelihood. Consequently, under this condition, there have been many social problems occurred within the local society and the outsiders, the forest concessions and gold-mining owners. This will surely increase complicated and serious socio-economic problems in Central Kalimantan in the coming years.

With regard to those problems, recently, there is a greater attention addressed to wetland ecosystems, especially tropical peat land in Central Kalimantan since it has been extensively exploited and converted for agriculture, the rice project. This paper reviews the socio-economic values of wetlands in Central Kalimantan.

Central Kalimantan’s Wetlands

Generally the major habitats of Kalimantan are wetlands, covering more than 10 million ha, or it is about 20% of Kalimantan’s land mass (MacKinnon and Artha 1981 in MacKinnon *et al.*, 1996). Where as in fact, the whole area of Central Kalimantan’s lowland is dominated by a naturally ever-wet, partially inundated, water catchment and floodplains for the rivers from the peripheral mountain ranges. In the everwet environment of a tropical floodplain, the fallen leaves and dead wood of vegetation do not decompose completely, accumulating to form a substrate of organic debris, called peat (Rijken, 1999).

Central Kalimantan's wetlands are also characterized by freshwater regulated by lake and rivers systems (11 main rivers and 33 tributaries, and 20,000 freshwater lakes), peat swamp regulated by rain systems (with rain falls 129 mm in average/year), and coastal mangroves regulated by tidal systems (Kalimantan Tengah Dalam Angka, 1997). In this case Central Kalimantan's wetlands are interchangeably wetted and dried. There is about 19.64% the area of Central Kalimantan are wetlands. The rivers of Kapuas, Mahakam, and Barito in Central Kalimantan have been the extensive floodplains with associated swamps and lakes system. Central Kalimantan wetlands habitats can be described in Table 1.

Table 1. Wetlands habitats in Central Kalimantan

Type	Original area (ha)	Remaining area (ha)	Area included in reserves (ha)	Percent protected
Freshwater swamp	1,880,000	940,000	78,000	4.1
Peat swamp	996,000	872,000	98,000	9.8
Mangrove forest	120,000	100,000	11,000	9.1
Beach	?	?	-	-
Vegetation				
Freshwater lakes	20,000	20,000	-	-
Total	3,016,000 100%	1,932,000 64%	187,000 6.2%	

Source : MacKinnon *et al.* (1996)

Natural wetlands provide people, either directly or indirectly, with an enormous range of advantages: staple food plants, commercial timbers, fertile grazing lands, support for inland and coastal fisheries, flood control, breeding ground for waterfowl and fuel from peat. These hidden values are rarely quantified. They are often overlooked in regional development plans. The same is true in the case of Central Kalimantan Development plans, which have been very seriously damaging wetland ecosystems.

As well as to the sustainable ecosystems, natural wetlands are extremely valuable to the local Dayak community. They are the main livelihood sources that guarantee their existence in this global world. So that the sustainable and integrated management of the wetland ecosystems is the key terms that should be taken into account in the development program of Central Kalimantan. For the local community this is the matter of survival. In the following parts, the indigenous people's livelihood: traditional shifting rice cultivation, harvesting secondary forest product, and traditional fisheries are reviewed in general.

The Indigenous People's Livelihood

For the indigenous people of Central Kalimantan, natural wetlands are the main livelihood. Therefore they have been very dependent on these natural resources. In this context, wetland resources have been used in various methods for various uses. The followings are the most common uses and have been long practiced:

a) Traditional Shifting Rice Cultivation (Ladang berpindah)

The traditional shifting rice cultivation is not only the cultural and economic cornerstone of Dayak peoples, but it has been the main subsistence activity. Shifting rice cultivation is especially important in Central Kalimantan as rice is the source of all life. There is around 30% of the population in Central Kalimantan involved in shifting cultivation (MacKinnon *et. al.*, 1996). And according to Sasaki (1998) there are more than 900,000 house members in Central Kalimantan are related to swidden agriculture.

The cycle of cultivation usually starts in May by slashing of the undergrowth, then felling of the trees. Then fields are burned in August by using wise and ritual traditional method which is well known as “TATAS METHOD”, and also by following wind direction, where by fire could not spread out to the other areas. After the land is cleared, in September the rice is sown in traditional ways by the so called “TUGAL” system, i.e., by making many holes using wooden sticks and carried out by many men followed by the equal number of women who put the seeds of rice into the holes. In this way the whole activity is very cost effective. Generally harvest time is around February the following year, during the short dry season.

But the history of traditional rice cultivation in Central Kalimantan, since late 1970s up to present time have been characterized by failures. This is due to two interchangeable extreme dry and rainy seasons. In 1997, traditional rice cultivation was totally failed due to extended draught and fires. This year, starting from mid-October 1999, the whole area of river-side especially Katingan, Rungan and Kahayan rivers have been totally flooded, and the lowland areas within the ex-PLG project are threaten by flood. So that there is no hope for the local and traditional farmers to harvest their paddy crop because 100% of their “ladangs” have been destroyed by severe strong flow flood (Kapos, 2 November 1999).

b) Harvesting Secondary Forest Product:

Harvesting minor forest products brings incomes and employment to local communities. The income of the Dayak people in Central Kalimantan is not only generated from paddy cultivation but also resulted from harvesting secondary forest product, cash crops such as damar, jelutong latex, natural rubber, honey, hunting, gemor, fresh water fish, rattan. Since these income generations were cultivated by simple and traditional ways, i.e., aimed at satisfying the very limited subsistence level of needs, the natural ecosystems were not disturbed. The following table shows some common secondary forest product as cash crops in Central Kalimantan.

From the table above, rattan was the leading secondary forest product in Central Kalimantan. However, the local price for this product has not been in a good prospective. Other products such as Jelutong latex and gemor went down. Especially for Jelutong product decreased by approximately 37.76% on average during this last four years. According to some local people interviewed informally, this was not due to the heavy forest felling for big scale plantation and forest fire in 1997, but also the methods used in harvesting it was not in sustainable manners, i.e., by felling the tree. The same is true with edible nest, this product was totally collapsed since 1997 until now. According to local people the price of this product now is in good prospective, the best quality reaches Rp. 10,000,000/kg. Where as honey of wild bees have been totally lost. Actually the presence of wild bees producing honey has a very strong collaborative relationship with the traditional rice cultivation. Bees help pollination process paddy

flowers.

In addition, Central Kalimantan's forests like other Borneo's forest, are rich in wild and or cultivated edible fruit trees including various kinds of mangoes (*Mangifera*), mangosteen (*Garcinia mangostana*) (which is also a favorite fruit of both Queen Victoria and wild orangutans) (MacKinnon in MacKinnon *et al.*, 1996), rambutans (*Nephelium*), durian (*Durio*), langsat (*Lansium*) and rambai (*Baccaurea*) (MacKinnon *et al.*, 1996).

Furthermore, there are also locally well-known typical wild and edible fruit trees of Central Kalimantan. For examples, such as "tongkoi", "paken" belonging to *Durio* species, "kasturi" and "rarawa" belonging to *Mangifera casturi* species, "manamun", and "katiau" belonging to *Nephelium* species, and "mangkahai" and the most delicious is "banturung" of jack fruit type. These fruits are also important nutrients for the local Dayak communities. So the importance of secondary forest products for indigenous can not be underestimated.

Table 2. Common secondary forest product in Central Kalimantan

Types of non-forest products	Unit	Production realization				
		1994/1995	1995/1996	1996/1997	1997/1998	1998/1999
Rattan	Tone	5,436.51	10,912.98	12,321.43	8,948.837	12,000.216
Rattan Manau	Piece	56,380.000	405,384.00	570,338.00	217.825	1,083.093
Damar	Tone	447.525	1,064.93	208.00	725.000	412.736
Gaharu wood	Tone	53.66	62.02	0.145	0.005	-
Jelutong latex <i>(Dyrea costulata)</i>	Tone	249.87	151.44	171.00	54.000	19.000
Kulit Gemor	Tone	2,983.00	1,567.74	952.55	233.000	362.736
Sarang burung/ Edible nests	Tone	1.42	1.34	0.028	-	-
Madu Hutan /Honey		NA	NA	NA	NA	NA
Pasak Bumi <i>(Eurycoma longifolia)</i>	Tone	-	-	-	2.000	-
Sirap	Piece	-	770,000.00	2,234,500.00	61.040	350.040
Kemedangan	Tone	-	-	-	-	138.010
Biji Tengkawang	Tone	-	312.00	0.11	-	-

Source: Adopted from Laporan Tahunan Departemen Kehutanan dan Perkebunan-Kantor Wilayah Propinsi Kalimantan Tengah, 1998/1999

c) Traditional fisheries

To the local Dayak community in Central Kalimantan, fish is very important protein sources. It is the main-source of animal protein for them. Fish consumption per capita is higher in Kalimantan than in any other part of Indonesia, three times greater than in Java (Birowo, 1979 in MacKinnon *et al.*, 1996). Fish consumption per capita, per year in Central Kalimantan reached 40.08 kg in 1998 (Evaluasi Pembangunan Lima Tahun-Sub Sektor Perikanan Kalimantan Tengah, 1994-1999).

In Central Kalimantan there are two types of fisheries: "Perikanan Laut", sea fisheries, and "Perikanan Darat", inland fisheries. The development of those fisheries can be explained in Table 3.

It is clear from Table 3 that freshwater fisheries were less developed. Marine fisheries generated 53.64% of the total fish product whereas inland and fresh water

fisheries did only 46.35%. This seems very illogical condition as Central Kalimantan fresh water fisheries resources are greater than marine fisheries.

Table 3. Fisheries Development in Central Kalimantan

No.	Type of fsheries	1993	1994	1995	1996	1997	Average increase (%)
1.	Perikanan Laut /Marine fisheries	43,221.6	46,900.8	48,233.9	50,542.8	50,027.1	3.78
2.	Perikannan darat/Inland fisheries	44,812.7	45,339.1	44,498.9	45,466.1	43,231.6	0.85
a.	Perikanan Perairan Umum/Inland open waters	44,812.7	42,253.2	41,773.5	42,265.8	39,444.9	3.09
b.	Budidaya/Freshwater aquaculture	-	3,085.9	2,725.4	3,200.3	3,786.7	8.02
-	Ponds	-	2,84.7	2,95.0	3,05.0	4,08.4	13.64
-	Cage/Floating net	-	2,794.2	2,412.1	2,865.3	2,936.3	2.53
-	Sawah paddy	-	4.0	8.3	16.5	192.0	423.31
-	Brackishwater ponds	-	3.0	10.0	13.5	250.0	673.40
	Total production	88,034.3	92,239.9	92,731.8	96,008.9	93,258.7	1.49

Source: Evaluasi Sub-sektor perikanan Kalimantan Tengah, 1998

Some traditional fisheries in Central Kalimantan are: “hempeng” “beje”, tambak, keramba or “jaring apung” are called inland fisheries.

Those livelihoods of indigenous people have been threaten to extinct since the development programs launched especially of those transmigration, logging concessions, and the Big Scale of Private Plantation programs including 1 Million hectare Mega Rice Project, which have been resulted in the most serious multi dimensional problems for Central Kalimantan Province. The threat is not only those, but the ambitious, and unworkable KAPET DAS KAKAB project, the legal license provision of forest felling (in many cases, are given to non-local people) and the newest forestry policies: “forest for people” are the most fatal to the sustainability livelihood of the local people in Central Kalimantan. The followings are some of socio and cultural-economic problems, which have been emerged.

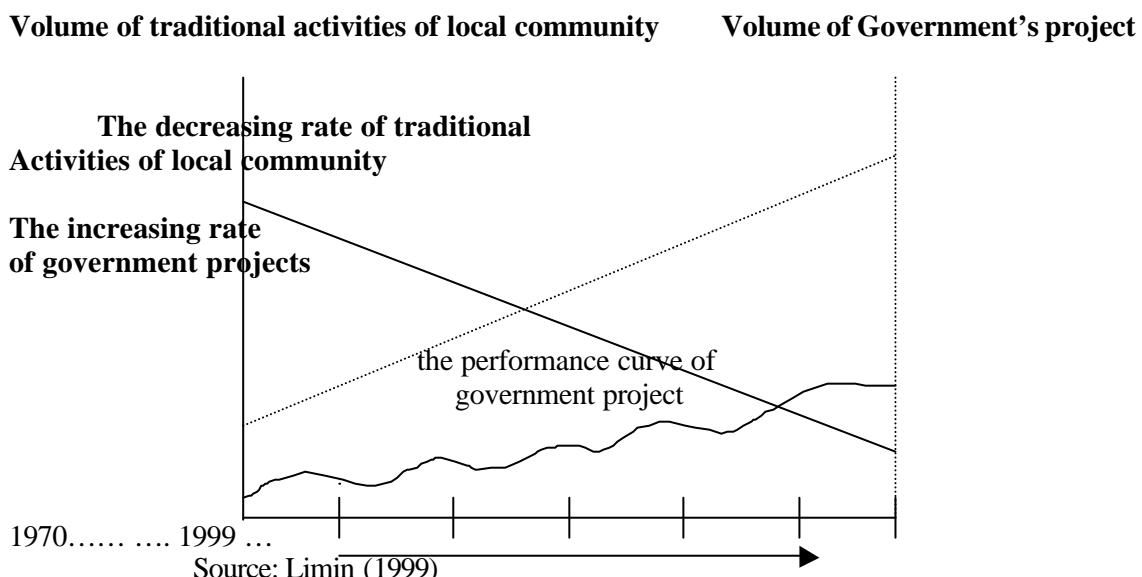
Socio-Economic Problems

Since the natural resources have been extensively exploited mainly through the sectoral government programs mentioned above, there have been many socio-economic problems widespread in Central Kalimantan. Here are the main problems:

a) Less access to Job opportunity

At the beginning, the local people thought that the government's development programs in plantation, logging concession and transmigration sectors are of great benefit for them, as they would provide more job opportunities. On the contrary, and in fact, only the “new comers”, the workforce from outside were recruited to work in the program, especially the transmigrants themselves. The local people have been ignored on the reasons that they were lack of skills and uneducated (Limin, 1999) All of the owners

of forest concessions, gold mining are from outside. The cultivation of forest resources and gold mining in Central Kalimantan has put the local people in a difficult position, they are passive spectators (Nasir, 1999). For example, many forest concessions operated within the area of Sandung Tambun and Upun Batu, Central Kalimantan, did not employ the local work force but recruited human resources from outside Kalimantan (Usop *et al.*, 1994) and (Awan, in Kapos Maret, 1999). Under this condition the local people were in the cross section of the roads. Further more, the number of ad hoc government's program like logging concession, big scale private plantation companies and the new forestry policies have been intensified from time to time. Where as the traditional activities, such as traditional shifting cultivation and as well as the areas for this activity has been reduced sharply. This condition can simply be described in the following figure:



This has changed the whole ways of their life. They would never go back to their former job as traditional shifting cultivators. This is because, in the one hand the ecosystems and the whole nature, which used to facilitate traditional shifting cultivation, have totally changed. They are not friendly anymore, the weather is not predictable, the water resources have been destroyed and polluted, lands and the forest resources as their livelihood have been so limited. On the other hand, those people, especially the young generation of local people are not ready to face the difficult life. Further more, young local people are from economically weak family, so that they have less opportunity in education, therefore many of them could not get any job in government sectors. So what are they earning and where are they going for life? In this way, the local people have been systematically marginalized (Kusni and Rukiah, 1999).

b) Loss of livelihood source and lack of accessibility to natural resources use

As the time goes and the government programs have been implemented and expanded the local community have now been in great difficulty. This is not only due to the excessive forest and land exploitation but also due to the extended forest concession

given that covering the whole area of Central Kalimantan, leaving no area for the traditional activities of local community. It has been the fact that the local community, who cut the tree for their own construction materials, around their villages, are often charged by legal action, because they were accused to have stolen the tree of certain forest concession. It is even more ironic that the local community have to go down to the capital city of Central Kalimantan, Palangka Raya, which took 3 up to 6 h by speed boat or 10–20 h by motor boat, to get wood plank material for coffin. This condition has gradually made the local community not only lost their trust to the government and its policies, but also their responsibility to the natural resources.

In addition, gold mining as practiced by PT. Ampalit Mas Perdana and PT Indo Muro Kencana, have no real contribution to the local community around the area. A research team from Palangka Raya University has reported that there have been a serious socio-economic gap between the local society and those are the employment of this company. Inside the area is equipped with sophisticated facilities; electricity, telecommunication system. Where as out-side, the surrounding villages have been neglected and live in the dark, with out electricity. The local community has been forbidden to traditionally mine gold, where they used to do so as their main income (Limin, 1999). Further more, the totally failed Mega Rice Project (PLG) in the area of the Kahayan, Kapuas and Barito Rivers, in 1996, has its own story. The story was expressed by Yetsi Ronjan, one of the traditional leaders of Dayak Ngaju at Dadahup village, he said he still remember how the Governor, Warsito Rasman expelled people from the area of the project. The governor said: “the PLG project is the development project, so who ever hampers the project is a communist (the PKI)”(Tempo, 1999). It is true that the local community within the area of PLG, around the mouth of the Kapuas River, have for generations harvested rattan and fish from traditional fisheries ponds (beje). In this area long before the project commenced, one person could gather 8 to 10 tones per ha of rattan plantation or it was equal to Rp. 500,000/ton, and Rp.300,000 per fish pond (beje)/harvesting, which was harvested twice a year. But now this is an old story, because the PLG project has destroyed all of those livelihoods of the local community, the Dayak (The Guardian, 18 February 1999).

c) Economically trapped.

The lifestyles of the local community, the Dayak, have been particularly relax, and there has not much competition among them. This is commonly assumed that the local people have been so far pampered by the abundant natural resources in the past: by getting down to the river, in a moment they could catch enough fish, gold, and a few steps from home, they could harvest vegetable. Where as from traditional rice cultivation they could get enough rice for one or two years ahead supply. In this way, the local people did not have to work hard for earning life (Rukiah and Kusni, Kapos, July 1999). They felt there was no need to save for future needs. And market places were not developed, so that there had been few of local people as traders. In one case, they have been traditionally formed as hopeless producers and buyers or the consumers. Since most of the local people lived in the remote areas, in the upstream of the rivers, with poor transportation infrastructures, which by it was very difficult to reach either in the dry or rainy seasons.

This condition has affected the whole aspect of their life. So that they had less access to the market places, to technology, to education and as well as to information.

This condition has also been used effectively by the outsiders, forest concession owners, including traders from South Kalimantan, either directly or indirectly to take the advantage. For example, those traders have been very clever, they have very well understood that the local people were in a very weak position. Therefore, they have the biggest role in determining the prices of goods and services as they wish. For examples, on the one hand, the price of rice, sugar, vegetable oil and so on can be 300–400% higher than in the market places in Palangka Raya.

On the other hand, the price of local commodity: rubber, rattan, jelutong latex is much lower. From an interview with the local community, it was found out that the price of jelutong latex produced by local farmers is Rp. 250,000 per quintal (100 kg), but the middle traders sell them to exporters on much more higher: Rp. 2,500,000. The same is true with rattan and the other forest products and services. Casual logging workers get paid Rp. 40,000/day (2.82 pounds), and independent logger get Rp. 190,000 for a cubic meter of ramin or red meranti. Where as the middle man gets four times as much in Jakarta (The Guardian, 18 February 1999). Further more, since the beginning of 1990s, rattan prices dropped to half of the previous price level, due to the export ban of semi-processed rattan canes. So that many swidden farmers in Central Kalimantan shifted their efforts to rubber cultivation. Recently, rubber price has been very low, therefore, many people turned to traditional, but naturally unfriendly small-scale gold mining (SCRDP-Kaltengbar, 1998). There are approximately 1904 units of water pump machines have been used for extracting gold along the Kahayan River alone. In this case, the local communities have been placed only as the potential market of nine consumptive necessity goods. Having done an in depth study on the socio-economic and cultural aspects of the local people in Pulang Pisau, (Central Kalimantan), Sjarkowi (1999), described Pulang Pisau, which used to produce 75% of Kalimantan timber production, looks like a dead city, indicating not even a single sign of economic development. Consequently, in terms of economy and geography, the local communities, especially those who totally dependent on the natural resource base, have been trapped into a highly dependency.

d) Legal oppression of local tradition, culture and customary rights

The centralized government of “*orde baru*” has been the main source of many scio-cultural and economic problems in every province of Indonesia, including the province of Central Kalimantan. During this regime, every traditional and customary institution, such as “lembaga damang” has been totally destroyed and amalgamated into governmental institutions. Therefore, those institutions were unable to function as they were used to be, i.e., as the important tools for conveying ideas and leading the indigenous people to harmonious life within the community. Cultural values were also oppressed, for example, by integrating the indigenous religion of Dayak, “Agama Kaharingan” with Hindu. Without this integration, the Kaharingan people would not get any legalization in Indonesia (Kusni and Rukiah, 1999).

In terms of traditional land right and customary right, the local people have established their right on a certain land area around their villages, and along the river banks, either in the high land or in the low land areas in Central Kalimantan, since the first time they made a swidden of primary forest land. Their children and other relatives on certain conditions can inherit the land ownership. Therefore, community members know well which land belongs to whom. In many cases, fruit trees or other useful trees

planted by the person designated as the mark of the land ownership. This has been confirmed by a regent, Badrus sapari in Kuala Kapuas regency in 1953. Some of the confirmed customary rights are:

- 1). The customary right (“hak ulayat adat”) as far as 5 km² from the left and right sides of the river or as far as the sound of “gong” is heard.
- 2). The customary right on main source of livelihood (“hak tanggeran, hak rutan pantung, hak anak sungai, hak danau, hak beje, hak andil tatas, hak panggul, sapinang sapukang, hak buhu huma hak petak rutan dan hak pahewan”). These customary rights have been established within the local community of Dayak for generations (Siun, 1999).

However, as the government project was introduced for natural resources extraction or land development over the territories of the indigenous communities, the situation have totally changed. In this case, the local traditional and customary land right of Dayak became powerless and overlooked by the government policies.

It is clearly stated in the national constitution of Indonesia, established in 1945, that land, water and natural resources are controlled by the government and are utilized for the interest of the public. Although local customary rights to land and natural resources have been acknowledged in the Basic Agrarian Law of 1960, the utilization of such customary right must not disturb the national and state interest concerning land and natural resources development. In fact, according to Article 10 of the Basic Agrarian Law of 1960, it is clearly stated As well that it is necessary for a person to get rights to agricultural land to actively or exploit by himself or herself on the appropriate methods, and permanently used. With regard to this Law, there are two problems have been facing by the local community: firstly, they just did not realized about this law. Secondly, since the indigenous shifting cultivation is composed of two main characteristics, opening forest for cropping and forest fallow, the indigenous swidden farming can not meet the condition to get formal land rights, because it is not permanent land use. This condition even worse at present time. The implementation of the new forestry policy on the forest extraction, “Forest for people”: the Decree of the minister of Forestry and Plantation number 677/1998/HPHKM. This decree can only allow the forest utilization by the society through many conditions, one of them through a business management called cooperation. Once again the local communities, the Dayak have not well informed with this kind of organization since their traditional customary institutions have been long destroyed and dysfunctional. In fact, there are many logging concession owners and other informal institutions, from outside Central Kalimantan designated forest concession in Central Kalimantan (Tim Realitas 1999).

What Do the Indigenous People Want?

With regard to those problems mentioned above, the local people simply need to be secure both in terms of socio-economic and as well as cultural and natural ecosystem aspects. This means that those aspect should be developed integrated methods, with out neglecting one of them.

With respect to the regional development methods which are being implemented now in Central Kalimantan, many experts are questioning with skepticism on their success. Related to the sustainability of the regional income and as well as the indigenous people’s livelihood, and examining the implication of the newest policy in the forestry department, Nasir (1999) stated that the new policy on forestry which is

called “ forest for people”, however, have legally facilitated great opportunity for serious forest felling. This of course have resulted in great loss of original regional income (PAD), and as well as loss of the livelihood of the indigenous communities in Central Kalimantan. This must not be allowed to happen in the future.

Further more, according to a comprehensive study done by JICA and BAPPENAS in 1998, that if the logging operations and oil palm plantation development are continued at the present pace, Kalimantan’s natural power on which the local people rely for economic activities would broken. And due the exhaustion of timber of timber resources ... in five years, the timber production from timber concession areas will decrease by 30% in Central Kalimantan. By 2018, the timber concession areas in both provinces, West and Central Kalimantan will be no longer productive. This means that the original regional income (PAD) of Central Kalimantan, on which the provincial government heavily relies, will not be very promising to support the coming total regional autonomy.

Addressing those problems, Center for International Co-operation in Management of Tropical Peatland (CIMTROP) at the University of Palangka Raya, Central Kalimantan, academics from various universities and institutions including non-governmental organization from both overseas and domestic, and as well as the local and traditional leaders of “adat in Central Kalimantan on 12-15 April 1999, have produced a declaration called “Declaration of Bumi Tambun Bungai” in Central Kalimantan, through a deliberate discussion. Some important points that clearly expressing the local people’s concern that should be taken into account in managing the land and forest use so as to minimize socio-economic problems are quoted as follows:

Article 2.

2.1. The utilization of Central Kalimantan’s natural resources should be based on:

2.1.1. Carrying capacity of the natural resources and ecosystem of Central Kalimantan. i.e., by a comprehensive, and wise consideration on many factors of local environment such as land, water, forest and as well as wildlife and their functions.

2.1.2. Ways of life of the indigenous people: For example, traditional farming on dry land and wet land must be developed based on the wise tradition which have been proven to be effective, productive and as well as naturally friendly.

2.2. Traditional ownership of the local people on the natural resources which have been passed for generations, must be taken into account in every development program of Central Kalimantan.

2.3. Any symbols indicating our ancestor’s belief must be appreciated and preserved within every format of development program and its execution.

2.4. Every planning and process of development program of Central Kalimantan must involve the local society so as to result in the most appropriate and acceptable and feasible programs.

Article 3.

The local government of central Kalimantan must pass a particular policy on natural resources management so that the welfare and prosperity of the local people can be improved. This can be carried out by:

a. developing both basic and advanced industries for handling the leading commodity within the area;

- b. regulating reasonable basic price rate for local commodity within the local producer level;
- c. empowering the local people to be able to wisely use their natural resources;
- d. providing proper privilege to the local people to own a certain width peace of land so that there will be a wide areas, enough for undertaking traditional economic activities;

Article 4.

Forest Concessions and Industrial forest concessions must be reduced, on the reasons that: 1) in fact the whole area of Central Kalimantan has been allocated for the forest concessions. 2) since the presence of the forest concessions and forest concessions for industrial plant in Central Kalimantan, the local people have never gained substantial contribution from those forest concessions. Instead, as the result of those programs, there have been many socio-economic problems arisen: loss of livelihood, natural resources degradation and last but not least cultural degradation.

In addition to those points, through Kalimantan Peat Swamp Research Project (KPSFRP) a very important facility, the Natural Laboratory for Peat Swamp Forest in Central Kalimantan, has been formally established in 9 July 1999. The main aims of this laboratory are:

- a. providing international natural facility as a museum of ecological components and scientific study
- b. Facilitating research and conservation, as the technology source on peat and peat swamp forest, and as well as facilitating science and technology transfer among experts which is needed for development acceleration both in terms of human and natural resources.
- c. Facilitating scientific as well as eco-tourism and conservation area that brings about positive contribution for the local people and government, through wise and sustainable management of potential natural resources as the main livelihood of the indigenous people.

The existence of this natural laboratory has been acknowledged to the local society through a meeting on 5 September 1999 at the Base Camp of LAHG Sebangau. The most important point expressed by the local communities, and strongly agreed by the management of this laboratory, is that the laboratory should be developed and managed not only for natural conservation but also for the sustainability of their livelihoods, such as jelutung latex, gemor, fresh swamp fisheries, and others.

References

- Conservation of the Sebangau Water Catchment Area in Central Kalimanatan. 1999. A project proposal for the preparatory phase of an integrated conservation and development project to conserve the Sebangau watercatchment area in its original state: The Golden Ark Association, CIMTROP and AIDEnvironment.
- Declaration of Tambun Bungai (12 April 1999)
- Evaluasi Pembangunan Lima Tahun-Sub Sektor Perikanan Kalimantan Tengah. 1998. Dinas Perikanan Propinsi Daerah Tingkat 1 Kalimantan Tengah.
- Kalimantan Tengah Dalam Angka. 1997. Propinsi Kalimantan Tengah
- Kume, T., Sasaki, H. and Yoshinobu N. 1998. Discussion Paper No. 12. Goals of Regional developmmt for Kalimantan: back to Basics, the sustainability of the

- “Kalimantan System”. *The Development Study on Comprehensive Regional development Plan for the Western and Central Part of Kalimantan SCRDP Kaltengbar*. Japan International Cooperation Agency (JICA), National Development Planning Agency (APPENAS) The Government of the Republic of Indonesia: Pacific Consultant International, International Development Center of Japan, Technical Report 2, D 12-2.
- Kusni, J.J. and Rukiah S. 1999. Marjinalisasi Masyarakat Dayak. Local daily Newspaper: *Kalteng Pos*, July 30, 1999, p.6.
- Laboratorium Alam Hutan Gambut (LAHG): Hasil Pertemuan antara Pengelola LAHG dengan Masyarakat Kereng Bangkurai dan Sekitarnya, tanggal 5 September 1999 di Base Camp LAHG Sebangau Tentang Tujuan dan Fungsi Pembangunan LAGH.
- Laporan Tahunan Departemen Kehutanan dan Perkebunan 1998/1999: Kantor Wilayah Propinsi kalimanatan Tengah.
- Limin, Suwido H. 1999. Pengalaman dan Persepsi di Daerah Tentang Pengembangan Masyarakat: Suatu Tinjauan di Daerah kalimantan Tengah.
- MacKinnon, K., Hatta, G., Halim and Mangalik A. 1996. *The Ecology of Kalimantan. Singapore*: Periplus Editions.
- Nasir, Darmae. 1999. Explitasi Sumberdaya Hutan dan Tambang Kemanakah Uangnya? Palangka Raya: CIMTROP UNPAR.
- Nasir, darmae. 1999. “Kesinambungan Pendapatan Kalteng: Antara Pemerintah daerah dan Masyarakat Lokal dari potensi SDA” in *Kalteng Pos*. (Sabtu 24 Juli 1999).
- Rampai, Kiwok D. 1993. Upacara Traditional dalam kaitannya Dengan Peristiwa Alam dan Kepercayaan daerah kalimantan Tengah. Departemen Pendidikan dan Kebudayaan Direktorat Jenderal Kebudayaan Direktorat Sejarah dan Nilai Traditional: Nilai-Nilai Budaya Kalimantan Tengah.
- Sasaki, H. 1998. Discussion Paper No.4. The Place of swidden Farmers (Shifting Cultivators) in regional development of Kalimantan. The JICA Study SCRDP-Kaltengbar. *The Development Study on Comprehensive Regional Development Plan for the Western and Central Kalimantan. (SCRDP – Kaltengbar)* Japan International Cooperation Agency (JICA), National Development Palnning Agency (BAPPENAS). The Government of the Republic of Indonesia: Pacific Consultant International, International Development Centre of Japan. Technical Report 2, D4-3.
- Siun. 1999. “Eksistensi Hak Ulayat Dalam Perspektif Negara Hukum Indonesia (2): Ketika Kompensasi Adil Diakali” in *Kalteng Pos*. (Rabu 1 September 1999).
- Sjarkowi, Fachrurrozie. 1999. Determinan Ekonomi Lingkungan Dalam Upaya Pelestarian Manfaat Ekosistem Lahan Rawa Gambut Tropik. (unpublished).
- Tempo. 1999. Edisi 6 -12 April 1999. pp. 39-48.
- The Guardian. 1999. February 18, 1999. pp. 7-9.
- Tim Realitas. 1999. Media Indonesia. “Merusak dengan IPK”.
- Usop, KMA.M., et al. 1994. Laporan Akhir: Penelitian Pengembangan Desa Tertinggal Ditinjau Dari Pendekatan Sosial Budaya. Pusat Penelitian dan Pengkajian Kebudayaan Dayak Universitas Palangka Raya dan BAPPEDA Propinsi Dati I Kalimantan Tengah.

Problems on Developing Ruminants Livestock in Inland Peat of Central Kalimantan

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Introduction

This writing is aimed at stimulating ideas and discussions and as well as solutions from the participants of symposium on the development of ruminants livestock in inland peat in Central Kalimantan.

Problems Encountered by the Ruminants Livestock in Inland Peat in Central Kalimantan

The main characteristics of ruminant livestock product in Central Kalimantan are the lower meat product. This is due to many important factors in ruminant livestock development, which in fact has not been paid proper attention to and improvement. Those factors are: 1) The quality of grass for feed stuff is very poor, and as well as the lack of farmers on the development of the grass feed stuff. 2) The local indigenous people of Central Kalimantan have not been used to raise ruminant livestock, such as cows, goats, sheep and buffaloes. Even if there are some people raising those livestock, they run in small scale and traditionally. 3) Lack of extension staff for livestock in giving explanation and providing practice about ruminants livestock, and as well artificial insemination, and as well lack of training on techniques of grass for feed stuff. 4) The complex condition of peat land, having high acidity and less fertile. This requires high input and high cost. 5) Low demand of meat (ruminant livestock in Central Kalimantan Tengah), firstly caused by the higher price of meat, reaching Rp.28,000-30,000/kg. This resulted in only a certain group of society who could afford for it. 6) Another reason of low product of meat is due to the less number of livestock, and many of the livestock were utilized as helping workforce. 7) There has not been enough research on the resources structure of livestock and the farmers' objectives of keeping livestock in small-scale and mixed farming scheme, which is generally practiced in Asian countries. Having examined the seven factors above, I try to present data as one of the main important factors in developing ruminant livestock, that is grass feed stuff which is available in Central Kalimantan (Table 1).

From the above table it is known that these types of grass planted in peat areas are within the District Cempaga, Baamang and Katingan. There is not any datum about the type of soil used for planting grass. From the available data only Barito Selatan is known to have produced 50 ton/(ha year), and it is not specified from any particular district.

From a direct formal interview with the Regional Livestock Department of Central Kalimantan, there has not been any complete record on grass feed production, therefore, it is not known the real potential of Central Kalimantan on the production of grass feed stuff. The main reason for not recording the data is classical: "no budget available". At the same time I was informed that the activity of planting grass feed stuff was not done by giving any treatment or input to the land used.

Table 1. Grass feed stuff of livestock under supervision of Regional Livestock Department of Central Kalimantan (ha).

No.	Regency/Municipality	District	Area (ha)	Type of grass
1.	Kotawaringin Barat	Kumai	5.54	King grass
		Arut Selatan	4.34	King grass
2.	Kotawaringin Timur	Danau Sembuluh	0.6	Rumput Gajah (<i>Pennisetum purpureum</i>)
		Cempaga	0.5	
		Hanau	0.25	
		Tewang	0.25	
		Parenggean	5.75	
		Baamang	14	
		Katingan	5.75	
		Mentaya Hulu	7.50	
		Mentaya Hulu Selatan	0.25	
		Mentaya Hulu Utara	0.25	
		Ketapang	0.25	
		Pulau Haman	0.5	
3.	Palangka Raya	Pahandut	2	King grass and Rumput Gajah (<i>Pennisetum purpureum</i>)
4.	Kapuas	Kahayan Hilir	0.75	
		Maliku	2	
		Pandih Batu	1	
5.	Barito Selatan	Bentot	0.50	
		Tamiang	0.50	
		Sababilah	3	
		Pamangka	1	

Source: Regional Livestock Department of Central Kalimantan, 1997

From the points expressed above, it is clear that another constraint that hamper the development of ruminant livestock and grass feed stuff in Central Kalimantan, i.e., lack of government's concern in providing substantial support.

Furthermore from the interview, it is known that the number of cows slaughtered per day is 20 cows. While in the municipality of Palangka Raya, 10 cows are slaughtered/day. In the case, Central Kalimantan requires about 7300 cows per year, while the municipality needs 3650 cows per annum.

To satisfy the need for meat as estimated above, the local producers from Pangkoh, Kapuas District have produced approximately 20%. While 80% of the need is met by the outsiders, from Madura Island of East Java Province.

The price of meat in the municipality of Palangka Raya is moving around Rp.28,000-30,000/kg. If it is conversed into US dollars, it is about \$ 4.5/kg.

Up to this point I have examined that the potential for ruminant livestock production has not been exploited. Based on the fact, this sector has a very good prospective either as an important source of animal protein or as the potential income generation for provincial government in facing the coming full autonomy.

So far the development of ruminant livestock and grass feed stuff is not studied well in Central Kalimantan. This condition is believed to be resulted from the lack of the government's concern and poor human resources and as well as lack of well-planned project of livestock development in Central Kalimantan.

Conclusion

1. There is an urgent need to carry out a comprehensive research on various kinds of grass feed stuff, such as “Rumput Gajah” (*Pennisetum purpureum*), and *Setaria spacelata*, within the area of inland peat. The limited food resource will be the main constraint in livestock production.
2. There should be a research on the development of grazing field for livestock by shifting grazing fields. This technique is important to guarantee the availability of grass feed during the year. This method should be introduced to the local society through a well-planned project.
3. There should be a research on farming system by fully utilizing the available human resources so as to produce the high level productivity of peat land at lower cost. In this way, the farmers and animal husbandry will be able to develop a mixed cultivation business, which is applicable to a large-scale livestock raising, such as cow raising.

Reference

Dinas Peternakan Tingkat I Propinsi Kalimantan Tengah (Regional Livestock Department of Central Kalimantan). 1997, 1999.